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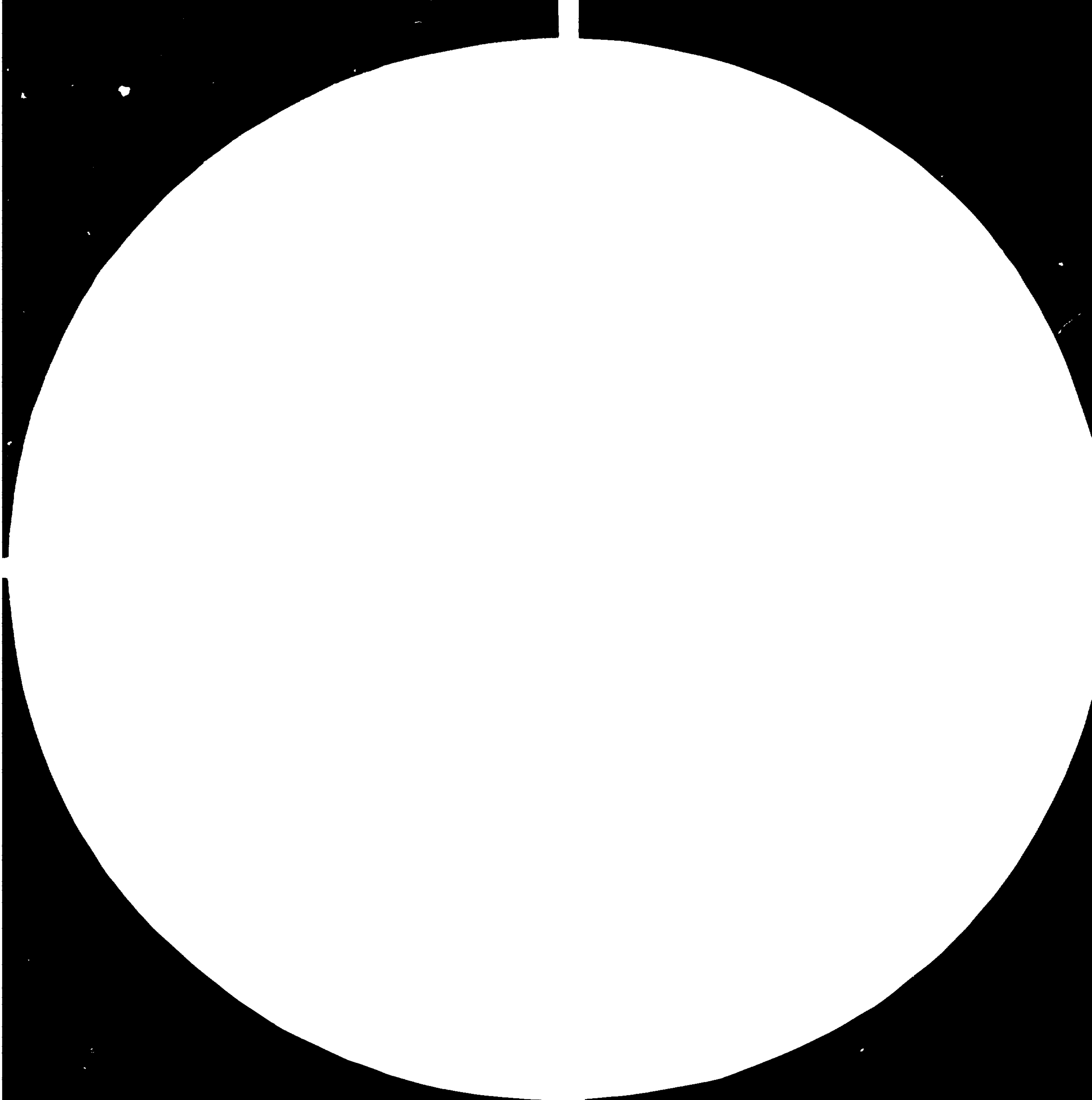

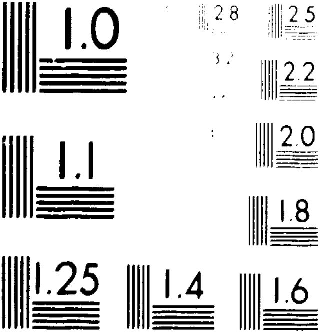
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MANAGEMENT CONSULTANTS

10622
(1 of 10)

FINAL REPORT
ON
THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME I OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

Mr. D. F. Mant
Head Purchase and Contracts Services
Section
United Nations Industrial Development Orginization
P.O. Box 300
A-1400 Vienna
Austria.

August 1 1981

Dear Mr. Mant:

In response to your acceptance of our Final Report on "The Development of a Textile Training System in Pakistan" Werner takes pleasure in submitting ten(10) copies of our Final Report as per our contractual arrangements.

In order that the Final Report will be as complete as possible we are reiterating the major portion of our Letter of Transmittal which was included in our Draft Final Report.

The initial project envisaged 4 training courses, 2 instructor courses and 2 demonstration courses. For the purpose of applying our activities on a wide base the two instructor courses were conducted in one company and the demonstration courses in another. The equipment in each of these mills is different necessitating the compiling of twice as many manuals as would have been the case if the facilities of only one company had been used.

The result is that the attached report is of necessity, in ten (10) volumes.

During the entire project both the T.I.R.D.C. and the U.N.I.D.O. co-ordinater have been kept fully informed of our activities and progress. Their constant co-operation and guidance contributed greatly to the successful conclusion of the project.

We would like to express our appreciation for the hospitality and co-operation which we received from the principals and management of the two companies in which the courses took place, Mohammed Farooq Textile Mills Ltd. and Jubilee Spinning & Weaving Mills Ltd. Without the availability of the facilities of these two mills the project could not have been performed in the manner originally outlined in our proposal.

Apart from the actual instructors who were trained, we would like to identify the following gentlemen who were instrumental in making the project a success.

Dr. M. Kamal Hussein, U.N.I.D.O. Senior Industrial Development Field Advisor

Dr. Niaz Ahmed, Director, T.I.R.D.C.

Eng. Hussein M. El-Missary, U.N.I.D.O. Project Co-Ordinator

Mr. Farooq Sumar, Director, Mohammed Farooq Textile Mills Ltd.

Mr. Muktar Sumar, " " " " "

Mr. Mahmood Chhapra, Mills Manager, Mohammed Farooq Textile Mills Ltd.

Mr. Mian Mohammad Rafi, Chief Executive, Jubilee Spinning & Weaving Mills Ltd.

Mr. Muhammad Shamim, T.I.R.D.C. Head of Quality Control & Training Dept.

Mr. Mohammad Yunus, T.I.R.D.C. Head of Spinning Division

Mr. Abdul Majeed, T.I.R.D.C. Head of Weaving Division

Mr. Latif E. Jamal, Chairman, Husein Industries Ltd.

Mr. A. Ghaffar Adamjee, Chief Executive, Adamjee Industries Ltd.

Mr. Mian Suhail Farooq Shaikh, Chief Executive, Colony Sarhad Textile Mills Ltd.

Mr. Zafar S. Sheikh, Chief Executive, Indus Dyeing & Mfg. Co. Ltd.

We sincerely hope that our efforts have been of benefit to the T.I.R.D.C. and the companies which were associated with the programme, and that the Pakistan Industry at large will continue to gain as a result of this work.

Yours sincerely,
WERNER INTERNATIONAL

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I. INTRODUCTION

I. INTRODUCTION

One of the major problems facing the textile industry in Pakistan is an acute shortage of skilled workers, supervisors and fitters.

The industry was hit hard, in the early 1970s, by a substantial outflow of workers to the Middle East, and more recently by a movement of workers to other industrial sectors, which offer higher wages, as these have come on stream. These outflows proved to be critical because at no time had the industry developed any kind of a training capability. Training was, and still is, a matter of learning by experience on the job.

A comprehensive survey recently conducted by Werner concluded that "the most urgent requirement of the Pakistan Cotton Textile Industry is the training of personnel in all sectors and at all levels. This one requirement supersedes all others". The survey report estimated that production, even under present conditions, could be increased by 15 - 20% simply through the institution of proper training programmes.

The industry and the Government of Pakistan are taking various steps to correct the present situation. One of the government measures has been to establish the Textile Industry Research and Development Centre (T.I.R.D.C.) to serve the industry by conducting applied research, providing trouble-shooting services, and - more recently - conducting training programmes for supervisors, technicians and operators. The T.I.R.D.C. has been assisted by

U.N.I.D.O. and has now reached the "take-off" point where its capacities need to be extended if it is to properly fulfil its role. The Centre requested U.N.I.D.O. assistance to(1) review and, if necessary, revise its present training programmes and (2) to develop a modern training programme for spinning and weaving fitters.

The project was designed to provide the following courses:

- instructor training of spinning and weaving fitters by Werner

- demonstration training of spinning and weaving fitters by the trained instructors under the supervision of Werner.

These courses were completed as planned and the manuals compiled during the presentation of the courses are included in this report as Volumes II to X.

The reviews of the present training programmes of the T.I.R.D.C. are included in Appendix "A" of Volume I.

The successful conclusion of this project during which many difficulties and obstacles arose depended in large measure on the co-operation of many individuals.
Werner wish to single out three men who made particularly

large contributions of time and effort to the success of the project. These gentlemen are:

Dr. Niaz Ahmed, Director, T.I.R.D.C.

Mr. M. Hussein El-Missary, U.N.I.D.O.

Mr. Mahmoud Chappra, Mills Manager Mohammed Farooq Textile Mills Ltd.

Dr. Niaz provided the very important input of manpower and follow-up which was required to assure the continuity of the project benefits to the T.I.R.D.C.

Mr. El Missary did an excellent job of organizing the start-up of the project and carrying out the day to day liaison tasks which were essential and particularly beneficial.

Mr. Mahmoud Chhapra's full support to the instructor training programmes which were carried out in M.F.T.M. made the success of the programmes possible. He supplied the programmes with training rooms and equipment, capable personnel, and personally insured the full co-operation of the mill management and supervision.

II. OBJECTIVES OF THE PROJECT AND CONTRACT

II. OBJECTIVES OF THE PROJECT AND CONTRACT

Synopsis

The basic long-term objective of the Project is to increase and improve the productivity of the textile industry so that it may better respond to present and future requirements.

The immediate objectives of both the Project and this Contract are to:

a) conduct a survey of the Pakistani textile industry for the purpose of developing and adapting training course (hereinafter referred to as the "Training Course") of 3 to 6 weeks duration to meet the technical requirements of spinning and weaving fitters in Pakistan;

b) supervise and instruct 15 to 20 trainers to enable them to conduct the Training Course; the instruction of the trainers shall include theoretical and demonstrative training under the guidance of the Contractor;

c) supply the Cotton Textile Industry Research and Development Centre (hereinafter referred to as the "T.I.R.D.C.") with all manuals, teaching guides and audio-visual materials and/or, assist the T.I.R.D.C. in designing and developing such materials, required to conduct the Training Course;

d) review the T.I.R.D.C.'s present training courses, including materials, and advise/assist in making them more effective.

III. EXECUTIVE SUMMARY

III. EXECUTIVE SUMMARY

The text of this report on the work performed is brief since the essence of the completed project is embodied in the 9 Fitter Instructor Training Courses which were developed and are included in Volumes II to X.

1. NUMBER OF PERSONS TRAINED

The main aim of the project, which was to train 15 to 20 Instructors has been achieved. The following 17 Instructors have been trained:

Name	Organization	Discipline		
Mr. Amin Ul Haque	T.I.P.D.C.	Weaving		
Mr. Shaheen	M.F.T.M.	"		
Mr. Ashad	T.I.R.D.C.	"		
Mr. Yacub Qureshi	T.I.R.D.C.	"		
Mr. T. Hussein	Husein Industries	"		
Mr. M. Amin	Jubilee Mills	"		
Mr. Khaliq Ahmed	T.I.R.D.C.	"		
Mr. M. Obeidullah	Colony Sharhad Mills	"		
Mr. A.H. Qureshi	Adamsee Mills	"		
Mr. Salim Akthar	T.I.R.D.C.	Spin.	Rov.	Draw.
Mr. Tariq Saeed	M.F.T.M.	"	"	"
Mr. Aleem Beg	T.I.R.D.C.	"	"	"
Mr. M. Sadiq	Husein Industries	"	"	"

Name	Organization	Discipline
Mr. Ali Akhtar	Jubilee Mills	Spin.Rov.Draw.
Mr. Mahmoud Fazli	Adamsee Mills	" " "
Mr. Arif Mahfouz	T.I.R.D.C.	Roving,Drawing
Mr. Aslam Suleiman	T.I.R.D.C.	Roving

In addition 7 other persons were trained as Fitters:

Name	Organization	Discipline
Mr. M. Riaz	Jubilee Mills	Weaving
Mr. Ahwar Jamal	T.I.R.D.C.	Spin,Rov.,Draw.
Mr. Shaukat Ali	Indus Dyeing Co.	Drawing
Mr. N.A. Shah	Jubilee Mills	Drawing, Roving
Mr. M. Nisar	" "	Spinning
Mr. Farid Kahn	T.I.R.D.C.	Roving
Mr. Mohammed Ali	M.F.T.M.	Training Officer

2. FITTER INSTRUCTOR TRAINING MANUALS

All of the 9 Fitter Instructor Training Manuals and teaching guides have been submitted to T.I.R.D.C. as per contract.

3. MODIFICATIONS TO EXISTING T.I.R.D.C. MANUALS

Written modifications to 17 of the existing T.I.R.D.C. Training Manuals have been submitted to the T.I.R.D.C. (see Appendix "A"). The remaining manuals require no change or are in the Urdu language.

IV. APPROACH TO THE PROJECT

IV. APPROACH TO THE PROJECT

Based on previous experience and the training methods which Werner have developed it was essential that the training courses be conducted in mills under actual operating conditions.

Details relating to the approach and start-up of the project are outlined in detail in the Progress Report which was submitted on September 23, 1980. The Progress Report is included in this report as "Appendix "D".

V. ACTIVITIES

V. ACTIVITIES

1. INSTRUCTOR TRAINING COURSES

a) Weave (Loom) Fitter Instructors Training Course

The course was planned for a period of 48 days and this plan was fulfilled. 4 men from M.F.T.M. were checked for mechanical ability and Mr. Shaheen was selected. Mr. Haque from the T.I.R.D.C. was also selected.

These two men were involved in the primary development stage of the course which took a period of 15 weeks. 8 men were tested for the second group of Instructor-Trainees and the following 4 men were selected:

Mr. Arshad - T.I.R.D.C.
Mr. Y. Qureshi- T.I.R.D.C.
Mr. T. Hussein- Husein Industries
Mr. M. Amin - Jubilee Mills.

All six men were given the remainer of the course together and all were able to complete the course satisfactorily. Jubilee Textile Mills agreed to have the demonstration course conducted on their premises. This mill has Sakamoto looms which is a different make of loom from the Farooq mill. The T.I.R.D.C. had a

Sakamoto loom and sent this loom to the M.F.T.M. to be erected in the training centre. The trainees were all given the opportunity to examine this loom and it was agreed between the T.I.R.D.C. and Werner that Mr. Terkelsen would spend extra time developing a pre-linary manual for this loom in conjunction with the 6 Instructor trainees. The Instructors course was terminated 56 working days after the start-up date.

b) Spinning, Roving, Drawing Frame Fitter/Instructor Training Course

Spinning, Roving, Drawing Frame Fitters Instructor course was started at the Mohammed Farooq Textile Mill. However after 3 days the course was postponed due to the illness of the Werner Team Leader, Mr. Ryynanen. These 3 days have, of course, not been included in Werner's contractual applied time. With the approval of U.N.I.D.O., Werner assigned Mr. G. Visvikis as the new Team Leader. Two men from the T.I.R.D.C. and two men from M.F.T.M. were sent as candidates. Two men, one man from each source were selected to be trained as Instructors. Unfortunately there was a delay in arranging the attendance of the T.I.R.D.C. men and the man selected, Mr. Aslam Suleiman was 6 days late in starting. A further misfortune occurred a week later when Mr. Aslam Suleiman made his own decision to withdraw from the course. Another T.I.R.D.C. candidate was put onto the course. The two instructor-trainees who worked through the first phase of development of the course were :

Mr. Salim Akthar of T.I.R.D.C.

Mr. Tariq Saeed of M.F.T.M.

24 working days after the start-of the spinning mill programme 4 additional Instructor-trainees were brought into the course. 7 men were checked for admission to the second phase of the course and the following candidates were selected:

Mr. Aleem Beg	- T.I.R.D.C.
Mr. Mohammed Sadir	- Husein Industries
Mr. Ali Akhtar	- Jubilee Mills
Mr. Mahmoud Fazli	- Adamjee Mills.

The course was completed 61 working days after the start-up and all six men were trained as Instructors.

2. DEMONSTRATION COURSES

Immediately following the termination of the Spinning Fitter Instructor course, the demonstration courses of both the Spinning Fitter and Weaving Fitter were started. Both of these courses took place in the Jubilee Textile Mills.

a) Weaving Fitter Demonstration Course

4 candidates were tested and selected:

Mr. Khaliq Ahmed	- T.I.R.D.C.
Mr. Mohammed Riaz	- Jubilee Mills
Mr. Mohammed Obeidullah	- Colony Sarhad Mills
Mr. Abdul Hameed Qureshi	- Adamjee Cotton Mills

Mr. Haque of T.I.R.D.C. and Mr. M. Amin of Jubilee Mills were the instructors on this course.

The course proceeded as planned for 58 working days. The course material for the Sakamoto loom was further developed during the course.

The trainee from the T.I.R.D.C. and the 2 trainees from Adamjee and Colony Sarhad Mills were given special instructor training by the Werner Team Leader and at the termination of the course qualified as Weaving Fitter Instructors.

b) Spinning, Roving, Drawing Frame Fitters Demonstration Course

7 persons were checked for the course and the following five were selected:

Mr. Arif Mahfouz	- T.I.R.D.C.
Mr. Anwar Jamal	- T.I.R.D.C.
Mr. Shavkat Ali	- Indus.Dyeing Co.
Mr. Nisar Ali Shah	- Jubilee Mills (for drawing & roving frames)
Mr. Mohammed Nisar	- Jubilee Mills for spinning frames

Mr. Beg of T.I.R.D.C. and Mr. Akhtar of Jubilee Mills were the instructors on this course.

Unfortunately Mr. Shavkat Ali for personal reasons resigned after 11 working days and returned to the Indus Dyeing Co. which is located in Hyderabad. He had completed the course on drawing frames.

Mr. Farid Kahn of T.I.R.D.C. was selected as a replacement. He started 7 days after the departure of Mr. S. Ali. Unfortunately this gentlemen left the course after 23 working days as his appointment to T.I.R.D.C. had not been confirmed by the Government. Mr. Kahn, however, completed the course on roving frames.

It is important to note that the equipment in the Jubilee Mill is of a different manufacture than the machinery in the M.F.T.M. Consequently completely new training manuals had to be developed for the drawing frames, roving frames and spinning frames. Moreover, the mill is equipped with 3 different types of machinery in all 3 processes. With the concurrence of the Spinning Mill Master it was decided to conduct the courses on the three processes on the types of equipment comprising the greatest number of machines at each process. The training on the three processes was set up in the following sequence : drawing, roving, spinning.

At the termination of the roving course which occurred at the end of January 1981, the T.I.R.D.C. requested that another type of roving frame, Saco-Lowell Rovematic, be included in the course. This request was outside the contractual agreement and not physically possible, for the Team Leader to complete during the time available and also do the work which had been developed by the T.I.R.D.C. (see Section V4) However, Werner agreed to an arrangement which was suggested by the T.I.R.D.C., whereby Mr. Arif Mahfouz would not work on the spinning frame, but would spend the remainder of the course time compiling as much of the Saco-Lowell Rovematic manual as possible.

Unfortunately Mr. Arif Mahfouz resigned during the first week in February. The T.I.R.D.C. then placed Mr. Aslam Suleiman back into the programme for the purpose of compiling the Saco-Lowell Rovematic manual. By the termination of the course this manual was not only completed but physical demonstrations on 3 of the 6 major sections on the machine had been carried out.

The demonstration course was completed in 64 working days. During the course the Werner Team Leader applied special attention to the T.I.R.D.C. trainees and continued this training for another 6 days. Two of the trainees received sufficient training to qualify them as instructors on specific processes: Mr. Arif Mahfouz on drawing and roving; Mr. Aslam Suleiman on roving. The demonstration course terminated as scheduled, 70 days after it had commenced.

It was the design of the course to have the two instructors develop the 3 new manuals for spinning frames, roving frames and drawing frames. Unfortunately the instructor from Jubilee Mills is not able to write in English and only the T.I.R.D.C. man, Mr. Beg, was able to contribute to this task. Although he is capable of doing this work, which required night work on his part, he was initially reluctant to carry it out.

However, since it was obligatory by contract that the manuals be developed, the Team Leader took the task of writing the drawing frame manual and most of the roving frame manual upon himself.

3. TRAINING OFFICER

As part of the Werner AMPS system a company Training Officer is given training. At M.F.T.M., Mr. Mohammed Ali was appointed to this position and was involved in the two training programmes, i.e.: Weaving Fitter Instructors and Spinning Fitter Instructors. He was included in the development and execution of the programmes and has the knowledge and ability to supervise additional courses in the M.F.T.M.

4. ADDITIONS TO T.I.R.D.C.'s PRESENT TRAINING COURSES

During the initial stage of the project the training courses were reviewed. Comments on these courses were included in the Progress Report, which was submitted,(see Appendix D.) With the agreement of Dr. M. Kamal Hussein, S.I.D.F.A., U.N.I.D.O., Pakistan, this portion of the Progress Report was given to the T.I.R.D.C. Dr. Niaz, Director, T.I.R.D.C. made complimentary remarks on these written comments and requested that even more details be provided. It was pointed out that if such activity were undertaken that it would necessitate curtailing the time assigned to the actual training programmes.

The schedule agreed upon by the T.I.R.D.C. and Werner on October 5, 1980 (see Aide-Memoire dated 6 October 1980, Appendix "A") was that Werner would spend 4 - 5 weeks on further detailed reviews of the existing courses.

The T.I.R.D.C. were advised that the Werner Team Leader's time would be scheduled to include ± 20 days for the purpose of reviewing these courses.

As it subsequently transpired none of the Team Leaders' time was spent on this activity.

The combination of spending:

- extra time in indoctrination of replacement trainees; example: the departure after 11 days of the Trainee from Indus Dyeing Co. and the arrival of his replacement from the T.I.R.D.C. 7 days later
- compiling almost completely the Jubilee Mills Drawing and Roving Frame manuals which were planned to be and could have been done by the T.I.R.D.C. instructor
- supervising the compilation of the S-L Rovematic frame which was additional to the contractual project

eliminated the possibility of the Team Leader applying ± 20 days on reviewing the courses. Consequently it became necessary to have the detailed reviews of the existing courses made by someone else. This was done in Brussels by Mr. Terkelsen, Mr. Rynnanen, Mr. Ladds and Mr. Hearns. The presentation and ensuing discussions were done in Karachi by Mr. Hearns.

The additional request of the T.I.R.D.C. to have a manual on the S-L Rovematic frames compiled obligated the Team Leader to spend time on this work.

VI. SUMMARY OF RESULTS

VI. SUMMARY OF RESULTS

1. NUMBER OF PERSONS WHO RECEIVED TRAINING

Different types of training was given during the courses. The total number of persons who received training of some nature amounted to 24. The list is as follows:

Weaving Fitter Instructors	9
Spinning, Roving, Drawing Fitter Instructors	6
Drawing Roving Fitter Instructor	1
Roving Fitter Instructor	1
Weaving Fitter	1
Spinning, Roving, Drawing, Fitter	1
Roving Drawing Fitter	1
Spinning Fitter	1
Drawing Fitter	1
Roving Fitter	1
Training Officer	1
	24

of which 9 persons were members of the T.I.R.D.C.

a) Instructor Quality Level

Each of the men who received training as instructors is capable of entering a mill and giving a course in the discipline which he learned. However, there are differences in the degree of their qualifications since some received more instruction time than others and there are variances in practical mill experience.

The trained instructors can be placed in three categories:

- Those who received training and conducted a demonstration course and have the ability and experience to conduct courses in mills.

Weaving:		Spinning Mill:	
Mr. Shaheen	- MFTM	Mr. Beg	- TIRDC
Mr. Haque	- TIRDC	Mr. A.Akhtar	- Jubilee
Mr. Ashad	- "		
Mr. Amin	- Jubilee		

(Mr. Shaheen and Mr. Ashad conducted demonstration courses in the MFTM which were independent from the programme).

- Those who received training and have the ability to conduct courses without additional guidance. All of these men have practical mill experience.

Weaving:		Spinning Mill:	
Mr. Hussein	- Hussein	Mr. Saeed	- MFTM
Mr.Obeiduleah	- Colony	Mr. Sadir	- Hussein
Mr. A.H. Qureshi	- Adamjee	Mr. Fazli	- Adamjee

- Those who know the training methodology but should conduct their first course under the supervision of a TIRDC instructor from the first category.

Weaving:		Spinning:	
Mr. Y. Qureshi	- TIRDC	Mr. S. Akthar	- TIRDC
Mr. Ahmed	- "	Mr. Mahfouz	- "
		Mr. Suleiman	- "

2. TANGIBLE QUALITY IMPROVEMENTS

Tangible results were gained in five mills.

a) M.F.T.M. : It became apparent early in the programme that most of the spare parts which were being constructed locally were not properly made. This situation was causing many problems, in loom waiting time and exact loom settings were not possible.Although it was outside the training progamme Werner worked together with the M.F.T.M. management to set up a special control system. Concerted effort was made by management which greatly alleviated this difficulty.

At the termination of the first weaving fitter instructor's training course the company immediately embarked on a weaving fitter training course. One of the T.I.R.T.C. instructors was engaged to conduct part of the training of the weaving fitters.

The standard settings of the spinning frames, roving frames, drawing frames were revised with improved quality results on the machines which were used for demonstration. End breaks were reduced from 100 to 60 per 1000 spindle hours.

A letter of commendation from M.F.T.M. is included in Appendix C of this report.

b) Jubilee Mills

The spare parts situation in Jubilee is extremely critical. Most parts are of poor quality and in short supply. The machines have not been well maintenanced. A list of the parts which had to be replaced or adjusted during the demonstration courses is shown in Appendix B of this report. An illustration of the quality benefits gained is an improvement in the coefficient of unevenness of the roving of the S-L frame from 6.27 to 5.67 through adjustments to the front roll settings.

c) Adamjee Textiles

Mr. M. Fazli of Adamjee Mill, has informed the Werner Team Leader that after returning to his own mill he improved the evenness of the yarn on a spinning frame over 15% from coefficient % 13.9 to 11.9, and simultaneously virtually eliminated "lap-ups" which had been causing much trouble.

d) Hussein Industries

Mr. M. Sadiq of Hussein Mill has informed the Werner Team Leader that after returning to his own mill he improved the evenness of the roving frames over 20%, from coefficient % 6.5 to 5.1.

e) Pakistan Polypropylene Packages Ltd.

At the termination of the Weaving Fitter Instructor course in M.F.T.M. and prior to the start of the course in Jubilee Mills 5 weeks later, Mr. Hague of T.I.R.D.C. worked in this mill. Although the assignment is only partially completed Mill Management have acknowledged that improvements have already been made and have requested his return to complete the job (see Appendix C).

VII. TIME APPLIED IN PAKISTAN

VII. TIME APPLIED IN PAKISTAN

As per contract Werner were to apply 41.2 weeks of 5 days per week i.e. 206 days on the project in Pakistan. The total time applied in Pakistan was 209 days as follows:

	Actual Applied Days
Team Leader	131
Training Specialist (Weaving)	56
Werner Executive	22
TOTAL	209

Due to the detailed reviews of existing courses which could not be carried out in Pakistan as planned, but were done in Brussels, the amount of time applied in the home office greatly exceeded the original estimated and contracted time.

VIII. RECOMMENDATIONS FOR FUTURE UNIDO TRAINING ACTIVITIES WITH T.I.R.D.C.

VIII. RECOMMENDATIONS FOR FUTURE UNIDO TRAINING ACTIVITIES WITH T.I.R.D.C.

1. FIVE LEVELS OF TRAINING

Werner's report on the Textile industry in Pakistan stressed the need for training at all levels.

The 5 levels can be broken down into 6 groups:

- Top Management
- Technical Management/Technicians
- Supervision
- Mechanical Labour (Fitters/Fixers)
- Production Labour:
  - Direct Operators
  - Indirect Labour

Of the six groups, UNIDO can provide training through T.I.R.D.C. for the Technical Management, Supervision, Mechanical Labour and Direct Operators.

The benefit that a training programme in manufacturing can achieve is largely dependant upon the condition of the machinery. Consequently the initial training project selection of Mechanical Labour was the correct start.

2. TRAINING OF TECHNICAL MANAGEMENT

Most of the technicians in Pakistan have had some type of formal academic training in textiles. What is lacking is the know-how to apply the technical knowledge and to manage the mill operations.

As stated in our report on the industry, " In-plant training is much more important than university training. The technical staff must be trained on-the-job via participation in implementation of technical and management controls." By physically implementing technical control and labour cost control systems the technical management will learn how to manage the mills properly.

Technical controls embrace the following areas :

- raw material properties
- quality
- labour productivity
- machine productivity
- maintenance
- waste control or material yield
- labour productivity.

Training of technical personnel to a modern level of management capability takes a rather long time, example : 5 to 6 months in a 25,000 spindle mill, and the same in a 300 to 500 loom weave plant. Moreover, only two technicians from the T.I R.D.C. could be assigned to a project taking place in a mill.

The mill technicians would receive training and so would the two T.I.R.D.C. technicians. Technicians from other mills could not be included in the training programmes.

If a training project was started in a spinning mill the mill technicians would receive training and would continue to manage and further improve the mill. The two T.I.R.D.C. technicians would then have to be guided through the implementation of training programmes in other mills. (Programmes in two separate mills could proceed simultaneously under the supervision of the consultant.)

It would be possible to place another T.I.R.D.C. technician in each of the two programmes. The programmes however would again proceed for another 5 months minimum time.

The end result after 10 months would be that programmes would have been implemented in three mills and the technicians in these three mills would have been trained. In addition two T.I.R.D.C. technicians would be well enough trained to enter other mills and install technical programmes, and two T.I.R.D.C. technicians would be partially trained. These latter two men should then help install programmes together with the two trained T.I.R.D.C. men. After two more installations each, they would also be qualified. Of course, other technicians could be added to subsequent programmes and in this manner the number of qualified T.I.R.D.C. technicians would increase.

From UNIDO's point of view, the number of people trained may be too few in relation to the expenditure. Unfortunately there are no short-cuts to the proper installation of a technical control programme. The programme will vary according to the status of the mill, but shorter programmes will not obtain the potential results and the T.I.R.D.C. technicians will not be sufficiently well qualified to warrant the interest of mill owners.

3. TRAINING OF SUPERVISION

Somewhat similar to the training of Technical Management, the number of T.I.R.D.C. Instructors being trained would again be limited to two. The number of Instructors in the mill who would be trained would be one or two only. The number of supervisors who would receive some training would range from 6 to 10 depending upon the size and organization of the mill. The intent of the course would be to train the Instructors, and then have them conduct a training course.

The total applied time of the UNIDO consultant would be about 7 months. It would however be advantageous to spread the course over a 10 month calendar time.

Again the number of mills receiving the training would be 3 since supervisors could not be brought into a mill from outside companies.

The number of T.I.R.D.C. instructors would be two and the partially trained also two, the same as in the technical management training courses.

Although the yield in the number on instructors might not be interesting when the total cost is considered, it should be pointed out that even in developed industrial countries the link between management and worker - the supervisor - has been neglected and that only now many leading mills have begun to appreciate the extremely important function the supervisor exercises on the factory floor.

Actually, the T.I.R.D.C. have at hand sufficient information to develop Supervisor Training courses which should take place in the mills. It will take a few test runs to develop a satisfactory course but they have the knowledge to do it.

4. TRAINING OF DIRECT OPERATORS

It must be recognized that the maximum benefit of training direct operators is achieved when both the technical management and supervision are properly fulfilling their function, and the mechanics are properly maintaining the machines.

However, although these conditions would provide the best results it is not advisable to wait until such conditions have been achieved before the training of direct operators begins. If the T.I.R.D.C. have developed operator training they can ultimately combine an implementation exercise of training technical management, supervision, mechanics and operators in the same mill.

The important thing is for the T.I.R.D.C. to learn the training techniques for operators and then apply the training where it will do the most good to the industry.

In this instance the training times are not so lengthy and two T.I.R.D.C. instructors can be trained on one or two operator jobs. Moreover the number of operator jobs which could be included in a UNIDO project could be limited to those which employ the most people in the industry.

If a selection of the following operator jobs was made; for example

- Roving Frame Tenders/Doffers
- Spinning Frame Tenders
- Spinning Frame Doffers
- Winder Tenders (Automatic)
- Winder Tenders (Conventional Winders)
- Weavers
- Battery Fillers (on looms)

the combined consulting time for training instructors and the running of a course for each job would be about 50 consulting weeks including executive supervision plus preparation, report writing and editing time.

The yield in trained instructors would be much higher than in the case of Technical Management or Supervisor training programmes. Of course, one instructor would learn two or even three of the operator jobs. Still a total of 6 or 8 T.I.R.D.C. instructors could be trained and an equal number of instructors in the mills.

It is therefore recommended that the next stage of training projects to be considered is the training of Direct Operators.

a) QUANTIFYING THE PERFORMANCE OF TRAINEES

When the T.I.R.D.C. and mill management agree to a specific job-load under existing conditions on a specific process, and the direct labour are trained to be able to carry out this job-load, then "quantifying the performance" would be the degree to which the worker can carry out the task which has been agreed upon.

In the case of technical staff, the installation of a programme when completed might be the measure of a successful assignment, however, quantitatively measuring the ability of a trainee is done by a follow-up inspection visit after he has run the newly installed systems and controls for about 6 months.

5. TRAINING OF INDIRECT LABOUR

Specific courses on the training of Indirect Labour should not take place. Part of the proper training of Supervisors and Technical Management involves the instruction, control and productivity of Indirect Labour. Furthermore, many indirect jobs are different in each mill and are of a non-repetitive nature. They do not lend themselves to controlled training techniques.

6. TRAINING OF GINNING TECHNICIANS/INSPECTORS

Although the Ginning process is outside the operations of the textile industry and is considered as part of the Ministry of Agriculture's domain, there is a training project which might come under the auspicies of UNIDO and which is, in Werner's view, one of great importance to Pakistan. This subject has been dealt with at length in our report on the industry as is attached to this report as Appendix E.

Whether the T.I.R.D.C. should be involved in such a training programme would have to be decided by the two ministries.

7. RECOMMENDED TIRDC STRATEGY

The following two basic strategy facets are recommended for the TIRDC:

- in-plant training
- selling the TIRDC services to the industry.

Prior to the completion of the project, TIRDC had, on its own initiative successfully sold "in-plant" training. This approach should be continued by the TIRDC management, and used as a selling point to the industry. Mill owners and managers would far rather have training done on their own premises than outside where they cannot watch what is happening.

The second item "selling the TIRDC services to the industry". The TIRDC has a great deal to offer to the industry. On the other hand the industry is far from fully aware of the services available. What is required is more active "old fashioned" selling of the services available. More knocking on doors throughout the country. It will de difficult initially since there is and will be much resistance from the industry. But this can be eliminated in one mill after another when the owners and mill managers are properly approached in their own offices and mills. The message must be taken to the owners and management of the companies, again and again. With each successful assignment the reputation of the TIRDC will grow and the selling of the services will become easier.

APPENDICES

APPENDIX A

ADDITIONS TO EXISTING
T.I.R.D.C. TRAINING MANUALS

AIDE - MEMOIRE 5/10/1980

Subject: Contract Item 1.01 (C)

At a Meeting Held on 5/10/80 in the Office of Dr.Niaz Ahmed and Attended by

Dr.Niaz Ahmed
Eng.H.El-Missary
Mr.Shamim
Mr.J.R.Hearns

Item 1.01(C) which reads as follows:

Supply the Cotton Textile Industry Research and Development Centre (hereinafter reffered to as the "CTIRDC") with all manuals, teaching guides and audio-visual materials and/or, assist the CTIRDC in designing and developing such materials, required to conduct the Training Course."

was discussed at length.
Agreement was reached on the interpretation of the phrase "the Training Course" to mean the training course of the spinning & weaving fitters only.

6/10/80

Jack R Hearns

H. El Missary

M. Shamim
6.10.80

6th October, 1980.

AIDE-MEMORIES OF THE MEETING ON 5-10-1980

Following were present:-

1. Dr. Niaz Ahmad. TIRDC.
2. Mr. H.M. El-Missary. UNDP Co-ordinator.
3. Mr. Jack Hearn's. Werner International.
4. Mr. Mohammad Shamim. TIRDC.

The Clause 1.01(d) of contract between Werner's International and UNDP on the training project which reads "Review TIRDC's present training courses (including material etc.) and advise/assist on making them more affective" was discussed in detail in this meeting. It was decided that M/s. Werner International will review all the training courses of the Centre thoroughly, that is page by page and give their comments and suggestions for improvement of course as per their Training Expertise. Mr. Hearn pointed out that for this purpose they require more time and this can be done by restricting the training of Fitters Instructors (Spinning and Weaving) to one demonstration only and use the time of second demonstration which is of 6 - 7 weeks duration mainly for reviewing the courses Part of the time approximately 2 weeks would be utilized for concentration on the completion of the training of four more Instructors, 2 in Spinning and 2 in Weaving thereby making a total number of Instructors to sixteen.

7.10.80

7.10.80

H. Elmissary

T.I.R.D.C.

KARACHI

ADDITIONS TO

SPINNING OPERATIVE'S INSTRUCTORS

TRAINING COURSE

(INSTRUCTIONS AND ELEMENTS OF WORK)

(MANUAL No 1)

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

SPINNING OPERATOR TRAINING

1.0 SELECTION TEST

The standard Werner selection test must be used to ascertain that training efforts and costs are only used on trainees that are likely to benefit from the course.

Formboard A + B
Pinboard
Perception test letters or figures according to language
Comprehension test is only applied to instructors (18 to be done).

1.1 QUALIFICATIONS

In most cases retraining will take place, where the experienced operators will be trained, to reach high productivity and quality.

Physical requirements vary according to the job:

Ex.	Blowroom Card Draw frames Flyer frames	}	operator to be strong must lift laps and move cans
	Doffers	-	small person is more suitable
	Creelers	-	tall person is more suitable

In general, operators must have good eyesight, and no disability of hands, arms and legs. Also it should be remember that the operator must be able to work in noisy, hot and humid conditions for 8 hours per day.

2. INSTRUCTOR

The instructor must be selected from the most experienced operators of the mill concerned.

The TIRDC officer cannot act as instructor as this would prevent continuity, when the TIRDC officer leaves the mill. Only the instructor is trained by him. The TIRDC officer is the person who develops the training system to suit each particular mill, as well as being coordinator and controller.

2 instructors should be trained. Even though only one is required. If only 1 instructor is trained, the whole training system collapses if the instructor becomes ill or leaves the mill. Always have a substitute.

Each instructor can handle 2 or 4 trainees. 2 trainees work together, timing each other under the supervision of the instructor. Safety points must be emphasized at each exercise.

HOW TO INSTRUCT OR PASS ON INFORMATION

Telling is not enough, it must be understood. The main purpose of training in industry is to help the beginner to learn his job and the skilled worker to be more efficnet in his present or future work.

Every instructor must ask himself:

"What do we want our trainees to learn?"
"How can we help them to learn quickly and efficiently?"

As a simple guide, it is suggested that the following steps are necessary before and during instruction, if it is to achieve success:

Break down the instruction.
Get everything ready and properly arranged.
Prepare the individual.
Present the job or instruction.
Try-out and check on understanding.
Round off instruction or information.

HOW TO GET READY TO INSTRUCT

BREAK DOWN THE INSTRUCTION

DO THE JOB OR REHEARSE THE SUBJECT BEFOREHAND.
DIVIDE THE JOB OR SUBJECT INTO STAGES.
SELECT THE KEY POINTS.
SAFETY FACTORS ARE ALWAYS KEY POINTS.

GET EVERYTHING READY AND PROPERLY ARRANGED

CHECK LAYOUT, MATERIALS, TOOLS AND EQUIPMENT.
PROVIDE AIDS TO INSTRUCTION SUCH AS SKETCHES, SAMPLE JOBS, ETC.
ENSURE GOOD LIGHTING AND WORKING CONDITIONS.

HOW TO INSTRUCT

PREPARE THE INDIVIDUAL

PUT AT EASE.

STATE THE JOB OR SUBJECT.

CHECK EXISTING KNOWLEDGE.

CREATE INTEREST IN LEARNING.

ENSURE CORRECT POSITION.

PRESENT THE JOB OR INFORMATION

TELL, SHOW AND ILLUSTRATE AS APPROPRIATE.

PUT OVER ONE STAGE AT A TIME.

STRESS KEY POINTS.

INSTRUCT CLEARLY, COMPLETELY AND PATIENTLY.

TRY-OUT AND CHECK ON UNDERSTANDING

HAVE THE JOB DONE OR SUBJECT EXPLAINED.

CORRECT ERRORS AS THEY OCCUR.

TEST UNDERSTANDING OF "KEY" POINTS.

CONTINUE UNTIL YOU ARE SATISFIED.

ROUND OFF INSTRUCTION OR INFORMATION

EXPLAIN PERSON'S RESPONSIBILITIES.

NAME PERSONS WHO WILL HELP.

ENCOURAGE QUESTIONS.

CHECK LATER AS NECESSARY.

TRAINING PLAN

Training is essentially a process of changing people - their knowledge, skills, attitudes, or behaviour - through instruction.

A well trained staff will not only achieve more satisfaction from their work, but will also do the job more efficiently.

3. CONTROL OF PROGRESS (separate forms for each course/machine)

a. Training program

At the end of each day the instructor together with trainees will review the results of the day and plan the following day - which subject/part of job to be done.

b. Daily work sheet

Each exercise must be timed, as many attempts are needed to reach the target time. Trainee must not continue with next exercise before the first is mastered,tempo and quality wise.

c) Progress report

Before the trainee is handed over from the training centre to the production supervisor, it is necessary to review the progress. This should be followed from the start of stamina build up - that is, the trainee operates, firstly, say 30% workload, then 60% and 100%.

Ex. : If a ring spinner is to attend 12 sides at full load, start at 4 sides, etc.

Measure % efficiency and quality to ascertain progress.

d) Overall progress report

As (c) but also evaluate other factors.

e) Management control chart

Give complete overview of the training situation. Shows each trainees attained time compared to standard time.

Also how many exercises each person has completed. As trainees work in groups of 2, it is important already at the selection test stage, or later, to group trainees, so 2 quick persons work together and perhaps 2 slow together, to avoid delays, and that the best become bored.

Ref. 1 - write name of exercise
Ref. 2 - write D for demonstration exercise
MIN. 0.10, 0.75 etc. as target time for each element.

The sequence and times are established during instructor training, by TIRDC officer and 2 instructors, for each machine group.

The programme is split into various sections of the mill:-

Blowing Room
Carding
Drawing
Combing
Speed Flyer Frames
Ring Frames

Some items are basic to each section so these should not required to be repeated.

Card Sliver	Coilers,	Cans,	Sliver Piecings
Draw Frames	-	Cans,	Sliver Piecings
Combing	-	Cans,	Sliver Piecings
Drafting rollers at		Draw frames.	
" " "		Combers	
" " "		Speed frames	

Drafting rollers with aprons at speed frames
" " " " at Ring frames

Although cleaning and patroling is basic to all machines these subjects should be stressed at each stage.

Each course must be divided up into parts of job, and the job elements timed, so progress may be measured against this standard time. Before the specific course commences, the trainees should be made familiar with the use of a stop watch.

EXAMPLE OF BREAKDOWN OF WORKING METHOD

RINGSPINNING

	PART JOB	N° OF THREADS	TARGET MINS
1a	Thread up- to pigtail	1	
1b	Thread up- to pigtail	8	
1c	Thread up- to pigtail	16	
2a	Thread up- to traveller	1	
2b	Thread up- to traveller	8	
2c	Thread up- to traveller	16	
3a	Thread up- complete	1	
3b	Thread up- complete	8	
3c	Thread up- complete	16	
4a	Piece-up	1	
4b	Piece-up	4	
4c	Piece-up	8	
4d	Piece-up	16	
5a	Repair end break	1	
5b	Repair end break	4	
5c	Repair end break	8	
5d	Repair end break	16	
6a	Gait up	1	
6b	Gait up	4	
6c	Gait up	8	
7a	Creel-bob. on hanger	1	
7b	Creel-bob. on hanger	4	
7c	Creel-bob. on hanger	8	
8a	Doffing - take off full lap	4	
8b	Doffing - take off full lap	8	
8c	Doffing - take off full lap	16	
9a	Doffing - put on empty tube	4	
9b	Doffing - put on empty tube	8	
9c	Doffing - put on empty tube	16	

	PART JOB (cont'd)	N° OF THREADS	TARGET MINS
10a	Doffing - change cops	4	
10b	Doffing - change cops	8	
10c	Doffing - change cops	16	
11a	Doffing - complete	4	
11b	Doffing - complete	16	
11c	Doffing - complete	32	
11d	Doffing - complete	126	
12a	Change traveller	1	
12b	Change traveller	4	
12c	Change traveller	8	

Target mins. Depends upon type of machine and working methods and aids (tools).

EXAMPLE OF JOB ELEMENT ANALYSIS

PURPOSE	To teach the trainee the correct method, quality and temo of creeling.
PREPARATION	- empty roving bobbins on holder - trolley with full roving bobbins in position of next spindles being replenished - trainee standing at end of trolley.
KEY POINTS	- do not damage surface of bobbin - bobbin holder must rotate freely.
METHOD	- left hand, holding base of spindle, lifts empty bobbin out of creel - right hand remove empty bobbin from spindle and put empty bobbin on shelf of roving trolley - left hand holding spindle at base. Right hand pick up full bobbin from trolley and place on spindle - left hand positions spindle with full bobbin in creel and right hand pick up end of roving.

TEMPO

	CODE	MINS
1 BOBBIN ON HANGER	BOH-1	....
4 BOBBINS ON HANGER	BOH-4	....
8 BOBBINS ON HANGER	BOH-8	....

TIMING

Most of the exercises have target times and each trainee must learn to use a stopwatch in order to check his own progress.

Stop watches are expensive and must be handled with care. They should not be left unattended at the work place.

The watch should have a string tied to it, so it may be tied round the wrist of the person using the watch, avoiding it to fall on the floor.

In order that the trainee may get practice in using a stop watch, let the trainee stop the watch at the following:

0.04 Mins
0.20 Mins
0.40 Mins
0.55 Mins
0.70 Mins
1.10 Mins

Allow the trainee to time the picking up and laying down of a pencil. This will enable the instructor to verify that they understand how to use the watch as well as when to start and stop it while timing a movement.

TRAINING PROGRAM (a)

46.

DAY	SESSION	Item of Training or Subject	Training given by	Reference Page
1	8.30 to 10.30	Reception of trainees Explanation of programme		
	11.00 to 13.30			
2	1st			
	2nd			
3	1st			
	2nd			
4	1st			
	2nd			
5	1st			
	2nd			
6	1st			
	2nd			

DAILY WORK SHEET (b)

Name : ____________________ Dated : ______________

Day : ________________ Week: ____________ days on course ________

PERIOD	EXERCISE			TIME TAKEN											
	NAME	TARGET	BEST												

Best (Time accomplished):
Target (Time)
Name (of job)

This sheet would be used by the Instructor to record the Trainees progress with such jobs as piecing up at Ring frames.

PROGRESS REPORT (c)

Trainee's Name: ____________

MACHINE	JOB, OR ITEM OF TRAINING	EXAMINATION DATE	% ASSIGNMENT	% EFF.	QUALITY

D = demonstration
MIN = std. time

INSTRUCTOR: ____________________ MANAGEMENT CONTROL CHART (e)

NO.	NAME:	STOP WATCH	Ref. 1														REMARKS
		D	Ref 2														

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

T.I.R.D.C.

KARACHI

ADDITIONS TO

TRAINING COURSE FOR

SPINNING SUPERVISORS

(Manual No. 2)

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

COURSE CONTENT (Spinning Supervisor)

1 - INTRODUCTION & TRAINING PLAN

2 - SELECTION TEST

3 - COURSE TIME TABLE

4 - INSTRUCTION AND TRAINING PLAN

5 - ORGANISATION AND JOB DESCRIPTION

6 - PERSONNEL

7 - GO DOWN

8 - BLOW ROOM

9 - CARDING

10 - DRAW FRAMES

11 - SIMPLEX

12 - RING FRAMES

13 - SAFETY AND HOUSEKEEPING

14 - FOLLOW-UP AND CHECKLIST

1.0 INTRODUCTION AND TRAINING PLAN

1.0 INTRODUCTION AND TRAINING PLAN

This booklet has been prepared by the Spinning Department of the Centre for the training of Spinning Supervisors scheduled to be held at Cotton Textile Industry Research and Development Centre, Moulvi Tamizuddin Khan Road, Karachi.

As Spinning Supervisors belong to the intial stage of the management, it is therefore necessary for them to have good knowledge about the maintenance and administration side of the spinning mill. Maintenance side has already been covered in the training of "Spinning Fitter's Instructors", whereas the other items belonging mainly to the administration side are discussed in this course.

As spinning mills are different in organization and people, it is not possible to train in one common way, therefore the course is in 2 phases - 1st. general and 2nd specific for mill concerned. The training must be tailor made for each mill and supervisors trained, or re-trained in the particular environment in which they operate.

The principle of the course should be taught at TIRDC and the practical part should be carried out in their own spinning room, under the supervision of TIRDC.

PREPARATION OF THE COURSE

During the preparation visit to mills, the following information should be collected and analysed (discuss with the Spinning manager).

1. Hank counter readings and weight produced
2. Stoptime recordings
3. Eff. calculations
4. Quality reports
5. P.M. and overhaul calendar
6. Production schedule (lot change)
7. Training plan and personnel appraisal
8. Machine rating
9. Spare parts, travellers, cots, aprons
10. Supervisors checklist
11. Workload calculations
12. Working hours record
13. Threadbreak study and analysis
14. Specifications and std. settings
15. Waste control form.

These records and reports vary from mill to mill, an important part of a supervisory training course is the analysis of the flow of information. Ask for each :

1. what is the purpose of this form
2. could it be eliminated
3. could it be combined with another form.

See Chapter 10 - follow-up and control.

Statistics of above information are useful, collect average figures for say 1 month before the course commences, so progress may be measured.

WHO SUPPLIES INFO

No.		FREQUENCY	WHO
1.	Hanks or kg. produced	Per machine Per shift	Clerk or Supervisor
2.	Stoptime	When machine is stopped/ started.	Fixer or Supervisor
3.	Efficiency	Per machine Per shift Per section For all machines	Clerk
4.	Quality	Per machine Per blend/count	By testing lab.
5.	P.M. and overhaul plan	Calendar for all machines - made periodical-ly	Spinning Manager Supervisor and Head Fixer
6.	Lot change	Per machine Per week	Production Planning
7.	Training Plan	Per person	Spinning Manager Supervisor and Training Officer
8.	Machine rating	Per machine Per fixer	Supervisor or Head fixer
9.	Spare parts	Per item Per machine	Stores keep record of stocks and usage
10.	Supervisor Checklist	Per Supervisor Per shift	Fill out by Supervisor
11.	Workload	Per count	Industrial
12.	Working hours	Per person Per shift	Clerk
13.	Thread breaks	Per count	Ind. Eng. Dept.
14.	Specification	Per count	Spinning Manager and Supervisor
15.	Waste control	Per Dept.	Waste recorder Clerk

10.2 SOURCES OF INFO. FOR CONTROL

1) Hank counters- Kg.doffer per shift per frame

2) Stoptime record time stopped & reasons per shift per loom

4) Quality Control
Per shift
Per machine
Reasons for substandard Production & Kg. rejected

3) Op. eff. Machine eff. mill eff.

5) Preventive maintenance and overhaul plan

6) Lot change Style & Count (Production Planning)

7) Training plan - cross training appraisal of personnel

8) Machine rating (operating condition) per machine per section

9) Spare parts stores
-spares available
-usage

10) Supervisor checklist and report to weav. manager

11) Workload calc. per style

12) Working hours records attendance % per person

13) Threadbreak study and analysis

14) Style specification and standard settings - per style

15) Waste control per dept. %

3.0 COURSE TIME TABLE

Each subject should be dealt with in 3 steps

(a) - go through text

(b) - general discussion

(c) - discuss specific mill problems.

The various subjects demand more or less discussion, hence time table should be elastic enough to allow extra time if required.

We expect that 1. Phase can be completed in one week, however, subjected to individual circumstances.

DAY	SUBJECT			
	N°	MORNING	N°	AFTERNOON
1	1.0 2.0 2.1	Introduction Selection test Interviewing	3.0 4.0 4.1	Course time table Instruction Communication
2	5.1 5.2 5.3 5.4 5.5	Organisation Job description Supervisory duties Leadership Your responsibility	6.1 6.2 6.3	Source of labour Cross training plan Staff and labour control
3	7.10 7.11 7.12 7.13 7.14 7.15	Patrolling Meaning of patrol Types of patrol Stepping stone patrol Systematic/regular patrol Patrol the machines	7.16 7.17 7.18 7.19 7.20 7.21	Cloth quality Loom speed Weft stocks Idle looms Relative humidity Reconciliatory patrol
4	7.22 7.23 7.24 7.241 7.242	Loss of production Loom Stoptime report Production Prod. calculations Loom efficiency	7.243 7.25 8.1 8.2	Workload calculations Loom stop analysis Quality control Waste control
5	9.1 9.2	Safety training for supervisors Weaving shed environment	10.1 10.2	Checklist Sources of info. for control
6	10.3 10.4	List of points to check Loom stops due to weft breaks	10.5 10.6	Maintenance and servicing of looms Main problems and how to tackle

TIRDC KARACHI	JOB DESCRIPTION DATE:	WERNER BRUSSELS

JOB TITLE : Spinning Room Supervisor

DEPARTMENT : Spinning

SECTION : XYZ

IMMEDIATE SUPERIOR : Asst. Spinning Master

IMMEDIATE SUBORDINATES: Spinners
Doffers

JOB SUMMARY: organise and control production and quality from his section.

MAIN DUTIES AND RESPONSIBILITIES

1. Make sure that all machines are manned
2. In cooperation with preparation depts. ascertain that materials supply is according to plan, and not causing loom waiting time.
3. Check stopped machines to find out reason for stop, and make sure that machines are started up as quickly as possible.
4. Make sure that machines are maintained correctly, for high performance and low usage of spares.
5. Check yarn for quality and in cooperation with laboratory, attend to problem machines immediately.
6. Together with Spinning Mill Master, and training officer, evaluate peoples performance and plan possible transfer of re-training.
7. Organise housekeeping to improve quality and working conditions.
8. Make sure that safety and fire regulations are followed.

14. FOLLOW-UP AND CONTROL
(2ND PHASE)

14. 1 CHECKLIST

The 2nd phase of Supervisor training is the implementing of the general knowledge and control procedures as discussed during 1st phase.

The Supervisor must be systematic and make at least 4 rounds per shift to check the situation on all his machines.

He should watch for all points listed below. He observes while patrolling and marks the machine n° and problem. At the same time he makes sure that the problem is corrected.

The TIRDC instructor follows the Supervisor on his patrol and points out important observations and makes sure that action is taken.

CODE

V = machine OK
LC = lot change
TC = traveller change
OH = overhaul
P.M.= Preventative Maintenance
R = repair
PQ = poor quality
NO = no operator
NM = no materials
NS = no spares
LE = low eff. many end breaks
LS = low speed
MS = machine not running correct - stopped by Supervisor

TIRDC KARACHI	SPINNING SUPERVISORS CHECKING							WERNER BRUSSELS
	DATE:		SHIFT:			SIGN:		
FRAME	8.00/16.00/24.00		10.00/18.00/2.00		12.00/20.00/04.00		14.00/22.00/06.00	
No.	Problem (code)	Corrected	Problem (code)	Correc-ted	Problem (code)	Correc-ted	Problem (code)	Corrected

ADDITIONS TO
TRAINING COURSE
FOR SPINNING MASTERS

(Manual No.5)

THE THREE BASIC FUNCTIONS OF MANAGEMENT

A manager must plan.
A manager must execute.
A manager must review.

Everyone knows that to "plan" means to think ahead or carry out a conceptual activity and to relate the possibilities of the future to the actualities of the present and the past. Almost everyone can see, too, that to "execute" is to carry out a plan or put it into practice. But "review" in this chapter is given a new connotation : it means the total activity of the manager in dealing with the plans and executions of his immediate subordinates. Very few managers use the word "review" for their interactions with their subordinates. Moreover, most managers have trouble recognizing the true nature of their planning and execution functions in relation to the review of their immediate superiors.

The first basic management function, planning, encompasses the conceptual relation of the uncertainties and possibilities of tomorrow and beyond to the facts of today and yesterday, in attempting to cope with or, in part, to determine the future. The second basic function, execution, is a collection of activities by which a manager puts into being his own plans for his own job. The third basic function is review, by which a manager interacts with his subordinates during their planning stages and helps them keep score on their performance against their plans.

Of the three functions, planning and review have been the ones to which managers have not usually devoted enough time and care. Time spent on execution has usually usurped time which might more properly be devoted to the other two, so necessary, functions.

At the bottom of the management structure is the level of management next to the direct workers. Most direct workers have a very small role in planning their own jobs. Thus, the manager usually reviews the worker's performance against plans which probably resulted chiefly from his own planning process, rather than from that of the workers. Failures in this area over the last century have probably resulted in more trouble for the management of business enterprises than failures in any other area. Studies of human motivational behavior reveal this practice as the key villain in causing lowered worker morale and productivity. For it is in this area - the classical failure of management to include the worker's knowledge of their own jobs and their thoughts for improving their own efficiency in the planning of their own jobs - that the main seed of discontent arises in the minds of workers. Changing this method of supervising workers stands as one of management's greatest challenges.

Subfunctions of Planning

There are two subfunctions which must be carried out in the planning activity :

1. Setting objectives
2. Programming.

Execution

After a manager develops his plans and describes them to his superior, obtains approval of them, and psychologically commits himself to their accomplishment, he begins the phase of implementation. The word "execution" was chosen for this major function for several reasons, among which are :

1. "Execution" is a shorter word than "implementation" or "administration".
2. "Accomplishing" denotes more the finish of an activity.

Execution includes all those activities which a manager employs in carrying out his plans, including reporting his results to his superior and carrying out a list of other personal duties, but excluding those of direct interaction with his subordinates. This direct interaction with his subordinates is especially reserved for the third basic function, review.

The execution portion of all manager's jobs always includes the common duty of reporting facts concerning the rate of completion of results for which the managers are personally responsible, whether the duties are carried out personally or by subordinates.

Review

Clearly the least understood of the major management functions, review is almost the most important, because in carrying out this function, a manager either seizes the opportunity to construct a management organization soundly conceived and carried out along practical social and motivational principles or, in failing this, creates for himself the seeds of his own destruction as a manager. It is in this area of relationships with subordinates that most managers succeed or fail as managers. Good management relationships with subordinates, causing the subordinates to excel at their work, naturally enhance the reputation of the manager and pushes him up through the ranks of any organization, because he becomes known as a man who can get results on an ever-broadening scale.

Review of planning

The competent manager can simultaneously satisfy several of his subordinates human desires when he asks them to perform planning, execution, and review in their jobs and limits his interaction with them to review. At the same time, he can satisfy several objectives of the organization such as the need to select intelligently and then develop management personnel.

1. First,"the desire of the subordinate for participation in planning his own future" is completely satisfied when planning is begun by the individual.

2. Second, managers can get their thoughts into subordinates' planning easily. All they have to do is :

   a. review their subordinates' plans on schedule
   b. study the plans carefully and contribute their ideas.

Review of performance

Performance is relative. But relative to what ? Management has fumbled this question for a long time and is only beginning to use "measures of performance acceptable to subordinates" - those measures which the employee has accepted and to which he has previously committed himself.

JOB TITLE : SPINNING MILL MASTER
MILL/DEPARTMENT : SPINNING MILL
IMMEDIATE SUPERVISOR : GENERAL MANAGER
IMMEDIATE SUBORDINATES: ASST SPINNING MASTER
SPARE PARTS SUPERVISOR
MAINTENANCE SUPERVISOR

\- - -

JOB SUMMARY

The primary responsibility of this position is the supervision through Asst. Masters and Supervisors of the mill. The objectives for this position are continuous and efficient production in desired quantity and quality.

MAIN DUTIES AND RESPONSIBILITIES

1. Exercises direct supervision over departmental or general supervisors with respect to production volume, cost and quality of production and meeting production schedules and delivery dates.
2. Stimulates maximum efficiency and productivity of both supervisors and production workers.
3. Encourages efficient utilization of equipment and facilities.
4. Set up product standards and specifications in conjunction with the Standards Supervisor. Once these standards have been established ensure that all production machine settings are in agreement with the standards.

5. Confers with General Manager in establishment of shift standards and working schedules for all departments connected with production.
6. Cooperates with Personnel Dept. in the recruiting, selection, and training of new employees.
7. Labour - establishes satisfactory relations with all the personnel. This is a key responsibility. Successful labour relations will result in better motivation of all operatives and foremen, reduced absenteeism, lower labour turnover, higher productivity per man and improved quality.
8. Reviews and approves recommendations of subordinates in matters of personnel or rate changes.
9. Control of raw material and process materials, including machinery spare parts, against agreed stock levels. Advise General Manager of re-order requirements as stock levels indicate.
10. Maintains conformance to budgetary limitations in all departments.
11. May initiate and recommend purchase of new capital equipment.
12. Prepares and maintains specific production and quality control reports.
13. Assumes responsibility for proper maintenance of the mill production facilities, including preventive maintenance program.
14. May also participate in collective bargaining grievance procedure and in actual contract negotiations.

15. Forecasts labor requirements based on known plant capacity and keeps Personnel Dept. aware of his needs well in advance of any emergencies.
16. Recommends equipment or layout changes, production methods or material handling procedures.
17. Maintains compliance with company policies, safety standards and good housekeeping practices.

REPORTS TO

General Manager.

INTERVIEWING

Interviewing is a skill which, like all skills, partly depends on natural ability and partly on learning. It is a meeting of persons face-to-face in order to accomplish one or more of several purposes.

These may include :

a. Correcting attitudes, behaviour or performance.
b. Obtaining information about a person or problem.
c. Discussing projects.
d. Getting to know an employee or colleague.

Many interviews lend themselves to planning in advance and the use of a prepared logical approach. The following advice applies to the majority of interviews.

1. Preparing for the Interview

Collect and record as much information beforehand from the questionnaires.

Ensure that any occupational information which is needed is available.

Check the environmental conditions :

- place
- reception and waiting room
- furniture - enough chairs ? suitably placed ?
- privacy
- arrange not to be interrupted
- ensure that all relevant papers are at hand
- clear your desk of other papers.

2. Opening the Interview

Greet him and introduce yourself.
Establish an easy talking relationship.
Make the purpose of the interview clear.
Encourage him to talk freely and openly.

3. Conducting the Interview

Ask purposeful questions.
Listen well and be seen to listen.
Keep alert and flexible.
Avoid prejudice and be sure you understand.
Do not interrupt unnecessarily - do not argue - do not monopolise.

Take notes unobstrusively.
Assess the situation.
Do not answer your own questions.

4. Concluding the Interview
Summarise the situation and state possible solutions.
Summarise points of agreement and disagreement.
Make sure any further action is clearly understood by the person or persons interviewed.

WEAKNESSES

Tactless remarks	Slang
Insensitive remarks	Hearty manner
Imperative remarks	Patronising
Facetious remarks	Moralising.

ADDITIONS TO SHORT TERM TRAINING COURSE FOR ASSISTANT SPINNING MASTERS

(Manuals No. 6 & 7)

JOB TITLE : ASST SPINNING MASTER
DEPARTMENT : OPENING THRU SPINNING
IMMEDIATE SUPERVISOR : SPINNING MILL MASTER
IMMEDIATE SUBORDINATES : DEPARTMENT SUPERVISORS

o O o

JOB SUMMARY

The primary responsibility of this position is the supervision through the departmental supervisors of the mill. The objectives for this position are continuous and efficient production in desired quantity and quality.

MAIN DUTIES AND RESPONSIBILITIES

1. Exercises direct supervision over department supervisors with respect to production volume, cost and quality of production and meeting production schedules and delivery dates.
2. Stimulates maximum efficiency and productivity of both supervisors and production workers.
3. Encourages efficient utilization of equipment and facilities.
4. Cooperates in training of new employees.
5. Labour-establishes satisfactory relations with all the personnel. This is a key responsibility. Successful labour relations will result in better motivation of all operatives and foremen, reduced absenteeism, lower labour turnover, higher productivity per man and improved quality.

6. Prepares and maintains specific production and quality control reports.
7. Assumes responsibility for proper maintenance of the mill production facilities, including preventive maintenance program.
8. Forecasts labor requirements based on known plant capacity and keeps Personnel Dept. aware of his needs well in advance of any emergencies.
9. Recommends equipment or layout changes, production methods or material handling procedures.
10. Maintains compliance with company policies, safety standards and good housekeeping practices.

T.I.R.D.C.

KARACHI

ADDITIONS TO

WEAVER'S INSTRUCTORS TRAINING COURSE

(INSTRUCTIONS AND ELEMENTS OF WORK)

(MANUAL No 8)

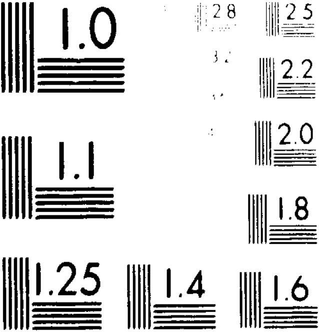
1.0
2.8
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TABLE OF CONTENTS

WEAVER TRAINING

1. SELECTION TESTS
2. INSTRUCTOR
3. CONTROL OF PROGRESS AND PROCEDURES
4. WORKING METHODS

1.0 SELECTION TEST

The standard Werner selection test must be used to ascertain that training efforts and costs are only used on trainees that are likely to benefit from the course.

Formboard A + B
Pinboard
Perception test letters or figures according
to language
Comprehension test is only applied to instructors
(18 to be done).

2. INSTRUCTOR

The instructor must be selected from the most experienced operators of the mill concerned.

The TIRDC officer cannot act as instructor as this would prevent continuity, when the TIRDC officer leaves the mill. Only the instructor is trained by him. The TIRDC officer is the person who develops the training system to suit each particular mill, as well as being coordinator and controller.

2 instructors should be trained. Even though only one is required. If only 1 instructor is trained, the whole training system collapses if the instructor becomes ill or leaves the mill. Always have a substitute.

Each instructor can handle 2 or 4 trainees. 2 trainees work together, timing each other under the supervision of the instructor. Safety points must be emphasized at each exercise.

HOW TO INSTRUCT OR PASS ON INFORMATION

Telling is not enough, it must be understood. The main purpose of training in industry is to help the beginner to learn his job and the skilled worker to be more efficient in his present or future work.

Every instructor must ask himself:

"What do we want our trainees to learn?"
"How can we help them to learn quickly and efficiently?"

As a simple guide, it is suggested that the following steps are necessary before and during instruction, if it is to achieve success:

Break down the instruction.
Get everything ready and properly arranged.
Prepare the individual.
Present the job or instruction.
Try-out and check on understanding.
Round off instruction or information.

HOW TO GET READY TO INSTRUCT

BREAK DOWN THE INSTRUCTION

DO THE JOB OR REHEARSE THE SUBJECT BEFOREHAND.
DIVIDE THE JOB OR SUBJECT INTO STAGES.
SELECT THE KEY POINTS.
SAFETY FACTORS ARE ALWAYS KEY POINTS.

GET EVERYTHING READY AND PROPERLY ARRANGED

CHECK LAYOUT, MATERIALS, TOOLS AND EQUIPMENT.
PROVIDE AIDS TO INSTRUCTION SUCH AS SKETCHES, SAMPLE JOBS, ETC.
ENSURE GOOD LIGHTING AND WORKING CONDITIONS.

HOW TO INSTRUCT

PREPARE THE INDIVIDUAL

PUT AT EASE.
STATE THE JOB OR SUBJECT.
CHECK EXISTING KNOWLEDGE.
CREATE INTEREST IN LEARNING.
ENSURE CORRECT POSITION.

PRESENT THE JOB OR INFORMATION

TELL, SHOW AND ILLUSTRATE AS APPROPRIATE.
PUT OVER ONE STAGE AT A TIME.
STRESS KEY POINTS.
INSTRUCT CLEARLY, COMPLETELY AND PATIENTLY.

TRY-OUT AND CHECK ON UNDERSTANDING

HAVE THE JOB DONE OR SUBJECT EXPLAINED.
CORRECT ERRORS AS THEY OCCUR.
TEST UNDERSTANDING OF "KEY" POINTS.
CONTINUE UNTIL YOU ARE SATISFIED.

ROUND OFF INSTRUCTION OR INFORMATION

EXPLAIN PERSON'S RESPONSIBILITIES.
NAME PERSONS WHO WILL HELP.
ENCOURAGE QUESTIONS.
CHECK LATER AS NECESSARY.

TRAINING PLAN

Training is essentially a process of changing people - their knowledge, skills, attitudes, or behaviour - through instruction.

A well trained staff will not only achieve more satisfaction from their work, but will also do the job more efficiently.

3. CONTROL OF PROGRESS

a. Training program

At the end of each day the instructor together with trainees will review the results of the day and plan the following day - which subject/part of job to be done.

b. Daily work sheet

Each exercise must be timed, as many attempts are needed to reach the target time. Trainee must not continue with next exercise before the first is mastered,tempo and quality wise.

c) Progress report

Before the trainee is handed over from the training centre to the production supervisor, it is necessary to review the progress. This should be followed from the start of stamina build up - that is, the trainee operates, firstly, say 30% workload, then 60% and 100%.

Ex. : If a weaver is to attend 50 looms at full load, start at 15 looms, etc.

Measure % efficiency and quality to ascertain progress.

d) Overall progress report

Use present form which is well designed.

e) Management control chart

Give complete overview of the training situation. Shows each trainees attained time compared to standard time.

Also how many exercises each person has completed. As trainees work in groups of 2, it is important already at the selection test stage, or later, to group trainees, so 2 quick persons work together and perhaps 2 slow together, to avoid delays, and that the best do not become bored.

Ref. 1 - write name of exercise
Ref. 2 - write D for demonstration exercise
MIN. 0.10, 0.75 etc. as target time for each element.

The sequence and times are established during instructor training, by TIRDC officer and 2 instructors, for each machine group.

EXAMPLES OF EXERCISE DEVELOPMENT

		REPEAT AT INTERVALS UNTIL 90% OF TARGET REACHED.
WEAVER'S KNOT	1a	5 Knots 10 threads on table
	1b	5 Knots in front of harness - on training loom
	1c	5 Knots in back of harness - on training loom
	1d	5 Knots between drop-wire & whiproll
	1e	5 Knots in each location - on training loom in weave shed
DRAWING IN REED	2a	5 Threads - on rack
	2b	2 x 5 threads - on rack
	2c	5 threads on training loom
	2d	5 threads in weave room
DRAWING IN DROP WIRE	4a	5 threads on separate bars
	4b	5 threads on training loom
	4c	5 threads in weave room
LOCATION & REPAIR OF BROKEN WEFT PICKS	5a	5 Loom stops - cut weft thread on training loom
	5b	5 Loom stops in weave room
FIND CAUSE OF LOOM STOP	6	10 Loom stops in weave room - instructor causes loop to stop for various types of warp & weft breaks.

EXAMPLE OF TASK : DRAWING IN REED

PREPARATION.

1. Have five separate ends, laying over reed cap.
2. Harness level.

QUALITY.

1. Each end must be properly drawn in a dent.
2. No ends should be crossed.
3. Dents are not to be damaged in any manner.
4. Penalty for quality error. 10 mins.
5. Trainee first checks quality, then instructor.

METHOD.

1. Separate warp at harness.
2. Pick up first end on left that is to be drawn.
3. If one less than correct number of ends are in 1st dent to left, pull end through this dent.
4. If correct number of ends are in 1st dent to the left pull end through first dent to right.

TARGET TIMES.

Have instructor do exercise five times and take average time as target. Target times will vary a little according to reed number type, ends/dent and yarn count.

TEMPO BUILD-UP.

Have trainee do exercise five times, then repeat at intervals of time until trainee reaches 90% of target time.

Vary the exercise by having 2 groups of five ends. Set target time for this exercise via instructor timing.

TIMING

Most of the exercises have target times and each trainee must learn to use a stopwatch in order to check his own progress.

Stop watches are expensive and must be handled with care. They should not be left unattended at the work place.

The watch should have a string tied to it, so it may be tied round the wrist of the person using the watch, avoiding it to fall on the floor.

In order that the trainee may get practice in using a stop watch, let the trainee stop the watch at the following:

0.04 Mins
0.20 Mins
0.40 Mins
0.55 Mins
0.70 Mins
1.10 Mins

Allow the trainee to time the picking up and laying down of a pencil. This will enable the instructor to verify that they understand how to use the watch as well as when to start and stop it while timing a movement.

DAILY WORK SHEET (b)

Name : ____________________ Dated : ______________

Day : _______________ Week: ____________ days on course _______

PERIOD	EXERCISE			TIME TAKEN											
	NAME	TARGET	BEST												

Best (Time accomplished):
Target (Time)
Name (of job)

This sheet would be used by the Instructor to record the Trainees progress with such jobs as piecing up at Ring frames.

PROGRESS REPORT (C)

Trainee's Name: ____________________

MACHINE	JOB, OR ITEM OF TRAINING	EXAMINATION DATE	% ASSIGNMENT	% EFF.	QUALITY

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

D = demonstration
MIN = std. time

INSTRUCTOR: ______________________

MANAGEMENT CONTROL CHART (e)

NO.	NAME:	STOP WATCH D	Ref. 1 Ref 2														REMARKS

TIRDC

KARACHI

ADDITIONS TO

TRAINING COURSE FOR WEAVING SHED SUPERVISORS

(MANUAL No. 10)

COURSE CONTENT (WEAVING SHED SUPERVISOR)

The principle of the course should be taught at TIRDC and the practical part should be carried out in their own weaving shed, under the supervision of TIRDC.

TRAINING PLAN

3 different ways are suggested:

1. - 4 mills together
2. - 1 mill - mill not able to release more than one shift supervisors (2) at a time
3. - 1 mill - mill can cover up by substitutes, so the supervisors (6) join 1. phase together.

Assumption — 2 supervisors per shift, depends upon mill, could be 3 per shift, which we feel is max. as 1. phase will be 4 mills x 3 = 12 persons or 3 mills x 3 = 9 persons.

Code

PR - Preparation
- selection test of supervisors
- make job description and organisation
- collect information systems and forms
- discuss procedure with weaving manager, who is key person, he must be involved in all parts, to ascertain continuity.

PL - Plan
- make training plan
- analyse forms and organisation
- get teaching materials ready

1. INTRODUCTION AND TRAINING PLAN

This booklet has been prepared by the Weaving Department of the Centre for the training of Weaving Jobbers/Supervisors scheduled to be held at Cotton Textile Industry Research and Development Centre, Moulvi Tamizuddin Khan Road, Karachi.

As Weaving Jobbers and Supervisors belong to the initial stage of the management, it is therefore necessary for them to have good knowledge about the maintenance and administration side of the weaving shed. Maintenance side has already been covered in the Volume -1 prepared for the training of "WEAVING FITTER'S INSTRUCTORS", whereas the other items belonging mainly to the administration side are discussed in this booklet i.e. Volume-II.

We are of this opinion that our textile weaving industry can achieve systematic and scientific methods to improve the production and quality of products in the Weaving Shed along with the reduction in the cost of production when the items discussed in this booklet are implemented.

As weaving mills are different in organisation and people, it is not possible to train in one common way, therefore the course is in 2 phases - 1st. general and 2nd. specific for mill concerned. The training must be tailor-made for each mill and supervisors trained, or re-trained in the in the particular environment in which the operate.

I - 1. Phase - training in general principle, which is expected to take 6 days

II (1)- 2. Phase - 1. Shift - implement in mill

II (2)- 2. Phase - 2. Shift - implement in mill

II.(3)- 3. Phase - 3. Shift - implement in mill

F.U. - Follow-up

TRAINING PLAN 1

DAYS	TIRDC	MILL-A	MILL-B	MILL-C	MILL-D	No. OF PERSONS TRAINED
SA		PR				
S			PR			
M				PR		
T					PR	
W	PL					
T	PL					
SA-TH.	I					(8)
SA		II (1)				2
S		II (1)				
M			II(1)			2
T			II(1)			
W				II(1)		2
T				II(1)		
SA					II(1)	2
S					II(1)	
M-SUN	I					(8)
M		II (2)				2
T		II (2)				
W			II(2)			2
T			II(2)			
SA				II(2)		2
S				II(2)		
M					II(2)	2
T					II(2)	
W-TUE	I					(8)
W		II(3)				2
T		II(3)				
SA			II(3)			2
S			II(3)			
M				II(3)		2
T				II(3)		
W					II(3)	2
T						

TRAINING PLAN 1
(cont'd)

DAYS	TIRDC	MILL-A	MILL-B	MILL-C	MILL-D	No. OF PERSONS TRAINED
SA		F.U.				
S			F.U.			
M				F.U.		
T					F.U.	
52 days						24 persons

$$\frac{\text{52 days x RS 15000/Wk}}{\text{6 days/wk x 24 persons}} = \text{RS 5417 per person trained}$$

TRAINING PLAN 2

DAYS	TIRDC	MILL A	-			No.OF PERSONS TRAINED
SA		PR				
S	PL					
M-SUN	I					(2)
M		II(1)				2
T		II(1)				
W-TUE	I					(2)
W		II(2)				2
T		II(2)				
SA-THURS	I					(2)
SA		II(3)				2
S		II(3)				
M		F.U.				
27 days						6 persons

$$\frac{\text{27 days x RS 15000/wk}}{\text{6 days/wk x 6 persons}} = \text{RS 11250 per person trained}$$

TRAINING PLAN 3

DAYS	TIRDC	MILL A				No OF PERSONS TRAINED
SA		PR				
S	PL					
M-SUN	I					(6)
M		II(1)				2
T		II(1)				
W						
T						
SA		II(2)				2
S		II(2)				
M						
T						
W						
T						
SA		II(3)				2
S		II(3)				
M		F.U.				

21 days

$$\frac{21 \text{ days} \times \text{RS } 15000/\text{wk}}{6 \text{ days/wk} \times 6 \text{ persons}} = \underline{\text{RS } 8750} \text{ per person trained}$$

PREPARATION OF THE COURSE

During the preparation visit to mills, the following information should be collected and analysed (discuss with the weaving manager).

1. Pick counter readings
2. Stoptime recordings
3. Eff. calculations
4. Quality reports
5. P.M. and overhaul calender
6. Beam and style change plan
7. Training plan and personnel appraisal
8. Loom rating
9. Spare parts, shuttle usage, etc.
10. Supervisors checklist
11. Workload calculations
12. Working hours record
13. Threadbreak study and analysis
14. Specifications and std. settings
15. Waste control form.

These records and reports vary from mill to mill, an important part of a supervisory training course is the analysis of the flow of information. Ask for each:

1. what is the purpose of this form
2. could it be eliminated
3. could it be combined with another form.

See Chapter 10 - follow-up and control.

Statistics of above information are useful, collect average figures for say 1 month before the course commences, so progress may be measured.

WHO SUPPLIES INFORMATION

No	INFORMATION	FREQUENCY	WHO
1.	PICKS PRODUCED	PER LOOM PER SHIFT	CLERK OR SUPERVISOR OR SECTION FIXER
2.	STOPTIME	WHEN LOOM IS STOPPED/STAR- TED	FIXER OR SECTION FIXER
3.	EFFICIENCY	PER LOOM PER SHIFT PER SECTION FOR ALL LOOMS	CLERK
4.	CLOTH QUALITY	PER LOOM PER SHIFT TOTAL PER STYLE	RECORD AND CALCULATE BY INSPECTION DEPT. CALC.% 1ST SORT. REASONS FOR REJECTION
5.	P.M. AND OVERHAUL PLAN	CALENDER FOR ALL LOOMS-MADE PERIODICALLY	WEAVING MANAGER, SUPERVISOR AND HEAD FIXER/OVERHAULER
6.	BEAM AND STYLE CHANGE PLAN	PER LOOM PER WEEK	PRODUCTION PLANNING
7.	TRAINING PLAN	PER PERSON	WEAVING MANAGER, SUPERVISOR AND TRAINING OFFICER
8.	LOOM RATING	PER LOOM PER FIXER	SUPERVISOR OR HEAD FIXER OR CONTROL PERSON
9.	SPARE PARTS	PER ITEM PER LOOM	STORES,KEEPS RECORD OF STOCKS AND USAGE
10.	SUPERVISOR CHECKLIST	PER SUPERVISOR PER SHIFT	FILL OUT BY SUPER- VISOR
11.	WORKLOAD CALCULATIONS	PER STYLE	INDUSTRIAL ENGINEE- RING DEPT
12.	WORKING HOURS	PER PERSON PER SHIFT	CLERK

No	INFORMATION	FREQUENCY	WHO
13.	THREAD BREAK STUDIES	PER STYLE	IND. ENG. DEPARTMENT
14.	SPECIFICATION + STANDARD SET.	PER STYLE	WEAVING MANAGER AND SUPERVISOR
15.	WASTE CONTROL	PER DEPT.	WASTE RECORDER

SOURCES OF INFO. FOR CONTROL

1) Pick counter readings per shift per loom

2) Stoptime record time stopped & reasons per shift per loom

3) Op.eff. loom eff. mill eff.

4) Quality Control
Per loom/shift
Calc. % 1st.sort.
Reasons for 2nd sort.
Total meters

5) Preventive maintenance and overhaul plan

6) Beam change and style change plan (production planning)

7) Training plan - cross training appraisal of personnel

8) Loom rating form.
per loom
per section

9) Spare parts stores
-spares available
-usage per loom (spares shuttles, pirns)

10) Supervisor checklist and report to weav. manager

SOURCES OF INFO. FOR CONTROL

(cont'd)

11) Workload calc. per style	12) Working hours records attendance % per person	13) Threadbreak study and analysis
14) Style specification and standard loom settings - per style	15) Waste control per dept. %	

2.0 SELECTION TEST

The standard Werner selection test should be applied in every case, whether training for promotion to supervisor or re-training of supervisors.
The position of supervisor is so important that some screening is necessary, so only the most suited persons are promoted, or if retraining it is important that management knows the potential of its present supervisory staff.

The full test to be given includes:

- formboard A + B
- pinboard
- perception - letters or shapes according to language
- comprehension - all 36 to be done.

The test results are but one side of the selection of most suitable candidates. Review also by past performance or interviewing. Even in case of re-training it is necessary to ascertain that the person in question is interested and willing to continue the ever demanding job of supervisor.

It often happens that a poor performing supervisor prefers to be transferred to other work, where he will be more capable. Job satisfaction comes from doing a job well.

3.0 COURSE TIME TABLE

Each subject should be dealt with in 3 steps

(a) - go through text

(b) - general discussion

(c) - discuss specific mill problems.

The various subjects demands more or less discussion, hence time table should be elastic enough to allow extra time if required.

We expect that 1. Phase can be completed in one week, however, subjected to individual circumstances.

DAY	SUBJECT			
	No.	MORNING	No.	AFTERNOON
1	1.0 2.0 2.1	Introduction Selection test Interviewing	3.0 4.0 4.1	Course time table Instruction Communication
2	5.1 5.2 5.3 5.4 5.5	Organisation Job description Supervisory duties Leadership Your responsibility	6.1 6.2 6.3	Source of labour Cross training plan Staff and labour control
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4	7.22 7.23 7.24 7.24 1 7.24 2	Loss of production Loom stoptime report Production Prod.calculations Loom efficiency	7.243 7.25 8.1 8.2	Workload calculations Loom stop analysis Quality control Waste control

DAY	SUBJECT			
	No	MORNING	No	AFTERNOON
5	9.1 9.2	Safety training for Supervisors Weaving shed environment	10.1 10.2	Checklist Sources of info. for control
6	10.3 10.4	List of points to check Loom stops due to weft breaks	10.5 10.6	Maintenance and servicing of looms Main problems and how to tackle

4. INSTRUCTION

4.1 COMMUNICATION

HOW TO INSTRUCT OR PASS ON INFORMATION

There are various methods of communication: these include - notice boards, circulars, newsletters, mass meetings, discussions, using the management structure, by discussion with union representatives, face to face discussions and the grapevine.

We are here concerned with communication through the supervisor which is generally face with supervisors and work people. It is through him that instructions from management are passed on to the workers and the views of the workers up to management.

He normally has to answer questions on various matters asked by his fellow supervisors. He has to report any difficulties he may experience in his daily work to his superiors and to give detailed instruction to the workers.

Work people want effective communication. Management equally, has a clear interest in improving communications and both sides could benefit from the higher productivity which would result from adequate attention being paid to ensuring that communications are effective - in other words, to ensuring that the RIGHT information reaches the RIGHT people at the RIGHT time.

The supervisor must keep himself up to date on all the information that crosses his desk. When a rumour reaches his ears, he should take immediate steps to get at the facts. If the answers are not forthcoming from the supervisor, the grapevine is only too happy to oblige.

Merely to shelve a story as a rumour does not help. People know that a rumour may well turn out to be true.

INSTRUCTIONS

One of the main responsibilities of a supervisor is to train his people. He may delegate this training to someone else, but the end responsibility remains his.

Many troubles in instruction on the supervisory level are due to the workers being afraid of the supervisor, and hence they may fail to check with him, or they may withhold information from him. If the supervisor is very busy he may forget to tell everyone concerned and taking too much for granted from those he does tell. He may show anger and irritation, his words will say one thing and sound as though the mean something else. He may refuse to discuss critical issues and situations from subordinates.

TELLING IS NOT ENOUGH IT MUST BE UNDERSTOOD

The main purpose of training in industry is to help the beginner to learn his job and the skilled worker to be more effective in his present or future work.

Every supervisor must ask himself:

"What do we want our trainees to learn?"

"How can we help them to learn quickly and efficiently?"

As a simple guide, it is suggested that the following steps are necessary before and during instruction, if it is to achieve success:

Break down the instruction.
Get everything ready and properly arranged.
Prepare the individual.
Present the job or instruction.
Try-out and check on understanding
Round off instruction or information.

HOW TO GET READY TO INSTRUCT

BREAK DOWN THE INSTRUCTION

DO THE JOB OR REHEARSE THE SUBJECT BEFOREHAND.

DIVIDE THE JOB OR SUBJECT INTO STAGES.

SELECT THE KEY POINTS.

SAFETY FACTORS ARE ALWAYS KEY POINTS.

GET EVERYTHING READY AND PROPERLY ARRANGED

CHECK LAYOUT, MATERIALS, TOOLS AND EQUIPMENT.

PROVIDE AIDS TO INSTRUCTION SUCH AS SKETCHES, SAMPLE JOBS, ETC.

ENSURE GOOD LIGHTING AND WORKING CONDITIONS.

HOW TO INSTRUCT

PREPARE THE INDIVIDUAL

PUT AT EASE.

STATE THE JOB OR SUBJECT.

CHECK EXISTING KNOWLEDGE.

CREATE INTEREST IN LEARNING.

ENSURE CORRECT POSITION.

PRESENT THE JOB OR INFORMATION

TELL, SHOW AND ILLUSTRATE AS APPROPRIATE.

PUT OVER ONE STAGE AT A TIME.

STRESS KEY POINTS.

INSTRUCT CLEARLY? COMPLETELY AND PATIENTLY.

TRY-OUT AND CHECK ON UNDERSTANDING

HAVE THE JOB DONE OR SUBJECT EXPLAINED
CORRECT ERRORS AS THEY OCCUR
TEST UNDERSTANDING OF "KEY" POINTS
CONTINUE UNTIL YOU ARE SATISFIED

ROUND OF INSTRUCTION OR INFORMATION

EXPLAIN PERSON'S RESPONSIBILITIES
NAME PERSONS WHO WILL HELP
ENCOURAGE QUESTIONS
CHECK LATER AS NECESSARY

TRAINING PLAN

Training is essentially a process of changing people - their knowledge, skills, attitudes, or behaviour - through instruction.

A well trained staff will not only achieve more satisfaction from their work, but will also do the job more efficiently.

Supervisors in charge of big departments may sometimes have difficulty in deciding whom to select for further instruction and which particular jobs to break down for instructing purposes. The answer is to find where the greatest need exists by making a training plan.

The main factors to be considered when making a "TRAINING PLAN" are:

- PERSONNEL CHANGES
- PERFORMANCE STANDARDS
- PRODUCTION COMMITMENTS
- COVER KEY JOBS FOR EMERGENCIES
- SELECT PEOPLE TO BE TRAINED
- FIX DATES FOR COMPLETION OF TRAINING
- MAKE BEST USE OF EACH PERSON'S ABILITY
- KEEP YOUR PLAN UP TO DATE.

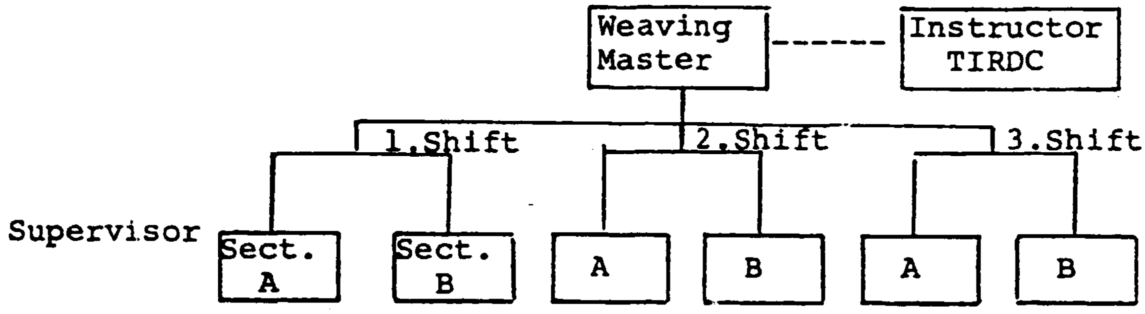
AN EFFICIENT SECTION IS DEVELOPED BY PLAN NOT BY CHANCE.

5.0 ORGANISATION AND JOB DESCRIPTION

5.1 ORGANISATION

It is not possible to generalise each mill must be looked at in isolation.

In simplified form:



5.2 JOB DESCRIPTION

No supervisor can be responsible without authority which must be delegated to him by management. To define this, a job description should be prepared so the supervisors know exactly what is expected of them.

This may vary from mill to mill, and before any course can commence, the job description must be drawn up in cooperation with management.

Example of job description:

See form.

TIRDC KARACHI	JOB DESCRIPTION DATE:	WERNER BRUSSELS

JOB TITLE : Weaving shed supervisor
DEPARTMENT : Weaving
SECTION : XYZ
IMMEDIATE SUPERIOR : Assistant Weaving Master

IMMEDIATE SUBORDINATES: Weavers
Section fixers
Cleaners
etc.

JOB SUMMARY : organise and control production and quality from his section.

MAIN DUTIES AND RESPONSIBILITIES

1. Make sure that all looms are manned
2. In cooperation with preparation depts. ascertain that materials supply is according to plan, and not causing loom waiting time.
3. Check stopped looms to find out reason for stop, and make sure that looms are started up as quickly as possible.
4. Make sure that looms are maintained correctly, for high performance and low usage of spares and shuttles.
5. Check look for quality and in cooperation with cloth inspection, attend to problem looms immediately.
6. Together with weaving manager, and training officer, evaluate peoples performance and plan possible transfer of re-training.
7. Organise housekeeping to improve quality and working conditions.
8. Make sure that safety and fire regulations are followed.

5.3 SUPERVISORY DUTIES

1. Effective mastery of the following areas without disrupting the operation. If the following concepts can be acquired, the supervisor will have mastered everything needed to perform the job properly.

2. Knowledge of what the worker expects (and should receive)
   - A. Proper job instruction
   - B. Impartial treatment and loyalty.
   - C. Fair production standards
   - D. Proper attendance and no lateness.

3. Proper expectations about the operator
   - A. Loyalty
   - B. Cooperation
   - C. Standard and above standard production
   - D. Proper attendance and no lateness.

4. Proper expectations about mangement.
   - A. A clear line of authority
   - B. Non-conflicting rules and regulations
   - C. Reasonable production schedules and production requirements
   - D. Decisions backed by management.

5. Knowing what management expects from the supervisor
   - A. Trouble-free leadership
   - B. Carrying out company rules
   - C. Loyalty
   - D. Meeting production quotas
   - E. Keeping adequate records.

6. Recognition of the labour turnover problem
   - A. The effect of turnover on production costs
   - B. The effect of turnover on departmental morale
   - C. Are the reasons given for discharge sufficiently detailed to allow a complete analysis of trouble spots?
   - D. Are grievances heard privately and are they resolved promptly?

7. Recognition of the worker as an individual.
   - A. What makes him different from other workers (temperament, education, outside interests, the nature of job)
   - B. What outside conditions can affect the worker (personal problems)
   - C. Age and how it affects the operator

8. Ability to elicit efficiency from the operator
   - A. Gain respect
   - B. Let the worker know what is expected
   - C. Fair and impartial treatment
   - D. Patience and understanding at all times
   - E. Making each worker feel a part of your team

9. Ability to recognize a potential problem worker
   - A. Lack of respect for supervisor
   - B. Inefficiency
   - C. Carelessness
   - D. Time and material waster
   - E. Privilege abuser
   - F. Excessive mistakes.

5.3. SUPERVISORY DUTIES (cont'd)

10. Knowing what causes employee problems
    A. Poor selection and placement by management
    B. Inadequate training
    C. Incompetent supervision
    D. Failure to enlighten workers on management's attitude on matters of promotion, grievances, etc.
    E. Unsound personnel practices
    F. Off the job problems

11. Ability to deal with problem workers and still maintain the other responsibilities
    A. Better aptitude tests
    B. Personality tests
    C. Study of work assignment in light of the worker's personality or ability
    D. Worker's physical condition
    E. Study of employee's environment
    F. Aid the employee in the adjustment of environment
    G. Adjust quality of supervision to worker's emotional needs
    H. Provide channels for grievances
    J. Provide support by being available.

5.4. LEADERSHIP TRAINING FOR SUPERVISORS

THE SUPERVISOR AS A LEADER

WHAT IS LEADERSHIP?

It is the ability to get other people to work willingly through the leader's influence or example. It has to do with the art of dealing with persons.

THE SUPERVISOR AND HIS JOB

One of the most important aspects of a supervisor's duties is the personal relationship between you - the supervisor - and the people you supervise.

The relationship is the key to the degree of success that you will have in carrying out your supervisory duties.

By mis-timing and lack of understanding of people you may never be really successful at your job.

Outlined underneath are a few fundamentals of effective supervision,worth bearing in mind for the use of them will make your problems considerably easier than you expect.

1. Aim to be technically proficient at your job. Know your section well but try also to have a working knowledge of the organisation you serve.

2. Acquire the ability to look ahead: to plan the work for maximum efficiency so that you can advise seniors when you foresee that some difficulty will arise.

3. Retain your ability to do many of the jobs in your section but also retain a clear memory of the physical effort involved in each job.

4. By being orderly in your working habits, your example will help to keep the section neat and tidy.

5. Be honest with yourself as well as with other people. If you realise you have made a wrong decision; you should try to correct it.
   Employees respect a supervisor who admits his own mistakes.

6. Understand the personalities of the individuals you control but show no sign of favouritism in any direction.

7. When you find it necessary to criticise or correct an employee, do this so that your remarks cannot be heard by other employees.

8. Do not have "moods". Keep your temperament even and your approach to the job and colleagues pleasant and enthusiastic.

9. Do not let the job crush your sense of humour.

Where there is bad relationship between supervisor and employees, the results of their work will be bad.

GOOD RELATIONSHIPS MEAN GOOD RESULTS

WHAT AN EMPLOYEE EXPECTS OF HIS SUPERVISOR

Every now and then, every supervisor should ask himself what his workers expect of him. Fortunately, he does not have to guess to get the answer. An employee expects the same treatment that the supervisor expects from his own supervisor.

Putting himself in the other fellow's place, the supervisor will agree that the following are some of the things expected of him by the workers:

Human Treatment
Recognition
Security
Advancement
Outlet for Initiative
Worthwhile Work

No two individuals can be exactly alike and this dissimilarity in individuals contributes greatly to the complexity of a supervisor's job.

SOME FOUNDATIONS FOR GOOD RELATIONS

A supervisor can create good relations by the use of the following well-tried principles:

LET EACH EMPLOYEE KNOW HOW HE IS GETTING ON

Decide what you expect of him.
Point out ways to improve.

GIVE CREDIT WHEN DUE

Look for extra or unusual performance.
Tell him right away.

TELL PEOPLE IN ADVANCE ABOUT CHANGES THAT WILL AFFECT THEM

Tell them why, if possible.
Help them to understand the change.
Get them to accept the change.

MAKE BEST USE OF EACH PERSON'S ABILITY

Look for ability not now being used.

Never stand in a man's way for promotion.

PEOPLE MUST BE TREATED AS INDIVIDUALS

HUMAN RELATIONS PROBLEMS

Although the use of the "Foundations for Good Relations" may prevent many problems from arising, none of us would expect them to prevent ALL problems.

Therefore another vital part of leadership is the ability to handle the problems that we cannot prevent.

In handling problems that do arise, we are helped by what we shall call "hints".

HINTS ON HANDLING HUMAN PROBLEMS

GET ALL THE FACTS

About the individual - His record - Similar problems. Check rules and customs affected by the problem. Talk with appropriate people and note their opinions and feelings.

WEIGH AND DECIDE

Fit the facts together.
Consider how one fact relates to another.
Consider gaps or contradictions in the facts.
Think out possible action.
Remember the practices and policies of your management.
Decide on an action with the best possible effect on the Individual, the Section and the Production.

TAKE ACTION

Decide who is best fitted to take action.
Consider what help is needed.
Decide whether your senior is to be informed.
Watch the timing of the action.

CHECK RESULTS

Check as soon as is reasonable.
Check as often as is necessary.
Watch for changes in output - attitudes - relationships

DETERMINE YOUR OBJECTIVES

When tackling any problem, we must know what we are trying to accomplish. At a later stage, it is possible that the first objective will be found to be too narrow and it may be necessary to broaden it. Therefore it is recommended that after "Getting the Facts" the first objective should be studied and altered if necessary.

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Be sure you have the whole story and the right objective.

Do not jump to conclusions.
Do not pass the buck.
Did your action achieve your objective?

REMEMBER

YOUR RELATIONSHIPS ARE THE KEY TO THE DEGREE OF SUCCESS YOU WILL HAVE AS A SUPERVISOR

YOU ARE PART OF THE MANAGEMENT OF THIS ORGANISATION
MANAGEMENT EXPECTS YOU TO INTERPRET ITS POLICY AND REFLECT ITS VIEWS TO WORK PEOPLE

BE CONCERNED WITH THE HAPPINESS OF THE PEOPLE WHO ARE UNDER YOUR CONTROL.
A SUPERVISOR GETS HIS RESULTS THROUGH PEOPLE.

5.5 YOUR RESPONSIBILITIES

As a supervisor it is your responsibility to:

Make best use of the workers under your control.
Assign work to employees.
Move employees to more suitable work when necessary.
Fill temporary vacancies in teams whenever possible.
See that team workers are familiar with more than one job.
Develop skill by detailed instruction and try-out on the job.
Make yourself personally responsible for each employee's training and progress.
Give constant help and encouragement until maximum output is reached.
Give employees as much advance information as possible about changes that will affect them.
Help them to understand why the change is to be made.
Report to your senior the feelings or reactions of your section, to any change in particular or to the organisation in general.
Interpret the rules of the Company and explain the need for them.
Interpret the Company's personnel policy to employees.
Recommend a such changes in methods, as you believe would improve efficiency.
See that your machines and equipment are properly maintained and in good working order.
Take or recommend such action as will prevent hold-ups within your section.
Encourage employees to make suggestions.
Ensure that all shortages of materials or tools are reported without delay.
Co-operate with other supervisors.
See that employees' grievances are dealt with promptly.
Maintain working conditions that are safe and healthy.
See that all comply with rules.
Develop and maintain good relationships between management and employees.

SUPERVISORS WHO CONCERN THEMSELVES WITH THEIR EMPLOYEES NEEDS, USUALLY GET MORE WORK DONE THAN SUPERVISORS WHO CONCERN THEMSELVES WITH WORK ONLY.

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ADDITIONS TO TRAINING COURSE FOR WEAVING MASTERS

(Manual No.11)

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

THE THREE BASIC FUNCTIONS OF MANAGEMENT

A manager must plan.
A manager must execute.
A manager must review.

Everyone knows that to "plan" means to think ahead or carry out a conceptual activity and to relate the possibilities of the future to the actualities of the present and the past. Almost everyone can see, too, that to "execute" is to carry out a plan or put it into practice. But "review" in this chapter is given a new connotation : it means the total activity of the manager in dealing with the plans and executions of his immediate subordinates. Very few managers use the word "review" for their interactions with their subordinates. Moreover, most managers have trouble recognizing the true nature of their planning and execution functions in relation to the review of their immediate superiors.

The first basic management function, planning, encompasses the conceptual relation of tue uncertainties and possibilities of tomorrow and beyond to the facts of today and yesterday, in attempting to cope with or, in part, to determine the future. The second basic function, execution,is a collection of activities by which a manager puts into being his own plans for his own job. The third basic function is review, by which a manager interacts with his subordinates during their planning stages and helps them keep score on their performance against their plans.

Of the three functions, planning and review have been the ones to which managers have not usually devoted enough time and care. Time spent on execution has usually usurped time which might more properly be devoted to the other two, so necessary, functions.

At the bottom of the management structure is the level of management next to the direct workers. Most direct workers have a very small role in planning their own jobs. Thus, the manager usually reviews the worker's performance against plans which probably resulted chiefly from his own planning process, rather than from that of the workers. Failures in this area over the last century have probably resulted in more trouble for the management of business enterprises than failures in any other area. Studies of human motivational behavior reveal this practice as the key villain in causing lowered worker morale and productivity. For it is in this area - the classical failure of management to include the worker's knowledge of their own jobs and their thoughts for improving their own efficiency in the planning of their own jobs - that the main seed of discontent arises in the minds of workers. Changing this method of supervising workers stands as one of management's greatest challenges.

Subfunctions of Planning

There are two subfunctions which must be carried out in the planning activity :

1. Setting objectives
2. Programming.

<u>Execution</u>

After a manager develops his plans and describes them to his superior, obtains approval of them, and psychologically commits himself to their accomplishment, he begins the phase of implementation. The word "execution" was chosen for this major function for several reasons, among which are :

1. "Execution" is a shorter word than "implementation" or "administration".
2. "Accomplishing" denotes more the finish of an activity.

Execution includes all those activities which a manager employs in carrying out his plans, including reporting his results to his superior and carrying out a list of other personal duties, but excluding those of direct interaction with his subordinates. This direct interaction with his subordinates is especially reserved for the third basic function, review.

The execution portion of all manager's jobs always includes the common duty of reporting facts concerning the rate of completion of results for which the managers are personally responsible, whether the duties are carried out personally or by subordinates.

Review

Clearly the least understood of the major management functions, review is almost the most important, because in carrying out this function, a manager either seizes the opportunity to construct a management organization soundly conceived and carried out along practical social and motivational principles or, in failing this, creates for himself the seeds of his own destruction as a manager. It is in this area of relationships with subordinates that most managers succeed or fail as managers. Good management relationships with subordinates, causing the subordinates to excel at their work, naturally enhance the reputation of the manager and pushes him up through the ranks of any organization, because he becomes known as a man who can get results on an ever-broadening scale.

Review of planning

The competent manager can simultaneously satisfy several of his subordinates human desires when he asks them to perform planning, execution, and review in their jobs and limits his interaction with them to review. At the same time, he can satisfy several objectives of the organization such as the need to select intelligently and then develop management personnel.

1. First,"the desire of the subordinate for participation in planning his own future" is completely satisfied when planning is begun by the individual.

2. Second, managers can get their thoughts into subordinates' planning easily. All they have to do is :

   a. review their subordinates' plans on schedule
   b. study the plans carefully and contribute their ideas.

Review of performance

Performance is relative. But relative to what ? Management has fumbled this question for a long time and is only beginning to use "measures of performance acceptable to subordinates" - those measures which the employee has accepted and to which he has previously committed himself.

JOB TITLE : WEAVE MILL MASTER
MILL/DEPARTMENT : WEAVE MILL
IMMEDIATE SUPERVISOR : GENERAL MANAGER
IMMEDIATE SUBORDINATES: ASST. MASTERS, SPARE PARTS SUPERVISOR, MAINTENANCE SUPERVISOR

o O o

JOB SUMMARY

The primary responsibility of this position is the supervision through Asst. Masters and Supervisors of the mill. The objectives for this position are continuous and efficient production in desired quantity and quality.

MAIN DUTIES AND RESPONSIBILITIES

1. Exercises direct supervision over departmental or general supervisors with respect to production volume, cost and quality of production and meeting production schedules and delivery dates.
2. Stimulates maximum efficiency and productivity of both supervisors and production workers.
3. Encourages efficient utilization of equipment and facilities.
4. Set up product standards and specifications in conjunction with the Standards Supervisor. Once these standards have been established ensure that all production machine settings are in agreement with the standards.

5. Confers with General Manager in establishment of shift standards and working schedules for all departments connected with production.
6. Cooperates with Personnel Dept. in the recruiting, selection, and training of new employees.
7. Labour - establishes satisfactory relations with all the personnel. This is a key responsibility. Successful labour relations will result in better motivation of all operatives and foremen, reduced absenteeism, lower labour turnover, higher productivity per man and improved quality.
8. Reviews and approves recommendations of subordinates in matters of personnel or rate changes.
9. Control of raw material and process materials, including machinery spare parts, against agreed stock levels. Advise General Manager of re-order requirements as stock levels indicate.
10. Maintains conformance to budgetary limitations in all departments.
11. May initiate and recommend purchase of new capital equipment.
12. Prepares and maintains specific production and quality control reports.
13. Assumes responsibility for proper maintenance of the mill production facilities, including preventive maintenance program.
14. May also participate in collective bargaining grievance procedure and in actual contract negotiations.

15.Forecasts labor requirements based on known plant capacity and keeps Personnel Dept. aware of his needs well in advance of any emergencies.
16.Recommends equipment or layout changes, production methods or material handling procedures.
17.Maintains compliance with company policies, safety standards and good housekeeping practices.

REPORTS TO

General Manager.

INTERVIEWING

Interviewing is a skill which,like all skills, partly depends on natural ability and partly on learning. It is a meeting of persons face-to-face in order to accomplish one or more of several purposes.

These may include :

a. Correcting attitudes, behaviour or performance.
b. Obtaining information about a person or problem.
c. Discussing projects.
d. Getting to know an employee or colleague.

Many interviews lend themselves to planning in advance and the use of a prepared logical approach. The following advice applies to the majority of interviews.

1. <u>Preparing for the Interview</u>

Collect and record as much information beforehand from the questionnaires.

Ensure that any occupational information which is needed is available.

Check the environmental conditions :

- place
- reception and waiting room
- furniture - enough chairs ? suitably placed ?
- privacy
- arrange not to be interrupted
- ensure that all relevant papers are at hand
- clear your desk of other papers.

2. <u>Opening the Interview</u>

Greet him and introduce yourself.
Establish an easy talking relationship.
Make the purpose of the interview clear.
Encourage him to talk freely and openly.

3. <u>Conducting the Interview</u>

Ask purposeful questions.
Listen well and be seen to listen.
Keep alert and flexible.
Avoid prejudice and be sure you understand.
Do not interrupt unnecessarily - do not argue - do not monopolise.

Take notes unobstrusively.
Assess the situation.
Do not answer your own questions.

4. Concluding the Interview
Summarise the situation and state possible solutions.
Summarise points of agreement and disagreement.
Make sure any further action is clearly understood by the person or persons interviewed.

WEAKNESSES

Tactless remarks	Slang
Insensitive remarks	Hearty manner
Imperative remarks	Patronising
Facetious remarks	Moralising.

ADDITIONS TO
TRAINING COURSE FOR
WEAVING ASST. MASTERS

(Manuals No.12 & 13)

JOB TITLE : ASST. WEAVING MASTER
DEPARTMENT : WEAVING
IMMEDIATE SUPERVISOR : WEAVE MILL MASTER
IMMEDIATE SUBORDINATES : WEAVE ROOM SUPERVISORS

o O o

JOB SUMMARY

The primary responsibility of this position is the supervision through the departmental supervisors of the mill. The objectives for this position are continuous and efficient production in desired quantity and quality.

MAIN DUTIES AND RESPONSIBILITIES

1. Exercises direct supervision over department supervisors with respect to production volume, cost and quality of production and meeting production schedules and delivery dates.
2. Stimulates maximum efficiency and productivity of both supervisors and production workers.
3. Encourages efficient utilization of equipment and facilities.
4. Cooperates in training of new employees.
5. Labour-establishes satisfactory relations with all the personnel. This is a key responsibility. Successful labour relations will result in better motivation of all operatives and foremen, reduced absenteeism, lower labour turnover, higher productivity per man and improved quality.

6. Prepares and maintains specific production and quality control reports.
7. Assumes responsibility for proper maintenance of the mill production facilities, including preventive maintenance program.
8. Forecasts labor requirements based on known plant capacity and keeps Personnel Dept. aware of his needs well in advance of any emergencies.
9. Recommends equipment or layout changes, production methods or material handling procedures.
10. Maintains compliance with company policies, safety standards and good housekeeping practices.

ADDITIONS TO
TRAINING MANUALS
IN FINISHING

(5 Manuals)

No. 15
No. 16
No. 17
No. 18
No. 19

TABLE OF CONTENTS

I. INTRODUCTION

1. Following a brief review in Pakistan in September 1980 of 6 training manuals covering various aspects of wet processing, we were asked to make a more detailed review and suggest how they could be made more effective.

2. The manuals that have been reviewed are the following :

REF."A" - Training course n° 1, Dyeing and Printing of Polyester and Polyester/Cellulosic Blends (Pretreatments).

REF."B" - Dyeing of Polyester and Blends by Discontinuous Methods.

REF."C" - Training Course on Quality Control and Testing in Wet Processing Department.

REF."D" - Training Course n°1, Printing on Polyester/ Cellulosic Blended Fabrics.

REF."E" - Training Course n° 2, Water Proofing of Cotton Textile Fabrics.

REF."F" - Dyeing of Polyester and Polyester/Cellulosic Blends by Continuous and Semi-continuous Methods.

To simplify the identification and reference to the manuals, they will be referred to as manuals Ref.A, Ref.B, etc.

3. With the exception of manual Ref.F, which was found to be satisfactory, all the other manuals will require extensive rewriting to make them effective training manuals.

   Suggestions, format, charges of content etc. for each manual have been made individually and these are given in separate sections of this report.

4. The method of application of these trainingmanuals, in order to give maximum benefit to the trainee, should be :

   a. Seminar and workshop sessions in the Training Centre to cover the contents of the training manual.

   b. Practical demonstration in the Training Centre laboratory to prove the validity of points covered in the manual.

   c. In the Training Centre, show examples of faulty fabric, caused by poor processing procedures and techniques so that trainees can appreciate the importance of the information contained in the training manual.

d. The course would be completed by mill visits or preferably a more prolonged stay in a mill, in order to see the application of the information contained in the training manual.

This is particularly important for manuals Ref.A, Ref.B, Ref.D and Ref.F where mill conditions are difficult to imitate in the laboratory.

II. REF."A" - TRAINING COURSE N°1 - DYEING AND PRINTING OF POLYESTER AND POLYESTER/CELLULOSIC BLENDS (PRETREATMENTS) - JANUARY 1977

1. Comments on this course given in September 1980 when reviewed briefly in Pakistan were

   - an academic report
   - this is not a training course but a lecture
   - contains general recipes.

2. This manual will be made more effective by

   - changing the title to "PRETREATMENT OF POLYESTER/ CELLULOSIC BLEND FABRICS FOR DYEING AND PRINTING"

   - Using the following layout and chapter headings

     . Type of blend fabrics
     . Typical impurities
     . Objective of preparation
     . Characteristics of a well prepared fabric
     . Pretreatment processes
     . Singeing
     . Desizing
     . Washing
     . Drying
     . Bleaching
     . Mercerizing
     . Heat setting.

3. A synopsis of the points to be covered in each section is shown in the following pages. If properly expanded upon this should result in an effective training manual oriented towards a practical goal of helping supervisors or operatives in the execution of their day duties.

TYPE OF BLEND FABRICS

Elends of polyester with cellulosic fabrics are usually

- Polyester/cotton in ratios of 50:50
  67:33
  80:20 (less frequently)

- Polyester/viscose in ratios of 50:50
  67:33

  The viscose may be either regular or polynosic.

TYPICAL IMPURITIES

Size
Sighting Color
Oil
Dirt
Natural cotton impurities such as waxes, pectins, and proteins.

OBJECTIVE OF PREPARATION

To remove all natural and added impurities from the fabric. To leave the fabric in such a condition so as to ensure its maximum receptivity to the dyeing liquors or printing pastes to be subsequently applied.

CHARACTERISTICS OF A WELL PREPARED FABRIC

- 100% hydrophility side to side and end to end
- Fabric free from stains, dirt, oil, size, sighting colors
- No loose or protruding ends of yarn
- Adequate degree of whiteness to permit faultless dyeing/printing of pale shades
- Equal whiteness side to side and end to end
- Sewings exactly edge to edge
- Mercerization to be equal
- Fabric to be neutral pH 6-7
- Fabric to be dry and cold when sent for pad dyeing
- No water drops on fabric before, during or after drying.

PRETREATMENT PROCESSES

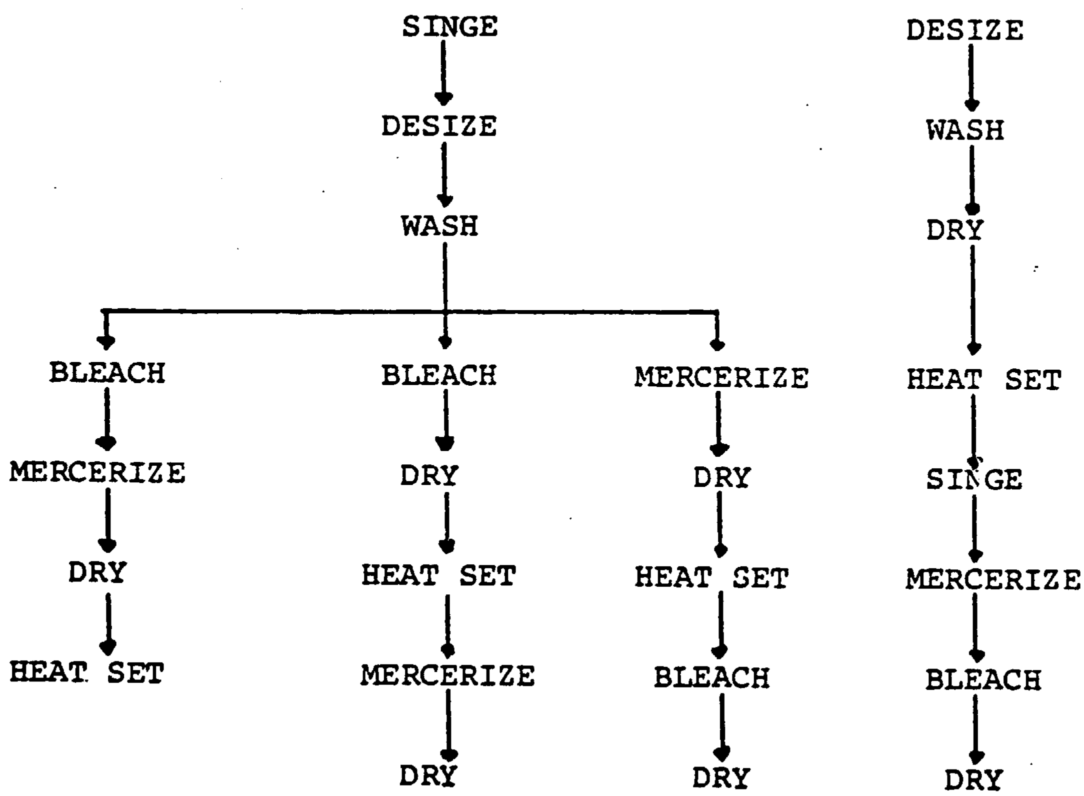
Pretreatment processes for polyester/cellulosic blend fabrics are

- singeing
- desizing
- washing
- drying
- bleaching
- mercerizing
- heat setting.

although polyester/viscose blends are usually not bleached or mercerized.

The following flow chart shows typical process routes for blend fabrics, bearing in mind the above remarks about polyester/viscose blends.

Pretreatment flow chart



SINGEING

Fabrics composed of staple fibres show protruding fibre ends at the fabric surface. These protruding fibres cause "frosting" in dyeing and in printing they can impair the definition of the printed outline. Singeing also helps to reduce pilling to an acceptable level.

Singeing is carried out on flame or plate machines. The more usual is the flame, this being gas, either natural, propane or butane depending on availability. The length of the flame can be varied as can the mixture ratio of gas to air. These variations together with the speed of the fabric enable the necessary controls and degree of singeing to be obtained.

Plate singeing machines may be either electrically or gas heated.

Singeing machines fitted with water cooled guide rollers are expecially suitable for polyester blend fabrics as they avoid globules of molten polyester from smearing over the fabric.

Fabrics where the polyester content is to be thermosol dyed can be singed before dyeing.

Fabrics where the polyester content is to be exhaust dyed should be singed after dyeing to avoid the globules of molten polyester from absorbing more dye and appearing as black spots on the dyed fabric.

DESIZING

Faultless desizing is essential for modern continuous dyeing and printing processes.

Sizes are either soluble or insoluble. Grey goods often contain mixtures of sizes.

Following methods are recommended for identification of the type of size.

- iodine test for identification of starch
- dabbing test for identification of polyvinyl alcohol size
- test for soluble size by extraction with water and determination of weight loss.

Water soluble sizes are usually removed by washing in open width on a washing range. It may be necessary to pre swell the size by padding the fabric through water and wetting agent and leaving it to stand before washing. This is especially the case if this type of size has been overdried during slashing.

Starch type sizes are today generally removed by padding the fabric with an enzyme desizing agent (usually a bacterial amylase type) leaving it to stand and then removing the soluble products of starch degradation by washing it in hot water.

Impregnation with the desize liquor often takes place after grey singeing by passing the cloth through an impregnation tank containing the desizing chemicals immediately after it has passed the singeing flame. The fabric is then squeezed but one must endeavour to have as big a liquor pick up as possible.

It is important to control the temperature and pH of the desizing liquor.

Singeing dust carried along into the desize liquor, can, over a period of time influence the pH to such a degree that the enzyme gradually loses its efficiency.

Desizing may also be carried out with oxidative products such as sodium bromite or ammonium persulphate. These products however, always involve a certain tendering of the fibre and for this reason are seldom used in mill practise.

Polyester/cellulosic blends are generally desized in open width form so as to avoid creases and cracks which show up after dyeing. Fabrics for printing only could be processed in the rope form, this would depend on the g/m2 of the fabric and its construction.

WASHING

Polyester/cellulosic blends are usually washed in open width form especially prior to heat setting. It is however not uncommon for printed goods to be washed in rope form either on a simple winch beck or in specially designed print washing ranges.

In the pretreatment of grey polyester/cellulosic fabrics it is possible that the fabric contains the following amount of impurities

- natural cotton impurities	5-10%
- size	5-10%
- pretreating chemicals	5-10%
	15-30%

This means that for each tonne of fabric, up to 300 kg of impurities must be solubilised, dissolved or dispersed and then removed from the fabric by washing.

Satisfactory preparation cannot be ensured if washing off is performed carelessly. Many faults in pretreatment can be traced to inadequate washing.

Washers can be rope, open width, continuous, batch, horizontal, vertical, atmospheric, high temperature.

Points to watch and control on continuous washers are,

- temperature control
- water flow
- chemical additions
- squeezing pressure
- evenness of squeeze
- % pick up
- counter current flow
- condition of guide rollers, scrimp bars, guiders and expander rolls.

DRYING

Drying is an expensive operation and therefore the process flow must be arranged so that the minimum number of dryings be carried out, consistent with the desired product quality. Processes such as bleaching or mercerizing should be carried out wet on wet wherever possible.

Drying machines are generally either - cylinder
- hot flue
- stenter.

They should be well maintained, steam traps in good working order, no leaks, balanced exhaust.

The first one or two cylinders of a cylinder drying range can be Teflon covered to avoid stains and facilitate cleaning.

The drying machine should give equal drying across the width and not have condensation drops on entering or leaving the dryer nor during the drying process. If the fabric is going for continuous dyeing it should pass through a cooling zone at the exit of the dryer. Hot fabric on a roll can retain its heat for 48 hours or more.

BLEACHING

Polyester/viscose blends are not normally bleached on account of the cleanliness of both components of the blend.

Polyester/cotton blends are bleached not so much from the point of view of whiteness but to achieve the good hydrophilic properties necessary for dyeing and printing. As the cotton alone is responsible for the hydrophilic properties, the bleaching operation applies to this component of the blend.

Bleaching can be done with hypochlorite, sodium chlorite or peroxide although the latter is most usual.

Bleaching is usually carried out by the one stage alkaline peroxide process and the following types of equipment are commonly used :

- tight strand steamer
- roller bed steamer
- conveyor steamer
- pad-roll
- cold pad-batch.

Characteristics of the common bleaching agents are shown in the following paragraphs.

<u>Hypochlorite</u>

Normal commercial supply is 150g/l. active chlorine.

Bleaching always carried out in alkaline baths, buffered with soda. pH at the beginning of the process should be 11.5-12.0. The lowest degree of fibre tendering is at pH 9-11 although in practise it is not usual to allow the pH to fall below 10.

Temperature of bleaching to be not more than 25°C.

Bleached goods have a tendency to yellow.

Sodium Chlorite

Normal commercial supply is 80% powder.

Optimum pH for bleaching is 3-4.5 but it is customary to begin bleaching at pH 5-7 and slowly liberate acid with activators to initiate the bleaching reaction.

Temperature of bleaching is 70-95°C.

Apart from its unpleasant odor, a disadvantage of sodium chlorite is its corrosive action, even on stainless steel.

Bleached goods may subsequently yellow but not as drastically as after a hypochlorite bleach.

Hydrogen Peroxide

Normal commercial supply is 35 or 50% liquid.

Peroxide bleaching liquors must be stabilised, generally with sodium silicate and magnesium ions. Because of difficulties with silicate residues, organic stabilisers are sometimes used. These organic stabilisers are generally less effective in short liquors such as pad application.

A well stabilised, alkaline peroxide bleaching liquor must still contain peroxide at the end of the bleaching process.

The bleaching liquor is sensitive to catalysts such as iron in the water and on the goods. Catalysts increase the rate of decomposition of the peroxide and cause tendering of the cellulose.

Peroxide bleaching gives a stable white fabric.

Apart from the cold pad batch process, peroxide bleaching is usually carried out at elevated temperatures.

MERCERISING

Polyester/viscose blends are rarely if ever mercerised.

Polyester/cotton blends may be mercerised for both increased dye affinity and improved appearance.

Mercerization is the treatment under tension with caustic soda of 28-32° Be. Lustre is improved due to the cross section acquiring a rounder shape, tear strength and dye affinity are increased.

Immersion time in the caustic soda is short (not more than 30 secs.) and caustic temperature is 13-15°C.

Fabric may be mercerised dry in the grey or wet on wet after desizing or bleaching.

Rapid wetting is essential, especially for grey fabrics and it is necessary to use special wetting agents to achieve a rapid and uniform wetting.
The main reasons for mercerising are the reduced dye consumption and the improved dyeability of dead cotton.

After mercerising it is necessary to wash out the remaining caustic soda from the fabric, commensurate with the following process e.g. if the goods are to be bleached after mercerising, the caustic soda does not have to be removed 100%. If the goods are to be dyed directly after mercerising, the fabric must be thoroughly neutralised.

HEAT SETTING

Whether alone or in blends with other materials, polyester fibres must be stabilised.

Heat setting is one of the most important processes. This treatment imparts shape retention, crease resistance, resiliance and elasticity.

The most usual way to heat set polyester/cellulosic blend fabrics is on the stenter with hot air at 190-210°C. It is most important that the fabric itself attain the temperature required for heat setting. The running speed of the stenter will depend on how quickly the fabric attains its temperature as it is only necessary to hold the fabric at temperature for a few seconds to achieve heat setting. Setting is completed by passing the fabric through a cooling zone or over cooling cylinders on leaving the stenter frame in order to "freeze" the reoriented molecules in position.

Heat setting must be carried out very evenly because it changes not only the mechanical but also the dyeing properties of the polyester fibres.

If fabrics are to be pre-treated in rope form or dyed subsequently by an exhaust method, heat setting should be carried out previously.

When dyeing by the thermosol process it may be possible to dispense with prior heat setting, this will depend on running properties and desired width control.

Before heat setting, the potential shrinkage and finished width should be ascertained by means of a wash test. The heat set stenter can then be adjusted accordingly both in the width and overfeed. After heat setting the dimensional stability can be checked again by a wash test.

III. REF."B" - DYEING OF POLYESTER AND BLENDS BY DISCONTINOUS METHODS

1. Comments on this course given in September 1980 when reviewed briefly in Pakistan were

   - this is a general discussion on carrier dyeing
   - only atmosphere jig dyeing of polyester and direct dyeing are discussed
   - the manual is incomplete and superficial.

2. This manual will be made more effective by

   - changing the title to "DYEING OF POLYESTER AND POLYESTER/CELLULOSIC BLENDS BY DISCONTINUOUS METHODS".

   - using the following layout and chapter headings

     . products
     . equipment
     . types of dyes
     . general
     . disperse dyeing
     . direct dyeing
     . sulphur dyeing
     . azoic dyeing
     . vat dyeing
     . reactive dyeing.

3. Points to be covered in each section are outlined in the following pages. If properly expanded upon, this should result in an effective training manual oriented towards a practical goal of helping supervisors or operatives in the execution of tneir day to day duties.

PRODUCTS

The basic products with which this manual is concerned are

- yarns and piece goods (usually knitted) of 100% polyester
- yarns and piece goods (usually woven) of polyester/viscose or polyester/cotton.

EQUIPMENT

- H.T. package dyeing machine
- H.T. jet dyeing machine, partial and full flooded
- beam dyeing machine
- winch beck
- jigger
- pad mangle.

TYPES OF DYES

Polyester does not have a range of dyes like cellulosic fibres. The principal class of dye for polyester is the disperse class. Disperse dyes are divided into 4 groups commonly referred to as A,B,C,D. Groupings are according to molecular weight and degree of sublimation fastness.

Mixtures of disperse/vat or disperse/reactive dyestuffs are available from the leading dyestuff manufacturers and are suitable for high temperature but not carrier application.

Cellulosic fibres can be dyed with a wide range of dyes, the most common being

- direct
- sulphur
- azoic
- vat
- reactive.

GENERAL

When dyeing polyester/cellulosic blends by discontinuous methods it is usual to adapt a 2 stage dyeing process, i.e. dye the polyester first, then in a separate bath dye the cellulosic component.

Dyestuff mixtures i.e. commercial preparations of disperse/ vat or disperse/reactive are of course dyed by a one bath procedure according to the manufacturers recommendations.

Selected direct, reactive and vat dyestuffs may be dyed by a one bath method with separate chemical additions. This procedures depend on the individual shades and circumstances.

There has recently been on attempt to reduce the dye cycle time of polyester/cotton knit goods by first dyeing the cotton with reactive dyes, followed by a wash to remove the bulk of the salt and then dyeing the polyester. During the dyeing of the polyester component, the reactive dyeing is washed free of unfixed dyestuff.

Matching to shade of 100% polyester presents no problems but is time consuming if the dye machine has to be cooled from high temperature to enable a sample to be taken.

Matching to shade of polyester/cellulosic blends requires a "burn out" or "skeleton" to be prepared in order to see the shade of the polyester component. The cellulose is destroyed in a sulphuric acid bath leaving the polyester skeleton to be compared for shade to the standard. If the shade is reasonably close to standard it is better to proceed with dyeing the cellulose and obtain the final exact match by making shading additions to the cellulosic portion of the blend.

DISPERSE DYEING

There are 2 main methods of dyeing polyester with disperse dyes

- at high temperature
- at the boil with carrier.

The choice of method depends on equipment available.

Carriers swell the fibre and facilitate the uptake of dye (use the existing information from the manual which is adequate to cover this point).

Small amounts of carrier may be used when dyeing at high temperature to facilitate levelling of dyestuff.

The general method of dyeing is to adjust the pH and hardness of the dye bath, add the dispersed dyestuff at approximately 80°C, raise at 2°C min. to 120 or 130°C and run for 30-60 minutes. The dyebath is then dropped and the goods given a reduction clear and rinse. In the case of polyester/cellulosic blends the cellulosic component can now be dyed.

In the case of carrier dyeing in atmospheric machines, the carrier is added before the dyestuff and the temperature is raised to the boil. It is most important to maintain the temperature as near to 100°C as possible. After dyeing for 60-90 mins. the dyeing is finished off as described above.

Include the chapters from the original manual on

- dispersing of disperse dyes
- pH value of the dyeings
- dispersing agents
- hard water
- reduction clearing
- removal of oligomers.

Finish this chapter with a detailed recipe for

- H.T. package dyeing
- atmospheric package dyeing
- H.T. jet dyeing
- H.T. beam dyeing
- atmospheric winch beck
- atmospheric jigger.

DIRECT DYEING

Direct dyes offer the simplest, quickest and cheapest way of dyeing the cellulosic component of a polyester/ cellulosic blend.

They should be selected with care for fastness properties such as light and washing and also for change of shade on finishing where the catalysts and temperatures used in resin finishing are liable to adversely affect the shade of the dyeing.

Direct dyes are soluble dyes and are divided into 3 groups, A,B and C depending on whether they are self levelling or on whether the exhaustion must be controlled by salt or temperature.

The exhaust dyeing method will depend on the group, but in general the bath is set with the dyestuff and after about 15 min. the salt is added. The temperature is gradually raised to the boil over 30 min. and dyeing is continued for 30-60 mins. After dropping the dyebath the goods are rinsed in cold water and perhaps after treated with a cationic fixing agent.

Matching to shade is carried out by turning off the steam, adding the shadeing dyestuff, and running for 15-20 mins. before sampling again.

Finish this chapter with a detailed recipe for

- package dyeing
- jet dyeing
- beam dyeing
- winch beck
- jigger.

SULPHUR DYEING

Sulphur dyes offer the cheapest method of obtaining dark shades with good fastness properties. In general, sulphurs are dull colors, ideally suited to the shades required for work clothing.

The fastness to washing and light is good, the only fastness deficiency being in their generally poor fastness to chlorine bleaching.

Sulfur dyes are insoluble in water and must be solubilised before dyeing and then converted back into their insoluble state after dyeing.

Sulphur dyes are normally solubilised by dissolving them with sodium sulphite . There is however a commercial range of dyes that are pre-solubilised.

The general exhaust dyeing method is to set the dyebath at approximately 50°C with the dissolved sulphur dye and sodium sulphide,after 20 mins. add salt if necessary, raise to the dyeing temperature (70-95°C depending on the individual dye) and run 30-60 mins . After the dye bath is dropped, the goods are rinsed in cold water , oxidised with bichromate and acetic acid or with hydrogen peroxide, rinsed and soaped off.

Sulphur black dyed goods have a tendency to tender on storage caused by the liberation of sulphuric acid. This can be combatted by giving a final rinse after dyeing with sodium acetate.

Matching to shade is carried out by washing and oxidising a sample in the laboratory before draining the bulk dyebath. Shading additions are made to the reduced dyebath together with an addition of reducing agent (sodium sulphide) if necessary.

The goods are run for a further 15-20 mins. before sampling again.

Finish this chapter with a detailed recipe for

- package dyeing
- jet dyeing
- beam dyeing
- winch beck
- jigger.

AZOIC DYEING

Azoics are generally used to obtain fast shades of red, maroon and burgondy that cannot be obtained with vat dyes and that cannot be obtained with the desired fastness with other types of dye.

Azoics are also used to produce shades of navy and black having excellent chlorine fastness and which cannot be obtained at the same cost or with the same tone with vat dyes.

The one particular deficiency of azoic dyes lies in their fastness to rubbing which is only moderate. This is particularly noticeable in those cases where lack of technical application knowledge has led to a less than optimum dyeing method.

Azoics are insoluble dyestuffs being formed in situ by the application of a diazotised color base to a naphthol ground that has already been applied to the fabric or yarn.

The naphtol is dissolved by either a hot or cold method involving caustic soda and various auxiliary products. The dissolved naphthol is applied to the goods by exhausting it from a bath containing common salt. This process is generally carried out at room temperature for 30-45 mins.

After application of the naphthol the shade is developed by coupling the naphthol with a diazotised base (Describe in general terms, the diazotising process). When the shade has been developed, the goods are washed off in acid, cold and hot water and boiling soap.

This aftertreatment developes the final brightness of the shade and remove surplus and loose color. It is frequently necessary to give two soapings to obtain the highest possible degree of fastness.

As the tone of the shade is predetermined by the chemical combination of naphthol and diazotised base, it is only necessary to check for depth of shade. For this purpose a sample of the goods is taken during the naphthol stage and developed in the laboratory. Any lack of depth is corrected by running longer in the naphtol bath before developing the shade in bulk.

Finish this chapter with - a detailed dissolving recipe for naphthol (hot and cold)
- a detailed diazotising recipe
- a detailed application recipe

for package dyeing and jigger dyeing.

VAT DYEING

Vats or Indenthrens as they are often known, offer the highest degree of fastness although in anything other than pale shades they are generally the most expensive type of dyestuff.

Most vat dyes possess excellent fastness to light,washing rubbing and chlorine, the latter being particularly important when goods have to withstand repeated commercial launderings.

Vat dyes are insoluble in water and must be solubilised and converted to their leuco compounds before use by dissolving them with caustic soda and sodium hydrosulfite.

Explain the different forms of vat dyes i.e. pastes, powders, fine dispersions etc.

Dyeing can be carried out by leuco, semi-pigmentation or pre-pigmentation techniques (Describe each in general terms).

After dyeing the leuco compound is converted back into the original vat dye by oxidising with air or peroxy compounds and the dyeing process is finished off by washing and soaping.

Soaping not only removes any remaining loose dye but developes the final tone of the dyeing. Some vat dyes undergo a quite significant change of shade on soaping.

Matching to shade is carried out by washing, oxidising and soaping a sample in the laboratory before draining the bulk dyebath. Shading additions are made to the reduced dyebath together with an addition of reducing agent (sodium hydrosulfite) if necessary. The goods are run for a further 15-20 mins before sampling again.

During the dyeing process the condition of the dyebath must be checked for sufficient caustic soda with phenolphthalein papers and for sufficient sodiums hydrosulfite with vat yellow papers.

Finish this chapter with a detailed recipe for

- package dyeing - leuco method
- beam dyeing - semi-pigmentation method
- jigger dyeing - pre-pigmentation method.

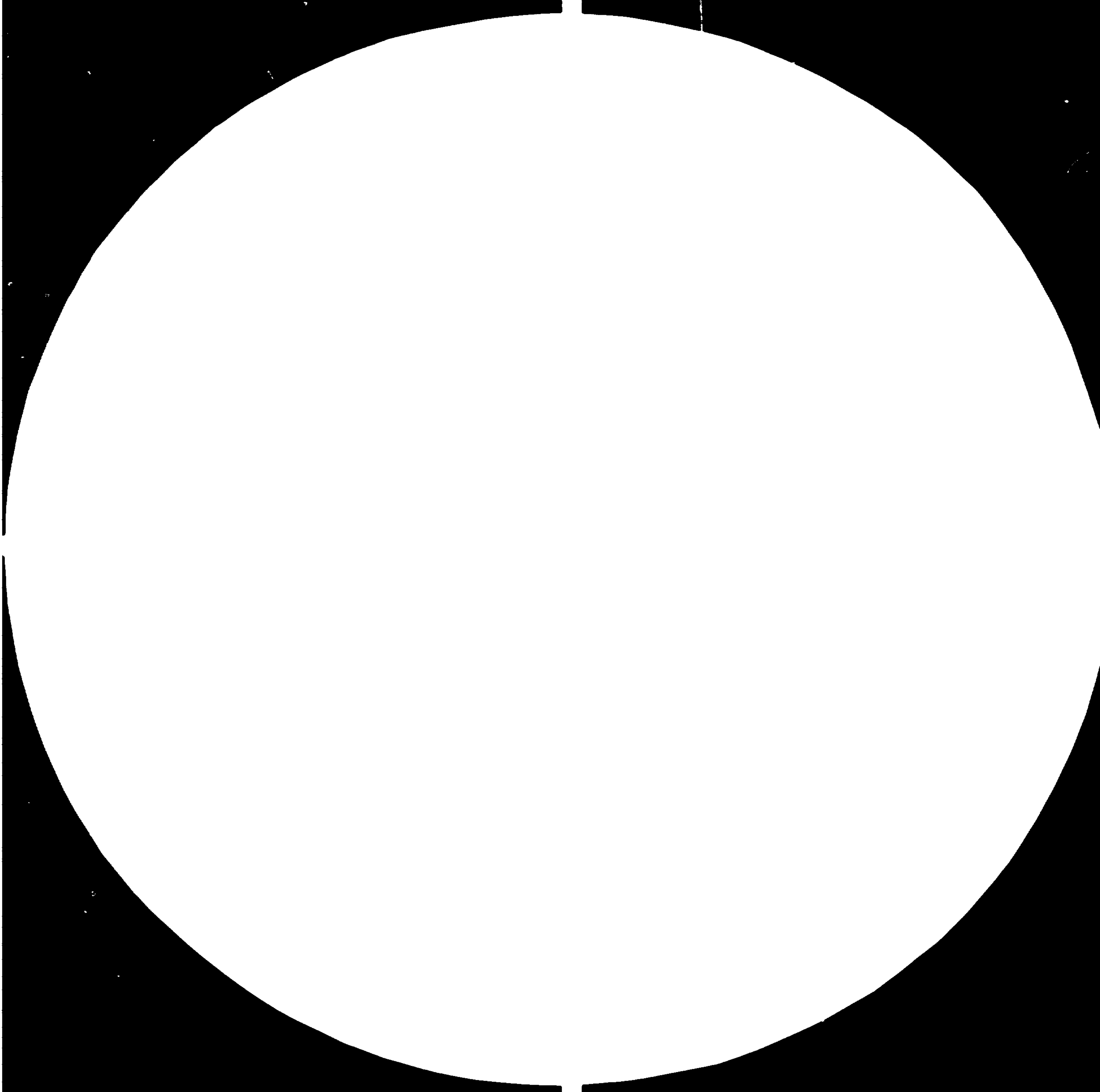
REACTIVE DYEING

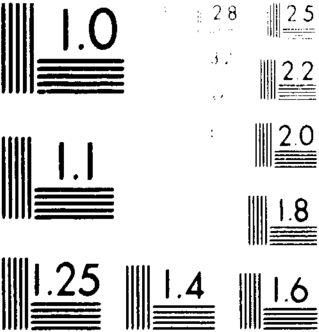
Reactives are the most recent class of dyestuff to come onto the market and are today one of the most popular classes of dyestuff. They offer ease of application, bright shades and good fastness properties.

Fastness to chlorine is not the strong point of many reactive dyes but where this is required, it can be obtained to a certain extent by judicious selection.

There are 2 main groups of reactive dyes, the so called hot dyeing and cold dyeing groups. Cold dyeing dyes are classed as highly reactive and can be dyed and fixed at room temperature or 40-50°C at the most. Hot dyeing dyes have lower reactivity and must be dyed at elevated temperatures (80-95°C).

G -660




1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

The method of application varies with the particular range of dyes put out by each manufacturer. In general they must first be exhausted onto the fibre in a dyebath containing salt and then fixed on the fibre by the addition of alkali into the same bath.

The reaction between dyestuff and fibre also involves a hydrolysis reaction between the dyestuff and the water of the dyebath. This hydrolysed dye is absorbed mechanically but not fixed on the fibre and must be removed. This is accomplished by rinsing the goods with cold water to free them from as much salt and alkali as possible and then washing with hot water and boiling detergent to remove the hydrolysed dye and so obtain maximum fastness.

Explain the different basic types of dye method such as

- all in method
- controlled salt addition method
- soda ash method
- mixed alkali method

and how they are best suited for the different types of dyeing machine.

Finish this chapter with a detailed recipe for

- package dyeing - all in method
- jigger dyeing- soda ash method.

IV. REF."C" - TRAINING COURSE ON QUALITY CONTROL AND TESTING IN WET PROCESSING DEPARTMENT

1. General

1.1 Comments on this course given in September 1980 when reviewed briefly in Pakistan were

- very academic
- lists a series of tests, some detailed, some not
- no indications of the desirable frequency of testing
- could be used to supplement a practical course
- the deficiences in the course would soon be noted and could be rectified.

1.2 Comments in greater detail for each section, are given below and these are followed by a suggestion for an improved layout and chapter headings, together with further tests which should make a more complete manual.

2. Detailed Comments

2.1 Introduction (Section 1.)

A good general introduction although it tends to equate Quality Control with Process Control without actually mentioning Process Control. It would be helpful here to distinguish between the two as both are essential.

2.2 Physical Testing (Section 2.1)

Six tests are listed and are described in minimum detail. It would be better to expand the detail and show how the calculations are performed. Go into detail as if it were necessary to show a novice how to do the tests.

Use the following format for the test description :

Name of Test :

Reason for Test :

Apparatus Required :

Method :

Calculation of Result :

2.3 Identification of Fibres (Section 2.2)

This is not really concerned with day to day Q.C. and testing but can be left in for general interest.

The estimation of % polyester in a polyester/ cellulosic blend is explained in a qualitative manner only. This is an important test and it should be explained in detail how the test is carried out quantitatively.

2.4 Chemicals Used in Finishing Processes (Section 2.3)

The "Brief Introduction" states that dyes are to be tested to evaluate strength and chemicals are to be evaluated for purity and strength. It does not however say how to do these tests.

Show in detail how dyes are tested for strength and tone, stress that a standard must be used for comparison and each new shipment checked. Cover the following points :

- liquor ratio
- substrate
- how to measure small quantities (volumetric aliquot)
- depth of shade to be checked.

Detail how detergents, softneners, finishing agents and other auxiliary products are evaluated by measuring the % active or solids content.

2.5 Water Supply (Section 2.3.1)

Whilst being a very good write up of water, water hardness and treatment methods, it is largely out of place in a manual of Q.C. and testing. The only relevant part of this is the Water Hardness Determination (Eriochrome Black T method) on page 16 which is well written and can be used as a model layout for similar chemical testing. The water hardness test using soap solution should be similarly detailed.

2.6 Acids (Section 2.3.2)

The pre-amble is superfluous. The tests for the different acids should be written up in greater detail showing the aliquot size, the indicator necessary, the precise way to carry out the test and how to calculate the results.

2.7 Alkalis (Section 2.3.3)

The same comments apply as for the Acids in para.2.6 above.

2.8 Desizing Agents (Section 3)

The pre-amble can remain. The only test described is a qualitative test for starch based size. This should be complemented by a detailed description of a qualitative test.

2.9 Surface Active Agents (Section 4)

The whole of this section is largely superfluous to the manual as it indicates that application tests are necessary for evaluation. These tests generally fall under the role of mill trials. The physical test mentioned in this section has already been dealt with by checking the solids content.

The only test of importance mentioned in this section is for the mercerising assistant. This test should be thoroughly explained and detailed.

2.10 Bleaching (Section 5)

The procedure for testing the strength of concentrated Hydrogen Peroxide is precise, detailed and well laid out. The only other test in this section is for the determination of available chlorine in bleaching powder. This is not as well laid out as the test for hydrogen peroxide.

As these are the only tests in this section, it cannot be regarded as complete.

The pre-amble used in this section is not necessary.

2.11 Finishing Agents (Section 6)

No tests are detailed in this section. The write up is of a general nature and not really necessary in a Q.C. and testing manual.

2.12 Dye Fastness Tests (Section 7)

This section is good apart from the fact that test methods are not written up.

For washing fastness it should be explained how to test fabrics and yarns, what white materials are required, ratio of washing solution to test material etc.

Wet and dry rubbing must be explained and also the different technique required for making rubbing fastness tests on prints.

The blue scale should be explained for the light fastness test as it is different to the normal fastness ratings of 1-5.

Bleaching and perspiration tests should be more detailed with explanations for fabrics and yarn and also the correct way to make a "sandwich" with the white.

2.13 Crease Recovery (Section 8)

The test for measurement of crease recovery is not described. This should be rectified.

2.14 Pilling (Section 9)

The phenomenen of pilling is described but not the test for assessing it. The inclusion of the detailed test method would complete this section.

3. Improvements

3.1 The manual will be made more effective by using the following layout and chapter headings

- introduction
- physical testing
- chemical testing
- preparation and bleaching tests
- dyeing and printing tests
- finishing tests
- dye fastness tests.

The tests already shown in the manual (written up with the necessary detail) can be placed in the appropriate chapters. Additional tests that should be incorporated in this manual are given in the following paragraphs.

3.2 Physical Testing

- strip tensile strength
- grab tensile strength
- Elmendorf tear strength
- abrasion resistance.

These tests are applicable to grey, semi-processed or finished fabric. Each lot of finished fabric is normally tested (depending on its size). Tests on grey and semi-processed are carried out daily.

3.3 Chemical Testing

Testing of chemicals such as acids and alkalis is normally done for each bulk delivery and also when new stock solutions are made up for mill use.

Water hardness is checked at least once per day.

Active or solid content of finishing chemicals, detergents etc. is checked for each bulk delivery.

3.4 Preparation and Bleaching Tests

- pick up
- evenness of squeeze
- squeeze roller hardness
- moisture content of cloth leaving the drying machines
- differential pick up for wet on wet processes.

The above tests are also carried out in dyeing and finishing where processing involves the application of liquors by padding. Frequency of testing is normally once a week.

- fabric pH
- residual fabric alkalinity
- residual hydrogen peroxide
- hydrogen peroxide content of bleach bath
- chemical damage (Fehlings solution)
- test for oxycellulose
- absorbency
- mercerising lye strength, hydrometer and titration.

Generally speaking, the frequency of testing depends on the individual mill circumstances such as lot sizes and processing methods.

Peroxide content of bleach bath is normally checked every 20-30', mercerising lye strength every 30-60' and other tests carried out daily.

3.5 Dyeing and Printing Tests

- viscosity of print pastes
- pH and temperatures of processing baths
- determination of sodium hydrosulphite and caustic soda in dye liquors and padding solutions.

3.6 Finishing Tests

- % resin applied to fabric
- temperatures of drying and curing machines with thermal papers
- dry crease recovery
- wet crease recovery
- wash and wear behavior
- dimensional stability
- pilling.

Frequency of testing for the physical tests is usually every fenishing lot depending on its size. Curing oven temperatures are normally checked weekly.

3.7 Dye Fastness Tests

- staining test for reactive dyeings.

V. REF."D" - TRAINING COURSE N°1 - PRINTING ON POLYESTER/ CELLULOSIC BLENDED FABRICS

1. Comments on this course given in September 1980 when reviewed briefly in Pakistan were

   - this course gives a general detail of methods of application but is too academic

   - it would be of limited use in training a print machine operator but would give a good general background to a dyer who was also in charge of a printing department

   - it should be designed for more practical demonstration and carried out in a finishing plant.

2. On fully reviewing this manual it is apparent that the subject matter itself is good. The course was not designed with a view to training a print machine operator. Such an operator training course is usually carried out on a specific machine.

   Nonetheless we feel that some discussion on things of a practical/mechanical nature as opposed to purely technical/chemical, would be of benefit. The inclusions of such points in the manual would give it a more complete and well rounded aspect and we feel would benefit greatly the recipient of the course.

3. Points of a practical/mechanical nature that can be expanded upon are outlined in the following pages. If this course could be carried out partly in a finishing plant having the different types of print machines, it would be even more beneficial.

POINTS FOR INCLUSION IN THE MANUAL

1. Advantages and disadvantages of flat and rotary machines such as
   - suitability for certain designs
   - versatility
   - economics of small runs
   - stripes and outlines
   - repeat precision
   - printing productivity
   - ease and speed of design and/or colorway change
   - repeat size.

2. Order of screens when printing a design to avoid such things as
   - smudging
   - blurring
   - dirtying
   - bar marks

   and to give the sharpest detail when wet colors have to fall on wet colors.

3. Printing problems such as
   - pinholes
   - difficult outlines
   - out of register
   - sticking in
   - flooding
   - pinny prints
   - etc.

4. Basic techniques of engraving including positive and negative emulsions, engraving for tightly fitting objects and for fitting with allowance.

5. Screen mesh size.

6. Techniques of blocking a screen with masking tape to accomodate the cloth width.

7. Effect of squeegee angle , sharp and round rubber flat bed squeegees and effects of hard or soft rubber.

8. Discuss types of glue, importance of glueing. Mention permanent adhesives.

9. Discuss basics of thickeners and rheology, describe long and short thickeners.

10. Viscosity and control of viscosity. Describe a basic viscometer.

11. Effects of increasing speed of rotary printing e.g. less color applied to fabric particularly with long flow tacky thickeners that gives high squeegee resistance.

12. Problems with thin pastes on rotary e.g. leaking through screens when the machine stops.

13. Discuss in greater depth the washing off procedures for the different types of dyes. Describe rope and open width washing off equipment.

VI. REF."E" - TRAINING COURSE N°2 - WATER PROOFING OF COTTON TEXTILE FABRICS

1. Comments on this course given in September 1980 when reviewed briefly in Pakistan were,

   - a good treatise of the methods available for water-proofing

   - the text refers to figures and diagrams which are not present

   - manual ends with list of available products and brief details of application procedure

   - a useful preamble to a practical course.

2. On further review, we once again confirm that the subject matter is good and in excellent detail. The only fault being the lack of diagrams wh are mentioned in the text and which should be easi remedied.

   The missing diagrams are,

   Figure 1A,B,C,D on page 3
   Figure 2A,B,C,D on page 6
   Figure 3 on page 7.

3. We feel that the subject matter is good enough to warrant a layout which will do it proper justice. The manual in its present form does not have a Table of Contents and neither are the main chapters numbered.

We would suggest a layout as shown by the following Table of Contents

I. INTRODUCTION

II. TYPES OF WATER PROOF FINISHED FABRICS

  1. Impermeable fabrics
  2. Water repellent fabrics
  3. Self sealing fabrics
  4. Water repellent, flame and weather resistant cotton fabrics

III. EFFECT OF GARMENT DESIGN ON EFFICIENCY OF WATER RESISTANCE

IV. TYPES OF WATER REPELLENT FINISHES

  1. Physical type
     - 1.1 Wax dispersion without Metallic salts
     - 1.2 Emulsions based on Aluminium Salts
     - 1.3 Emulsions containing Zirconium Salts
     - 1.4 Emulsions containing Titanium Salts
     - 1.5 Protein Products
  2. Chemical type
     - 2.1 Esterification reaction of cellulose
     - 2.2 Estherification reaction of cellulose
     - 2.3 Condensation polymers
     - 2.4 Metal complex
     - 2.5 Fluoro chemical derivatives
     - 2.6 Silicone compounds.

V. TEST METHODS

1. Testing of water repellency effect
2. Determination of impermeability to water

VI. EXISTING PROPRIETORY PRODUCTS

4. Suggestions for improving the manual are

- add to the manual the test methods for water repellency and impermeability as shown by the suggested Table of Contents in para.3 above.

- Supplement the manual with examples of fabric and demonstrations of mixing the chemicals.

More details of these suggestions are shown in the following paragraphs.

5. Test Methods

5.1 Testing of water repellency effect

5.1.1 Bundesmann Rain Test (DIN 53888)

The material to be tested is subject to sprinkling on the Bundesmann rain apparatus under standardised conditions such as

- angle of inclination of the test fabric
- spraying time
- quantity of artificial rain
- height from which the rain falls
- size of droplets.

At the same time the underside of the test specimen is rubbed mechanically.

After the sprinkling, the adhering water is removed on a centrifuge disc, then,

- the absorption of water by the specimen is given as a percentage based on the difference in dry and wet weights

- the amount of water that has penetrated through the material into the receiver of the apparatus is measured in mls.

- the water repellency is assessed visually and given ratings of 1-5 where 5 is the best and 1 the worst.

This paragraph can be supplemented by the inclusion of a diagram of the Bundesmann Rain Test apparatus.

5.1.2 Spray Test (AATCC 22-1971)

A fabric cutting or a portion of a garment (it is not necessary to cut the garmant) is mounted on a circular frame and sprayed at an angle of 45 degrees for 25-30 seconds with 250 ml. of distilled water through a spray fitted in an inverted funnel.

The water repellent effect is assessed visually in the following manner.

Rating 100 - no wetting of the surface

Rating 90 - very slight wetting of the surface

Rating 80 - wetting where droplets impact on the surface

Rating 70 - Partial wetting of the whole surface

Rating 50 - Complete wetting of the upper surface

Rating 0 - Complete wetting of the upper and lower surfaces of the specimen.

This paragraph can be supplemented by the inclusion of a diagram of the Spray Test apparatus.

5.2 Determination of Impermeability to Water

5.2.1 Schopper Water Pressure Test (DIN 53886)

A column of water presses with uniformly increasing pressure (10 cms/min) on the underside of a specimen mounted in the testing apparatus. The test continues until the first 3 droplets of water appear on the face of the cloth. The height of the column is measured and the resistance of the material to hydrostatic pressure is given in terms of centimetre water gauge.

This paragraph can be supplemented by the inclusion of a diagram of the Schopper hydrostatic pressure test apparatus.

5.2.2 "Basin" Test

This is a much simpler test than the Schopper Test and it can be easily carried out on a home made apparatus.

The corners of a 500x500mm specimen are secured to a wooden frame or to the legs of an upturned chair in such way that the specimen forms a basin of approximately 350x350mm. Distilled water at room temperature is carefully poured into this basin until the depth at the deepest point is 100mm.

Two measurements are made

- the time taken for water droplets to become visible on the underside of the fabric basin

- the amount of water passing through the specimen in a given time.

This paragraph can be supplemented by the inclusion of a diagram of the apparatus.

6. Examples and Demonstrations

Some suggestions for examples and demonstrations are outlined here. It is felt that this would round off the course in a practical manner.

- Show examples of cloths treated with different basic types and various percentages of water proofing products

- Show the degree of repellency/impermeability by carrying out tests by the various methods

- Obtain samples of the different groups of water proofing products and show the correct way of mixing them for optimum stability. Also show the wrong way of mixing so that precipitates and broken emulsions are shown up

- Show the effect of pH on bath stability

- Show the effect of different concentrations of emulsifying agents on bath stability.

ADDITIONS TO

DESIGN DEVELOPMENT CENTRE

AND PRODUCT DEVELOPMENT

(Manual No.22)

I. INTRODUCTION

Design Development Centre and Product Development.

1.1 Key to success - Records and Reports

The key to success of all development work of the Design Centre is the supplying to the Marketing Director and the Managing Director a constant flow of information as to the progress of the development of the ranges and new products so that actions and decisions can be taken at the proper time. This flow of information is in the form of :

1. compilation of Market Information at the commencement of each season, and at crucial periods during this season,

2. maintaining accurate up-to-date records of the progress of every item in the range as it is being developed,

3. maintaining a detailed record of each stage of development of new types of products,

4. establishing a time schedule for the development of each range,

5. determining the plan for each range at the commencement of each season and constantly recording the progress throughout the period of development.

The information regarding the progress must be circulated so that each member involved in the development of the ranges and new products is aware of individual and overall progress.

Clear instructions and maintaining of records on progress will result in increased volume of sales through having the ranges and new products designed from the proper information and developed on time. The importance of maintaining records and issuing weekly progress reports cannot be over-emphasised.

1.2 Functions of the Design Development Centre

The basic functions of the Design Development Centre are :

- to develop a range which should be :
  a) marketable
  b) timely
  c) profitable
  d) which can be successfully manufactured, utilizing company equipment whenever possible.

1.3 Functions of Product Development Department

The basic functions of the P.D.D. pertaining to Technological Development is to act for the Marketing Division in all matters pertaining to :

1) projected or potential new types of yarns and fabric constructions

2) projected or potential new types of finishes

3) projected new dye-methods.

II. WOVEN AND PRINT DESIGN COLLECTION

2. DETAILED DUTIES

Following is a list of duties of the design development centre relating to functions as well as policies and principles which should be adhered to.

2.1 Collection Determination

- to maintain constant liaison with the Manufacturing Division, both the Weave Mill and the Finishing Plant regarding technical problems during determination of the collection,
- to accept responsibility that the range or collection is available and presented at the appropriate time,
- to gather together the ideas, samples illustrations, sketches, etc. from which the collection is finally selected,
- to determine the collection to be woven in consultation with the Sales Department,
- to determine the number of styles and patterns in the range in consultation with the Sales Division,
-

- to give consideration to artistically suitable fabrics which can be manufactured within the limitation of the company's equipment when selecting the collection,

- to be responsible for timely coordination with the Manufacturing Division for the sampling production requirement,

- utilize previous sales analysis and additional information relative to probable consumer acceptance and market volume,

- keep informed of local and worldwide fashion trends,

- consult frequently with the Head of the Sales Department during the development of a seasonal collection,

- maintain a record of all samples, sketches, etc. which seem desirable for possible future use.

2.2 Cost and Pricing

- to select and develop the woven and print designs in the collection with cost limitation in view. Each article is to be aimed at a definite price range or as a prestige item,

- determine the price range of each item in the collection in consultation with Sales Department. (Final price determination is made by the Sales Department)

- have costings or estimates made of yarns, fabrics, finishes before sampling begins,

  N.B. Requests for cost estimates must be given the highest priority.

- after sampling has been made accurate costings should then be calculated. Then objective evaluations should be made with the Sales Department both during and after each season in order to analyse the causes of various sales volumes and sales prices received.

1.3 Range Limitations

- to determine the limitation of the collection,

- to review the previous range and its sales analysis when establishing limitations of the number of styles and patterns. In determining the limitation of the collection, the following types of information should be utilized :

a) number of patterns of designs not sold,

b) numbers sold in less than economical quantity,

c) cost of sampling, etc.

III. OPERATING PROCEDURES

The fulfilment , when desired, of a particular requirement is the essence of development work.

T'e element of time is so important that nothing must be left to change. If a new development is too late, it matters not that it may be perfect, for a perfect article that is not wanted is of no value. Further, an article improperly constructed or finished regardless of how rapidly the development was accomplished is of no value if it is not what is desired.

Thus, routines and procedures are establishes that will minimize the chances of error and will facilitate the follow-up of sampling production, thereby improving the opportunities of achieving the desired article on time.

3.0 Design Development Procedures

3.1 Coloured Woven Fabrics

3.111 Sample weaving order

This is actually a combination Sample Weaving Order and Sample Construction Sheet.

Made out by : the Design Development Centre

Distribution : Production Planning
Weave Mill Manager
Weave Room Assistant Manager
Sample Room later with
Finishing Order

3.112 Piece card

A Piece Card is made out for every piece, or part-piece on the Weaving Order.

Made out by : Production Planning Department

Distribution : Weave Mills Manager with Sample
Weave Order
Preparation Department with
Sample Weave Order
placed on locm with Loom Beam
attached to the piece when it is woven
accompanies the piece from Weave
Room through Finishing Inspection.

3.113 First piece control card

A First Piece Control Card is made out for each first piece or part piece of each color-way.

Made out by : Production Planning Department

Distribution : Weave Mill Manager with Sample Weaving Order and Piece Cards
placed on loom with loom beam and Piece Cards
signed by the Designer
signed by Weave Mill Manager after he or his representative have inspected the piece in conjunction with the Designer
initially by the Designer
Designer takes the Card back to the Design Development Centre.

Note : the Weave Mill Manager will signature the First Piece Control Card only if he agrees that subsequent production of the same fabric can be woven successfully. If he feels that the fabric presents too many problems during manufacturing and the quality level cannot be controlled then he should not sign the First Piece Control Card, but should discuss the construction with the Designer, and if necessary refer the problem to the Director of Manufacturing.

-Designer sends First Piece Control Card to Production Planning with Finishing Order

Note : the First Piece Control Card of the first color way only is sent to the Production Planning with the Finishing Order. The other cards are placed on file by the Design Development Centre after reviewing the pieces with the Weave Mill Manager

-Production Planning sends control card to Finishing Plant Supt.
-Finished Cloth sent to Laboratory
-laboratory test results are recorded on the card
-returned to Finishing Plant Manager
-signed by Finishing Plant Manager
-returned to Design Development Centre.

3.14 Pattern control

As soon as the Sample Warp is placed on the loom and the loom started up, a maximum of 2 meters only may be woven without the written or express approval of the Design Development Centre.

The Pattern Control man checks the loom and the pattern and cuts off a full width strip of the fabric. He sends the strip accompanied by the First Piece Control Card to the D.D.C.

The D.D.C. examines the strip and signs the First Piece Control Card approving the design and returns the card with any necessary comments to the Pattern Control man.

The Pattern Control man makes whatever changes are necessary. If none are required the Pattern Control man then instructs the weaver to start up the loom.

The Pattern Control man retains a sample of the pattern for future reference.

Note : every color-way and design change follows the same procedure. However, only the first control is recorded in the D.D.C.

3.15. Sample finishing order

Made out by : Design Development Centre

Distribution: -Production Planning Department accompanied by the First Piece Control Card

-Finishing Plant Manager
-from this order the Finishing Plant Manager makes out the Sample Processing Sheet for finishing and dyeing
-Sample Room (accompanied by a copy of the Weaving Order. On subsequent Finishing Orders for the same Weaving Order the Finishing Order is sent alone).

3.116 Sample processing sheet (Finishing Plant)

Made out by : Finishing Plant Manager

-sent to the Grey Cloth Storage and attached to the Piece Card
-accompanies the piece through every required process in the Dyeing and Finishing
-filed together with the Piece Card

3.117 Sample inventory card (Sample Department)

Made out by : Sample Department

A Sample Inventory Card is made out for each colorway which is ordered. The grey pieces are recorded on the card and the finished pieces are marked off when received.

3 J18 Finished sample piece

- when sample piece is finished it is sent to the Quality Control Department
- two full-width cuttings of 60cm in length are made. One is retained by the Quality Control Department for future control. The second is sent to the Laboratory for testing
- when the Laboratory Reports are completed the piece is sent to the Sample Department

  Note: all pieces even those which are not acceptable for quality or other reasons are sent to the Sample Department.
- the Sample Department notifies the Production Development Department of receipt of the sample piece
- Feelers are cut from the sample piece after approval of the sample has been made by the D.D.C.

3 J19 Final construction sheet

Made out by : Product Development Department

Distribution: -Production Planning Department accompanied by Notification of Approved Constructions Form Letter

Note: stencils are made out for weaving and finishing processing employing this sheet as a guide. When orders are received these stencils are used to make up the orders which go into the mill as well as the piece cards

-Costing Department accompanied by form letter

<u>Note</u> : final cost calculations are made using this final construction sheet. The Costing Department no-fies the Product Development Depar-tment of the calculated cost.

3120 Range development record

Made out by : Design Development Centre

The following information is recorded in the Range Development Record.

Sample number	- the number which is given to the development. This is the same number as the Weaving Order number, or rather the same number is used for both purposes.
Date	- the date on which the Weaving Order is made out.
Promise of delivery date	- the date (week number) on which the sample has been promised for delivery by the Production Planning Department
First piece	- the date on which the First Piece Control Card is returned to the Production Development Department from the Weave Room Manager.
On Loom	- the date on which the First Piece Control Card is submitted with a full-width strip of fabric by the Pattern Checker.
Finishing Order number	- these numbers run in sequence

Finishing Order Date	- the date on which the Finishing Order was made out.
Received	- the date on which the Finishing Order was completed and the First Piece Control Card was received by the D.D.C.
Date to Costing	- the date on which the Final Construction Sheet was sent to the Costing Department.
Date from Costing	- the date on which the Cost Department reported the costing.
Quality number	- the Quality Number which is assigned to the sample after final approval has been given.
Remarks	- a column for remarks is provided for whatever remarks are pertinent to the development.

3.2 Print Designs

The procedure for print design development is similar to the woven design but less complicated.

The major difference is that when "strike-offs" are made they must be checked without delay as the print machine is stopped which is costly, as opposed to having one sample loom stopped.

IV. PRODUCT DEVELOPMENT

4.1 Basic Concept

There are two distinct factors relating to development work.

a) designing of patterns and colour-ways,

b) designing of fabric constructions and technological changes which could occur in processing such as weaving, finishing, dyeing.

In some instances both factors are involved simultaneously. (For example, where a new type of pattern is applied to a new fabric construction).

The basic concept of this work is that Fabric Development encompasses <u>any change that takes place in a fabric which affects the end product in any way</u>.

It is very important that all new developments involving new constructions, finishes, new types of dyeing methods and other technological changes be controlled. The recording and controlling of such developments must be assigned to the "Product Development Department". This department may be composed of one or more individuals depending upon the number of developments which take place.

In medium sized companies one man is usually sufficient to do all the necessary follow-up work required and possibly this work can be combined with other work (example Quality Control).

4.2 Organisation

The function of this department requires the involvement of both the Marketing Division and the Production Division.

4.3 Fabric Development Forms

Forms should be developed for the following purposes:

a) Record of the details pertaining to each development

b) Master records showing sequence and progress of all developments

c) Weaving/knitting requests for specific developments

d) Dyeing and finishing requests

e) Submission for approval

f) Weekly Progress Report on incompleted developments.

4.4 Product Development Procedures

a) As each new development is received the Product Development Supervisor will assign a Product Development Number and open a file

b) The development will be recorded in the Product Development Master Record, which is similar to the Range Development Record

c) The designers will make the layouts and the Product Development Department will attach a separate form, which will contain specific information including approval by the Mill Manager

d) The P.D.D. will issue the production order for weaving and knitting directly to the sample dept. or via the Sales and Promotion Coordinator, if it is to be produced in the Production Departments.

In the same manner as with woven range designs, after the sample has been properly started-up, but before many inches are woven, the loom or knitting machines is stopped and must wait the approval of the designer before production is continued. A full width strip must be cut from the woven cloth and checked by the designer. The designer must sign the First Piece Control Card

e) When the first piece is completed, the Mill Manager or a responsible partly who he appoints must sign the First Piece Control Card before it may be forwarded to mending

f) Dyeing, printing and finishing
The P.D.D. will issue finishing instructions, for the first piece via the Sales and Production Coordination Dept. These instructions must be clear so that no ambiguity can result. If possible a sample of the finish or a reference to an established finish should be included. The dyeing and finishing formulations and sequence of processing is not included in thes instructions since this is not the responsibility of the P.D.D. However, the formulations and sequence of processing must be written down on either the Dyeing and Finishing Order or an accompanying form by the Finishing Plant Manager or his assistants

g) Upon completion through the finishing processes, the Manager or persons delegated by him must examine the sample piece and sign to the effect that the development is acceptable for production.

N.B. If the piece must be re-finished, then final approval must wait until another piece is processed and the proper finish achieved in one sequence of processing.

h) **Testing Laboratory Approval**

A sample must be sent to the Testing Laboratory for routine and special testing to determine if the development passes the specifications for that type of product.

The Laboratory Supervisor must sign the approval to this effect

i) **Marketing Approval**

The finished sample is sent to the Head of the Design Development Centre for examination and approval, accompanied by a form letter. Sometimes the Marketing Director is required to give his approval.

N.B. If the sample is approved it is then sent to the Quality Control Dept and is established as an approved standard for all subsequent production on that fabric. At this time the procedure for establishing style number is put into work and all parties are informed that this new style has been established. The Sales and Production Coordination Dept. in particular must be informed as they may not accept any production orders of any style which is not approved and established by the Marketing Division.

N.B. If the sample is rejected then the procedure of development must begin anew or be discarded according to the decision made.

3.5 Weekly Progress Report

A weekly Progress Report showing the status of the incompleted developments must be up-dated each week. This will enable management to expedite projects if this should be found necessary.

The following personnel should receive this weekly report :

Marketing Director
Production Director
Finishing Plant Manager
Head of the Design Development Centre
Weaving mill Manager
Raschel Knitting Manager
Circular Knitting Manager.

3.6 Approvals

It is vitally important that approvals on new developments be given by responsible persons.
It is the responsibility of the Fabric Development Department to obtain specific approvals from these individuals.

a) Weaving

The Manager of the weaving mill is required to give his signatured approval that the individual fabrics as they are developed can be woven successfully in volume production.

b) Knitting

The Managers of the Knitting Mills are required to give their signatured approval that the individual fabrics as they are developed can be knitted successfully in volume production.

c) Finishing

The Finishing Plant Manager must also give his approval that the fabric as finished or finished and dyed can be duplicated in production.

d) Testing Laboratory

The Head of the Testing Laboratory must give his approval of the fabric as regards specifications.

e) Marketing

The Head of the Design Centre must give his approval that the fabric and finish as submitted is acceptable.

This final approval by the Marketing Division is vital'y important. The acceptable quality standard can then be established by the Quality Control Dept. A sample of the approved fabric is subsequently used as a standard.

f) <u>Responsibility of Product Development Department</u>

The P.D.D. is responsible for:

1. recording and following-up the progress of new developments

2. maintaining a constant liaison between the production departments and the Design Centre regarding development work

3. obtaining approvals on developments from responsible individuals.

g) <u>Summary of Product Development Procedures</u>

- The system requires that every new development of any nature where changes in construction and finish are involved must be controlled by the Fabric Development Department

- The P.D.D. does not instruct the production departments in their technical work relating to the developments although the P.D.D. can frequently be of great assistance in this regard

- The P.D.D. records the progress of the developments through the plants and obtain approval of the developments from the various parties concerned

- The P.D.D. submits a weekly report on the progress of all developments to the Marketing Director, Production Director and the Head of the Design Centre

- The finished product of the work of the P.D.D. is the established new styles and finishes.

APPENDIX B.

MAINTENANCE REPAIRS DONE
ON DEMONSTRATION MACHINES
IN JUBILEE MILL

Karachi, March 2nd, 1981.

Mr. H. EL-MISSARY
UNIDO Co-Ordinator.

Dear Mr. El-Missary,

Please find herewith enclosed a list of the jobs performed at Jubilee Mills during the training on Drawing, Roving (Simplex) and Spinning frames.
A list of broken parts or worn-out parts of one wide loom requested by the management of the mill is also enclosed; this to make a thoroughly maintenance, and to show them how to adjust that particular type of loom and to fix the loom by making the necessary repairs in order to evaluate the need of the repairs to be done on all the other looms.

As you can see, practically all parts needed repair or replacement, and as the mill doesn't have original parts and in most of the cases not even local made parts, we had to repair the parts in the machine shop.

Sincerely Yours.

G. Visvikis.

Encl.: 4 lists.
cc :Dr Niaz Ahmad

JUBILEE MILLS

223. LOOM No. 109

WORN OUT PARTS TO BE REPLACED OR REPAIRED.

- Whip roll + shaft + bush + arm.
- Stop rod + bush + brackets.
- Spring slots.
- Spider pulley lever + roller + pins + studs.
- Spider pulley guide lever holders.
- Centre wing.
- Duck bills + fingers + studs + springs.
- Feeler bar slides.
- Oscillating shaft + rod + fingers.
- Beam guide spacers + bolt.
- Feeler bar bracket.
- Dropper bars + stand.
- Rocking shaft + brackets + bushes.
- Shoulder brackets.
- Cross cannons.
- Sley ends (complete).
- Temple rod + guides + slides.
- Loose starting rod.
- Beam presser shaft + bracket + stay + stud.
- Presser arm link pin.
- Inclined lever + pin + roller + connecting rod.
- Brake-off tongue.
- Take-up lever + pawl + pin.
- Lifting catch.
- Brake lever stud + shoe + weight.
- Treadle lever + heels + balls + pin.
- Weft hammer + pin.
- Bunter.
- Racks + Rods + pins + pinion holder.
- Horizontal lever pins.
- Travelling rollers + pins.
- Main lifters + pins.
- Hook lever joint rod + end + pin.
- Pinion wheel stud.

./...

- Cam follower.
- Picking nose.
- Shuttle guard bolt.
- Cloth roll levers.
- Spring handle lever pin.
- Bobbin disc + stud.
- Small end disc.
- Weft grate shape re-moved to be in line with the box fly back. (this is common on all looms).

JUBILEE MILLS

JOBS DONE ON DRAWING FRAMES

1) Have adjusted the spring pressure arms of 1 Saco-Lowell and 4 Ingolstadt Model 5 Frames and have improved the regularity.
2) Have adjusted on some old machines the height of the hooks.
3) Top rollers of Model 5 were of various sizes and this affects the pressure, also top rollers were eccentric, and needed buffing. Have straightened some top rollers and have buffed all the top rollers to bring them at the same diameter.
4) Have shown to Mr. Akhtar and the Top Rollers Grinding man that most of the Saco-Lowell top rollers are eccentric and have to be repaired before installing new cots or buffing.
5) The traverse on all frames was dismantled. Have installed for trial on 1 frame. This affects the top rollers as they are grooved where the sliver passes in the same position.
6) Most of the top roller slides were open and the Top roller had a lot of play. This has been fixed on all model 5 and some old type machines.
7) All the front roller couplings were damaged and have been fixed. (Model 5).
8) Many calender roller bushings were damaged and have been fixed.
9) On the drafting gearing many gears, bushings, and keys were damaged and fixed.
10) Some bottom rollers were eccentric and have been repaired.
11) Many bushings of top rollers are damaged and need replacement.
12) The coiler tube gears have been washed to avoid chocking.
13) All oil pumps (Model 5) were out of order and have been fixed.
14) One pressure arm bracket was badly welded and it was impossible to adjust the pressure, it has been fixed (Model 5).
15) Have adjusted the clearers, and on 1 frame replaced the cleaning combs. Most of them need replacement as they don't clean the top clearers.
16) Bottom roller settings were not equal and have been adjusted.
17) The driving belt guides were damaged and have been repaired. (On 2 frames).
18) On one old frame both motor and machine pulleys were eccentric and have been replaced.

ROVING FRAME No. 5

Parts Adjusted or repaired.

1) Top pressure arms height not correct touching the Fluted rollers, and re-adjusted.
2) Top pressure arms weight not correct and re-adjusted.
3) Bottom roller and support bar settings re-adjusted.
4) Increased lift from 8 3/4 to 9 3/4.
5) Bobbin carrier slides jammed with waste.
6) Balancing weight pulleys and brackets (All) worn out.
7) Chains found short have been increased in order to increase the lift.
8) More than 30 % of the spindles foot steps replaced.
9) Some bolsters replaced.
10) All Bobbin gears have been replaced as were worn out and the new ones were not of the same height.
11) Some Spindle and Bobbin driving gears have been replaced as they were worn out.
12) Have repaired the Spindles slots and tip of the Spindles as it was not easy to remove the Flyers.
13) Building motion gears broken and replaced.
14) Building motion pawls replaced as they were worn out.
15) Cone belt rack supporting rolls replaced.
16) Cone wheel worn out has been replaced.
17) Twist change gear was worn out and has been replaced.
18) Shaft of Twist intermediate gear was worn out, has been badly repaired by the Machine shop and has jammed the gear and broke the Bracket.
19) Differential motion gears and shafts have been repaired.
20) Reversing bevel gear has been replaced.
21) Carrier gears cover was worn out and has damaged 3 Helical gears. All of them have been replaced.
22) Support of Bobbin Carrier was broken and the Carrier was shaking (probably was the cause to damage the Carrier gears cover) has been welded.
23) Drafting gear key has been replaced.
24) Top rollers have been buffed.
25) Have changed the Apron Nip from 6 to 4 to improve the quality.

./...

26) Bobbin carrier has been levelled, it was also out of alignment and has been aligned by the Dept. Foreman as no Instructions for that machine available.

27) Have adjusted the Building Motion rack in order to obtain a better package weight. The Bobbin net weight has been increased to 720 Grams The actual weight on other machines varies from 557 to 670 Grams.

P.S. : It has been also made a gauge to adjust the Driving gears of the Spindles and Bobbins for the No. 8-9 Roving Frame, most of them were way out, and we explained to the Dept. Foreman how to use tha gauge and adjust the Gears.

JOBS DONE ON SPINNING FRAME

1) Spindle oiling was excessive. This results to oily tapes, reduce life of tapes, and Spindle slippage with less twist on the yarn.
2) On frame 38, some lappets were jammed and the rods were damaged. Have adjusted the guides.
3) All supports of lappets are not properly set. The rollers were closer and therefore at the end of the doff they were higher which results to more tension on the yarn.
4) On the UF 620 drafting system,have changed the top roller settings, adjusted the height and reduced the pressure. The quality has been improved.
5) Have shown to Mr. Wali Khan and Mr. Ali Akhtar how to adjust the UT3-G pressure arms in order to eliminate the hard roving undrafted sliver and improve the quality and breaks.
6) Have adjusted the winding down stopper screw in order to eliminate the yarn accumulation at the bottom of the spindles.
7) Have made adjustments of the building motion chains and distance of the lugs in order to eliminate the breakages at the start up and winding, obtain a proper bottom former and increase the package weight.
8) Have shown how to treat the building motion chains. The chains must be oiled before installation on the machines, and the parts that they are jammed dipped in petrol in order to remove the rust. Actually they change a lot of chains when they are jammed.
9) Most of the motor or frame pulleys were not aligned reducing the life of the belts.
10) Have made gauges for the plumbing of the Anti-balloon rings all of them were not properly centered. This affects the end breakages and ha of the yarn.
11) Have made new plumbing devices to adjust the thread guides. With the existing gauges the centering of the lappets was not accurate and many of them are not properly set. On some frames we had to change the position of the lappet rod as the lappets were way off.

./...

"

12) Have given instructions to make 2 gauges for the adjustment of the collars and tension pulleys. Actually the set collars of the tension pulleys are not properly adjusted and the tapes are too short, damaging the support rod and jockey pulley brackets.

13) Have adjusted the sliver rod at the middle of the roving bobbin in order to decrease the stretch of the sliver.

14) On frame 41 have re-arranged the creel in order to accommodate full Rovematic bobbins. Actually the cardroom makes smaller size bobbins as the big ones cannot fit in the Spinning creel. This will improve the Cardroom efficiency and reduce the handling, knots, and job loads in both Spinning room and Card room. The Bobbin weight can be increased to 1.3 - 1.5 Kgs. The actual weight is only $.9^{-1.02}$ and the lift is 11" instead of 12".

APPENDIX C

LETTERS OF RECOMMENDATION

February 28, 1981.

(Section of letter refering to the programme)

(Page-:2:-)

As mentioned earlier training was the key to success. Having realised the importance of training it was certainly our pleasure and privilege to have the Werner International Management Consultants at our mills to improve our rudimentary training methods and organize it along the most effective techniques.

Although the Werner's training programs have recently been concluded in our Spinning and weaving departments, yet in our assessment, the training programme has given us an excellent method to train the fitters to be productive in the shortest possible time. The available preliminary results obtained from the first batch who has already undergone the training with this method has shown results in the form of stable performance of the machines under them with slow but steady improvement in efficiency, quality and spare parts consumptions.

We feel as the number of trained persons increase, the speed of improvements will accelarate and easier to maintain. The results of this training program as more people are trained will be most prominent in developing our position in the highly competitive world market of now a days which demands peak performance from textile manufacturers.

Having learned the Werner's system of training and due to the favourable preliminary results which we have achieved, we are now giving the training process to fitters in Spinning and Weaving our full attention and care.

We take this opportunity to thank UNIDO for availing this assistance to the textile industry, with best regards, we remain.

Yours faithfully,
for MOHAMMAD FAROOQ TEXTILE MILLS LTD.

MUKHTAR SUMAR
DIRECTOR.

c.c. to: Mr.El-Missry
c.c. to: Dr. Niaz Ahmed.

PAKISTAN POLYPROPYLENE PACKAGES LIMITED
Haq Nawaz Building, 11 - West Wharf Road, Karachi-2 Pakistan
Telephones : Direct : 200164 201640. Cable : 'PAKPLAST' Telex : 25499 HMAI PK

06 January 1981

Mr. Hussein El-Missary
Project Co-Ordinator
Cotton Textile Development &
Research Centre
Queens Road
KARACHI

SUBJECT : TRAINING OF "FITTERS INSTRUCTORS" AT MULTAN FACTORY

Dear Mr. El-Missary :

We refer to the above training program as carried out by your Mr. Amanul Haq, Senior Development Officer, at our Multan Factory.

We wish to put on record our appreciation for the valuable training imparted by your Mr. Amanul Haq and also for the guidance you gave during your observation of the training course at our Multan factory.

Thanking you,

Yours sincerely,

Pervez Hanif

PERVEZ HANIF
Director

APPENDIX D

PROGRESS REPORT

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

PROGRESS REPORT ON THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

UNIDO CONTRACT NO. 80/84
PROJECT NO. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

Submitted to:
Purchase & Contracts Services Section
United Nations Industrial Development Organization

September 23, 1980

WERNER ASSOCIATES INC.
523 AVENUE LOUISE, BOX 29, 1050 BRUSSELS, BELGIUM • TEL. 649 97 64 • TELEX: 22907 • CABLE: WERNERCONSULT
MEMBER: ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

Mr. D. F. Mant
Head Purchase and Contracts Services
Section
P.O. Box 300
A-1400 Vienna
Austria

Dear Mr. Mant:

Following is the Progress Report on the Development of a Textile Training System in Pakistan.

The Contract item 1.01a) states :

"conduct a survey of the Pakistani textile industry for the purpose of developing and adapting a training course "hereinafter referred to as the "Training Course") of 3 to 6 weeks duration to meet the technical requirements of spinning and weaving fitters in Pakistan".

As was related in our proposal we did not plan to conduct a survey of the industry as Werner had made an extensive examination of the industry during 1977/78, and so we were able to begin the actual training aspect of the programme one week after my arrival.

We received full co-operation from all of the UNIDO personnel whom we met. We would like to remark that Dr. M. Kamal Hussein, UNIDO Senior Industrial Development Field Advisor who conducted our interview and organized our meeting with Mr. Asif Ali Shah, Joint Secretary, Ministry of Industries was extremely efficient in conveying the role of UNIDO, and in correlating our approach to the programme with the aims of UNIDO.

WERNER ASSOCIATES INC.
523 AVENUE LOUISE, BOX 29, 1050 BRUSSELS, BELGIUM • TEL. 649 97 64 • TELEX: 22907 • CABLE: WERNERCONSULT
MEMBER: ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

Mr. Hussein M. El-Missary, UNIDO Project Co-Ordinator, in the absence of Dr. Niaz Ahmed, Director, CTIRDC, was invaluable in organizing the training arrangements for the programme. His experience and understanding of the textile scene in Pakistan, as well as all the elements and requirements of the training programme greatly facilitated the organizing and actual start-up of the training schedules. Mr. Muhammad Shamim, Head of the Quality Control and Training Department also contributed to the organization of the rapid start of the training schedules.

The gentlemen in UNIDO Vienna, Mr. A.W. Sissingh, Senior Industrial Development Officer, Policy Coordination Division, formerly Acting Chief, Training Section plus Mr. Gilles Stevens, Industrial Development Officer and Mr. Abdulkerim O. Karamanoglu, Industrial Development Officer, all of the training section, and Mr. Harold Ross, Contract and Services Section, were all very helpful in providing information during my briefing period in Vienna on August 21, 1980.

I would like to single out Mr. Harold Ross of your section who was not only invaluable during my briefing in Vienna but also gave guidance and assistance during the arrangement states of the project.

Yours sincerely,
WERNER INTERNATIONAL

Jack R. Hearns
Manager

JRH/gc.

TABLE OF CONTENTS

I. PREPARATIONS FOR START-UP OF TRAINING COURSES

I. PREPARATIONS FOR START-UP OF TRAINING COURSES

The CTIRDC were awaiting the arrival of the Werner consultants. In the absence of Dr. Niaz Ahmed, Mr. Hussain M. El-Missary, Project Co-ordinator, UNIDO, took charge of the arrangements which were necessary to get the actual training underway. 7 working days after the arrival of Mr. Hearns the weaving fitter/fixer training course was underway, with one instructor from the CTIRDC and one instructor plus one training officer from the Mohammed Farooq Textile Mills. This action corresponded to Werner's plan.

The Dr. Niaz Ahmed, Mr. Muhammad Shamim, and Mr. El Missary had been in contact with many textile companies regarding the training programme and were well aware of the possibilities for individual company participation.

The subject of location of training was reviewed the first day. Mr. Hearns requested that the programme be carried out in an integrated spinning and weaving mill so that the training of the spinning and weaving fitter/fixers could be easily co-ordinated. Training in a selected mill was stipulated in our proposal and formed part of the contract. All of the integrated mills in the Karachi area were considered, and from the joint knowledge of the mills a list of four possible mills was selected. These were:

Guhl Ahmed Textile Mills Ltd.
Mohammed Farooq Textile Mills
Husein Industries Ltd.
Jubilee Spinning and Weaving Mills Ltd.

Appointments were made with executives of each of these companies. Guhl Ahmed unfortunately was unable to keep the appointment. The programme was explained to each of the executives and they agreed to participate in the programme.

It should be noted that the programme calls for fitter/fixer instructor trainees from one company to work in the mill of another company. There is a natural reluctance on the part of the mill owners to do this but via a gentleman's agreement between the company executives a mutually suitable arrangement was reached.

The mill which was selected in which the training is taking place is the Mohammed Farooq Textile Mills. Husein Industries were offered the opportunity to have the project conducted on their premises, but the Chairman Mr. Jamal correctly wished to review the project with his production executive before making a commitment of this nature, and unfortunately this gentleman was away at the time. It was the intention to offer the project to Guhl Ahmed but immediate contact was not possible. Jubilee Mills does not have sufficient English speaking personnel to accommodate the project.

Since the project could not be delayed, the only mill available was M. Farooq. This is a very acceptable situation since the management is very co-operative and progressive and training facilities are available. Mr. El-Missary had previously conducted assistance programmes in this mill with considerable succes and had arranged for the training services to be set up.

II. START-UP OF TRAINING COURSES

II. START-UP OF TRAINING COURSES

The training course for weaving fitters/fixers started on Saturday August 30,the first working day after the arrival of Mr. Terkelsen.

The training course for spinning fitters/fixers stated on Sunday, September 7, one day after the arrival of Mr. Ryynanen.

III. OUTLINE OF PROJECT EXECUTION PLAN

III. OUTLINE OF PROJECT EXECUTION PLAN

During the first day of the project a tentative schedule was drawn up which gave full consideration to the Terms of Reference, the number of available personnel from the CTIRDC and the original programme as proposed by Werner. It is the plan of the programme to train 8 instructors, each in both weaving fitting/fixing and spinning fitting/fixing, 16 instructors in all, plus 6 weaving fitter/fixers and 6 spinning/fixers. In addition two training officers, one in each of the demonstration mills if available will be trained in their special duties. A total of 30 persons are planned to receive training of varying degree.

Attached is the final schematic schedule which was drawn up. This schedule will be followed as closely as possible.

SPINNING FITTER/FIXER PROGRAMME

FIRST TRAINING COURSE

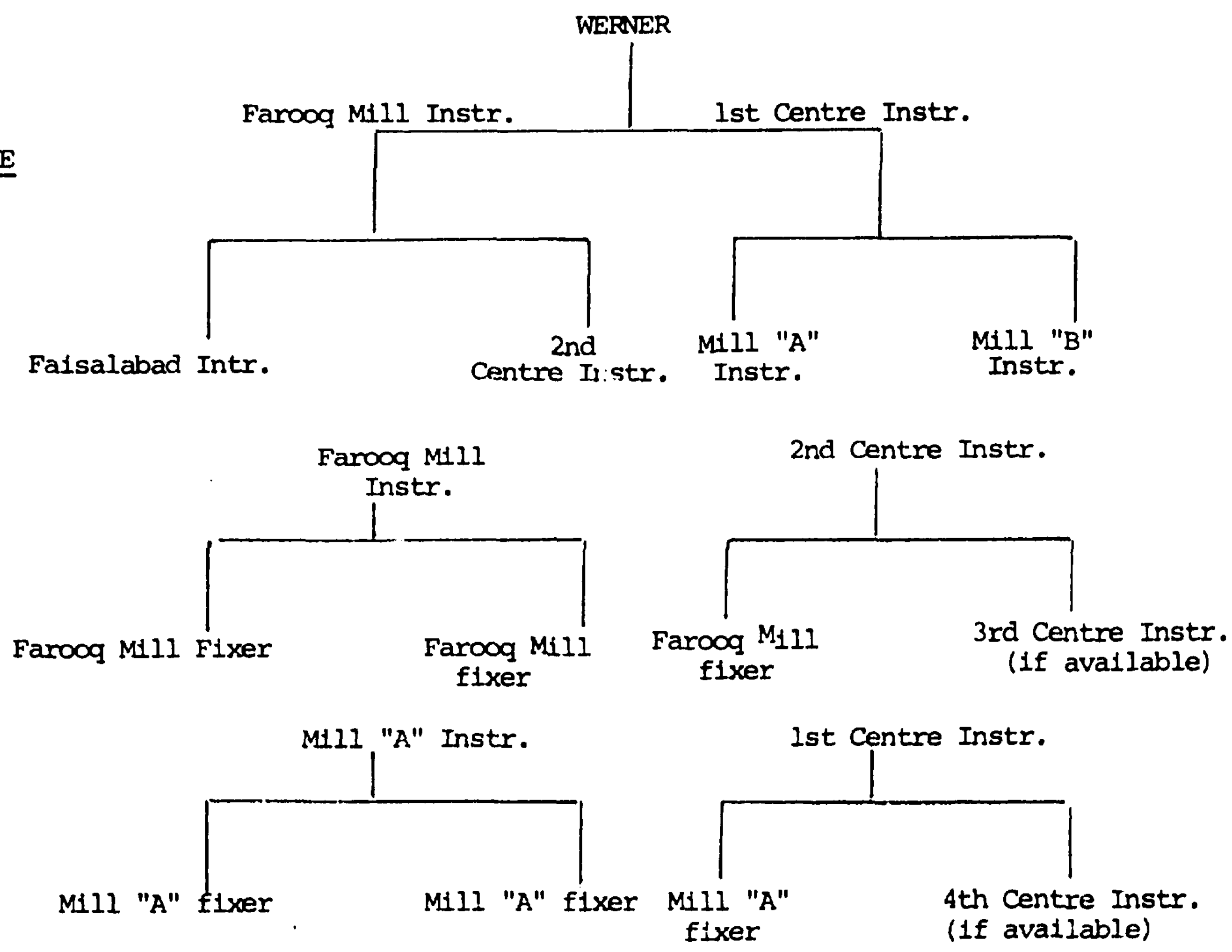
PHASE I

DEMONSTRATION

PHASE IIA

DEMONSTRATION

PHASE II B



THE IDENTICAL PROGRAMME IS PLANNED FOR THE WEAVING FITTER FIXER.

TOTAL PERSONS TRAINED:	INSTRUCTORS	16
	FIXERS	12
	TRAINING OFFICERS	2

IV. INTERPRETATION DIFFERENCES

IV. INTERPRETATION DIFFERENCES

1. SPINNING FITTER

For the sake of the record it is necessary to relate a difference in interpretation which occurred regarding the occupation of a spinning fitter.

The terms of reference states:

- The aim of the project, Page 2, states "developing ... training programme for spinning and weaving fitters".
- The scope of contracting services, item (2) Page 3 "Training course for spinning and weaving fitters".

The interpretation by CTIRDC of spinning fitters is all fitters/fixers and card grinders/setters from blow room through to spinning which would include the following jobs:

blow room equipment fixer
combing fixer: for combing section equipment
card grinders and setters for carding machines
drawing frame fixer
roving frame fixer
spinning frame fixer

The interpretation of Werner International is that a spinning fitter is the fitter/fixer who works on the Spinning Frame only. This interpretation is based on international understanding of the job title "Spinning Fixer", and our proposal was designed on this assumption.

In an analogous manner Werner International interprets the term "Weaving fitter" as being the specific job of tne fitter/fixer on the actual Weaving Process, and does not include any other fitter/fixers in a weavirg mill, such as

cone winder fixer
pirn winder fixer
warper fixer
slasher fixer
cloth room equipment fixer.

CTIRDC agrees with Werner regarding the weaving fitter/ fixer.

The basic point made by Werner is that Carding can in no way be construed as Spinning. Carding is a distinct type of process by itself. Carded material need not necessarily be spun into yarn. Millions of tons of carded fibre are processed into non-woven fabric.

Moreover, where a mill sells yarn on cones or any form of put-up other than on spinning bobbins, the common practice internationally is to categorize a Spinning Mill into three basic departments:

- carding department
- spinning department
- yarn finishing department

In turn the Carding Department is commonly segregated into:

- blow room (opening and picking or opening only in the case of chute feed)
- carding
- combing
- preparation (drawing and roving)

So that there is no misunderstanding of the Spinning Process in the contract, the spinning process is understood to mean Ring Spinning and not Open-End Spinning because the industry is comprised of ± 3,800,000 spindles whereas only a few thousand rotors are installed.

Only in small mills, ± 15,000 spindles and under, does any fitter/fixer's area of responsibility include more than the actual Spinning Process, and even in mills down to ± 10,000 spindles only the Preparation Processes and Spinning Processes and possibly Winding are handled by the same fitter/fixer.

Werner's time schedule was based on our interpretation of the Spinning Fitter being responsible for the Ring Spinning Frames only. Had the terms of reference specifically stated "all fitters in the spinning mill" or even "spinning mill fitters" the scope of training wished by the CTIRDC would have been clearly understood and the time required would have been longer than was offered in Werner's proposal.

During the development of the planned schedule and even before the difference in the interpretation of Spinning Fitter became apparent Mr. Hearns considered the possibility of including the Roving Process which has many mechanical similarities to spinning, and also the Drawing Process which also has some similarities to the spinning process.

The CTIRDC wanted to have some training on the Blow Room equipment and Cards included. In the opinion of Mr.Hearns it is not possible to include these other processes and be able to meet the contract agreement item 2.12 Standards of Work which states:

> "The contractor agrees that the performance of work and services, persuant to the requirements of this contract, shall conform to the highest professional standards".

A compromise understanding was reached between CTIRDC, the UNIDO Project Co-ordinator and Werner which was written as an Aide-Memoire which forms Appendix "A" of this report.

2. OTHER ITEMS

Other points of differences in interpretation were reviewed and discussed at length. These include:

a) Contract item 1.01 d) "Review the CTIRDC's present training courses, including materials and advise/ assist in making them more effective".

The CTIRDC wished to have this expanded to include "modify and up-date" the existing courses.

Werner have agreed to do the following which in our view is more encompassing than the contract item 1.01 d).

i) Werner will review the courses, write a report containing a critique and advice on the courses as well as recommendations which will assist in their improvement. (This report is included as Annex C to this progress report).

ii) The CTIRDC will implement the recommendations they chose to apply.

iii) After the changes have been completed, Werner will review the changes with the department heads related to the subject matter.

No further action will be taken by Werner.

This compromise has been agreed upon by both parties.

The report referrred is included as Appendix "C".

b) Contract item 1.01 c) "The CTIRDC wanted to include "provide the material for training courses which in Werner's opinion are necessarily required in various departments of a textile mill and the Centre has not developed those so far. The contract clearly states "required to conduct the Training Course". There is no mention that Werner will provide the material asked for by the CTIRDC, and such material will not be provided.

c) Contract item 1.01 b) "supervise and instruct 15 to 20 trainers to enable them to conduct the training course; the instruction of the trainers shall include theoretical and demonstrative training under the guidance of the contractor". The CTIRDC wondered if the number of 15 to 20 trainers did not mean 15 to 20 each in weaving and spinning, but agreed that the wording meant 15 to 20 in total.

V. LOCATION OF TRAINING

V. LOCATION OF TRAINING

A serious difference of opinion arose regarding the location on the training. The background of the opinions are as follows:

Werner

In our sectoral study we stated:

Chapter XVIII 4a)

"In-plant training is much more important than university training. The technical staff must be trained on-the-job via participation in implementation of technical and management controls which are installed by international professionals in the textile industry".

Chapter XVIII 5)

"Organised "In-Plant" supervisory training courses should be installed, using professionals in the textile industry. The supervisors should learn their jobs in the local environment. Technical training must be included as well as the techniques of control over labour, quality, productivity and costs".

Chapter XVIII 6d)

"TRAINING OF DIRECT OPERATORS SHOULD BE DONE IN THE PLANTS ON A SCIENTIFIC BASIS AND SET UP BY TEXTILE TRAINING SPECIALISTS."

Partly based on this report the present UNIDO project was conceived.

2) Our proposal distinctly states: "Training Centre in a Selected Mill".

3) It is very important to note that Werner's Training Programmes will provide the CTIRTC with far superior services to offer to the industry than is presently available from the centre. As opposed to reducing the need for the centre it will enhance their opportunities. At present the mills are obliged to send trainees to the Centre, whereas in future the CTIRDC instructors should go to the mills. This will be particularly attractive to the mills which are outside the Karachi area.

CTIRDC:

The CTIRDC are of the firm opinion that the training should be carried out in the Centre. This opinion seems to be based on their experience in training. Moreover they are of the opinion that their approach wherein more persons are trained in the initial stages is superior to Werner's. They were willing to compromise to the point where Phase I, the course preparation and initial trainer-trainee development,take place in the Centre and Phase II, the demonstration phase in the mills.

The case was finally resolved by Dr. Kamal Hussein who gave instructions to carry out the programme according to Werner's plan.

A step by step sequence of events leading up to the decision are outlined in Appendix B

VI. CONSULTANT ILLNESS

VI. CONSULTANT ILLNESS

The team leader Mr. Ryynanen was scheduled to arrive Friday, August 22, the same day as Mr. Hearns. He contracted an illness and was delayed two weeks. In one sense it was fortunate he was not in attendance the first week, since numerous arrangements as previously described had to be made and his time could not have been spent to the best advantage of the project.

However, he was indeed not in good health upon his arrival and after six days Mr. Hearns sent him back to Brussels since he was too ill to carry out his duties.

Mr. George Visvikis has been selected as a replacement for Mr. Ryynanen. His biographical profile has been submitted to UNIDO.

Aide-Mémoire of the meeting held on 2nd September 1980, in which following participated:-

1. Mr. H.M. El-Missary : UNIDO Training Co-ordinator
2. Mr. J. Hearns : Werner International Senior Executive
3. Mr. M. Shamim : Head of Quality Control and Training Deparment. Textile Industry Research & Development Centre.
4. Mr. M. Yunus : Head of Spinning Department. Textile Industry Research & Development Centre.

This meeting was held at 9.00 a.m. following the discussions held on 1st September, 1980.

Mr. Hearns who asked this meeting to convene mentioned that he has given further thought about the point in which Werner International has interpreted the term "Spinning Fitter" as being only to train the fitter's instructor or the ring frames, although he mentioned that they will include, as well, the roving and drawing frames in their training. This interpretation was explained to him as being in the minds of the participants contradictory to the spirit and understanding of the project.

After further discussions on this difference of opinion, it was agreed upon the following compromise:-

i. Werner International will also provide to TIRDC for the processes of carding training materials used by Werner, the written material relating to the training system for card fixers as well as recommended preventive maintenance schedule, and standard card settings.

   These settings will be further developed, whenever possible, during the demonstration phase as mentioned thereinafter in term iv.

ii. The above mentioned material will be supplied not later than 18th October, 1980.

iii. Answers, explanations or queries on the material supplied will be provided to TIRDC by Werner International Consultants to enable them to carry future training programmes on their own.

iv. As time permits Werner consultant will work with the TIRDC instructor, who has been trained in 1st Demonstration period, in developing with him the training course for card fitters, when the Werner consultant is free in the second demonstration period.

APPENDIX B

SEQUENCE OF DISCUSSIONS AND ACTIONS ON LOCATION OF TRAINING

1) Upon Mr. Hearns' arrival Mr. El Missary questioned as to why the training should not be carried out in the CTIRDC where equipment is available. After an explanation of Werner's Training Methods he fully agreed that the training should take place in a mill.

2) The subject was discussed the first day with Mr. Shamim, the senior man in the centre during the absence of Dr. Niaz Ahmed. He stated he felt the training should be done in the Centre. The reasons for training in the mill were explained to him. Even if the equipment was first class, which, in the weaving section it is not, proper training could not be given in the Centre. Mr. Shamim then accompanied Mr. El-Missary and Mr. Hearns on visits to two textile companies where the programme was outlined again.

3) The programme was explained to Mr. Yunus and Mr. Majeed, heads of the spinning and weaving section. Both questioned why not in the Centre and seemed to understand to the benefit to have the training in a mill.

4) On Tuesday August 25 Mr. El Missary and Mr. Hearns visited Islamabad and reviewed the project with Dr. Kamal Hussein who also enquired as to why the programme should not be held in the centre. He was convinced that a mill programme would be superior to one held in the centre.

5) The same day the programme was explained to Mr. Azif Ali Shah, Joint Secretary, Ministry of Industry, the procedure of mill training.

6) The actual training in a mill was started in the weaving on Sunday August 31.

7) On Monday September 1, a detailed programme was shown to Mr. Shamim and Mr. El Missary.

8) On Tuesday September 2 Mr. Shamim, Mr. Yunus and Mr. Majeeb confronted Mr. El Missary with a joint request to have the training done in the Centre.

9) On Wednesday September 3 the same group plus Mr. Hearns discussed the subject at length. Mr. El Missary and Mr. Hearns presented all the reasons why the training had to be carried out in the mill. Although nominally in charge Mr. Shamim would not give his approval and preferred to wait for the return of Dr. Niaz.

10) Sunday September 7, Dr. Niaz returned to the office. He was briefed on what had transpired. He definitely wanted the training at the Centre. He agreed with his subordinates to visit the mill where they questioned Mr. Terkelsen who explained thoroughly why the training had to be carried out in the mill. When asked what would be the difference in training value, he replied ± 30% in the Centre compared to the mill.

11) The men at CTIRDC were still not convinced, so Mr. El Missary persuaded Mr. Shamim and Mr. Majeed to again review the programme with Mr. Terkelsen on Monday, September 8.

12) Tuesday, September 9, Mr. Hearns presented Dr. Niaz with all the arguments and benefits pointing out particularly contract item 2.12:

"2.12 Standards of Work

The Contractor agrees that the performance of work and services, pursuant to the requirements of this Contract, shall conform to the highest professional standards" and this, in our opinion could not be fulfilled at the Centre. He asked Dr. Niaz to give the matter further consideration.

13) At a meeting Wednesday morning September 10, Dr. Niaz was adament that the Centre should be the place.

14) The same day Mr. Hearns contacted Dr. Kamal Hussein in Islamabad and explained the impass and that Werner had no alternative but to refer the matter to him. Dr. Hussein said he had heard from both Dr. Niaz and Mr. El Missary and his instructions were to carry out the programme as Werner saw fit.

15) Although Thursday, September 11, was a national holiday a meeting was convened at which Mr. Hearns quoted Dr. Hussein's remarks. Dr. Niaz did not infer that he had received different instructions.

16) The programme is proceeding in the manner planned by Werner and Mr. El Missary.

APPENDIX C

REVIEW OF THE PRESENT COURSES BEING GIVEN BY THE CTIRDC

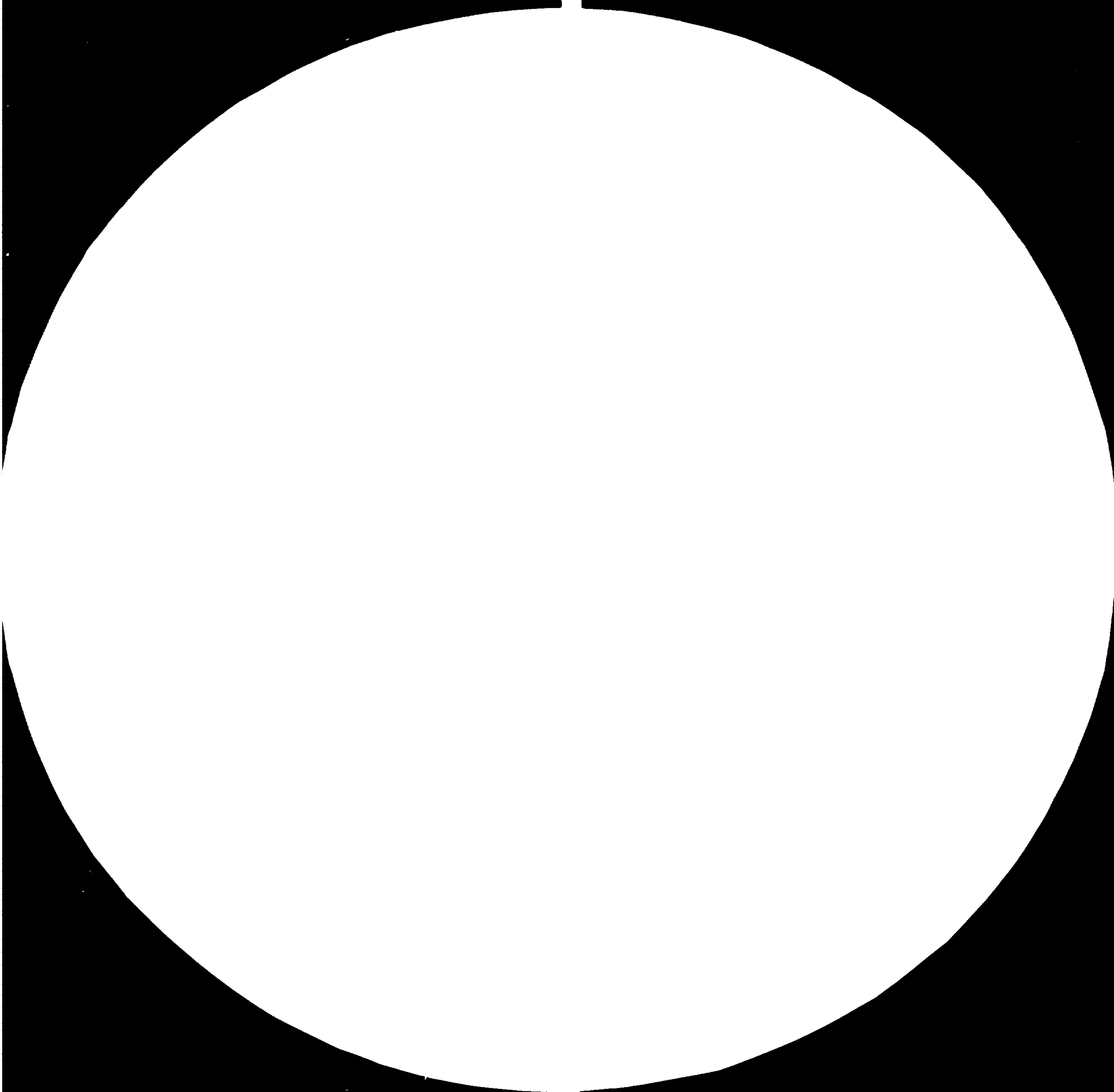
Almost every course is very complete in technical detail. Some are skilfully and expertly compiled. The courses cover almost all of the technical aspects in the course subject matter. In some instances the courses could be condensed in written form.

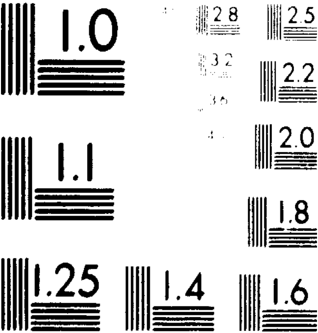
Since the courses cover almost every facet of the subject matter, the "meat" of the courses have been well developed. All of the courses are academically designed and perfectly satisfactory to be given in class rooms or lecture halls. What is missing, however, is the "how" to present the course and achieve measurable results.

Consequently it is virtually impossible without an excessive amount of follow-up mill visits to determine if the courses have been effective and in what degree.

The Centre has proven the benefits of a few of their courses when the courses were conducted in mills. In one instance, a Spinning Mill Supervisors Course given in one of the public-sector mills shows an increase in spinning efficiency from $\pm$ 50% to $\pm$ 85% and at the same time a notable reduction in the percentage of waste. There are, however, too few of these illustrations. Also he very successful results in weaving mills by Eng. H. El Missary took place in the mills, not in the Centre.

10.12.18




1.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

The missing data is the actual every-day performance of the trainee, the actual development of the trainee to reach the proper "on the job performance".

The training courses must be more industry oriented (in the mill) and include industrial engineering, quality and cost minded approach.

It is recommended that the operator, fixers and supervisor training courses be carried out in the mills and the benefits measured and recorded.

When this type of activity takes place the course material would, of necessity, contain guidelines as to "how" the course should be conducted. Practical examples of the application of the subject matter at hand could then be demonstrated and in some instances measured. The "how to conduct the course" which is presently missing would then round out the course material more fully.

The courses carried out in the mills would be given to each mill individually, and although the time spent by the Centre personnel per trainee would be high,the resultant benefits would be much greater than at present.

The Centre would, with this approach, move from a purely academic body which is functioning in similar manner to the existing Technical Institutes toward a dynamic practical group that can physically assist mills in improving their operations.

Some courses, example "Laboratory Testing Techniques" are better performed in the Centre since the techniques learned can generally be readily applied to the testing equipment in the mills. Moreover, participants from various mills can attend the course together.

It is recommended that the approach and technique of training which is presently being conducted by Werner be studied closely by the Heads of the Spinning and Weaving Sections and this approach of explanation, demonstration, trainee participation and repeated practice be copied and adapted to Operator Training Courses. In this way the aspects of

approach to training
technique of training
development of speed

which are presently missing in the courses would be added.

Twenty-three courses were submitted for review. Following are comments relating to the individual courses.

1. SPINNING OPERATIVE'S INSTRUCTORS

This manual is a perfect illustration of the remarks which are made in the general comments. Every job is broken down into the items of work that go to make up an operators job. From the standpoint of detail the manual is very complete. The comments on care and quality are very good. No-where, however, are there any indications as to the speed, time elements or pace expected of an operator or the ultimate job loads. Showing the operator all the work elements only familiarizes the trainee with these items. The principals are good. There is a control sheet per trainee, a daily exercise schedule and a timing sheet as well as a spinners job specification.

What is missing is:

- how to prepare a machine exercise
- how to break it down to parts
- how to determine the target times
- how to combine knowledge and job exercises
- how to select trainees to give them the job best suited to them
- procedure to test instructors is not complete
- transfer of trainees to production is not described.

The job-load calculation sheets shown in the industrial engineering manuals should be included in this course. The course covers every direct operator in the spinning mill, in 14 days. If the intent of the course is simply to state all of the activities of the operators, then 14 days are sufficient. If however the purpose of the course is to train instructors it should be expanded to ± 35 days and should be carried out in a mill with practical demonstration made. The build-up of job loads through work study should be included in the course.

2. SUPERVISORS LEVEL COURSE IN SPINNING

Again all the data relating to a spinning mills is included. The items explaining the processes could be eliminated since a supervisor knows these points. There is insufficient data on how to organize the supervisor's job. A check list for supervisors of all items is shown but not the frequency and sequence.

- the course should include first of all the two important items
  - distribution of time and energy, an hourly time schedule for each supervisory job, what to do and when
  - supervisory check list for each purpose.

Practical exercises in mill conditions are required, where the trainer follows the supervisor and they perform the task first together then the supervisor performs the tasks alone, with trainer following. Discussions should be held daily.
The missing data required in this course would be more readily filled out if more courses were held in the mills.

3. TEXTILE TESTING IN SPINNING

and

4. QUALITY CONTROLLERS IN SPINNING

These manuals are in one volume and are very complete and can advantageously be given in the Centre.

5. SHORT TERM TRAINING COURSE FOR SPINNING MASTERS

The initial chapter on responsibility is good, and can be expanded. As a technical textbook it is very good and useful, but every spinning master knows most of this data, particularly if they have been to technical school or attended the supervisor's course. It is actually a course for students not spinning masters. Most of the meat is there but the extraneous data should be edited out. The course misses completely the most essential element - "How to manage a spinning mill". The course time is only 5 days which is all the more reason to edit it. This course should be given at the Centre.

6. SHORT TERM TRAINING COURSE FOR ASSISTANT SPINNING MASTERS (MAINTENANCE)

Only 6 working days.

This course covers the subject of maintenance quite well. What is missing is the role played by the assistant spinning masters in controlling the maintenance.

This course could be given in the Centre but would be better to apply practical illustrations in a mill.

7. SHORT REFRESHER TERM TRAINING COURSE FOR ASSISTANT SPINNING MASTERS (PRODUCTION)

4 working days.

The same comments on No. 6 apply to this course.

8. SPINNING FITTERS TRAINING COURSE

The mechanic fixers manuals in spinning cover virtually every mechanical point on the machines. What is lacking is the method of training to be applied. This will be supplied in detail by the time the present training course is completed.

9. TEXTBOOK FOR THE TRAINING OF:

WEAVER'S INSTRUCTORS

The remarks which were made on Course I, Spinning Operative's Instructors in general are applicable here.

Selection by interview, should be included in testing. Step-by-step course very good, however timing should be part of each step. Timing should be, together with the method technique, the measurement to decide when the trainee is ready to proceed to the next step.

Stamina build-up is missing, This will shorten the time when top performance is reached.

Explanation of types or shuttles, or overpick vs underpick is only confusing, instruction must be target-oriented, train people in exactly the type of loom which they will be operating - not give irrelevant knowledge. If given in a mill this problem would not occur.

Cloth fault analysis is fine. Overall progress record is alright.

10. TEXTBOOK FOR THE TRAINING OF:

WEAVING FITTER'S INSTRUCTORS

This course will be totally revised when Werner completes their training programme.

11. TRAINING COURSE FOR:

LOOM SHED SUPERVISOR

The same comments as with Course 2, Supervisors Level Course in Spinning can be applied to this course.

Loom stoppage analysis chart is fine as a very elementary introduction to supervision. Gives good details of what to do, but not how. (not practical). The course should be carried out in the mills and should be elaborated to show what items should be checked at what frequency.

12. TEXTBOOK FOR THE TRAINING OF WEAVING JOBBERS/ SUPERVISORS

2 week Course.

We do not feel that the very brief spinning knowledge is relevant in above course.

Text is very general, should be more target-oriented. Contains few facts.

Warper stoppage control is alright. To write: "to maintain looms to get the maximum output" is meaningless, unless the teacher explains how.

Loom stoppage: efficiency and workload are related. This course could readily be combined with the Training Course for Loom Shed Supervisors.

13. TRAINING COURSE TEXTBOOK FOR WEAVING MASTER IN PAKISTAN

Weaving Master in Pakistan

Duration: 1 week.

This is a good theoretical course for weaving masters.

The book is full of facts and figures and needs no further modifications.

This course should be given in the Centre.

The title should not include "in Pakistan" it could apply anywhere.

14. TRAINING COURSE FOR WEAVING ASST. MASTER (PREPARATORY)

and

15. TRAINING COURSE FOR WEAVING ASST. MASTER (WEAVING SHED)

Duration one week each.

The same comments on the weaving master's course apply here.

This can be given in the Centre since it is not designed to be a practical application course.

16. DYEING OF POLYESTER AND POLYESTER/CELLULOSIC BLENDS BY CONTINUOUS AND SEMI-CONTINUOUS METHODS - APRIL 1978

This is the most detailed and specific of the finishing manuals with some good practical hints and tips. This could be used as a practical training course. Should be applied in a finishing plant.

17. TRAINING COURSE No. 1 - PRINTING ON POLYESTER/CELLULOSIC BLENDED FABRICS

This course gives a general detail of methods of application, but is too academic. It would be of limited use in training a print machine operator but would give a good general background to a dyer who was also in charge of a printing department. It should be designed for more practical demonstration. Should be carried out in a finishing plant.

18. TRAINING COURSE No. 2 - WATER PROOFING OF COTTON TEXTILE FABRICS - APRIL 1977

A good treatise of the methods available for water-proofing. The text refers to figures and diagrams which are not present. Ends with a long list of available products and brief details of their application procedure which appear to be generalities supplied by the manufacturer.

Again, this would be a useful preamble to a practical course which should be carried out in a plant and applied to the processes.

19. QUALITY CONTROL AND TESTING IN WET PROCESSING-APRIL 1980

Very academic.
Lists a series of tests, some detailed, some not.

No indications of the desirable frequency of testing.
Could be used to supplement a practical course. The deficiencies in the course would soon be noted and rectified.

20. TRAINING COURSE No. 1 - DYEING AND PRINTING OF POLYESTER AND POLYESTER/CELLULOSIC BLENDS (PRETREATMENT) JANUARY 1977

An academic report.

This is not a training course but a lecture.

Contains general recipes.

21. DYEING OF POLYESTER AND BLENDS BY DISCONTINUOUS METHODS.

This a general discussion on carrier dyeing.

Only atmospheric jig dyeing of polyester and direct dyeing are discussed.

The manual is incomplete and superficial.

GENERAL COMMENTS ON FINISHING COURSES

A supervisory training course in finishing should be designed to expect them to already have the knowledge contained in the manuals which appears to have been gleaned from basic textbooks and manufacturers' brochures and pattern cards. There is nothing original or particularly practical from an application standpoint.

22. SUPERVISOR'S TRAINING COURSE ON DESIGNING AND PRODUCT DEVELOPMENT

The course contains some good chapters on basic constructions and designs. It is a good outline for the uninitiated but not for people who have reached the supervisory level.

The basic thing that is missing is how to organize the development of a collection and how to control the development of new products.

23. INDUSTRIAL ENGINEERING COURSES

The group of subjects are very good and conform to the accepted approach used internationally. No improvements required. This course should be carried out in the mills and practical applications made.

APPENDIX E

TRAINING OF GINNING

TECHNICIANS/INSPECTORS

SECTION XII OF THE

STUDY OF THE COTTON

TEXTILE INDUSTRY

IN PAKISTAN

XII. GINNING CONCLUSIONS AND RECOMMENDATIONS

1. The BASIC PROBLEMS

Two basis problems exist

- The lack of implementation of recommendations
- The poor condition of many of the present gins.

A recent study showed that only 62 gins out of the total of 579 in the country could be considered as being in a reasonable operating condition. However, the study further showed that 321 gins suitably modernised and operating at a 72% efficiency could produce 6 million bales of ginned cotton in a season, which approximates the planned cotton production by 1983.

2. MAJOR CONCLUSION

It is the conclusion of the study group that investment and improvement in ginning is the very top priority of the cotton growing and textile industry sectors. Investment and improvement in ginning will provide the greatest monetary return in the shortest time via:

- Improved textile manufacturing
- Increased foreign exchange from raw cotton exports.

It is estimated by qualified international cotton traders that the benefit to be derived from this activity could reach a price improvement of ± 5% on the export price of the raw cotton. The yield of raw cotton from the seed cotton would be reduced by ± 4% since a higher percentage of waste would be taken out of the seed cotton. The net improvement in price would be ± 1%.

The price of Pakistani raw cotton at the time of writing was $ 0.50 per pound in Karachi. Consequently at today's prices an estimated $ 196,000 would be gained on exports of 100,000 bales of 392 lbs.

The monetary benefits which would be derived in the spinning mills is difficult to determine. Obviously spinners throughout the world are prepared to spend more money for a higher quality cotton because of the improvement which results in the operating costs and the quality. A conservative estimate is that a reduction of ± 4% in conversion costs could be obtained in the Pakistani mills if the cotton was properly ginned. On the companies surveyed in this report, the amount of saving could exceed $ 250,000 per year.

3. RECOMMENDATIONS

It is recommended that the government take the following action:

- A training center of ginning technician/inspectors be established

- Testing laboratories throughout the cotton growing areas to be established

- Fixed rates be paid to the ginner according to quality of ginning

- Low interest loans be made available to gin owners for improvement programs

- Ginners failing to comply with the improvement program or financially be able to do so will be closed.

4. TRAINING CENTER FOR TECHNICIAN/INSPECTORS

It is recommended that a training center be established which would contain complete complements of both old and new ginning equipment

(The old equipment to be taken from an existing installation in Pakistan). Technician/inspectors would be trained in this training center.

The function of the trained ginning technicians will be to inspect the ginneries and advise on modernisation and optimum operating conditions.

It is envisaged that this training which should take at least six months should be conducted in an organised manner. Moreover, the training should be given by an ex-patriot who is qualified in the technical operations of gins and gin management. The fact must be faced that although there may be a handful of individuals in the existing gins who could be rated as being technically qualified to train inspectors, it is far better to start this program with people who have experience in operating gins at a low cost and with high productivity. As the ginning sector is at present in such a deplorable state of

- High costs
- Low productivity
- Low quality ginning

it is recommended that competent outside help be sought to assist in this program of work for a minimum period of three years.

a) ACTION PLAN

i. TRAINING CENTER

An action plan should proceed as follows:

- Determine location of training center
- Select ex-patriot engineer/teacher
- With his assistance design the center and select the machinery, both old and new
- With his guidance set up a detailed, thorough training program (course should be at least six months in length, but should not exceed one year)
- Utilise as much as possible the handbook which was compiled during the C.T.C. study of the gins
- Screen applicant and select students
- Commence the first course of training
- Develop a plan of inspection to cover all the ginneries in the country (if there are insufficient inspectors, then a limited area should be selected)

- The areas selected should include the gins close to the maximisation projects, so that as these projects advance, so the gins in the area will be improved.

ii. FIELD INSPECTION

- Commence the program of field inspection

- Systemize the method of inspection. The inspectors should be provided with the reports of each gin made last year plus a series of forms showing each item to be inspected and checked. The inspection should, preferably, be carried out during the close season and a copy of the inspection report given to the owner.

- Develop program of improvement with the owner which would include repairs, maintenance and modernisation schedules. Having developed the program the gin-owner would then be obliged to implement the yearly program for modernising and maintaining his installation, but the time limit should not exceed three years. The individual program period would depend upon the state of the ginnery. The arrangement for loans and repayment would have to be established by the government. It is recommended that these loans be long-term low-interest loans.

- The following year the gin technician/inspector would return and inspect each gin. If the targets have not been reached or insufficient progress made, then the gin owner would be given new targets for the following year, but would still be expected to achieve the three year target unless unavoidable delays in machinery delivery etc. have occured. The next year if the gin owner has again failed to meet his targets then his licence to operate the gin would be revoked and the gin closed until the program is on target or advanced to an acceptable degree.

This procedure should continue annually and in all subsequent years if the gins are not maintained in proper working order they should be closed until the required standard of operating performance is achieved.

The approach may seem somewhat authoritarian but it has its parallel in many countries where cars are required to pass a road-worthiness test every year before a license is issued.

A system of arbitration must be set up so that onerous, unrealistic and impractical demands are not imposed on the gin owner. The system of inspection should not commence until the system for arbitration is organised. It should be relatively simple to set up the arbitration system during the period when the technicians/inspectors are being trained.

It would not be practical to assume that all the gins would be modernised within one or two years. Spare parts might not be available, where new equipment is required the equipment may not be available and if the equipment is of foreign origin the import permits etc. may take considerable time to process. However, it must be recognized that maintenance can be made on every machine regardless of spare parts and this maintenance must be done.

The financial burden will be the biggest problem to be faced by the ginner. However, if a fair price is established for ginning during the rehabilitation period, then there should be no excuse for failure to comply.

If a gin owner refuses to participate in the rehabilitation program he should be given one year to reconsider the proposition. After one year if he still refuses then his licence should be revoked and his gin closed.

iii. CONTROL OVER THE SYSTEM

The system of inspection could conceivably be thwarted by collusion between the gin owner and the inspector. Consequently it is suggested that the inspectors be rotated from area to area after a two-year period. Furthermore, there must be an independent team of technician/inspectors who visit ginneries on a random basis and check-inspect the inspectors. This is an absolute must or the system will break down.

iv. TYPE OF GINS

It is recommended that all new gin installations be of the saw-gin type. Air suction, cleaning, drying, humidifying and automatic feed equipment should be mandatory.

5. TESTING LABORATORIES

At least 20 testing laboratories should be established in strategic locations in the cotton growing areas which are equipped with instruments for raw cotton analysis and testing. The laboratories must, of course, be staffed with trained personnel. The amount of equipment in each laboratory and the number of personnel will depend upon the volume of testing required. The number of bales per 100 which are tested should be the same throughout the country. If it is not physically possible to test every bale then the selection of bales should be done on a statistical basis.

The laboratories would perform the task of checking on the quality of the ginned cotton and seed cotton.

a) QUALITY CONTROL

Quality control would be a major part of the overall programme. The aim is to upgrade the cotton. This could be achieved as follows:

- Technicians would visit the gins and obtain samples of both the seed cotton and the resultant ginned cotton of the idential variety.

- The samples would be tested in a government sponsored laboratory, which is located in the local cotton growing district. The samples would be coded so that the tester would not know from which gin the samples were taken. This phase of the program implies that laboratories must be set up in strategic locations throughout the cotton growing areas.

- The test results would be correlated with the reports ofthe technicians/inspectors and shown to the gin owner and the technicians/inspectors.

6. FIXED RATE ACCORDING TO QUALITY OF GINNING

During the period of renovation fixed rates should be paid to the ginnery commensurate with the quality of the cotton ginned. The laboratory tests would determine the ginning results and the gin owner would be given a corresponding rate per pound. The higher the quality of the ginned cotton, the higher the rate awarded. The rate for quality improvement would have to exceed the loss in weight between the poorly ginned cotton and the well ginned cotton.

At present the less trash removed by the ginner the larger the yield of ginned cotton. Since the ginner is generally paid for the quantity, not the quality, he has no incentive to gin the cotton to the best of his ability, nor to invest money to improve his operation.

The ultimate aim would be to create a monetary incentive for the ginner to upgrade his ginning operation.

7. FINANCIAL ASSISTANCE

The government would have to make loans available at low interest rates. These loans should be handled by a special section of PIDC or another financial body designated by the government, but the procedures must be streamlined so that undue delay in obtaining financing will not occur. The financing arrangements and procedures should begin to be prepared at the same time the training center is decided upon so that the procedures can be part of the technician/inspectors training program and will be completely organised when the first inspection of the gins takes place.

8. CLOSING OF GINS

As has been mentioned, gin owners who do not wish to invest in modernisation and who do not have sufficient volume of business to warrant investment in new equipment, should be closed.

This decision may appear arbitrary but it has many parallels in developed countries, and Pakistan cannot afford to continue to allow inferior ginneries to operate.

Compensation should be given to a gin owner whose ginnery has been closed.

9. RE-LOCATION OF GINNERIES

At the time of modernisation some of the gins which are poorly located should be encouraged to relocate to areas more accessible to the farms.

10. NET EFFECT OF RECOMMENDATIONS

The net effect of

- increased payment rates for better quality ginning
- financial assistance by long-term low-interesc loans for investment in new equipment and modernisation
- technical assistance from qualified technical inspectors
- bonafide quality information from official testing laboratories
- a sufficiently long period in which to effect the improvement

should produce sufficient incentive to the gin operators to effect a marked improvement in the ginning process throughout the country and ultimately a much improved quality of ginned cotton. This in turn will gain a higher price on international markets as well as improve the operating results of the domestic spinning and weaving mills.

FINAL REPORT

ON

THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME II OF TEN VOLUMES

WERNER INTERNATIONAL

MANAGEMENT CONSULTANTS

10622

(2 of 10)

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

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UNIDO CONTRACT No. 80/84

PROJECT No. DP/PAK/78/055

ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

MANUAL I

WERNER AMPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

DRAWING FIXER'S MANUAL

RIETER DO/2

Prepared for:

T.I.R.D.C. (UNIDO)
KARACHI - PAKISTAN.

Prepared at:

M.FAROOQ TEXTILE MILLS
KORANGI - KARACHI.

Prepared by:

WERNER INTERNATIONAL
BRUSSELS - BELGIUM.
NEW YORK - U.S.A.

DECEMBER 1980.

I N D E X

PERSONNEL SPECIFICATION

Job:	ROVING AND DRAWING FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum _ months good roving tender or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy weaverroom.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

ROVING FIXER'S MANUAL

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months GOOD spinning/roving experience.
The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (4 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you. Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.
Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

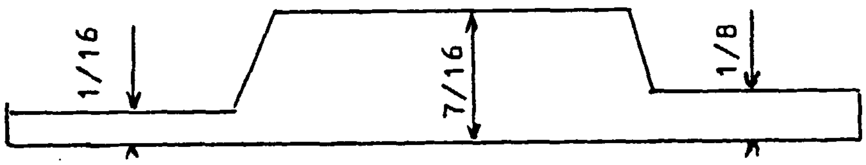
3.8 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool,box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.
A fixed position or datum is used, e.g. the position of the top rollers.
Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.
When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

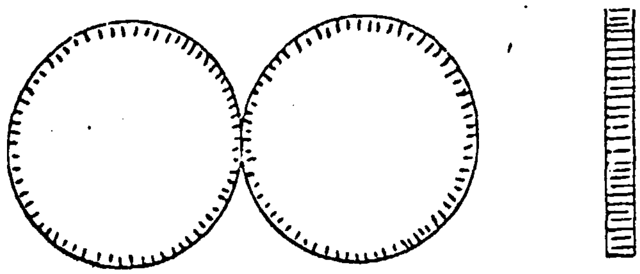
plan or roller
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

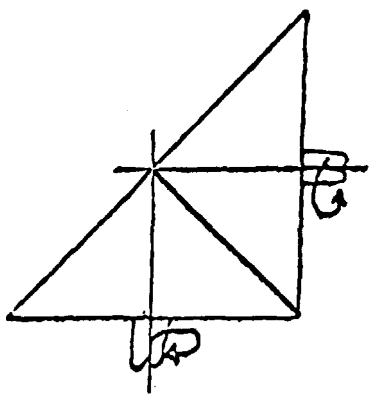
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



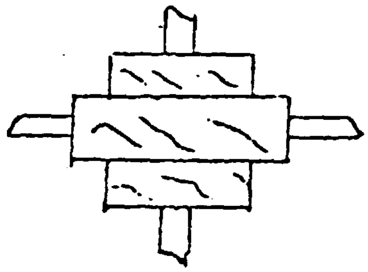
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



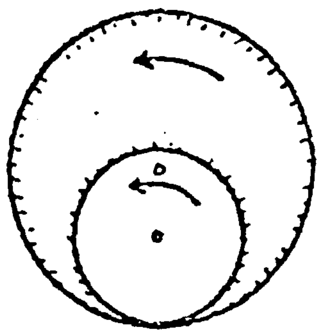
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



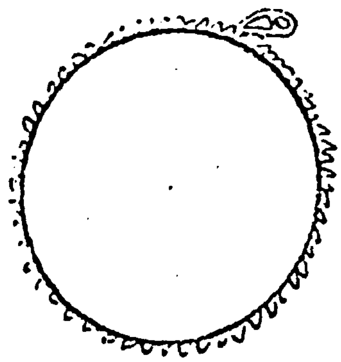
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. ______________ 120 Kg.

4 m. 6 m.

180 Kg. ______________ 90 Kg.

4 m. ? m.

180 Kg. ______________ ? Kg.

4 m. 5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

DRAWING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided into 3 groups :

1. A. MOTOR DRIVE
   B. AIR PRESSURE

2. A. FRAME

3. A. CHANGE POINTS

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all three(3) groups of adjustments so that when complete, the trainee has completely set up three(3) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

DRAWING FRAMES

PART I OF THE TRAINING

GROUP 1 A. MOTOR DRIVE.
B. AIR PRESSURE.

1.A. MOTOR DRIVE.

1. DESCRIPTION.

Power for the drawing frame is provided by a total enclosed, fan cooled motor that is flange mounted to the head end cabinet.
Transmission from the motor is by V-belts pulleys.
The delivery speed is determined by the size of the motor V-belt pulleys.

2. PARTS.

2.1 MOTOR
2.2 V-BELTS
2.3 PROTECTIVE COVER
2.4 BRAKE
2.5 INTERMEDIATE RINGS "Z"
2.6 PRESS RING "P".

3. SETTINGS.

3.1 Procedure for changing the motor V-belt pulley.

- Unfasten the four M-12 fixing nuts, raise the motor as far as it will go and secure it with a nut in this position.
- Change pulley.
- Lower the motor into the V-belts with its own weight, and tighten all four nuts.

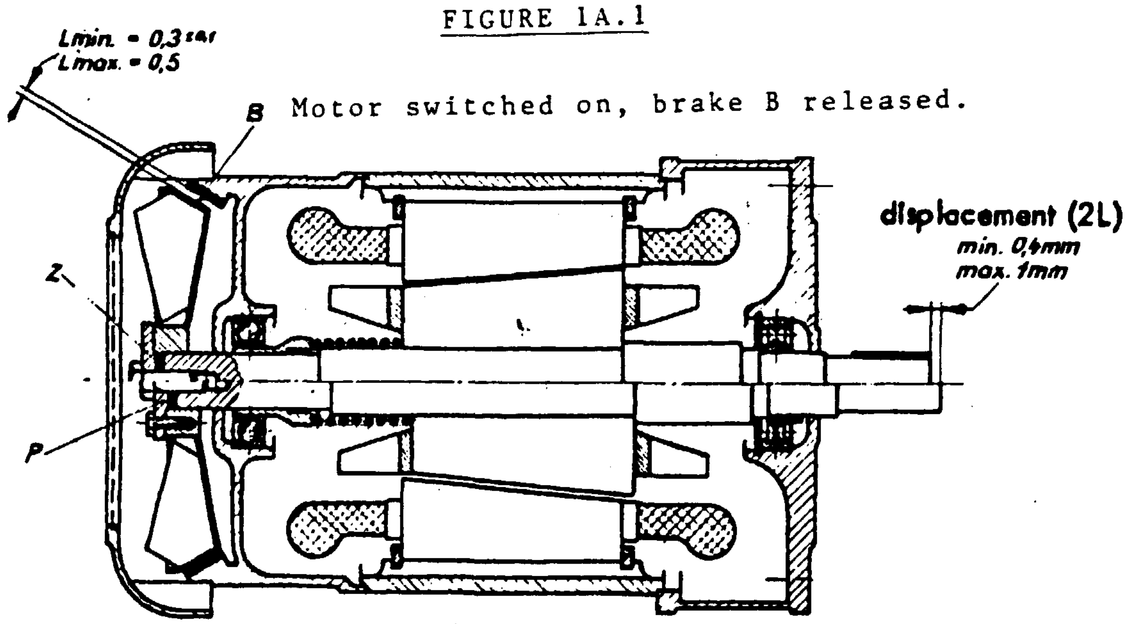
3.2. Brake adjustment - Fig. 1A.1

The machine is driven by two V-belts from a Brown Boveri motor flanged on to the head frame. When the current is switched on, the spring-loaded conical rotor is axially displaced by 1 mm. and drawn into the magnetic field of the stator, whereby a cone brake is released. Upon cutting the current, the spring forces the rotor back into its previous position and the brake is acting.

Every 2 years the brake gap is to be checked. If the gap L has increased to more than 0,5 mm. owing to wear, it is to be re-adjusted to 0.3 ± 0.1 mm.

- Set safety switch to "O",
- Remove protective cover.
- Push back motor shaft as far as it will go against the spring force.
- Check brake gap with feeler gauge. If "L" is greater than 0,5 mm., the following procedure is to be adopted:
- Remove press ring "P" by unfastening the four screws.
- Take out intermediate rings "Z'. Removal of one intermediate ring "Z" narrows the brake gap by 0,25 mm.
- Secure press ring again with the 4 screws.
- Check brake gap (0.2 mm. absolute minimum).
- Fix protective cover once more.

FIGURE 1A.1



Motor switched off, brake B applied.

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GROUP 1.B AIR PRESSURE.

1. DESCRIPTION.

Air pressure is provided by an independent compressor.

2. PURPOSE.

The air pressure drives various mechanisms of the frame such as loading the drafting system and lubrication.

3. SETTINGS.

Pressure reducing valve.

The working pressure range is 0.7 - 0.9 at.ga. (10.3 - 13.2 p.s.i.).
Set the pressure reducing valve to 0.8 at.ga. (11.75 p.s.i.) (max. 0.9 at.ga/13.2 p.s.i.) and secure lock nut. This valve always remains open.

0.7 at.ga. (10.3 p.s.i.) gives approx.65 kg.loading per top roller.

0.8 at.ga. (11.7 p.s.i) gives approx. 72 kg.loading per top roller.

0.9 at.ga. (13.2 p.s.i.) gives approx.80 kg.loading per top roller.

GROUP 2A. MACHINE FRAME.

1. DESCRIPTION.

Machine frame.

The frame consists of a heavy base plate. The two side frames together with the coiler beam are forming a strong unit.
The roller brackets carrying the polar drafting arrangement are mounted on the coiler beam.

The machine is not fixed on the floor, but itmay be recessed by the height of the base plate (65 mm.).

The base plate is levelled up by means of four M20 setting screws, which press on to supporting plates. The latter are secured in the base plate for shipping the machine. Therefore the four M20 set screws fitting on the base plate at the sides must be loosened first, so that the supporting plates rest freely on the floor.

The feed table is fixed on the bearing and is adjustably held at the back by the table support. Anchor the foot well on the floor, or better still - grout it in. The clamping hub of the top flange is to be tightened and secured with a split pin.

The spinning mill may suspend the table from the ceiling instead of resting it on the floor at the back (e.g. for feeding the drawing frame with cans on transport trucks in two rows).
Exact horizontal longitudinal location of the table is not required generally, since it hinges on the feed shaft.

Feed table. Fig. 2A.3

The feed table is provided with separate feed tracks for each delivery. The sliver lifting rollers (26) are designed to act as contact rollers which stop the machine if a sliver breaks.
To avoid any interruption of the current supply a bronze spiral spring is built-in at (27) and an undulated contact washer at (28).

Sliver breakages are indicated by a red pilot lamp on each side of the table.

The table is kept free of fly by the current of air emanating from the top air duct.

Gearing. Fig. 2A.4

All gearing is housed in the head frame. The high-speed gears run in an oil bath inside an enclosed gear box. Most wheels have helical toothing.

Can coiler. Fig. 2A.1 + 2A.13

The tube wheels with spiral sliver channel fitted in the coiler beam are driven synchronously by a toothed belt. The coiler wheels are carried in adjustable wire race ball bearing, and can be dismantled as one unit by loosening the four cap screws.

The coiler plate gears on which the cans are placed have inside centring. They can be lifted out with a M 10 screw. The can plate can be shifted lengthwise to regulate the can filling.

Toothed belts for driving tube wheels (timing belts).

A toothed belt properly fitted meshes evenly and without difficulty on all gears, and has a slight play similar to toothed gearing. It can be depressed about 7 mm. in the middle between tube and tension pulley, using the finger and without applying force. This play and the correct belt tension are obtained by appropriate adjustment of the tension pulleys to the belt.

Polar drafting arrangement. Fig. 2A.1 + 2A.2

The polar drafting arrangement comprises 5 fluted rollers and 3 rubber covered top rollers. With their common top roller (3) the 1st and 2nd fluted rollers (1 +2) form a stationary delivery trio. The middle trio consists of the 3rd and 4th fluted rollers (4+5) and their common top roller (6). Their bearing assemblies (7) are screwed on to bearing saddle lever (8), which are fixed rigidly on the 2nd pressure pipe (9) and with a swivel joint to the 3rd pressure pipe (10).

The main draft zone lies between the delivery trio and the middle trio.

The preliminary draft zone lies between the middle trio and the feed pair.

In the main frame and end frame, scales and adjusting lever pairs are mounted similary to the bearing saddle levers. After releasing the bearing saddle locking screws (14), the pressure pipes can be turned with them, thus adjusting the draft zones centrally. The scales give direct readings of the distances between nipping points in milimetres. The outer scale shows the main draft zone, the inner one the preliminary draft zone. Gears and clearing arrangements are adjusted along with them automatically.

Weighting of drafting arrangement.Fig. 2A.2

The drafting arrangement is loaded by means of pressure hoses (15) inserted in the pressure pipes and under a pressure of 0.7 - 0.9 at.ga. (10.3 - 13.2 p.s.i.). The pressure bars (16) are embedded in the hose and reach across the entire section. They are suspended on pressure hooks (17) at both ends; these pressure hooks are giving pressure to the top roller bushes by means of pressure brackets (18). Hose guides are fixed in the pressure pipe to prevent twisting of the pressure hose between the pressure bars.

Clearing arrangement. Fig. 2A.1

Rubber stripper (19) are hinged on to the weighting heads of the 1st and 2nd top rollers, with a steel stripper (20) on the 3rd top roller; they rest on the rubber cots with their own weight.
The 1st and 2nd fluted rollers are kept clean by a rubber stripper pair hinged on to the roller brackets (21). They are held in their working position by two press bolts, and can be swung to the front. The 3rd,4th and 5th fluted rollers also have rubber strippers, which are hinged on to the corresponding bearing assemblies. These strippers are held in their working position by a drum, which can be turned backwards by a double lever fixed on the door of the filter box. These strippers are thus becoming free and are accessible.

It is a good thing to turn the drum out periodically during operation in order to have fibre tufts which accumulate on the bottom clearing arrangements sucked away.
All the five bottom strippers are movable in bearing guides and are kept in contact with the fluted rollers by means of springs.

Suction clearing Fig.2A.1

The cover over the drafting arrangement which extends over both deliveries is designed as suction duct. Over the 1st top roller is a suction slot running across the whole section. The air is drawn-in from the rear of the drafting arrangement streaming over all top strippers, and removing the fibres accumulating there.
At the bottom side of the drafting arrangement the air is likewise drawn-in from behind between the strippers and the drum, removing the fibres on the strippers and taking them through the lower longitudinal trunk into the filter box.

Above the calender roller is a liftable funnel plate.

The filter box and suction unit are situated in the end frame. The filtered air is blown partly into the coiler beam, and oozes out from the delivery section. Another air stream is led into the feed table, where it emerges through slots and openings and blows the table clean to a large extent. The rest of the air is discharged on to the base plate.

Fig.2A.1

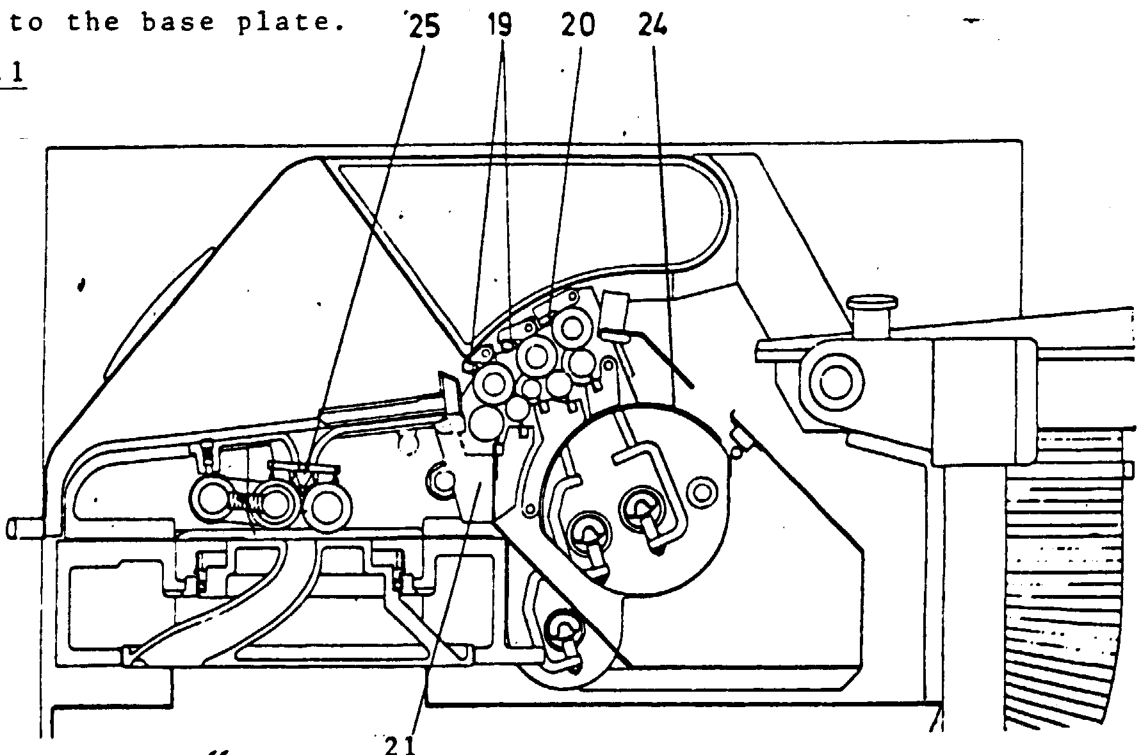
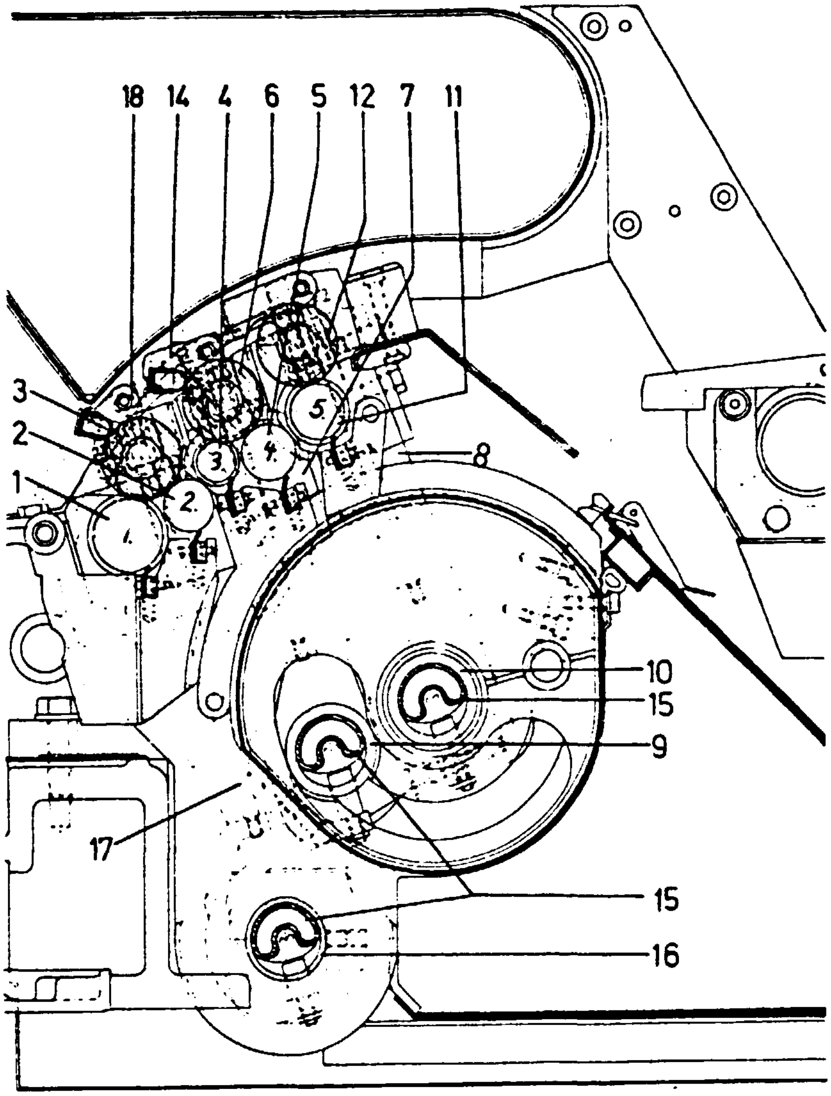


FIGURE 2A.2



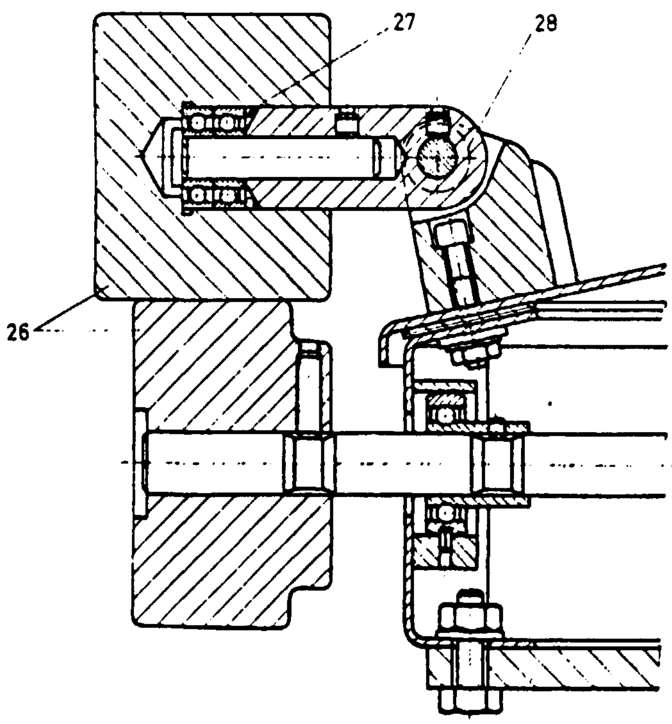
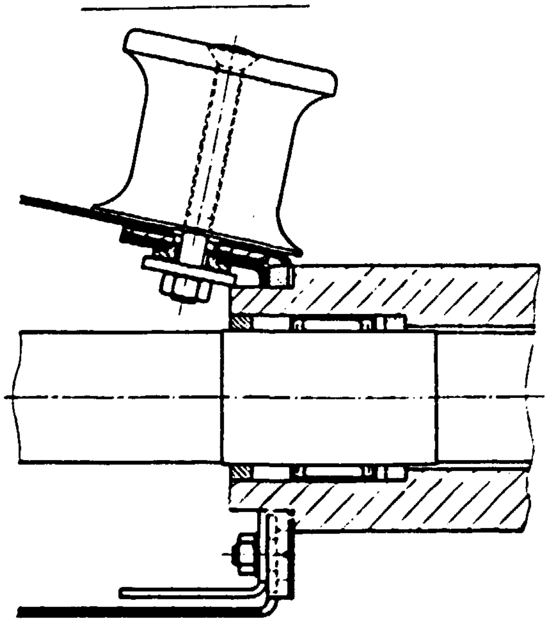


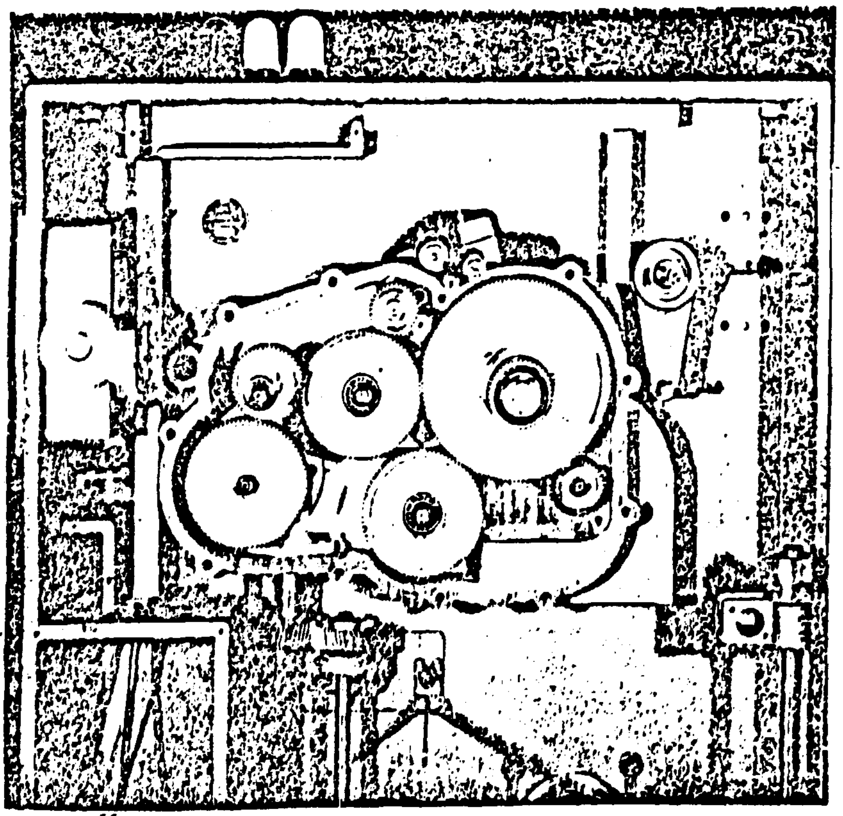
FIGURE 2A.3



Delivery. Fig. 2A.1

After leaving the drafting arrangement the drafted material is drawn off by means of two calender rollers through a delivery trumpet mounted on the funnel plate and an echangeable condensor (25), and is then fed to the coiler wheel.
The triangular funnel plate is fixed in a swivel mounting between two roller brackets, and rests on the hinge bearing of the calender roller with its front tip by means of an insulating pin mounted on a spring. The front cqlender roller is spring-loaded and held in the swivelling hinge bearing. With the insulated hinge pin it is under low voltage. The condenser bore of the funnel plate varies in size according to the sliver count. If it becomes clogged it is pulled down, making contact with the hinge bearing and tripping the machine stop motion. A contact spring likewise fitted on the funnel plate makes contact in case of lapping of the calender rollers or the funnel plate becoming blocked and the machine is stopped. If there is no sliver between the calender rollers owing to trouble in the drafting arrangements, electrical contact between the calender rollers actuates the stop motion. The funnel carries strippers for cleaning the calender rollers. The return air discharged keeps the whole delivery side clean.

Fig.2A.4



2. PARTS - See also Figures.

1. 1st FLUTED ROLLER
2. 2nd FLUTED ROLLER
3. TOP ROLLER
4. 3rd FLUTED ROLLER
5. 4th FLUTED ROLLER
6. TOP ROLLER
7. BEARING ASSEMBLING
8. SADDLE LEVERS
9. 2nd PRESSURE PIPE
10. 3rd PRESSURE PIPE
11. 5th FLUTED ROLLER
12. TOP ROLLER
14. LOCKING SCREWS
15. PRESSURE HOSE
16. pressure bar
17. PRESSURE HOOKS
18. PRESSURE BRACKETS
19. RUBBER STRIPPERS
20. STEEL STRIPPER
21. ROLLER BRACKETS
24. LOCKING SCREWS
25. CONDENSER
26. LIFTING ROLLER
27. BRONZE SPRING
28. CONTACT WASHER
30. MAIN DRAFTING ZONE SCALE
31. PRELIMINARY ZONE SCALE
32. SCALE LEVER
33. ADJUSTING LEVER (Break Draft)
35. CLAMPING HUB SCREWS
38. CARRIER GEAR
45. SLOTTED SCREWS
50. CAP SCREWS
51. HEADED SCREWS
52. TIN DISC
53. BELT SHEAVE
54. END PLATE
58. FIXING SCREW
59. CHANGE WHEEL LEVER
60. FEED SHAFT
61. CLAMPING RING
62. GEAR PLATE
64. TOOTH GEAR
65. DELIVERY SHAFT
66. FITTING BUSH
67. CENTRAL WHEEL
68. SHAFT SEAL
69. GEAR PLATE

3.1 SETTINGS.

Setting the drafting arrangement.

The scale indicates the distances between nipping points in milimetres.

The outer scale shows the main drafting zone (30) the inner scale the preliminary drafting zone (31).

Procedure for setting Fig. 2A.5 + 2A.6.

- Unfasten the 3 screws of the bearing saddle locking arrangements (14).
- At end plate: Slacken locking nut on scale and adjusting lever as far as the stop on the rod nut.
- At main plate: Unfasten the locking nut of the scale lever (main draft) with a 22 mm. fork spanner, and fit the second spanner on the rod nut. Turn to the desired scale graduation. Tighten locking nut with the first fork spanner again.
  The preliminary drafting zone is adjusted in similar fashion by means of the adjusting lever.
- At end plate: Fit the first fork spanner on the rod nut and turn to the same scale graduation as in the main plate, then tighten locking nut with second fork spanner.
  The adjusting lever for the preliminary draft is set and locked in similar fashion.
- Tighten the 3 screws of the bearing saddle locking arrangements again.
  Of course the main or preliminary drafting zone can also be adjusted individually.

Stops on the corresponding levers restrict the minimum main drafting zone to 32 mm., and the minimum preliminary, drafting zone to 34 mm. The minimum setting is also the basic adjustment of the drafting arrangement; in this position the fluted rollers should be absolutely parallel. In this position the distance measured over the flutes

between the 2nd and 3rd rollers must be 1.2 - 1.3 mm.
and between the 4th and 5th rollers 1.7 - 2.0 mm.

FIGURE 2A.6

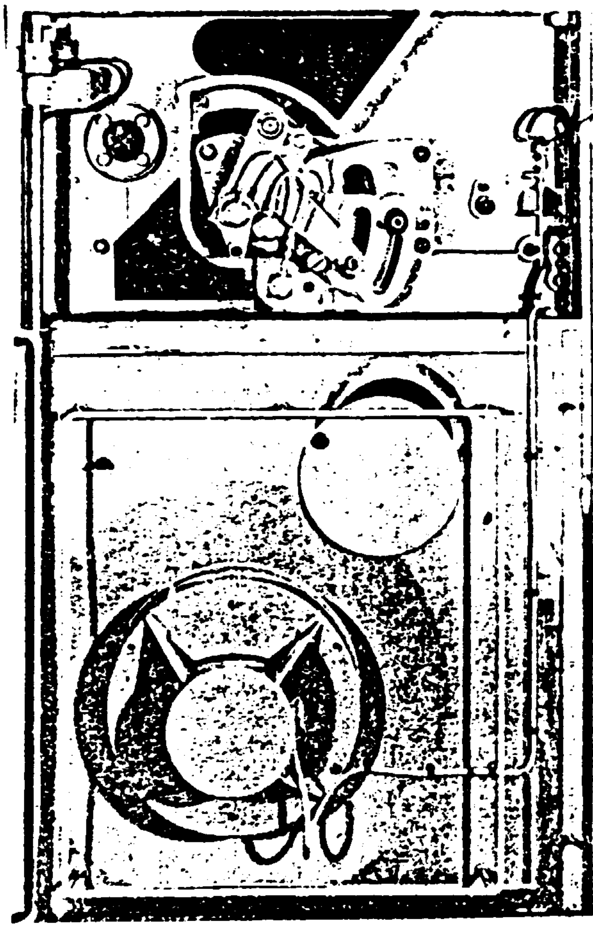
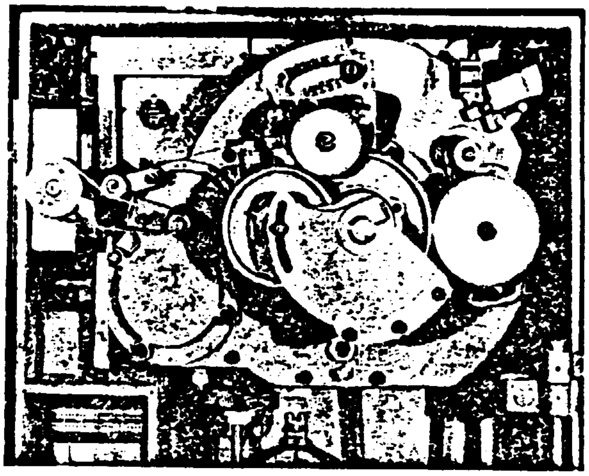


FIGURE 2A.5

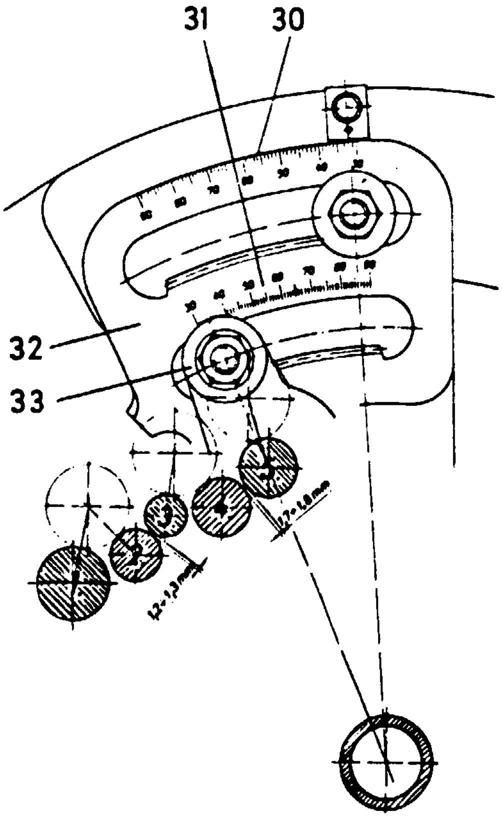


When setting the drafting arrangement together from a wider spacing down to the minimum, make sure that no lumps of cotton or other foreign objects have become jammed between the bearing saddles. No force must be used when adjusting the drafting arrangement. If the adjustment should stick, the cause must be ascertained. Should the drafting arrangement have become shifted due to the use of force, it must be adjusted again. It is a good thing to check the basic adjustment of the drafting arrangement from time to time.

Basic adjustment of the drafting arrangement - Fig. 2A.7

- Scale lever (32) - main draft - to 32.
  Adjusting lever (33) - Break draft - to 34.
- Lift up the longitudinal trunk at the rear and unscrew the 3 covers on the roller brackets.
- Slacken the clamping hub screws (35) of the bearing saddle levers.
- Set 3rd roller exactly parallel to 2nd roller with 1.2 - 1.3 mm. distance.
  Tighten the clamping hub screws of the corresponding bearing saddle levers.
- Set 5th roller exactly parallel to 4th roller with 1.7 - 1.8 mm. distance.
  Tighten the clamping hub screws of the corresponding bearing saddle levers.
  (The screws are to be tightened securely but not excessively, owing to the danger of the lever breaking).
- Tighten the bearing saddle locking arrangements and check once more that the rollers are parallel; correct if necessary.
- Fit covers and replace suction trunk.

FIGURE 2A.7



3.2 Feed plate.

The two-piece feed plate should be adjusted according to the slivers fed, e.g. for:

8 normal card slivers	1. Passage about	80 - 95 mm.
	2. Passage about	75 - 85 mm.
8 normal combed slivers		60 - 70 mm.

Set the plate high enough to prevent the slivers from riding up over one another. It should be aligned with the delivery condenser on the trumpet plate.

3.3 Trumpet plate.

Fit the appropriate trumpet to suit the sliver count.
Trumpet diameter: 3 - 3.5 - 4 - 4.5 mm.

The pressure spring at the tip of the trumpet plate must be tightened by means of the set screw in such a way that the plate still stops the machine if a trumpet clogs. (It must be possible to press the trumpet plate by hand on to the hinged bearing of the front calender roller).

Emperical values:	Ne 0.12	=	4 mm.
	Ne 0.14	=	3,5 mm.
	Ne 0.16	=	3 mm.

3.4 Fitting and dismantling the rollers of the drafting arrangement Fig. 2A.9

If only the 3rd and 4th rollers are to be removed, the jobs set out in Sections c) and f) are not necessary.
If only the 5th roller is to be removed, the jobs set out in Sections b), c), e), and f) are not necessary.

Dismantling the central adjustment in the end plate.

a) - Release compressed air connection at 3rd pressure hose.
   - Remove crank for turning out the drum.
   - Unscrew M 12 nut of 5th roller (11).
   - Take off adjusting lever (33) of 5th roller.
     (If only the 5th roller has to be dismantled, and if the recommended distance of 1,250 mm. shown on the space requirements sketch is available, only the outer Seeger circlip in the adjusting lever needs to be removed. Subsequent dismantling of the bottom stripper is also superfluous in this case).

b) - Release compressed air connection at 2nd pressure hose.
   - Take out slotted screws on 3rd and 4th rollers (45) with special spanner (left-hand thread).
   - Take away scale lever (32).

c) - Slacken compressed air connection at 1st pressure hose.
   - Take off end plate (55).

Dismantling the gearing of the drafting arrangement.

d) - Take off wheels and key on 5th roller.

e) - Change gear plate with 109-tooth wheel.
   - Preliminary draft with 18-tooth wheel and key on 4th roller.
   - Dismantle adjusting lever and scale lever.

f) - Dismantle feed gear - Fig. 2A.10
     - Take out M 12 fixing screw (58) of change wheel lever (59).
   - Unscrew M 12 nut on feed shaft (60) and remove gear,key and distance ring.
   - Unfasten clamping ring (61) behind gear plate (62).
   - Relieve tension spring for compensating the weight of the lid.
   - Lift feed shaft and withdraw change wheel lever with transport wheels.

Strip counter drive down:

- Disengage 51-tooth gear on counter and 16-tooth gear (64) on delivery shaft (65), together with chain.
- Drain off oil.
- Take down gear plate:
  The fitting bush (66) supplied is to be pushed over the rim of the 42-tooth central wheel (67), to avoid damaging the shaft seal (68) in the gear plate (69).
- Take off gear wheels and keys on 1st and 2nd rollers.

Dismantling the drafting arrangement.

- Place cover back on feed table (if gear plate has been dismantled.).
- Remove the top rollers.
- Unscrew top strippers with holder.
- Take away feed plate with rail.
- Swing drums to the back.
- Dismantle bottom strippers of 3rd, 4th and 5th rollers by unfastening the M 6 hexagon socket-headed screws.
- Take off bearing saddle locking arrangements.
- Unscrew draw bars and take out with weighting heads.
- Take out bearing saddle screws.
  The rollers can now be shifted lengthwise, and the bearing saddles can also be moved at will on the rollers. But make sure that the split neddle cages do not drop out; it is best to take them off immediately.
- Pull the rollers back out of the head frame. Run the rollers and bearing saddles up slantwise at the same time.

FIGURE 2A.9

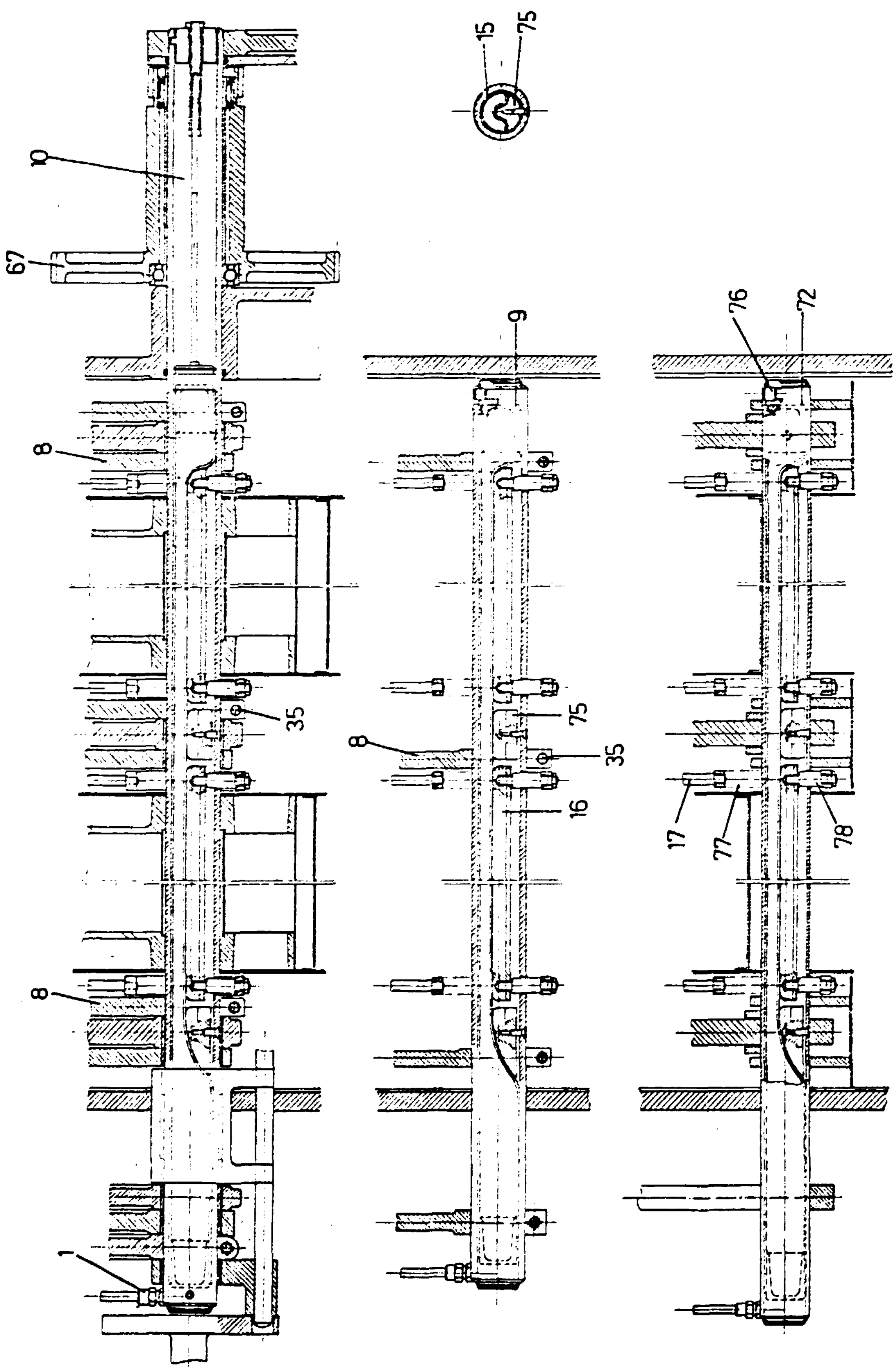


FIGURE 2A.10

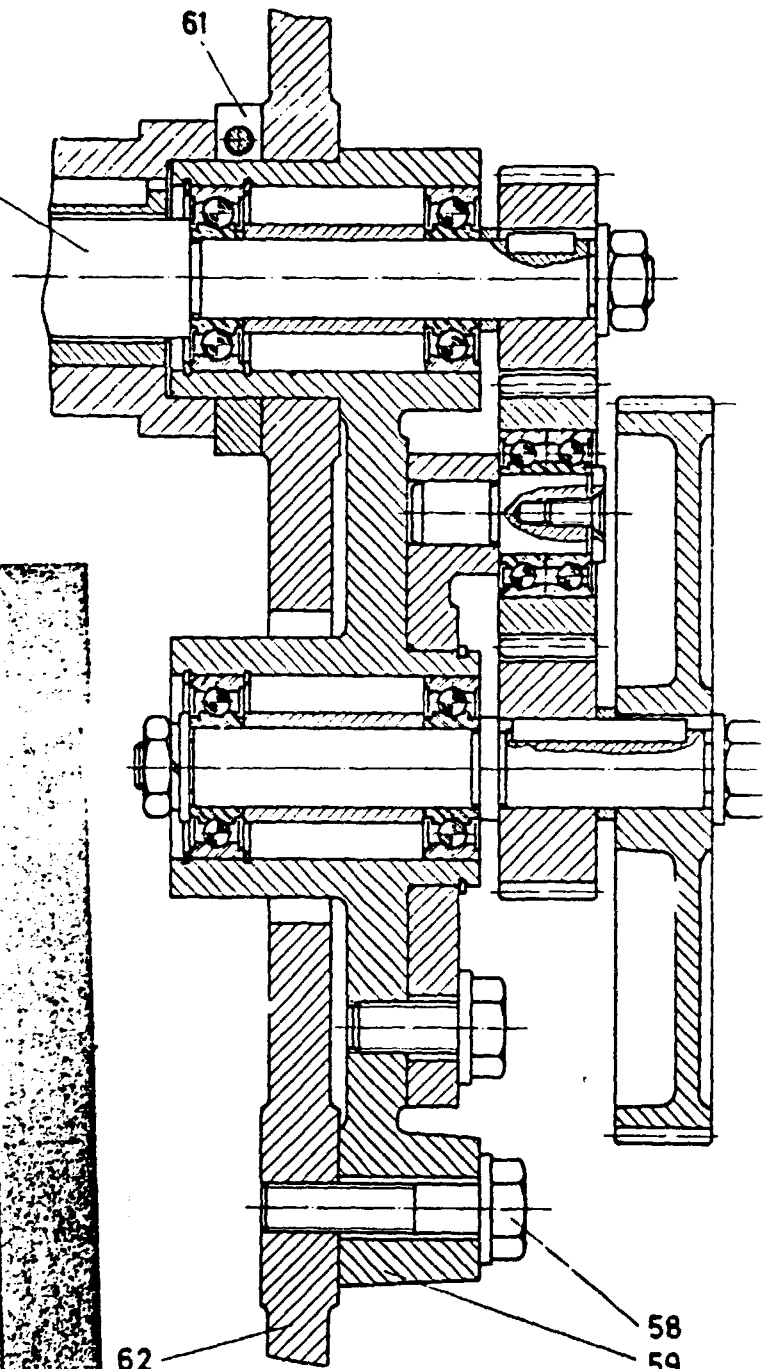


FIGURE 2A.12

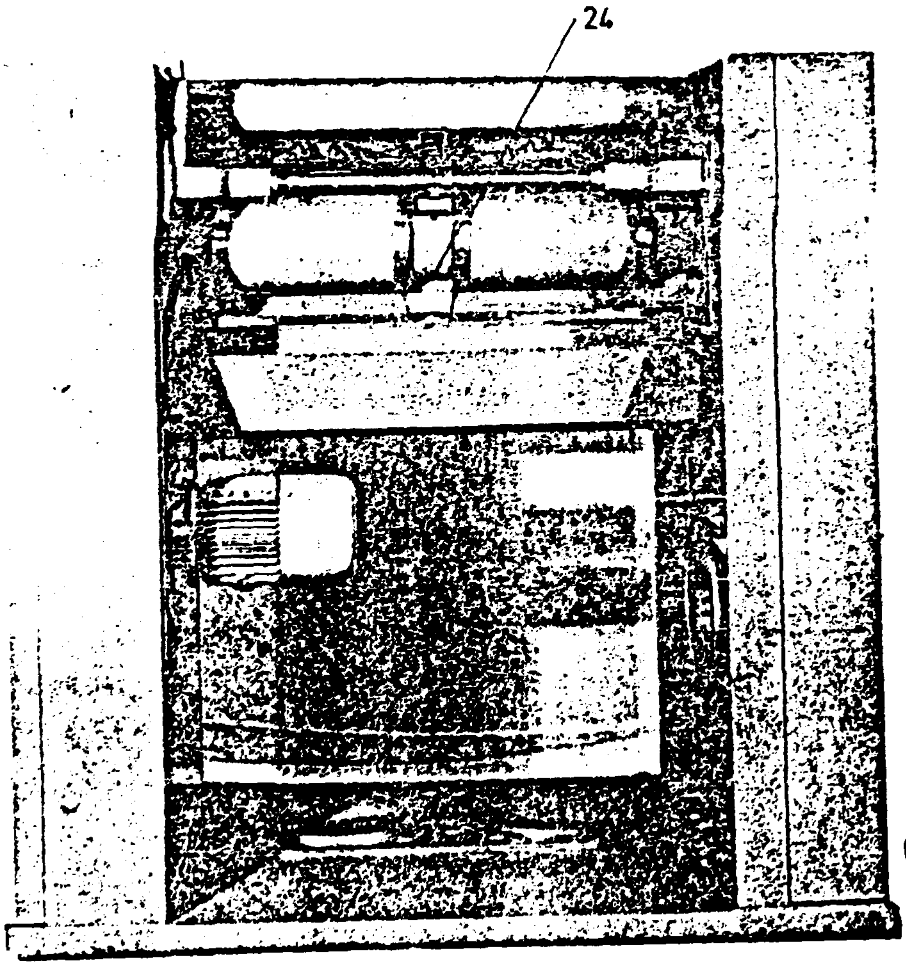
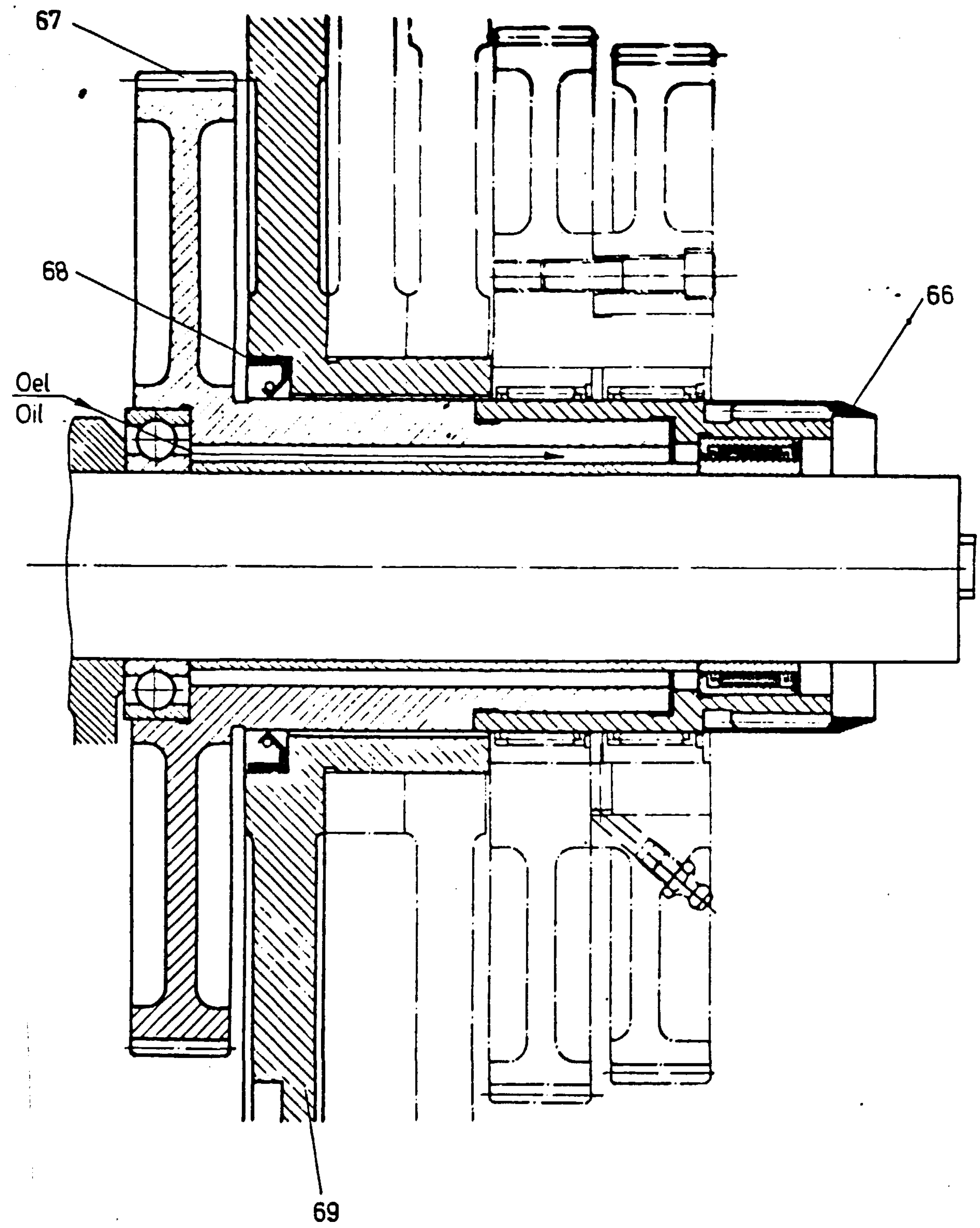


FIGURE 2A.11



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Fitting the rollers of the drafting arrangement.

To fit the rollers, the instructions in previous sections are applied in the reverse sequence. Make sure that :

- The split needle cages are stuck on their bearing points with grease for fitting.
- The shafts seals are not damaged when running the 1st and 2nd rollers into the head frame.
- The nuts and bolts in the gear box are properly tightened.
- Replace the gearing cover using the fitting bush again, so as not to damage the shaft seal with the 42-tooth wheel.
- Coat the contact surface of the gearing cover with a good sealing compound (such as Hermetik).
- To assemble the pressure system of the drafting arrangement, the rear suction trunk is to be raised and the covers between the drums (24) removed - Fig. 2A.12
- The pins of the weighting links must be run into the holes of the pressure bars properly.
- The weighting linkage must not stick after tightening the threaded connections.
- The clamping hub screws of the adjusting levers to the 5th roller in the main and end plates are not to be tightened yet.

First :

- Set scale lever)3rd and 4th roller) to 32.
- Adjusting lever (5th roller) to 34.
- Check distance and parallelism between 2nd and 3rd roller with 1.2 - 1.3 mm. feeler gauge, and correct if necessary. (See section : Basic adjustment of the drafting arrangement.

Finally :

- Set 5th roller parallel to 4th roller with 1.7 - 2.0 mm.distance, then tighten clamping hub screw of both adjusting levers.

3.5 Replacing the strippers.

If there is increased lapping on the top rollers or fluted rollers without visible reason, this may be traced to crooked, damaged or worn strippers. If the strippers are bent for any reason, they must be straightened so that they make contact with the whole of the roller again. Check with a strip of paper.

Damaged or worn strippers must be replaced. The rubber strippers are normally subjected to wear, and are to be regarded as a replacement item.

Stripper for 1st and 2nd top roller :	Rubber tube with steel or aluminium bar.
Stripper for 3rd top roller :	Steel stripper.

The bottom clearing arrangements have 2 sorts of strippers :

- Stripper for 1st, 2nd and 5th fluted rollers,
- Stripper for 3rd and 4th fluted rollers.

When fitting new strippers, make sure that they turn freely on their pivots.

3.6 Removing the bottom strippers - Fig. 2A.1

- Stripper pair to 1st and 2nd rollers :

  Unfasten the 2 hexagon socket-headed screws on the funnel plate hinge and withdraw the pins from the roller brackets.
  The funnel plate can now be taken out with the stripper pair and the cleaning flap.

- Stripper pair to 3rd and 4th rollers :

  Swing drums back. Take out the 2 hexagon-headed screws, whose heads form the pivots on the extended stripper holders, from the curved intermediate levers (using a 5 mm. socket wrench).The 2nd stripper pair can now be pushed out towards the front.

- Stripper to 5th roller :
  Take out from behind the 2 hexagon socket-headed screws on the bearing saddle, whose heads form the pivots of the strippers. Use a 5mm.socket wrench.

3.7 Tube wheel bearings (wire race ball bearings) Fig.2A.13

The wire race ball bearing consists of 4 hardened spring steel wired which act as races for the 37 balls of 8 mm. diameter. Alternating between these load-bearing balls there are 37 spacer balls of 5/16".

If the wire race ball bearing should show excessive play (more than 0,5 mm) after prolonged service they must be duly adjusted. To do this the tube wheel must be taken out.

The thin metal strips at the socket headed screws serve for the adjustment of the wire race ball bearing. The tube wheel should be checked every 6000 working hours.

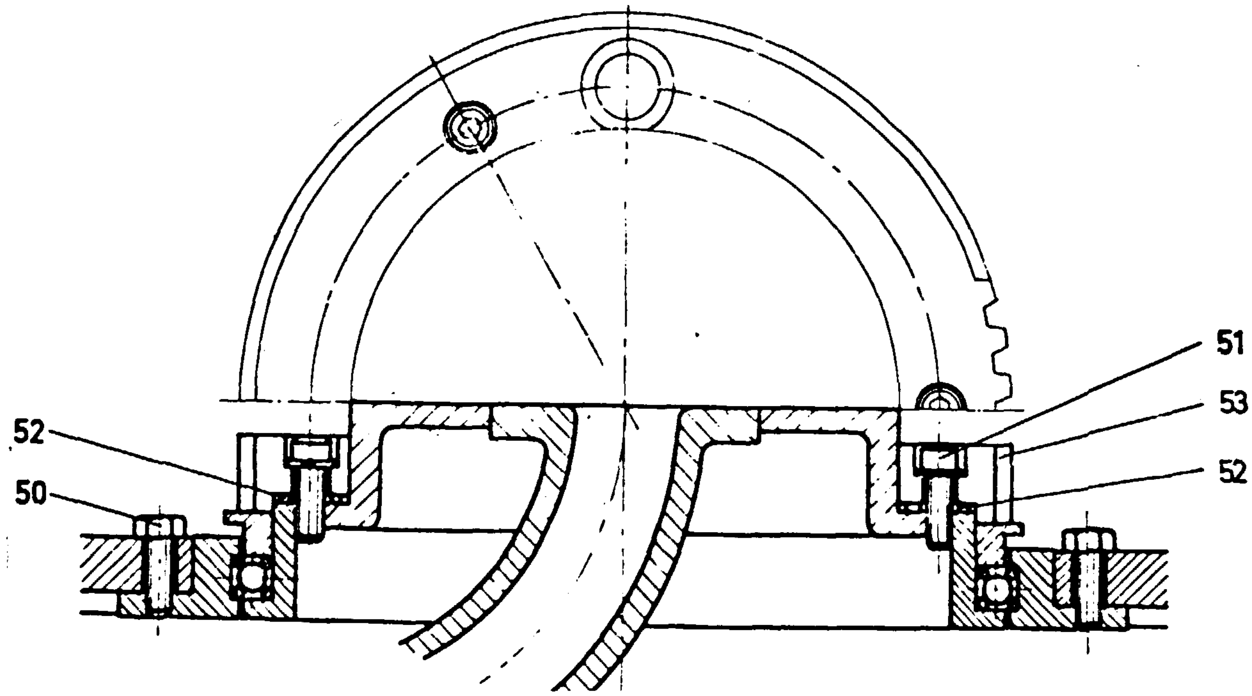
3.8 Adjustment of the wire race ball bearing - Fig. 2A.13

After removing the 4 cap screws (50) the tube wheel can be taken out of the coiler beam downwards in one place.

- Slacken the 3 socket headed screws (51).
- Remove the timing belt sheave (53).
- Take away a tin disc (52) at each of the 3 hexagon socket screws.
- Fit the timing belt sheave again and tighten the screws.

If the wire race ball bearing still has too much play, further tin discs must be removed until only a slight play can just be felt and the timing belt sheave still be turned easily.
The timing belt sheave must on no account jam.
The tube wheel can now be fitted into the coiler beam again.

FIGURE 2A.13



3.9 Regulating the suction - Fig. 2A.8

- Throttling diaphragm A with threaded spindle regulates the air flowing on to the feed table.
- Throttling slide B regulates the suction below the drafting arrangements. Since the bottom suction will be slightly greater than that on the top, the two can be balanced with slide B so that the material passing through runs in the neutral suction zone. This will be attained if slide B covers the bottom duct by 60-70 mm.

(Pushing the slide too far forward will tend to favour suction of the material upwards).

Good observation of the bottom suction arrangement is possible from behind. If good fibres are extracted in the main drafting zone, the throttling slide should be advanced by the above amount.

- Regulating disc C over the opening connecting the discharge chamber with the suction chamber can be utilized if too many good fibres are still getting into the filter in spite of the throttling slide B being pushed forward properly.
- Twin throttle plated D are used if the suction rate is not sufficiently reduced when regulating disc C is opened wide. With proper adjustment of the suction, the waste should amount to less than 0.5 % as a rule. At the beginning it is advisable to inspect the filter screen through the cleaning flap openings after every can change with delicate materials (combed stock etc.0.

Example: carded cotton.

A Closed far enough to prevent the air current causing a nuisance on the feed table.

B Open wide in 1st passage.
pushed forward 60 - 70 mm. in 2nd passage.

C Fully closed (perhaps open slightly in 2nd passage).

D n o t utilized.

Bottom suction arrangement.

The condition of the bottom suction arrangement can easily be checked from behind during operation. It is a good thing to blow the suction system out once or twice per shift while the machine is running, by turning the drum out using the two-armed lever in the end door. Much less force is needed to operate the drum while the machine is running than when it is idle.

To turn the drum back into its working position during operation, the front stripper pair must also be in its working position. If necessary the front stripper pair can be lifted to the front after depressing the two press bolts. Under the delivery roller there is a cleaning flap, which can also be hinged up towards the front.

After greasing the roller bearings the grease emerging at the sides must be removed thoroughly. If the bottom suction is completely blocked due to greasy strippers, the web will be drawn upwards as the balance between top and bottom suction is disturbed.

Should the fluted rollers become wrapped, this can be traced to bent or damaged strippers.

When processing synthetic fibres, it is possible that residue from the finishing may settle on the fluted rollers. This residue is not fully removed by the strippers. It is consequently necessary to clean the rollers additionally by hand. The interval for cleaning must be suited to the material being processed. In general, cleaning is carried out once or twice a week.

Top suction clearing arrangements.

The drafting arrangements are largely proof againt wrapping. If the top rollers should get wrapped none the less, crooked or worn strippers will be the cause. Only perfect top strippers are to be used, especially when handling combed cotton.
The strippers are a normal wear item.
After manipulation on the drafting arrangement, make sure that the strippers are placed back against the top rollers before closing the cover.

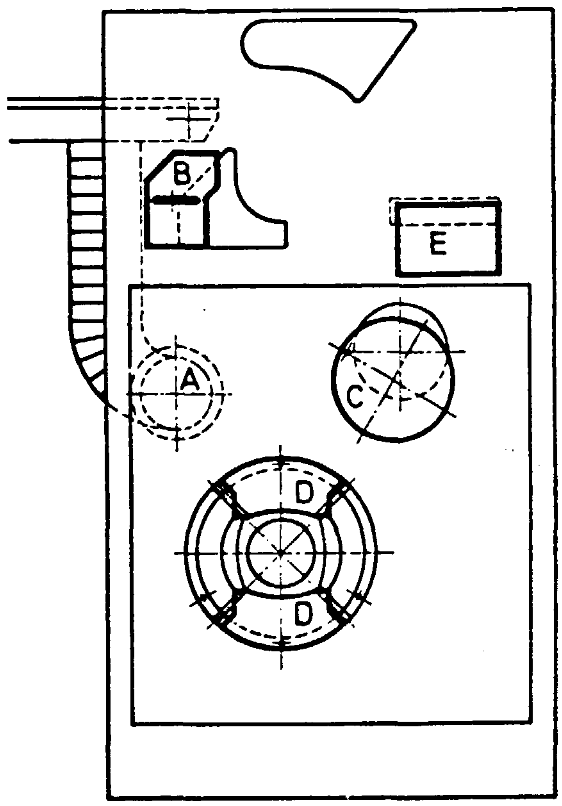
Except for piecing the machine should not be run with the cover of the drafting arrangement open. There are two reasons for this stipulation:

1. With the cover open the top suction has no effect, so that the waste on the strippers drops back into the web, resulting in a much greater risk of wrapping.
2. Accident risk: With wrapping in the drafting arrangement, the 1st top roller may be flung out.

Cleaning the filter.

The filter must be cleaned periodically through the two cleaning flaps in the end door; this can be done while the machine is running. Cleaning is necessary every 4 Hours normally, with every dirty and short stock every 2 hours.

FIGURE 2A.8



GROUP 3 CHANGE.

1. Procedure for changing the break draft - Fig. 17 + 18

The break draft may only be changed if the setting device of the drafting arrangement is lockend.

- The three M 12 head screws and the clamping hub screw on the change wheel plate are to be unfastened, and the plate taken off.
- Change break draft gear "G" and meshing wheel "V" on the 5th roller. Fit gear with same number of teeth as "V" on the feed shaft (Fig.18).
- Fit change wheel plate again and tighten clamping hub screw well.

Delivery gear.

The delivery change gear is in the gear box. The 47-tooth gear fitted gives minimum tensioning of the web between front roller and calender rollers. Should different tensioning be needed contrary to expections, 46 and 48 tooth change gears are available; the 47 and 48 tooth gears have corrected toothing and are coloured red for identification.

To change the delivery gear, as well as the coiler wheel change gears "A" and "T", the counter drive and the small gear cover must be removed.

2. Tube wheel change gears "A" and "T".

Gears "A" and "T" are fitted in accordance with the can size of the machine (Fig.18). Allowance must be made for the can coiling, sliver delivery to the next machine and the spectrogram

Tube wheel runs too slowly:

- untidy, wavy coiling.
- pronounced cycles in accordance with the coiling length in the spectrogram
- coiler wheel tends to become chocked.

Tube wheel runs too fast:

- coil is drawn together,
- false draft gives pronounced cycles in accordance with coil length in the spectrogram.
- poor Uster percentages.

Exception : When processing synthetic fibres, in particular in the case of 60 mm. acrylic fibres, it is often necessary to let the tube wheel run quicker than in the case of cotton: e.g. when using 18" cans. Wheel A = 50 t, wheel B = 81 teeth.

When judging the spectrogram it should be noted that the sliver twist usually produces an apparent cycle, which is no longer detectable after next processing stage.
The total number of teeth of change gears "A" and "T" is 131.
Tighten the nuts thoroughly after changing the gears.

3. Can change gears "R" and "S".

The can change wheels "R" and "S" serve to regulate the coiling density in the can. They also exercise a small influence on the tension of the sliver in the coiler wheel.
The total number of teeth of change gears "R" and "S" is 85.

4. Can wheel plate.

To regulate the can filling in relation to the can diameter, the can plate can be shifted 10 mm. to the right or left.
Take care that the coiled pile of material always has sufficient play in the can.

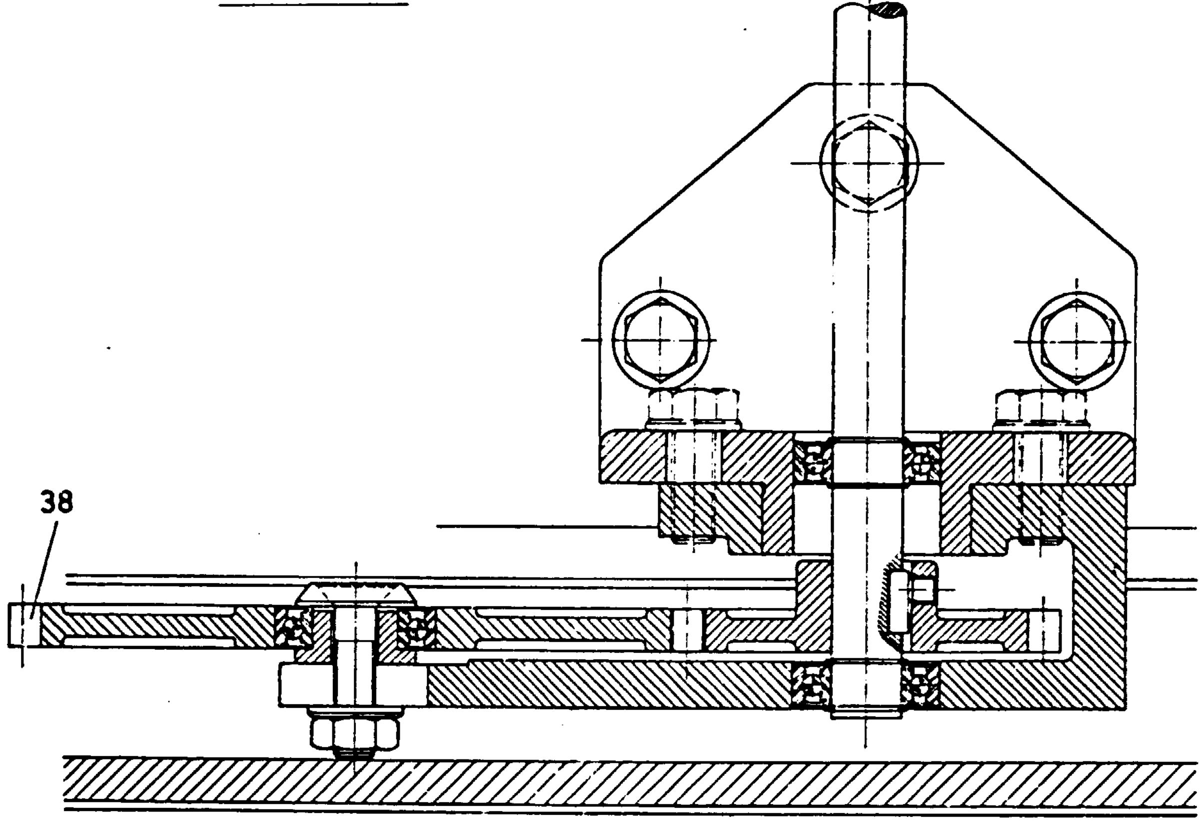
Procedure when shifting the can wheel plate -Fig.19

- Swing out the carrier gear (38) with the cast teeth for driving the can wheels.
- Slacken the four M 12 cap screws in the corners of the can wheel plate.
- Shift the can wheel plate: towards the out end frame if a coiled pile of material of larger diameter is desired.
  Towards the headstock if a smaller diameter of the pile is desired.

Tighten the four M 12 cap screws.

- Re-engage the 43 T carrier gear with the first can wheel (allow plenty of play on account of the cast teeth).

FIGURE 19.



5. Draft change gear.

The number of teeth of the draft change gear "N" is reckoned from :

$$N = 8.45 \times \text{draft} \quad \text{or else}$$

$$N = \frac{8.45 \times \text{delivered sliver count} \times \text{doubling}}{\text{feed sliver count.}}$$

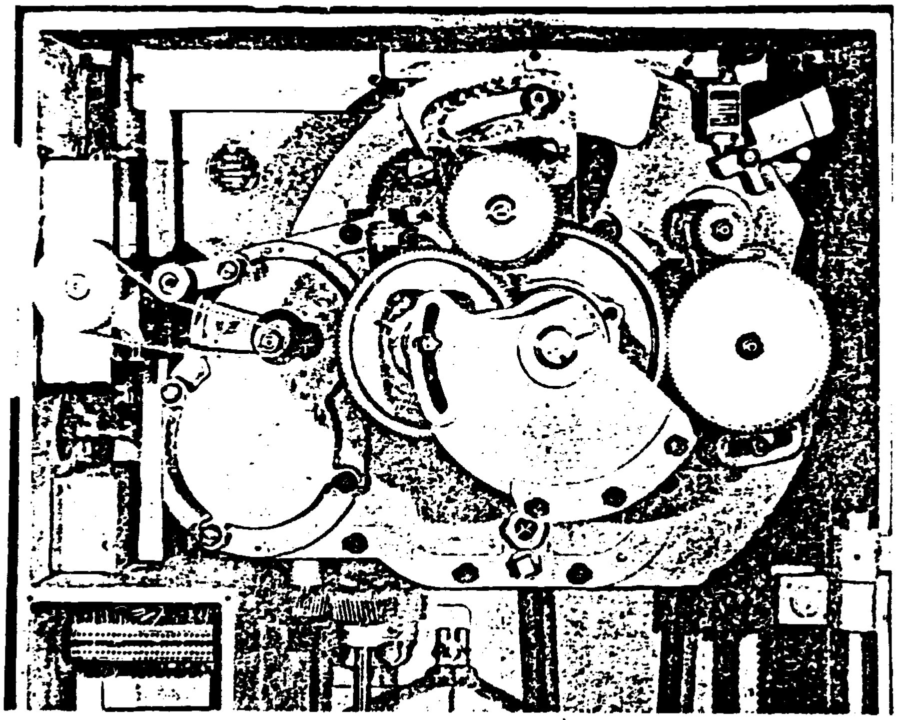
Draft gears with 30 to 110 teeth can be fitted, making drafts of 3.5 to 13 possible.

6. Feed change gear.

The slivers should run into the drafting arrangement under slight tension, but on no account must false drafts occur on the table.

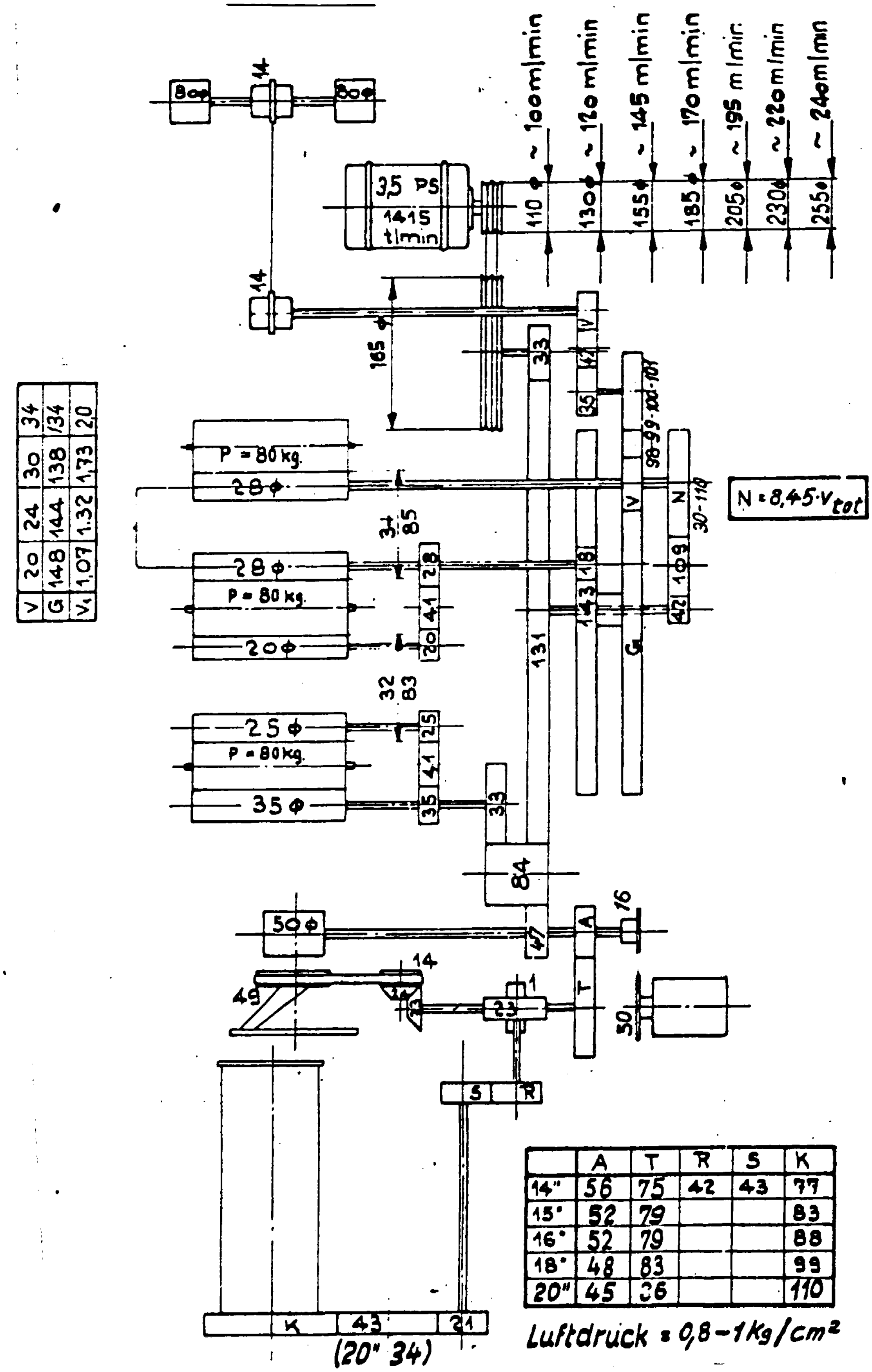
Feed change gears : 98 - 101 teeth (98's feed change gear for synthetic fibres.

FIGURE 17



GEARING DIAGRAM DRAWING FRAME DO/2

FIGURE 18.



V	20	24	30	34
G	148	144	138	134
V_1	1,07	1,32	1,73	2,0

	A	T	R	S	K
14"	56	75	42	43	77
15"	52	79			83
16"	52	79			88
18"	48	83			99
20"	45	86			110

Luftdruck = 0,8–1 Kg/cm²

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. TROUBLE SHOOTING
3. PREVENTIVE MAINTENANCE
4. FRAME INTERFERENCE
5. QUESTIONNAIRE
6. CHARTS AND GRAPHS

DRAWING FRAMES

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job abilities of the trainee.

b. Method.

The trainee is to walk the section of the Preparation Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.
The suggested number of each defect is as follows :

- Creel	5
- Clearers	5
- Bottom roller settings	5
- Top roller setting	5
- Top roller pressure	5
- Air suction	5
- Coiler	5
	35

2. TROUBLE SHOOTING WITH THE SPECTOGRAPH.

If your mill laboratory is equipped with a Uster Spectrograph you can trace mechanical faults in the drawing sliver directly to the machine part that is responsible. All that is needed is a spectrogram showing the wave length at which the fault occurs, a gearing diagram of your drawing frame and a chart devised through the use of the diagram and appropriate formula.

By substituting the number of teeth in the gears that you are using for the letters in the formula, you can devise a chart for your drawing frame. Recurring faults in the sliver can then be traced directly to the machine parts that are causing them.

The Spectrograph, operating in conjunction with the Evenness Tester, provides a quick method of locating the source of any unevenness in the sliver. As the sliver is fed through the Evenness Tester, variations in weight per unit length of material being tested is recorded on a chart. The Spectrograph receives the impulses from the tester in the form of short to long signals.

These signals are sorted electronically by a method that can be compared to sorting oranges according to size. The smaller oranges will drop through small openings and the larger oranges will proceed to larger openings until finally the largest orange reaches the largest opening and drops into the bin.

This then, gives a rough idea of how the Spectrograph stores these signals, according to length, in its electronic bins. When the register button on the Spectrograph is pushed, these bins are drained and the results are shown on a chart known as a Spectrogram.

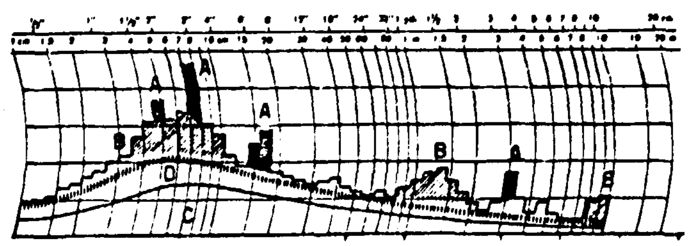
The chimmney-like peaks marked "A" are mechanical faults, which are caused by parts of the machine that are out of adjustments, or parts that are worn to such an extent that they are making constant repetitive patterns. The humps, or hill-like peaks shown at "B" are drafting waves caused by improper roll settings.

The curve "C" is a perfect Spectrogram, mathematically calculated and difficult, if not impossible to obtain in textile processing. The curve "D" is a more practical Spectrogram, higher than the perfect spectrum.

The area between curves "D" and "C" is very hard to improve and depends upon the processing and the type of fibre that is used. The area between "D" and "C" is random variation, difficult to control in staple fibre processing and our chief concern is with the peaks "A" and humps "B".

The mechanical faults at "A" can be found on the machine by looking above the peak on the Spectrogram and reading the length of this particular defect, and then looking at the chart and gearing diagram to pinpoint the source of the defect.

It is very simple and easy to calculate a gearing diagram for each machine that will give the length at which each roll or gear will repeat. For example, if the front roll of the drawing frame is 1 3/8 inches in diameter, we know that it will give a repeating pattern if it is eccentric, which will be 1 3/8 x 3.1416 or 4.3 inches. Therefore, an eccentric 1 3/8 inch front roll will show up as a chimney on the Spectrogram at slightly more than 4 inches. The drafting waves, or humps indicated at "B" on the diagram can be located in the same manner by using the centre of the hump as the point of location for length of defect.

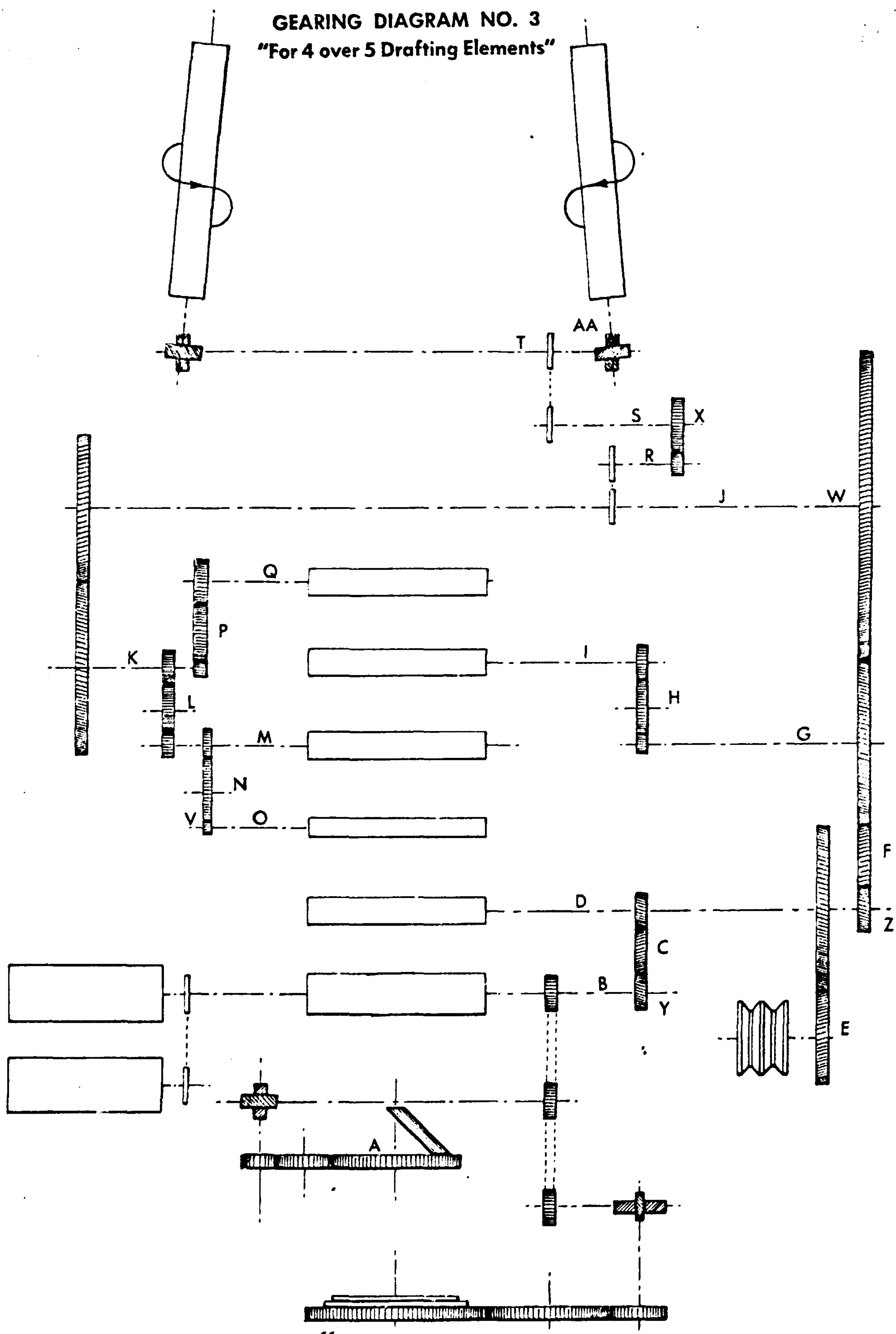


The drawing frame is a versatile machine and it is possible to operate it with a wide range of gears and settings. It is, therefore, impossible to give gear diagrams and spectrograph trouble-shooting charts for every combination that can be used. The diagram, tables, charts, and formulas shown here are only representative, but from a study of them, you can interpolate any differences in your drawing frame components and compile data applicable to your individual machines.

The tube gear and calender roll data is the same for all models of the drawing frame.

The wave length shown always denoted the number of inches between like defects or variations in the sliver that cause the high peaks on the spectrogram.

GEARING DIAGRAM NO. 3
"For 4 over 5 Drafting Elements"



WERNER INTERNATIONAL

KEY	3 OVER 4 (Cotton)	3 OVER 4 (Synthetics)	4 OVER 5
C	$\frac{512}{(Y)}$	$\frac{460.8}{(Y)}$	$\frac{512}{(Y)}$
D	$\frac{236.8}{(Y)}$	$\frac{288.0}{(Y)}$	$\frac{236.8}{(Y)}$
E	$\frac{186.4}{(Y)}$	$\frac{226.7}{(Y)}$	$\frac{186.4}{(Y)}$
F	$\frac{12787.2}{(Y) \times (Z)}$	$\frac{15552.0}{(Y) \times (Z)}$	$\frac{12787.2}{(Y) \times (Z)}$
G	$\frac{236.8 \times (W)}{(Y) \times (Z)}$	$\frac{288.0 \times (W)}{(Y) \times (Z)}$	$\frac{20838.4}{(Y) \times (Z)}$
H	$\frac{947.2 \times (W)}{(Y) \times (Z)}$	$\frac{1152.0 \times (W)}{(Y) \times (Z)}$	$\frac{83337.6}{(Y) \times (Z)}$
I	$\frac{868.3 \times (W)}{(Y) \times (Z)}$	$\frac{864.0 \times (W)}{(Y) \times (Z)}$	$\frac{1157.7 \times (W)}{(Y) \times (Z)}$
J	$\frac{22259.2}{(Y) \times (Z)}$	$\frac{27072.0}{(Y) \times (Z)}$	$\frac{236.8 \times (W)}{(Y) \times (Z)}$
K	$\frac{25233.0}{(Y) \times (Z)}$	$\frac{28664.2}{(Y) \times (Z)}$	$\frac{250.7 \times (W)}{(Y) \times (Z)}$
L	$\frac{51907.9}{(Y) \times (Z)}$	$\frac{58966.4}{(Y) \times (Z)}$	$\frac{516.7 \times (W)}{(Y) \times (Z)}$
M	$\frac{720.9 \times (V)}{(Y) \times (Z)}$	$\frac{819.0 \times (V)}{(Y) \times (Z)}$	$\frac{7.16 \times (V) \times (W)}{(Y) \times (Z)}$
N	$\frac{1029.9 \times (V)}{(Y) \times (Z)}$	$\frac{1310.4 \times (V)}{(Y) \times (Z)}$	$\frac{10.2 \times (V) \times (W)}{(Y) \times (Z)}$
O	$\frac{386.2 \times (V)}{(Y) \times (Z)}$	$\frac{491.4 \times (V)}{(Y) \times (Z)}$	$\frac{3.8 \times (V) \times (W)}{(Y) \times (Z)}$
P			$\frac{1002.8 \times (W)}{(Y) \times (Z)}$
Q			$\frac{780.0 \times (W)}{(Y) \times (Z)}$
R	$\frac{23372.2}{(Y) \times (Z)}$	$\frac{28425.6}{(Y) \times (Z)}$	$\frac{249.0 \times (W)}{(Y) \times (Z)}$
S	$\frac{779.1 \times (X)}{(Y) \times (Z)}$	$\frac{947.5 \times (X)}{(Y) \times (Z)}$	$\frac{8.3 \times (X) \times (W)}{(Y) \times (Z)}$
T	$\frac{876.5 \times (X)}{(Y) \times (Z)}$	$\frac{1065.9 \times (X)}{(Y) \times (Z)}$	$\frac{11.9 \times (X) \times (W)}{(Y) \times (Z)}$
AA			$\frac{12.6 \times (X) \times (W)}{(Y) \times (Z)}$

WAVE LENGTH TABLE FOR TUBE GEAR AND CALENDER ROLL

Tube Gear Diameter (Inches)	Wave Length (Inches)
12	22.4
14	26.3
15	28.3
16	30.2
18	37.0
20	38.3
2″ Calender Roll	6.4

WAVE LENGTH TABLE FOR FRONT BOTTOM ROLL

Tension Gear	1⅛″ Roll	1⅜″ Roll
63	3.76	4.56
64	3.70	4.50
65	3.65	4.44

Constants have been devised to simplify calculations to obtain wave lengths for the second, third, fourth, and—when used—the fifth bottom rolls. Constants and formulas are given in the following tables:

CONSTANTS FOR BOTTOM ROLLS 4 OVER 5 DRAFTING ELEMENT

Roll	Tension Gear		
	63	64	65
¾″ Second Roll	.061	.060	.059
1⅜″ Third Roll	1.140	1.120	1.105
1⅜″ Fourth Roll	18.40	18.10	17.85
1⅜″ Fifth Roll	12.40	12.20	12.02

CONSTANTS FOR BOTTOM ROLLS, 3 OVER 4 DRAFTING ELEMENT

Roll	Tension Gear		
	63	64	65
¾″ Second Roll	6.12	6.03	5.94
1⅜″ Third Roll	11.45	11.25	11.15
1⅜″ Fourth Roll	13.80	13.55	13.35

CONSTANTS FOR BOTTOM ROLLS, 3 OVER 4 DRAFTING ELEMENT (SYNTHETICS)

Roll	Tension Gear		
	63	64	65
1″ Second Roll	7.8	7.68	7.56
1⅜″ Third Roll	12.95	12.78	12.65
1⅜″ Fourth Roll	13.68	13.48	13.28

Formulas to be used with the constants are as follows:

SECOND AND THIRD ROLLS
3 OVER 4 ELEMENT

$$\frac{\text{Constant x Break Draft Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

FOURTH ROLL
3 OVER 4 ELEMENT

$$\frac{\text{Constant x Fine Change Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

SECOND AND THIRD ROLLS
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Break Draft Gear x Fine Ch. Gear}}{\text{Total Draft Gear}}$$

FOURTH ROLL
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Break Draft Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

FIFTH ROLL
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Fine Change Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

CONSTANTS FOR LIFTING ROLL OF POWER-DRIVEN CREEL

Tension Gear		
63	64	65
.1975	.1940	.1910

FORMULA:

$$\frac{\text{Constant X Lifting Roll Change Gear x Fine Change Gear}}{\text{Total Change Gear}} = \text{W.L.}$$

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Delivery can full (Frame doesn't stop).	Counter not set to zero at doff	Caution operator to always reset counter.
	Defective counter	Repair or replace counter
	Switch not properly grounded	Repair ground wire Clean and tighten connections.
Calender roll lap-up. (Frame doesn't stop)	Cam not close enough to switch roller.	Reset cam to specifications
	Cam loose	Tighten cam, check setting.
	Defective limit switch or wiring	Repair or replace switch. Clean and tighten wiring connections. Check insulation.
Tube choke (Frame doesn't stop).	Tube sticking	Clean pin,contact surfaces.
	Accumulation of lint in rim of tube gear.	Clean out rim with wood peg.
	Defective limit switch or wiring.	Repair or replace switch. Clean and tighten wiring connections. Check insulation.
	Too much tension on tube latch	Replace spring Reduce friction between contacting surfaces
Roll lap-up (Frame doesn't stop).	Broken weighting plunger or spring.	Replace plunger or spring. Trace and correct cause of breakage
	Lint deposit insulates contacts	Clean all contact points.
	Defective limit switch or wiring.	Repair or replace switch Clean and tighten connections. Check insulation.
Sliver breaks at creel. (Frame doesn't stop).	Accumulation of lint on lifter	Clean top and bottom lifter rolls
	Defective limit switch or wiring.	Repair or replace switch. Clean and tighten connections. Check insulation.
	Top lifter roll sticking.	Repair or replace roll or bearing.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Choke at condenser. (Frame doesn't stop).	Defective limit switch or wiring	Repair or replace switch
		Clean and tighten connections
		Check insulation.
	Accumulation of lint between contacts.	Clean all contact surfaces.
Sliver break Between calender & can.	Trumpet bore too small	Drill trumpet with next larger drill.
	Wrong calender tension change gear.	Select and use correct gear.
	Obstruction in tube.	Clean out tube.
	Burr or rough edge on tube or gear	Remove roughness with file or sandpaper.
		Polish with crocus cloth.
	Defective delivery can	Repair or replace can.
Sliver break Between condenser & trumpet.	Trumpet bore too large	Replace trumpet with one that has smaller bore.
	Wrong calender tension change gear.	Select and install correct gear.
	Sliver trough rough or incorrectly aligned	Repair or realign sliver trough.
Sliver break In drafting element.	Draft too high for stock	Reset drafting rolls.
	Draft not allotted correctly in zones.	Reapportion draft between zones.
	Rolls sticking	Lubricate roll bearings.
		Check for wear.
	Defective rolls or roll bearings.	Repair or replace rolls or bearings
Sliver break at creel	Wrong creel tension change gear	Select & install correct gear.
	Cans not positioned correctly at creel.	Reposition cans & check concentricity.
	Rough edge on can rim	Remove roughness with emery cloth
	Tangled sliver	Check coiler of prior process.
	Top lifter roll sticking	Repair or replace roll or bearing.
	Eccentric or rough sliver guide	Realign guide, smooth with emery cloth.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY.
Uneven sliver (One delivery)	Defective drafting roll	Repair or replace roll
	Eccentric drafting roll	Replace roll
		Locate and remedy cause of eccentricity.
	Worn top roll covering	Replace or buff roll covering.
	Rough flute on bottom roll	Remove roughness with file or emery cloth.
		Polish with crocus cloth.
	Roll weighting incorrect	Install spring with correct tension (or check pressure)
	Wrong bore in trumpet	Replace or rebore trumpet
Uneven sliver (All deliveries)	Eccentric shafting or studs	Locate and replace defective shaft or stud.
		Locate and remedy cause of eccentricity.
	Defective gear	Locate and replace defective gear
		Trace and eliminate cause of defectiveness.
	Sticking shaft or bearing	Clean shaft and bearing
	Foreign object between gear teeth.	Remove object and check for damage.
	Drive belt slipping	Clean belt and pulleys.
		Tighten belt if needed.
	Wrong tension gear	Select and install correct gear.
	Defective bearing	Replace bearing.
Frame stops too quickly.	Brake too close	Reset brake.
	Moisture on brake contact surfaces.	Wipe contact surfaces with rag or soft waste.
		Locate and, if possible, eliminate source of moisture.
Frame stops too slowly.	Brake too far	Reset brake.
	Accumulation of lint on braking surfaces.	Clean braking surfaces with rag wet with quick -drying solvent.
	Worn brake contact surfaces	Replace friction ring.
		(Do not machine surface of armature)

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roll Laps.	Incorrect clearer setting	Set clearer so that it will contact roll full width.
	Cut, nicked, or rough top roll	Buff, or replace roll. Locate and correct cause of damage
	Foreing matter on rolls	Clean rolls.Locate and if possible eliminate source of trouble.
	Excess humidity	Reduce relative humidity in room. Check for condensation at machine or creel.
Reduced air suction.	Clogged plenum	Remove waste from plenum.Check for, and remove, burrs or rough edges.
	Slide assembly out of adjustment.	Check and readjust slide.
	Collector unit full	Empty and clean collector unit.
	Screen clogged	Clean screen.
	Fouled fan.	Clean fan blades.
Lint accumulates in pressurized area.	Leak at entry	Check rubber seal on filter entry assembly - replace if needed.

3. PREVENTIVE MAINTENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance,the form shown on page 57 has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame,the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF THE DRAWING FRAMES PREVENTIVE MAINTENANCE

FRAME No .... Fixer ....Date..............

Standard	Points	
10		A. Creel Feed rollers
5		B. Sliver guide
10		C. Top rollers
10		D. Bottom rollers
10		E. Bottom clearers
10		F. Top clearers
10		G. Basic settings
7		H. Suction
5		I. Coiler tube
5		J. Coiling
5		K. Timing belt and pulleys
3		L. Driving belt
5		M. Brake
5		N. Stop motions
100		

MILL	MAINTENANCE WORK REPORT	
WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE:

Department: PREPARATION.	Type of machine: DRAWING FRAME RIETER DO	Machine No.	Type of maintenance.
Persons per crew:	Expected time:		

CYCLE

2 MONTHS		YEARLY	
1	Top rollers		All jobs listed under 2 months maintenance, and in addition:
2	Bottom rollers	2	Bottom rollers
3	Bottom clearers	3	Roller stands
5	Top clearers	8	Head stock
6	Covers	9	Can drive
8	Head stock	14	Gears
9	Can drive	19	Coiler
10	Counter chains	22	Creel drive
11	Doors	26	Suct.con.& tubes
12	Pulleys	27	Screen
13	Belts	28	Filter box
14	Gears	29	Bearings
16	Sliver guides	31	Motors
17	Trumpets	33	Lubrication
18	Calender rollers		
19	Coiler		
20	Turn tables		
22	Creel drive		
23	Feed rollers		
24	Feed table		
26	Suct.con.& tube		
27	Screen		
28	Filter box		
30	Electrical appar.		
32	Pressure system		
33	Lubrication		

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months

Working minutes:	Persons per crew: 3	Down time in hours: 6

1. TOP ROLLERS

Dismantle the top rollers and send them to the roller shop.
The top rollers must be buffed or be replaced as they must be in perfect condition.
Make sure that weighting bars move easily.
Wash out and grease top roller bearings.

2. BOTTOM ROLLERS

Clean with a stiff bruch the fluter rollers in order to remove all dirt from the flutes.
Check the settings and parallelism of the bottom rollers.

3. BOTTOM CLEARERS

These bottom clearers affect the machine productivity as they avoid bottom lap ups. The rubbers must be in optimum condition and the settings must be perfect.
Replace the rubbers considered bad.

5. TOP CLEARERS

In top of each suction opening exists a top clearer for helping the suction of the dust.
Check condition of the clearer covers and replace them if they are cut, worn out or defective.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

6. COVERS
Check condition and function of the covers.
Clean the covers and adjust them, if necessary.

3. HEAD STOCK
Clean the outside of the head stock.
Check oil level and add oil if necessary.

9. CAN DRIVE
Clean without dismantle.

10. COUNTER CHAINS
Check condition and tension. Clean the driving sprocket gears.
Adjust if necessary and grease.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

11. DOORS

Check, clean the inside and outside of the doors.
Adjust if necessary. The doors must close properly otherwise they affect the machine productivity.

12. PULLEYS

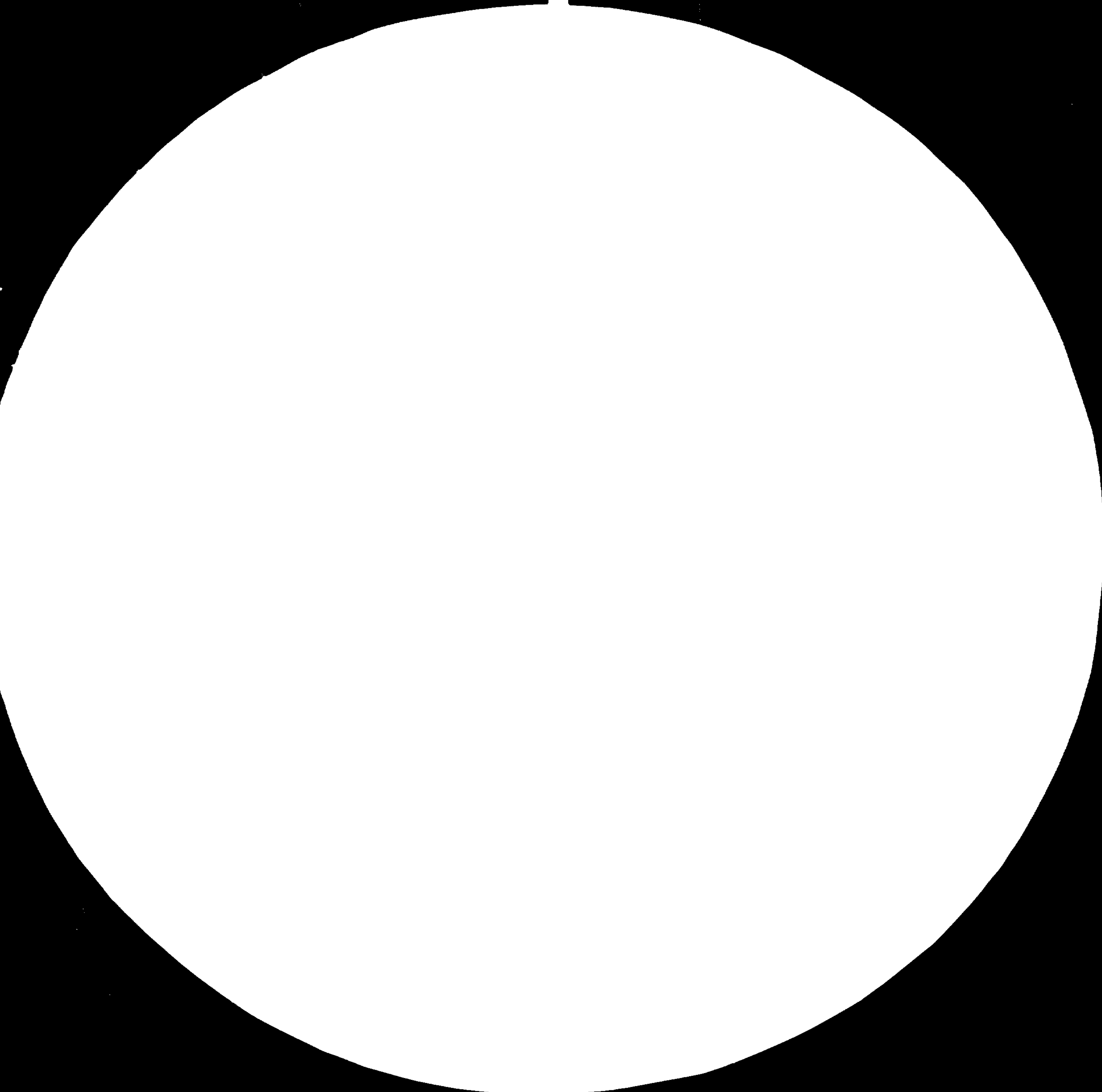
Check condition of the pulleys and replace any defective one.

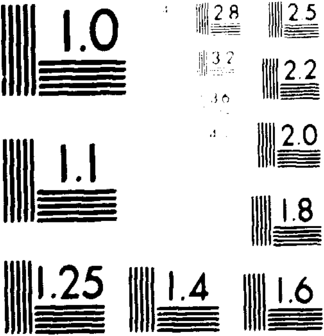
13. BELTS

Check the condition of the belts. Replace them if they are worn out or cut. Check the tension.

14. GEARS

Clean all gears without dismantle them.
Replace the defective ones. Grease them afterwards.
Check oil level.





MICROCOPY RESOLUTION TEST CHART

MILL	DESCRIPTION OF THE WORK TO BE DONE 62.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months

Working minutes:	Persons per crew: 3	Down time in hours: 6

16. <u>SLIVER GUIDES</u>
Check the guides if they do not have sharp ends or damaged and repair them if possible.
Clean them using eventually a solvent and polish.

17. <u>TRUMPETS</u>
The trumpets must be in perfect condition and of the proper size. Repair or replace the damaged ones or the ones that don't have the proper size. Check if they are properly fixed.

18. <u>CALENDER ROLLERS</u>
Clean the calender rollers and gears.
Check their condition and especially the nylon gear.
Repair or replace if necessary.

19. <u>COILER</u>
Clean without dismantling. Check properly the coilers oblique funnel. It must be in perfect condition to allow an easy passage of the sliver. Check condition and tension of the coiler driving belts.
Clean with solvent the sliver tube.

MILL	DESCRIPTION OF THE WORK TO BE DONE 63.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAMES RIETER DO	Type of maintenance: 2 months

Working minutes:	Persons per crew: 3	Down time in hours: 6

20. TURN TABLES

Remove the plates and clean the inside.

22. CREEL DRIVE

Clean properly without dismantling. ADjust the chain tension if necessary.

Remove bottom plates of feed table clean and lubricate chains and wheels.

Screw plates back again.

23. FEED ROLLERS

Clean with a solvent the top rollers, bottom rollers and sliver guides, polish them afterwards.

24. FEED TABLE

Clean the feed table and polish where the sliver is passing through.

MILL	DESCRIPTION OF THE WORK TO BE DONE 64.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months.

Working minutes:	Persons per crew: 3	Down time in hours: 6

26. SUCTION CONNECTION AND TUBES

Check thoroughly the connections and tubes.
Fix damages and replace if very defective.

27. SCREEN

Check condition and replace if damaged or cut. Otherwise clean with a brush.

28. FILTER BOX

Clean inside and outside. Clean also the exisiting inside of the box gears without dismantling them. Make sure that the box closes hermetically. Check and adjust the suction openings.

30. ELECTRICAL APPARATUS

Call an electrician to do the following controls :

- automatic stop motions
- connections
- push buttons
- electrical bulbs

Replace the defective ones.

MILL	DESCRIPTION OF THE WORK TO BE DONE 65.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME RIETER DO	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

32. PRESSURE SYSTEM
    Clean and check.

33. LUBRICATION
    Make a general lubrication after the maintenance.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Drawing Rieter Do.	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 3	Down time in hours: 8

General

Repeat all the elements of the 3 months maintenance and also the following :

2. Bottom Rollers

Check with a gauge the roller eccentricity.
Dismantle the rollers and clean them properly with asfiff brush in order to remove all impurities from the flutes.
Clean the bearings.

3. Roller Stands

With the rollers dismantled, clean and check their stands.
Before replacing the bottom rollers, put some grease on the seats.

8. Head Stock

Drain the oil and afterwards open the gear box.
Dismantle all gears and check all parts such as : shafts, bearings keys, supports,etc. replace the defective ones or worn out.
Assemble the gears and mesh them properly.
Clean properly the inside of the box before closing it.
Afterwards fill the box with tne proper oil.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Drawing Rieter Do	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 3	Down time in hours: 8

9. <u>Can Drive</u>

Dismantle, clean and check all parts.
Assemble and grease the gears.

14. <u>Gears</u>

Dismantle also the other head stock gears.
Clean and check properly shafts, keys, supports. Replace the defective damaged or worn out.
Assemble the gears and mesh them properly.
Grease them afterwards.

19. <u>Coiler</u>

Dismantle the coiler and clean thoroughly.
Check condition of the belts and replace if necessary.
Clean the inside of the coiler.
Check tension of the belt and adjust if necessary.

22. <u>Creel Drive</u>

Dismantle and clean thoroughly.
Adjust the chain tension and if necessary remove one or two links.
Grease afterwards.

MILL	DESCRIPTION OF THE WORK TO BE DONE 68.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Drawing Rieter Do.	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 3	Down time in hours: 8

26. Suction Connections and Tubes

Dismantle and clean the inside of the suction system.
Check all connections and tubes and replace the defective ones.

27. Screen

Remove the screen and wash it with water and detergent.
Replace the screen once dry.

28. Filter Box

Dismantle the existing gears in the box and do the same as point 14 (gears).

29. Bearings

Check all bearings and replace the defective or worn out.
Grease afterwards.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Drawing Rieter Do.	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 3	Down time in hours: 8

31. Motors

The electrician will make the yearly revision of the motor.
He will clean the inside, and check rotor, stator and bearings.
He will grease afterwards the bearings.

33. Lubrication

Make a general lubrication after the maintenance.

4. FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.

for case b. 10 min.

for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames:		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that <u>Method 1</u>. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

5. QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and help the trainee to understand his job.

QUESTIONS :

1. What type of working uniform, suits a mechanic?

   Short sleeve shirt.

   Tight trousers, with leather shoes.

2. What tools will be required for the mechanic?

   Set of: Tool box
   Metric allen keys
   English allen keys
   Screw drivers star and flat
   Spanners (open & close)
   Hammer (soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Callipers
   Spirit level

3. How a mechanic should file?
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.
6. Some soft metal pieces should be used in between the jaws of the vise.

4. What are the specifications of drawing frames?

Hank sliver running on various frames : 0.120 - 0.125 - 0.150

Drafting system: 3/5 Pneumatic.

Number of ends: 8

Number of deliveries per frame : 2

Size of cans : 18 x 42

Type of drive : V-Belt.

Top and Bottom clearers : strippers.

5. What are the functions of the drawing frames?

To improve regularity of sliver by doubling of slivers and parallelisation of the fibres.

6. What are the basic adjustments of the drawing frames?

1. Motor brake adjustment : 0.3 - 0.5 mm.
2. Feed plate gauge : carded 1st passage 80 - 95 mm.
   2nd passage 75 - 85 mm.
   combed and synthetics : 60 - 70 mm.
3. Trumpet size : 3 - 4 mm.
4. Basic settings : 2nd to 3rd roller :1,2 - 1,3
   4th to 5th roller :1,7 - 1,8
5. Suction adjustments: for carded cotton.
   A: Closed.
   B: Open wide on 1st closed 6-7 cm. on 2nd
   C: Closed.
   D: not utilized.
6. Strippers adjustment : straight check with a strip of paper.
7. Pneumatic pressure : 0,8 - 1,0 Kg.

7. How to stock the lubricants?

   Different colours should be used for different lubricants.

8. How you classify the lubricants according to use?

   Recommended lubricants should be used.

9. What should be the criteria for break down maintenance?

   Mechanic should first handle the machine which requires least time, so that, down time is reduced.

CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 77) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 79) for recording the performance of the trainee on Preventive Maintenance.

a. <u>The Complete Defect - recognition Schedule</u>.

As explained in the chapter on "Diagnostic Development" (page 45 of Phase II), the trainee has to repair at least five defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
7 reasons x 5 defects
Per reason = 35 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 77) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day. That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 35 defects within 12 days.

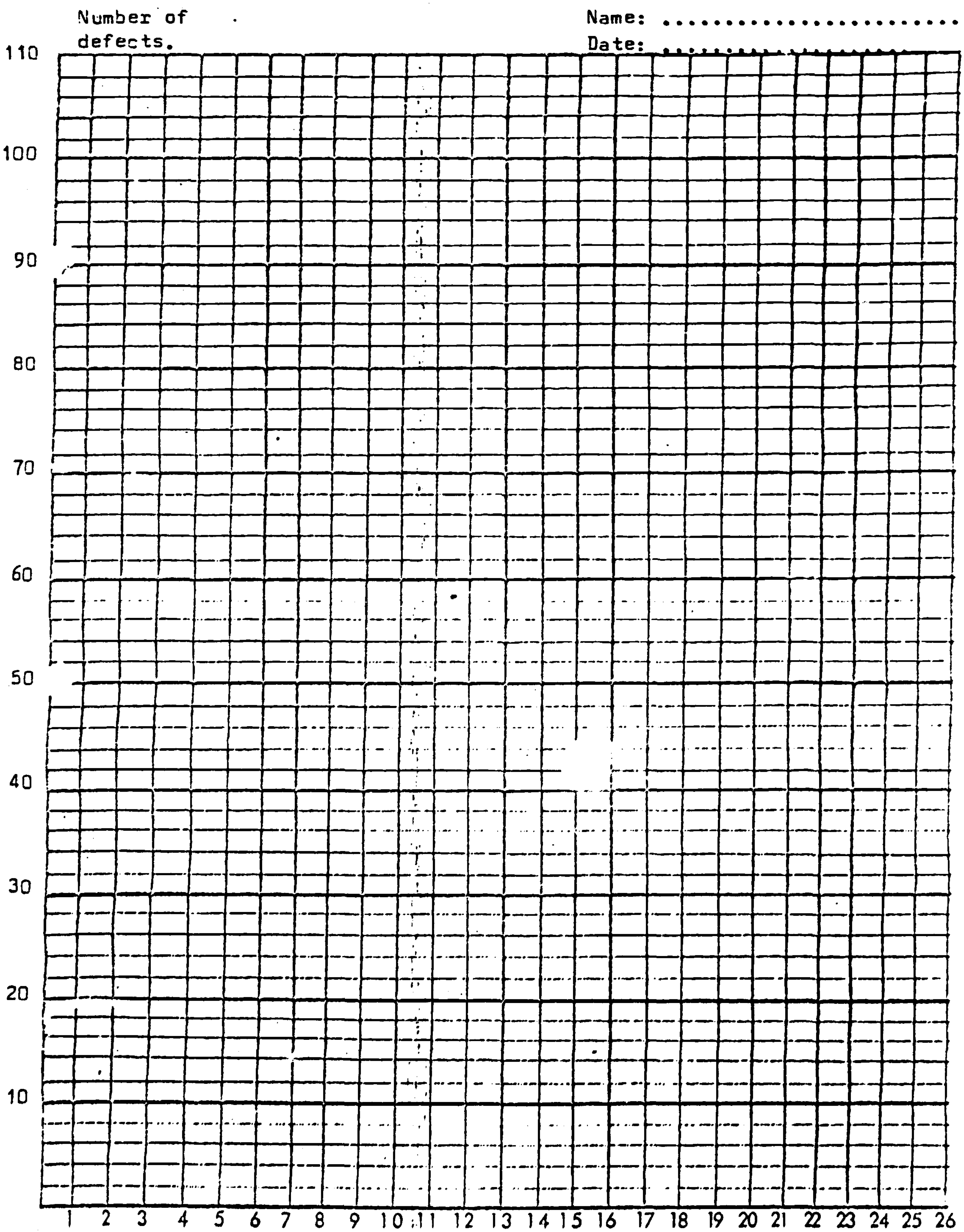
As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

PHASE 2

COMPLETED DEFECT RECOGNITION SCHEDULE

Name: ....

Date: ....



b. <u>The Preventive Maintenance Results Efficiency</u>.

In the chapter on "Preventive Maintenance (see page 56 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evaluation on Preventive Maintenance" as shown on page 57 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

The Preventive Maintenance Results Efficiency.

Name:...........................

% 95 90 85 80 75 70 65 60 55 50 45 40 35

FRAME Nr.:

DATE:

(3 of

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME III OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(3 of 10)

FINAL REPORT
ON
THE DEVELOPMENT OF A
TEXTILE TRAINING SYSTEM
IN PAKISTAN
VOLUME III OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

MANUAL II

WERNER A·MPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

ROVING FRAMES FIXER'S MANUAL

RIETER GS AND F 1/1

Prepared for:

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KARACHI.

Prepared at:

M.FAROOQ TEXTILE MILLS
KORANGI - KARACHI.

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BRUSSELS - BELGIUM.
NEW - U.S.A.

DECEMBER 1980.

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I N D E X

PERSONNEL SPECIFICATION

Job:	ROVING AND DRAWING FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum _ months good roving tender or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy weaverroom.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

ROVING FIXER'S MANUAL

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months GOOD spinning/roving experience.
The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (4 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you.
Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.
Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

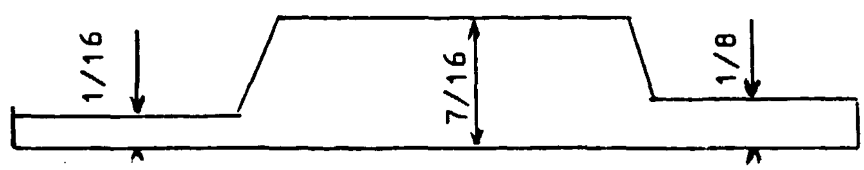
3.8 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool,box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.

A fixed position or datum is used, e.g. the position of the top rollers.

Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.

When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

plan or roller

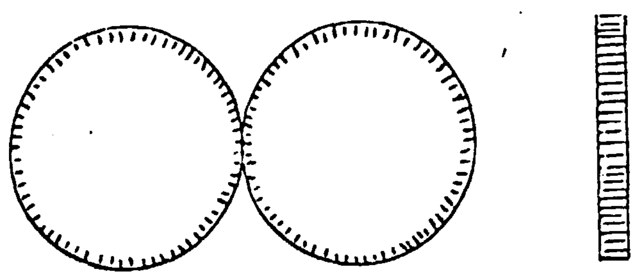
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

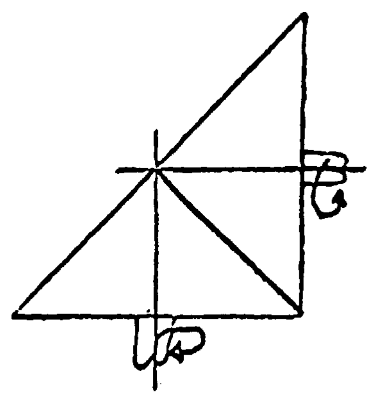
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



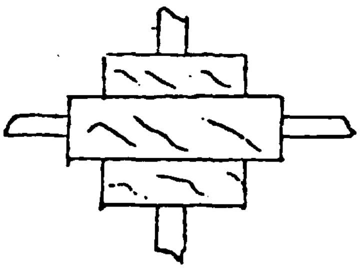
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



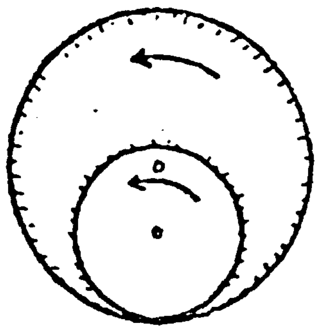
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



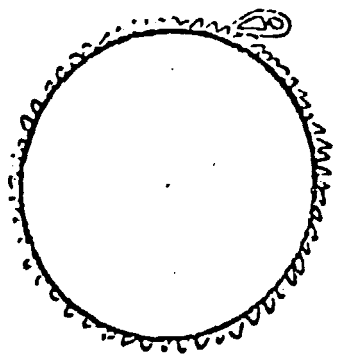
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. 120 Kg.

4 m. 6 m.

180 Kg. 90 Kg.

4 m. ? m.

180 Kg. ? Kg.

4 m. 5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

ROVING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided into 6 groups:

1. A. DRIVE
   B. PNEUMATICS

2. A. BOBBIN CARRIAGE AND DRIVE
   B. FLYERS

3. A. PACKAGE BUILD F 1/1
   B. PACKAGE BUILD GS

4. CHANGE POINTS:

5. A. DRAFTING SYSTEM F 1/1
   B. DRAFTING SYSTEM GS

6. A. SAFETY DEVICES
   B. WASTE COLLECTION SYSTEM

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all six (6) groups of adjustments so that when complete, the trainee has completely set up six (6) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

PHASE 1 OF THE TRAINING

GROUP 1 A. THE DRIVE
B. PNEUMATICS

1.A THE DRIVE.

1. DESCRIPTION.

Power for the roving frame is provided by a totally enclosed, fan cooled motor that is mounted between the 2-3 samson below the drafting system and after the cones . Pulleys on the shaft drive the main shaft with the differential gear.

2. PURPOSE.

The drive transmits power to the various mechanisms of the frame. Through its pulleys, belts, sprockets, gears and rolls, the movement is imparted to make the roving sliver and wind it upon the bobbins. The drive also powers other auxiliary mechanisms such as the hank counter.

3. CONSTRUCTION.

The roving frame has individual motor drive and the horse-power and voltage are determined by the number of spindles and mill specifications.

The driven pulley is attached to the main shaft directly above the driver pulley. Both pulleys are the plain V-belt type. The main shaft is mounted upon ball bearings that rest upon, and pinned to the samsons it extends into the head and cabinet.

4. PARTS.

1 MOTOR
2 PULLEYS
3 SLIDES
4 COUPLING.

5. SETTINGS.

The motor is mounted into slides and is adjustable.
A change of speed through the drive is accomplished by changing to different size pulleys.
Both pulleys must be properly aligned to avoid wear of the belts.

OPERATING CONDITIONS FOR V-BELTS.

To endure good operation, the following points concerning the V-belts should be watched:

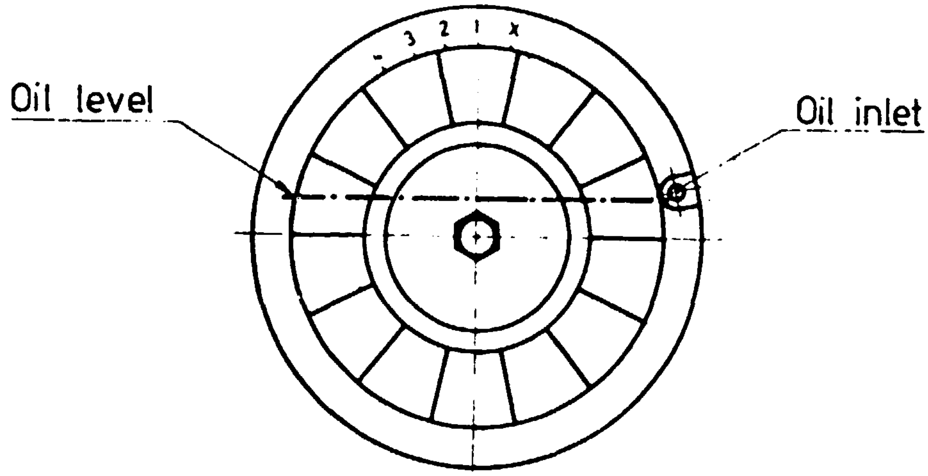
1. The belts should not be taut like violin strings. Proper belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 m. and over.
2. Never use any adhesives. The V-belts should be kept clean and dry, and should be protected from oil and grease. V-belts do not reauire any maintenance.
3. Forcing the belts over the grooves will damage the pull cord and reduce belt life. For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.
4. Belts and pulleys should not heat up. Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.
5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.
6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.
7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only.

Belt tension: The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

HYDRAULIC COUPLING FOR GENTLE STARTING. (Fig.1)

Running-up the machine can be regulated by varying the oil filling in the hydraulic coupling.

- Turn the hydraulic coupling until the mark "1" is vertical.
- Pour in oil up to the filling hole. If the machine takes too long to run up with this filling, set mark "X" vertical and fill up to the hole again. If the run-up is too quik, set mark 2,3, or 4 vertical and drain off oil accordingly.



1.B PNEUMATICS F 1/1 - GS.

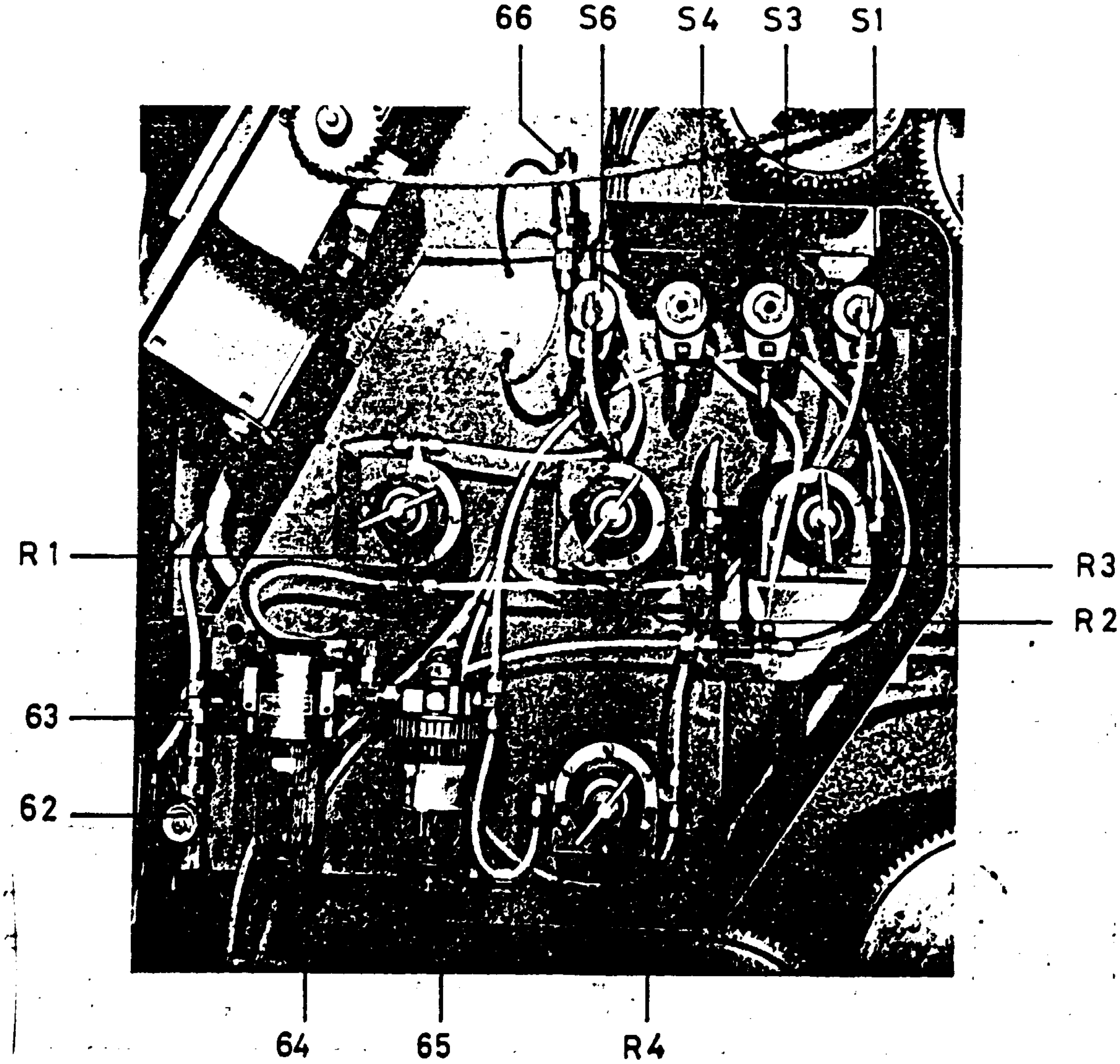
1. DESCRIPTION.

Air pressure is provided by an independent compressor.
The supply pressure must be 7-9 bar and the operating pressure 4,5 - 5,5 bar.

2. PURPOSE.

The air pressure drives various mechanisms of the frame such as loading the drafting system, builder motion, brake and lubrication.

Figure 1B.1



3. PARTS. (Fig. 1B1)

62 MAIN AIR COCK.
63 NON-RETURN VALVE
64 WATER SEPARATOR
65 OIL VAPOUR LUBRICATOR
66 OVERPRESSURE VALVE

R1 Pressure reducing valve for drafting arrangement weihting, working pressure
R 2 Pressure reducing valve for drafting arrangement weighting, reduced pressure for standstill.
R 3 Pressure reducing valve for control functions.
R 4 Pressure reducing valve for brake
S 1 Electromagnetic valve for brake
S 3 Electromagnetic valve for cone belt relieving
S 4 Electromagnetic valve for reversing clutch
S 6 Electromagnetic valve for drafting arrangement weighting.

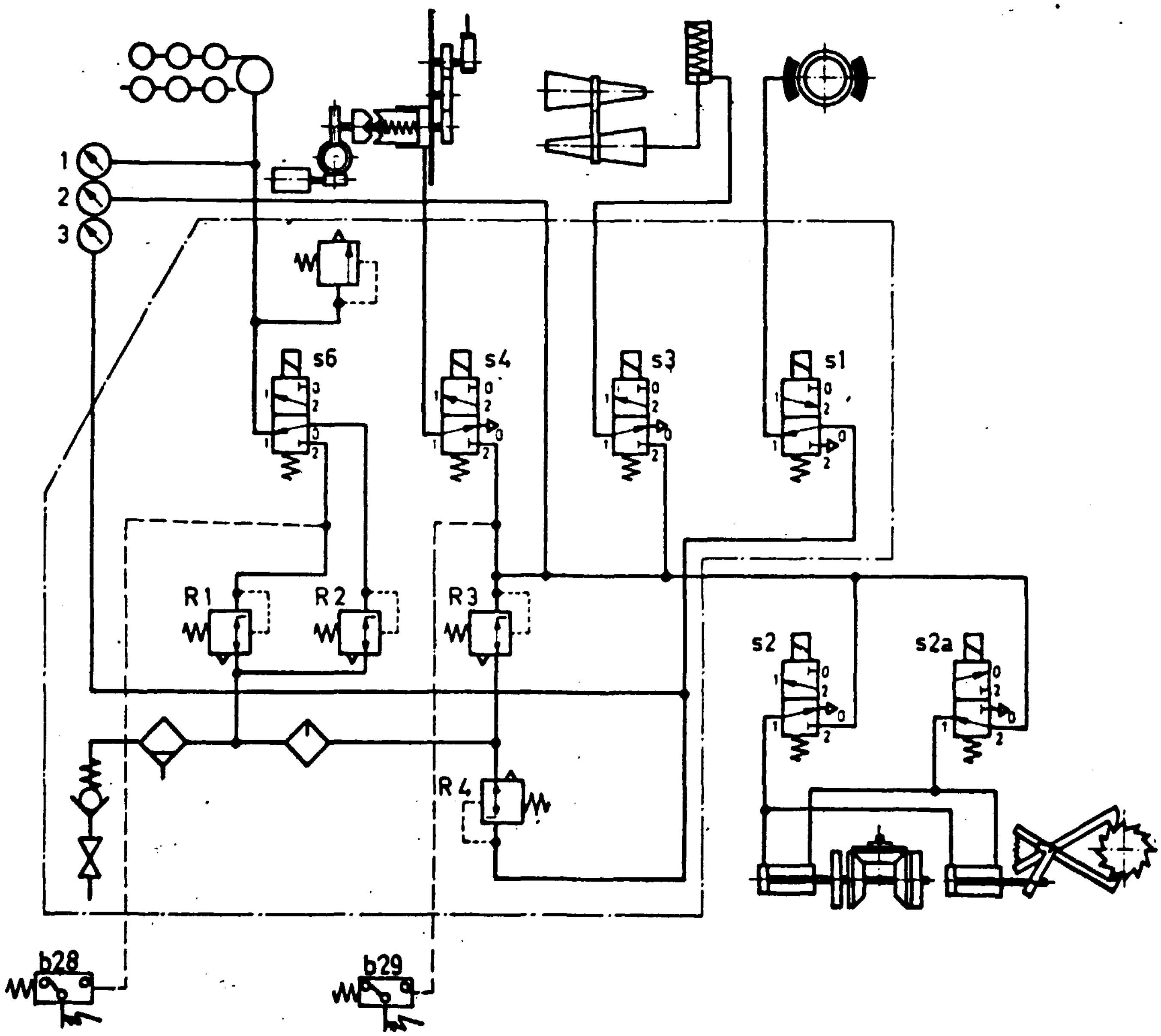
4. SETTINGS.

1. Weighting of drafting arrangement.

Adjust the working pressure of 0.8 at ga. marked on the pressure gauge (1),Fig.6, with the reducing valve R 1. Pressure is monitored by an overpressure valve and a diaphragm pressure switch B28, which stops the machine if the pressure drops below a certain level. Switch B 28 is mounted on the panel, Fig.5.
The hose pressure is normally 0.8 at ga., and the diaphragm pressure switch is set to about 0.5 at.ga. in the works.
To spare the top rolls on the one hand and to avoid broken rovings on the other, if the machine is to be stopped for a long time the weighting of the drafting arrangement should be reduced rather than complete switching off.

The reduced pressure is obtained automatically by turning the main switch A 1 (Fig.6) from 1 to 0. It amounts to 0.2 - 0.3 at.ga. and is adjusted with the pressure reducing valve R 2.

Figure 1B.2



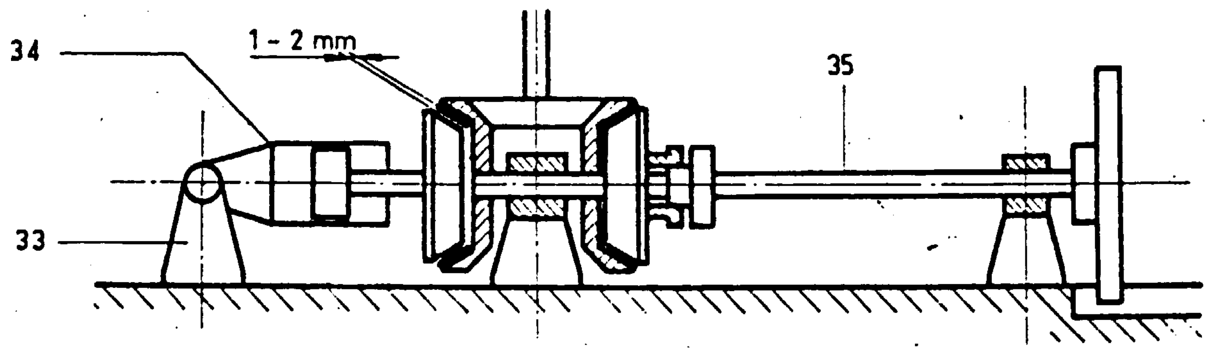
2. Builder motion, carriage reversal, cone belt relieving.

The following functions of the building motion are controlled pneumatically:

- Movement of the pawl on the ratchet wheel via a double-acting servo-cylinder.
- Engaging the clutch to reset the cone belt.
  (Declutching is accomplished electro-mechanically).

The reversing gear is controlled by a double-acting servo-cylinder. Together with the bearing bracket, the housing of the servo-cylinder is to be adjusted so that the piston can perform the same stroke on both sides (Fig. 1B.3).The stroke of the reversing gear, i.e. distance between friction lining and cone, should measure about 1-2 mm.

Figure 1B.3



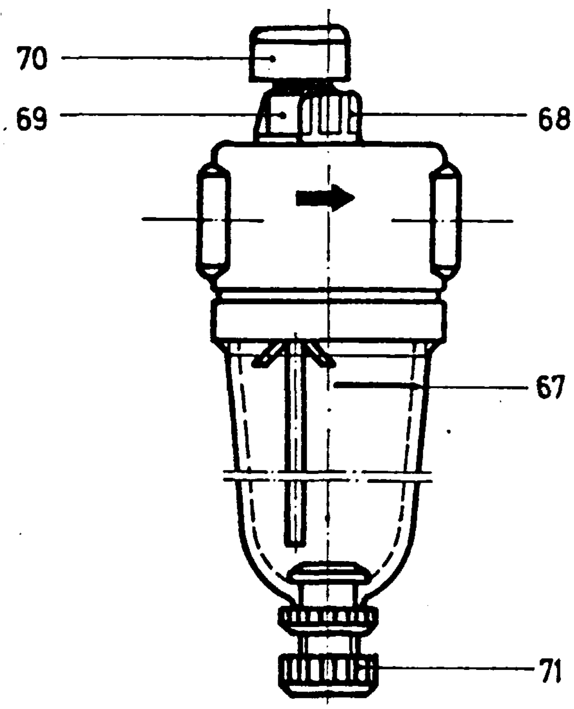
Adjustment: Unfasten piston bracket (33) on baseplate. Draw piston bracket with servo-cylinder (34) and horizontal shaft (35) to the left. Mark the position of the piston bracket on the baseplate. Draw the horizontal shaft with servo-cylinder and piston bracket to the right. Mark the position of the piston bracket on the baseplate. Bring the piston bracket into the mid-position and tighten the screws.

The cone belt is unloaded by the servo-cylinder (24) ,Fig. 3A.2. The end stop is provided by a spacing sleeve inside the servo-cylinder. The cone belt is loaded with a coil spring in the servo-cylinder.

The necessary working pressure is adjusted with the reducing valve R3. It is about 5 at.ga. and is indicated by the pressure gauge (2). This pressure is monitored with a diaphragm pressure switch B 29 fitted in the panel. It is adjusted to 3 at.ga. in the works.

An oil vapour lubricator is fitted for lubricating the rubber gaskets (Fig. 1B.4). The air passes through a Venturi nozzle, and oil is introduced at its narrowest cross section through a capillary tube. Only about 5 % of the oil is atomized and carried by the air stream; the other 95 % drips back into the oil tank.

Figure 1B.4



67 Oil level,max.filling height.
68 Oil filling plug
69 Sight glass
70 Setting ring for oil flow
71 Oil drain

Adjusting the oil flow.

The oil flow (rate of drops)is adjusted with the red setting ring (70). This ring must be pulled up to readjust it. By pressing it down the adjustment is locked. Locking alters the drop adjustment slightly, and this must be taken into account when adjusting.

- Turning clockwise means less drops
- Turning anticlockwise means more drops.

The adjustment can be made with the machine stopped (main switch on).
- Operate cone belt relief, at the same time watching the oil flow (number of drops) in the sight glass. During this operation 1 or 3 drops of oil should pass through the sight glass.

Replenishing the oil.

Use spindle oil: Item E of F of the General Lubricating Instructions D 17 a.

Shut off the air, release pressure, unscrew plug (68) and pour in oil. The container may be filled up to the mark (67) at the most. If the mark is missing, not higher than 1 cm. below the die casting.

IMPORTANT!

Clean the oil container only with hot soapy water. Detergents will decompose the plastic! Apply silicone grease to O rings.

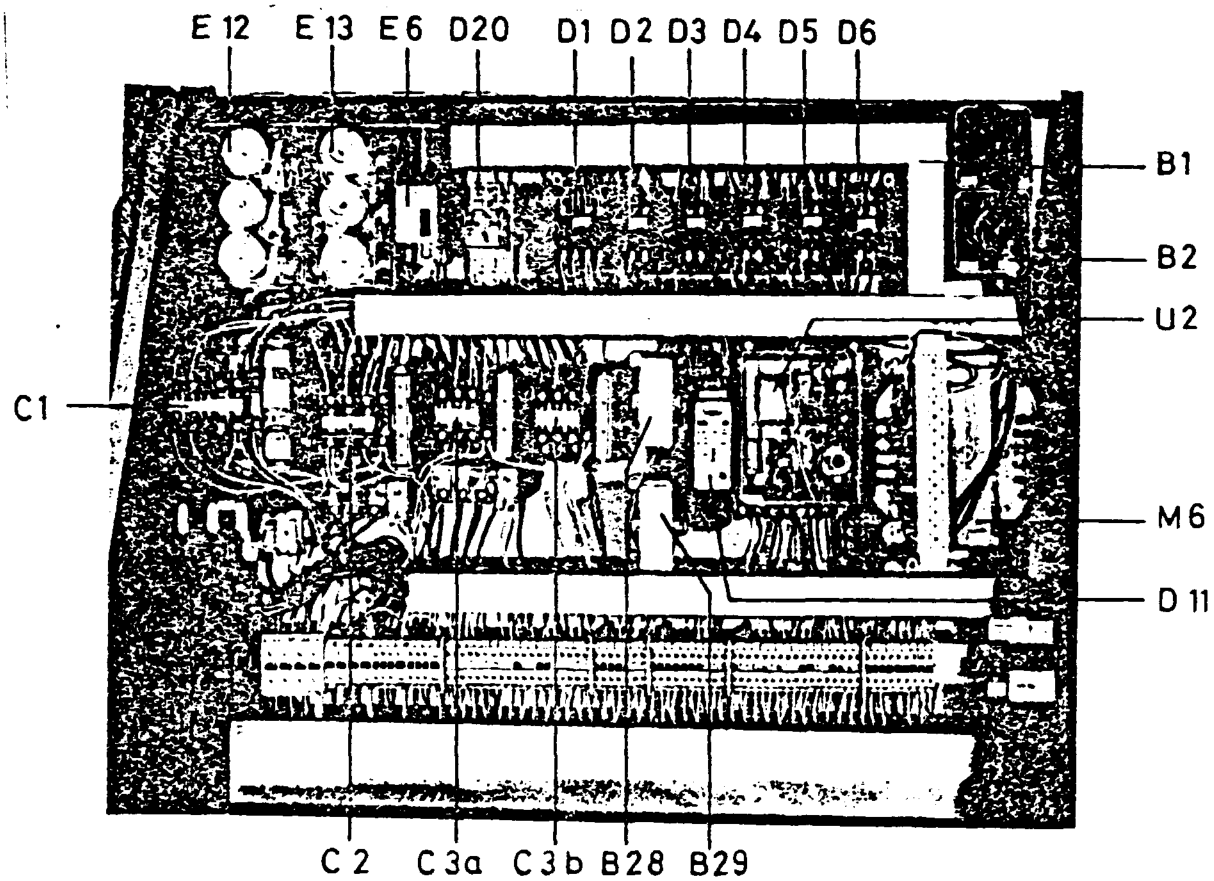
3. Brake.

The brake is in action when the machine is switched off. The braking time is adjusted with the pressure reducing valve R 4 (Fig.1B.2). It should take about 5 seconds, corresponding to about 1 at.ga. on the pressure gauge (3),Fig. 1B.6.

4. Delayed fan starting (Fig. 1B.5)

The time lag is the same for starting and stopping: about 5 seconds. It is adjusted on the time relay D 11.

Figure 1B.5



B 1	Pneumastop selector switch "On - Off"
B 2	Light barrier selector switch "On-Off"
B 28	Pressurestat for draft system.
B 29	Pressurestat for builder motion and carriage reversal.
C 1	Main motor contactor
C 2	Suction clearing motor contactor
C3a/C3b	Contactor for builder motion reversal motor (two directions of rotation).
D 1	Auxiliary contact for machine "Operating".
D 2	Auxiliary contact for delayed fan starting and stopping.
D 3	Auxiliary contact for cone belt relief and builder motion reset.
D 4	Auxiliary contact for light barrier.
D 5	Auxiliary contact for Pneumastop
D 6	Auxiliary contact for builder motion reversal ended.
D 11	Time relay for delayed fan starting and stopping.
D 20	Auxiliary relay for Pneumastop (6 V)

E 6 Automatic circuit breaker for control voltage

E 12 Fuses for suction clearing motor

E 13 Fuses for builder motion reset motor

M 6 Transformer for control voltage

U 2 Amplifier for light barrier.

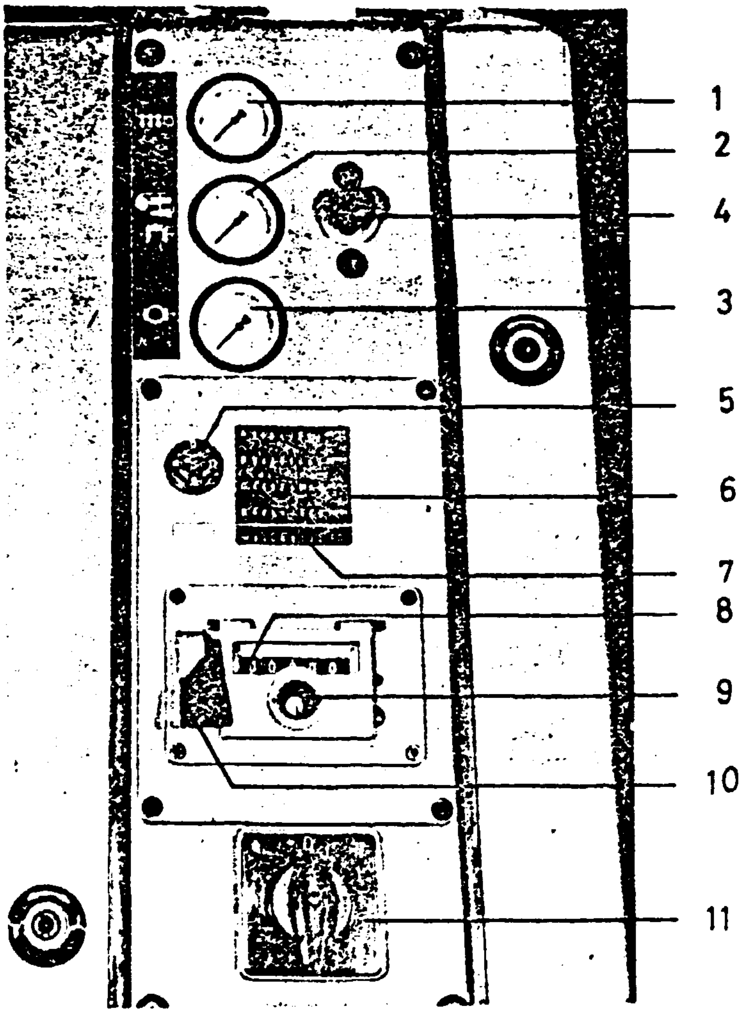


Figure 6.

1 Pressure gauge for weighting draft

2 Pressure gauge for cone belt relief, reversing gear, cone belt reset, actuating pawls.

3 Pressure gauge for brake

4 Selector switch B4 for cone belt relief.

5 Shift selector knob

6 Shift counter

7 Elapsed time meter

8 Predetermined roving length stop

9 Safety lock for adjusting roving length

10 Counter reset

11 Main switch A 1 for interrupting power supply and reducing the weighting on the draft system.

GS.

5. Fittings and connections for the pneumatic pressure.

The reducing valve with the appropriate fittings is housed in the headstock and installed complete.
The lay-out of the piping and fittings is shown in Figs.1B7a and 1B7b.
Before putting the drafting arrangements into commision the entire pneumatic system is to be checked as follows:

6. Safety valve.

The safety valve is only set to blow off at the maximum admissible working pressure of the drafting arrangements, and as soon as its discharge causes the pressure to drop once more it seals tightly again when the minimum working pressure is reached.
In drawing-up the table the following overpressures were chosen above the maximum working pressure:

Max.working pressure kg/cm2g (at.ga.0	up to 0.7	0.71 - 0.85	0.80 - 10	1.1 - 1.5
Overpressure at which safety valve responds	0.05 - 0.1	0.1 - 0.15	0.1 - 0.2	0.15 -0.25

Before putting the machine into service the safety valve is to be checked by raising the pressure slowly and carefully. If it does not blow off within the specified range the safety valve needs re-adjusting. If considerable re-adjusting is called for, this indicates fouling of the safety valve. It must then be cleaned and correctly adjusted afterwards.
After this check of the safety valve, the guide arms must be inspected for location and pressure once again, to make sure that nothing has been shifted.

7. Throttling point.

After reducing valve a throttling point (B) is fitted (Fig. 1B7c). This ensures proper functioning of the safety valve. Under overpressure the air can only pass slowly through this throttling point, so that in the event of any incorrect manipulation the safety valve is able to discharge the excess air.

8. Manometer.

The manometer is connected-up so that it shows the hose pressure direct. To prevent damage in the event of the compressed-air supply being opened suddenly, a second throttling point (a) is interposed before the manometer (Fig. 1B7c).

For the machine in question the minimum service pressure is indicated on the scale by a green line, the maximum service pressure with a red line.

The scale range must never be exceeded on the manometers used, and the continuous load should not amount to more than 2/3 of the scale range.

Figure 1B7c

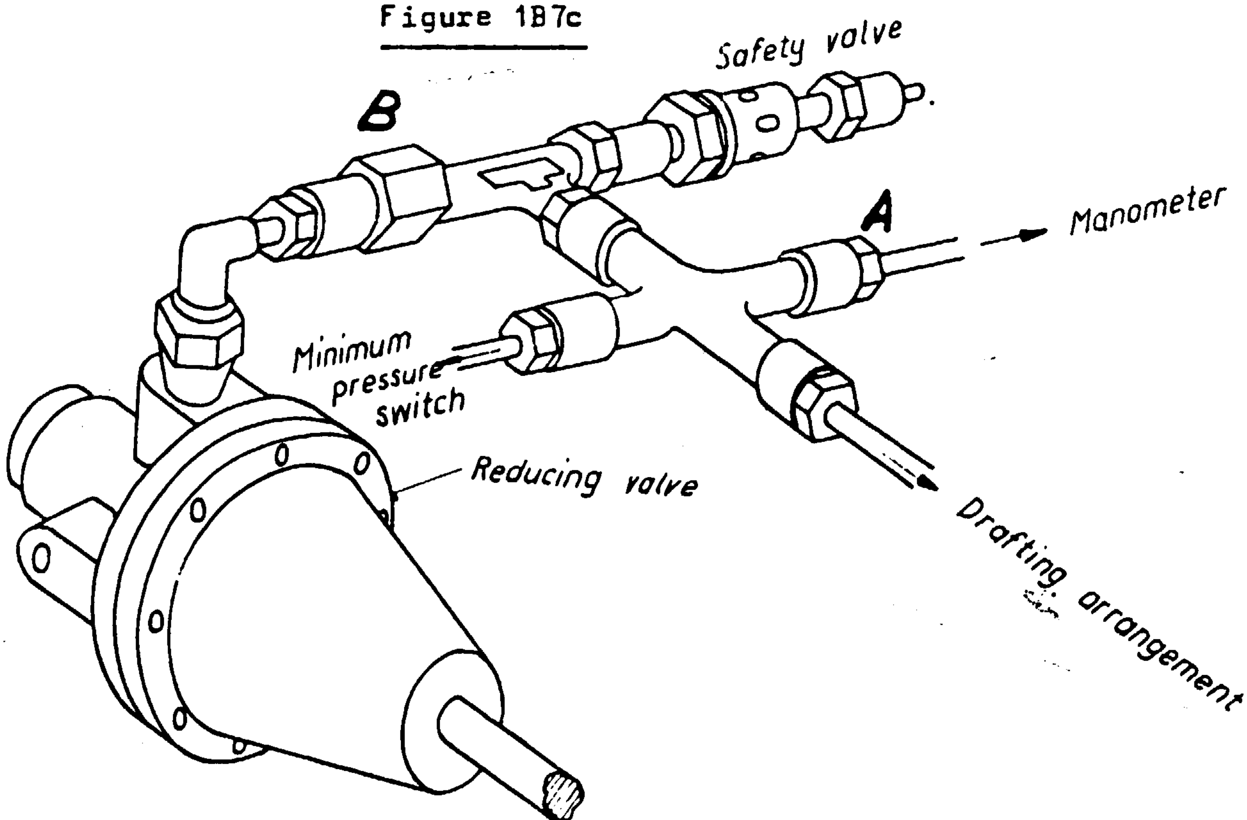


Figure 1B7a

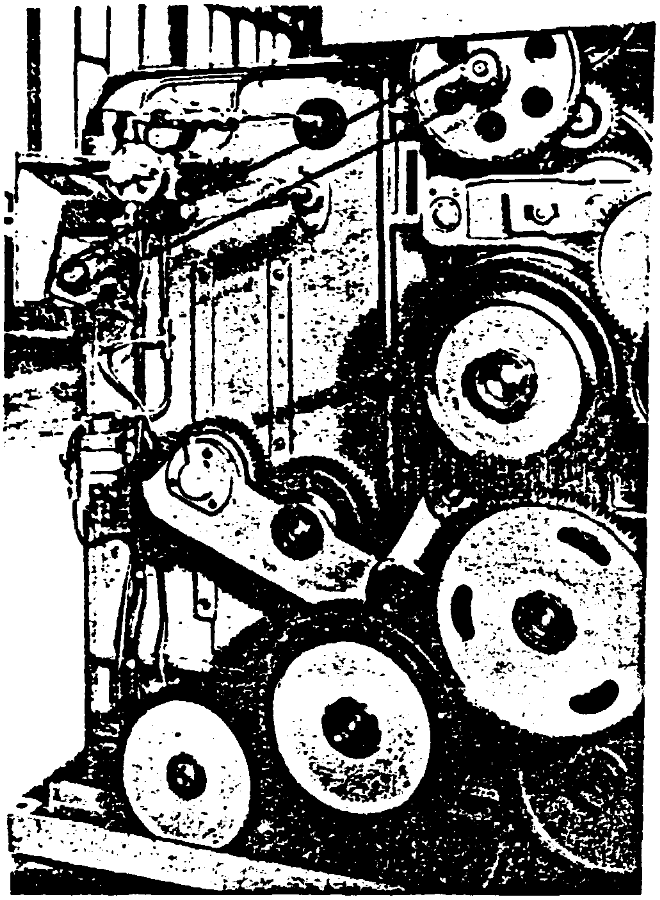
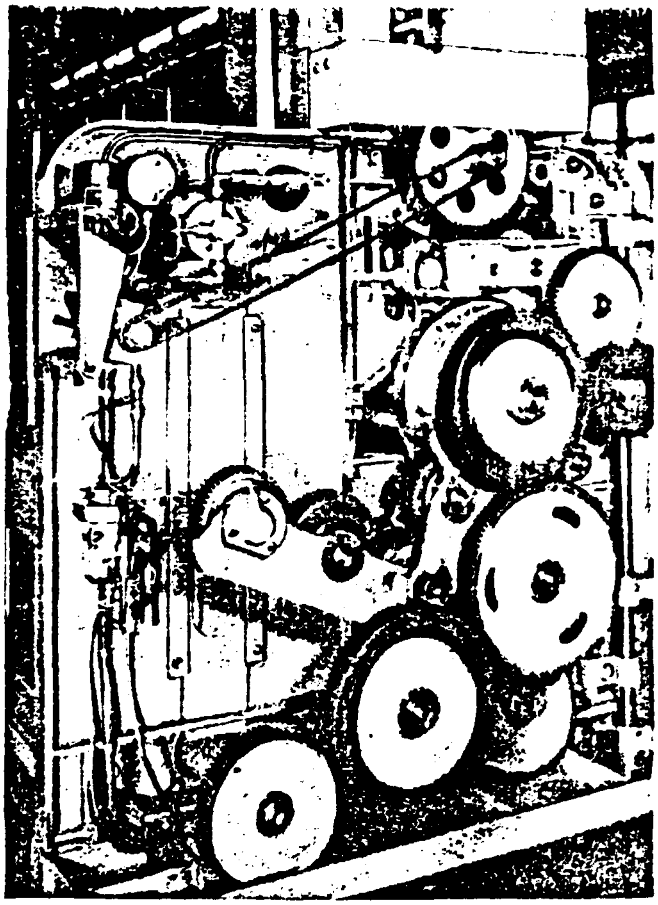


Figure 1B7b



Minimum pressure switch.

The minimum pressure switch prevents the machine running without pressure, or brings it to a stop if pressure should fall due to trouble in the pipe system or compressor installation.
This switch is also adjusted at the works.

The machine should stop when pressure drops about 10 - 15 % below the minimum service pressure. If pressure rises once more, the minimum pressure switch then switches on again around the minimum service pressure.

The functioning of this switch is to be checked at commissioning, and the adjustment corrected if necessary.

GROUP 2. A. BOBBIN CARRIAGE AND DRIVE
B. FLYERS

2.A BOBBIN CARRIAGE AND DRIVE.

1. PURPOSE.

Carries and drives the bobbins.

2. PARTS.

2.1 BOBBIN CARRIAGE
2.2 BOBBIN GEARS
2.3 DRIVING SHAFT
2.4 SPINDLE GEARS
2.5 SPINDLE BUSHES
2.6 SPINDLE CUPS

3. SETTINGS.

3.1 Levelling the bobbin carriage (Fig.2A .1)

- Bring bobbin carriage (2) into mid-position with hand crank.
- Lift covers from bobbin carriage
- Place spirit level on bobbin drive shaft
- With the nuts (1) the bobbin carriage can be levelled.
- Check the bobbin carriage 2 or 3 times from the headstock to the end frame.

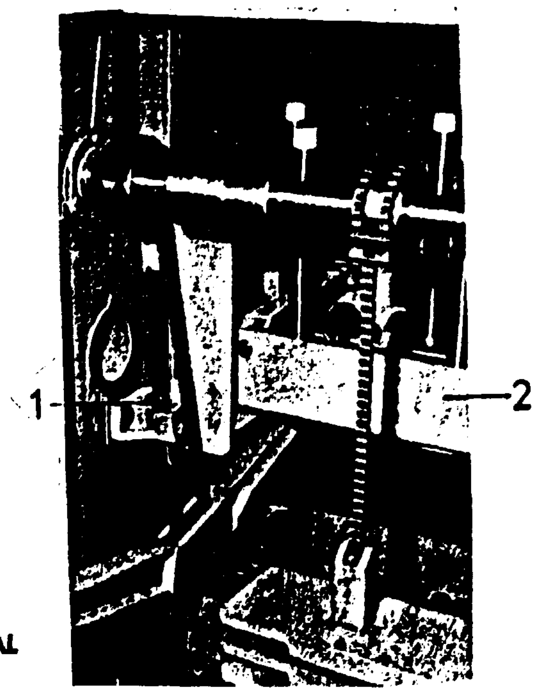


Figure 2A.1

3.2 Adjustment of the drive gears.

- Use of gauge, Fig. 2A.2

  With gauge (8) the height of the spindle drive gears can be adjusted according to A. The distance from drive shaft to spindle or spindle bush can be checked according to b.

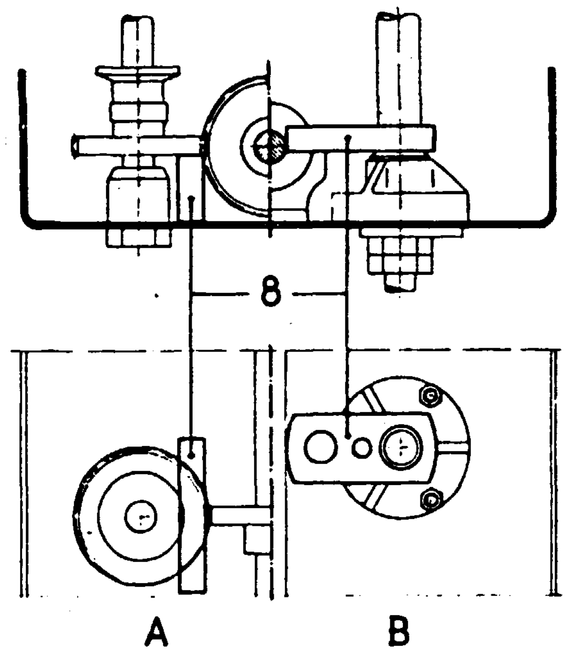
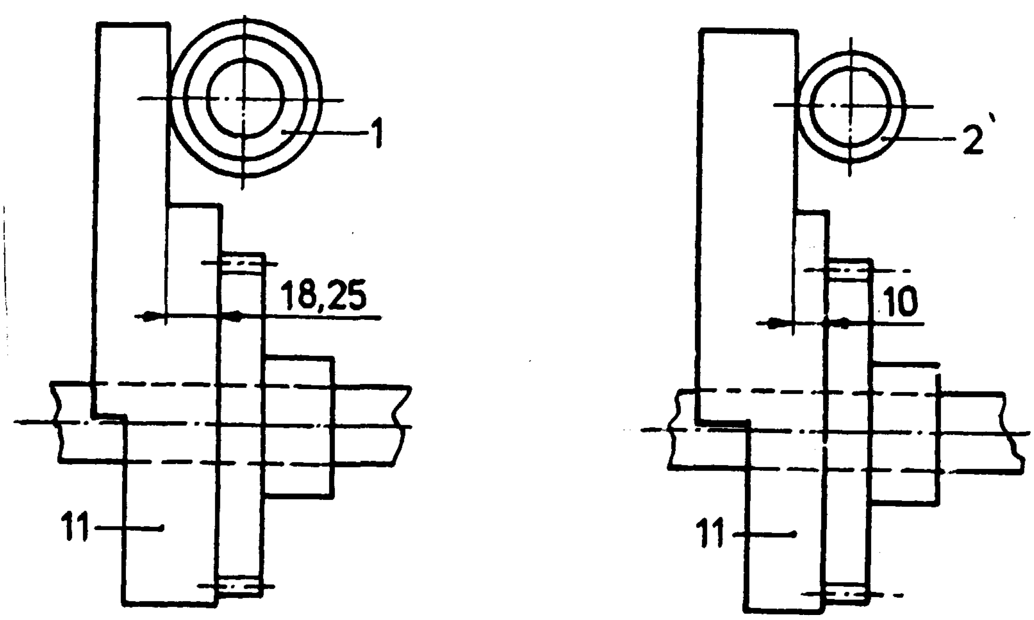


Figure 2A.2

- Use of gauge, Fig. 2A.3

  With gauge (11) the spindle drive gears can be aligned on the spindle cups (1) and the bobbin drive gears with the spindle bushes (2)

Figure 2A.3



2.B FLYERS.

1. FLYER INSPECTION AND RECONDITIONING.

One of the most important factors in the operation of roving frames is the maintenance of the flyers. This assembly is often neglected, even though years of hard and continued service will create mechanical conditions, which may very easily be the cause of a deterioration in the quality of the roving produced. We strongly recommend that flyers should be checked carefully on the semi-annual overhaul of the frame, with particular emphasis placed on the points illustrated below.

1. SMOOTHNESS OF NOSE.
   The nose is handtooled and polished to remove all scars and rough places resulting from wear or abuse.

2. WEAR OF KEY.
   A formed steel key, inserted by means of special equipment, assures accurate positioning with respect to both the horizontal and vertical axes of the flyer.

3. WORN LUGS.
   When necessary to replace, new lugs are brazed onto the hollow arm.

4. FIT OF LET-ON.
   The let-on is reworked to standard dimensions, thus securing a proper fit on the taper of the spindle, with all flyers at a uniform height.

5. POLISH OF HOLLOW ARM.
   The hollow arm is thoroughly cleaned and refinished on the inside. A trouble-some, expensive, but necessary operation.

6. WIDTH OF SLOT.
   The slot in the hollow arm is adjusted and gauged to the proper standard.

7. WEAR OF TIP.

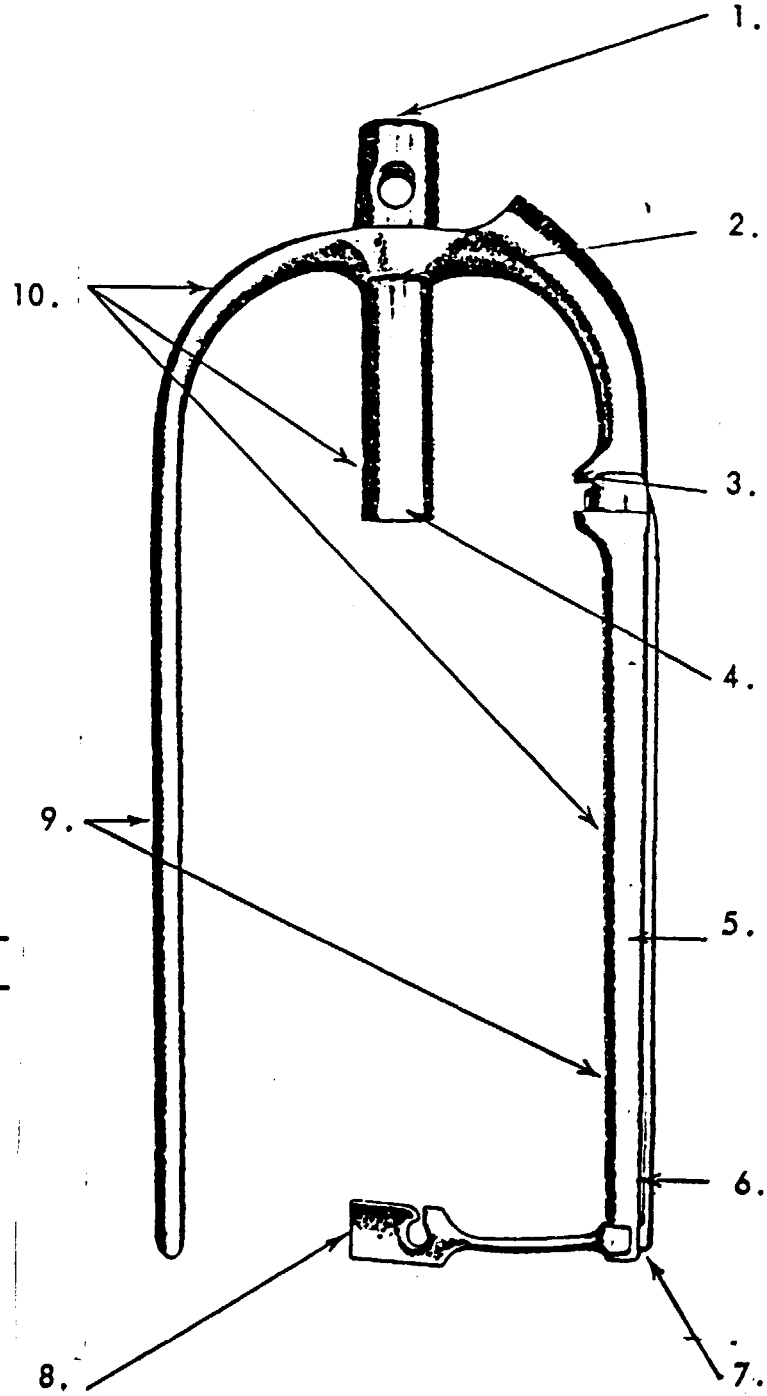
The worm tip of the hollow arm is cut off and a new one of high-grade steel is welded on electrically, thus securing a new wearing surface of unsequestioned durability.

8. PRESSER SHAPE AND BALANCE.

The presser is adjusted to secure the proper shape and balance. All roving marks are removed from the arm and paddle, leaving no rough sports to stretch and tear the roving.

9. FLYER BALANCE.

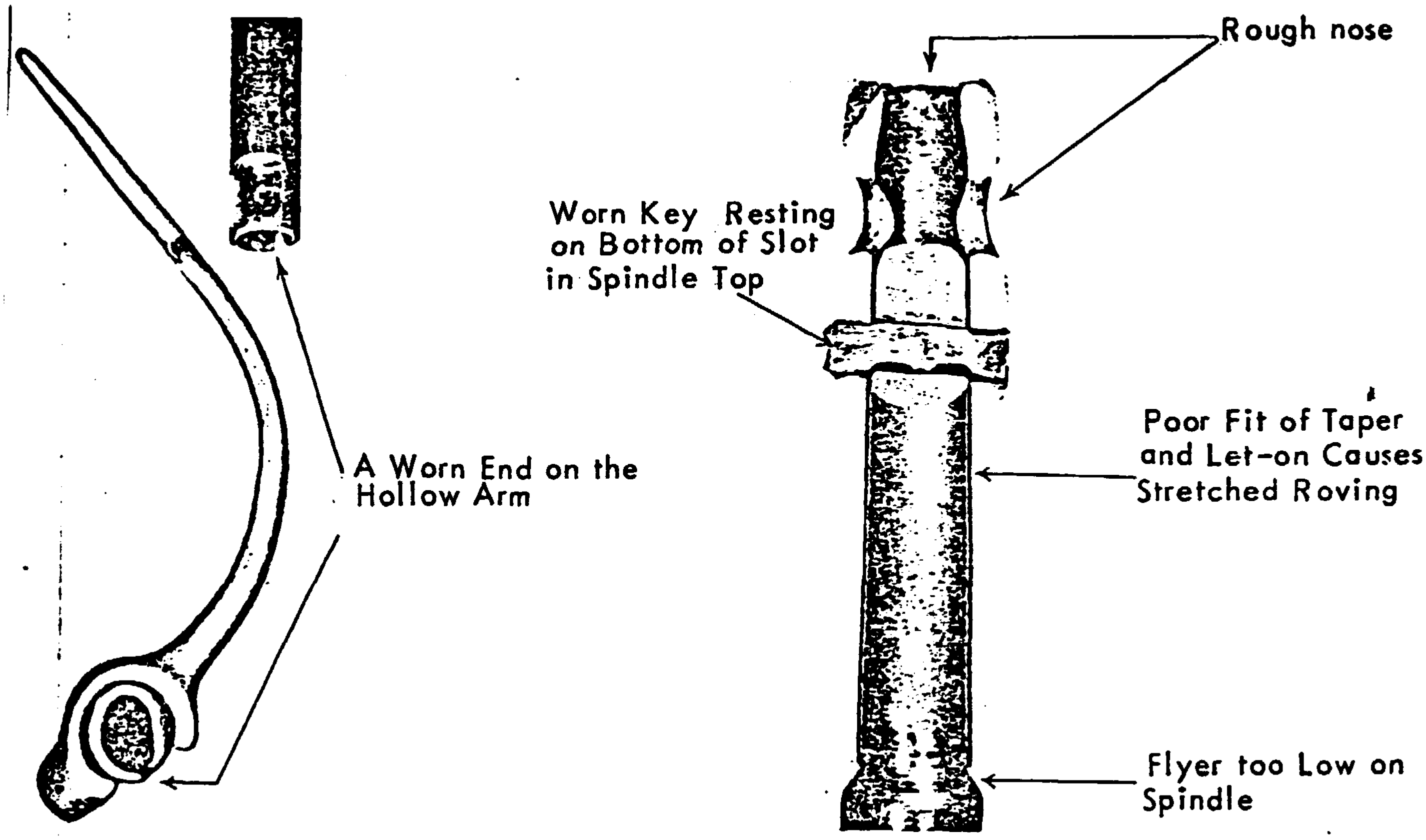
Both legs of the flyer are brought to a perfect balance, using equipment which revolves the flyer at operating speed. Balancing at speeds lower than operating speed gives results which are misleading and entirely unsatisfactory.A flyer perfectly balanced by hand will necessarily be out of frame speed, due to the uneven spread of flyer legs. Tests have shown that our method of balancing is so accurate that an excess weight of ten grains will cause violent vibration of the testing spindle.

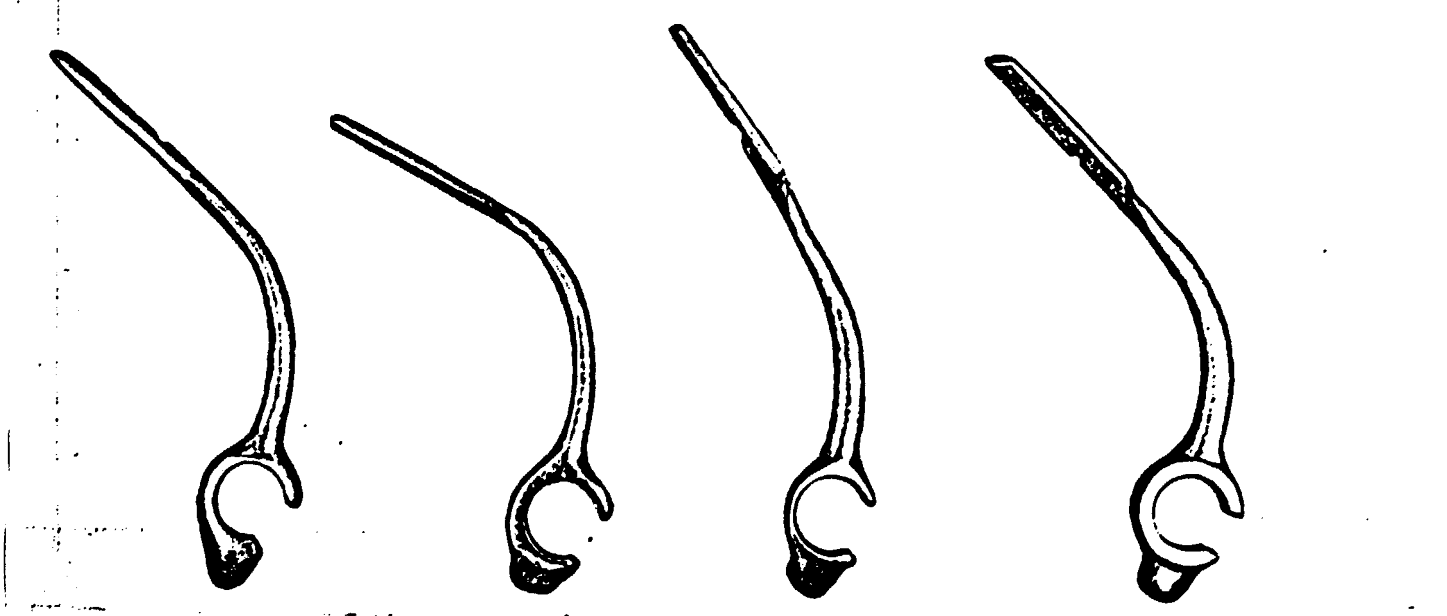


10. OVERALL POLISH.

Every part of the flyer is given a high polish to secure cotton smoothness. This makes it easier to keep dirty lint and slugs from being drawn into the roving.

FLYER INSPECTION





Bent and Misshapen Presser Arms

A New Presser Showing Correct Shape and Curvature

2. A USEFUL FIXTURE FOR REPAIRING PRESSERS.

Modern production methods in the textile industry demand and require the strictest maintenance of uniformity in the processing of fibres throughout the various manufacturing stages to which they are subjected, from the opening room to the finished yarn. Particularly is this constant vigilance necessary in the roving process, where uniform and precise tension is the important factor in securing and maintaining a consistently high quality product.

On the two previous pages, we have endeavored to illustrate and effective routine of flyer inspection. Assuming that all of the defects discovered in such an inspection have been repaired, the flyer should be in good condition for several years of usage, provided it is not damaged by rough handling or abuse.

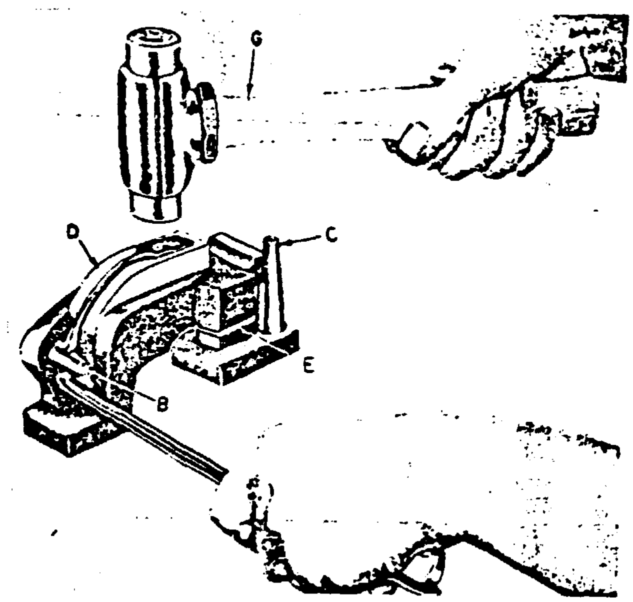
However, the condition of the Presser Assembly is often overlooked, and should not be as it has a very important function to perform. The stresses and strains to which the Presser Arm is subjected during the operation of the frame, may bring about a gradual distortion which destroys its curvature and, consequently, the balance of the flyer. Experience has shown that the Presser, in poor condition, may create a set of conditions which cause linear irregularities in the roving; the flyers operating with faulty Pressers may cause variations in the roving produced on different spindles, even though the sliver may be identical and the drafting performed effectively and with a high degree of fibre control.

To enable the mechanics in the mill to carry on an intelligent and "on the spot" repair of faulty Pressers, it has been designed the "A.R. Presser Repair Kit" .

THE "A.R." PRESSER REPAIR KIT

A cast-iron anvil weighting about five pounds is the basic element of this unit. The top of the anvil is recessed to receive the template blocks D., of which there are seven sizes, as shown in Figure 2.A tapered horn, C, Figure 1, is fastened to the base as shown in Figure 3 and 4. A slot is cut in the face of the anvil base at E. The unit is completed by the rawhide hammer G.
The major operations which can be quickly carried out with this special kit are illustrated in the accompanying figures.

FIG. 1



The Presser, after being removed from the flyer arm, can be brought to the correct shape by placing the lower bearing on the anvil horn B. The diameter of the horn is suitable for all sizes of Pressers, and its position is fixed in the anvil base. With the Presser secured on the block, and held securely by the horn of the anvil, it is quite easy to bring the arm of the Presser to the correct curvature.

FIG.2

Each set contains seven templates of different sizes to shape Presser Arms.

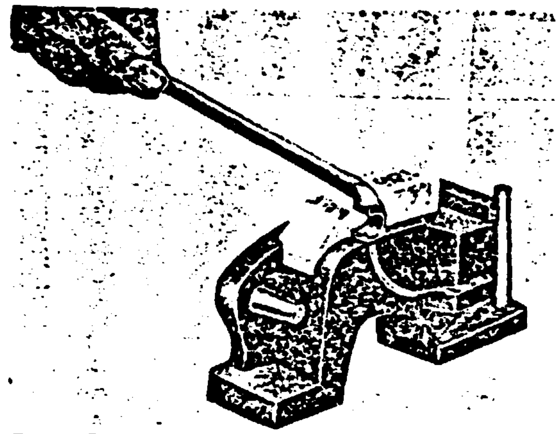


FIG.3

If the paddle of the Presser is not exactly parallel to the main axis of the flyer, it can be quickly brought to the desired position by inserting it in the slot, and bending it until it comes to the correct position.

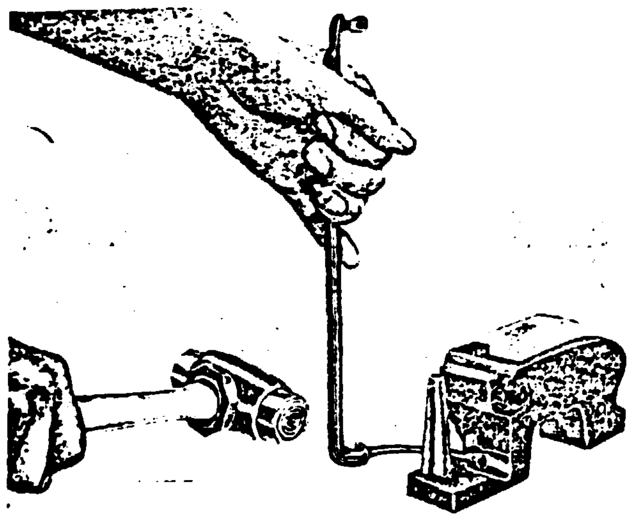


FIG.4

For shaping the shank of the paddle,in the section not in contact with the template, the Presser is put on the anvil, as shown, when a few taps with the rawhide hammer are sufficient to obtain the curvature required at the shank.

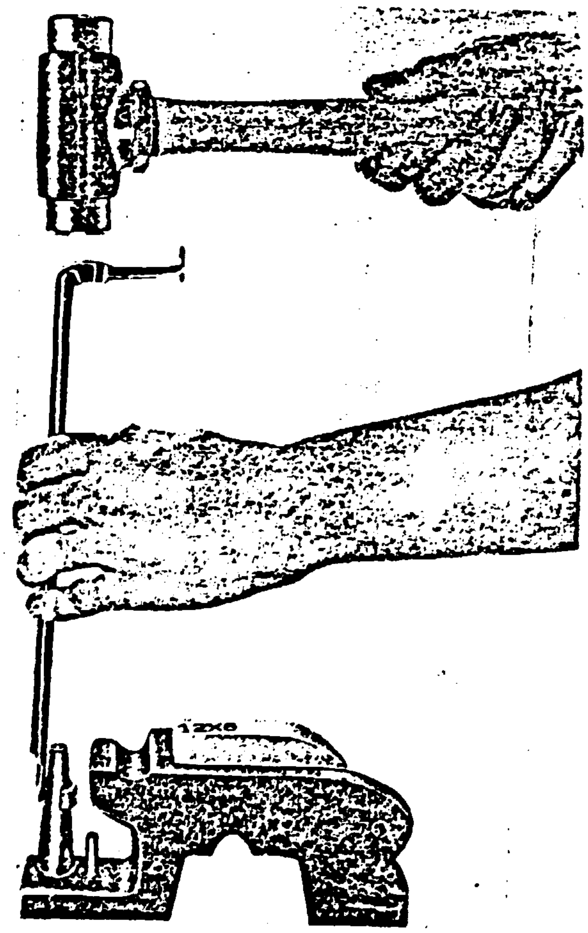


FIG.5

This illustration shows how the assembly is used to spread the bearing eye of the Presser to secure the correct fit on the flyer leg.

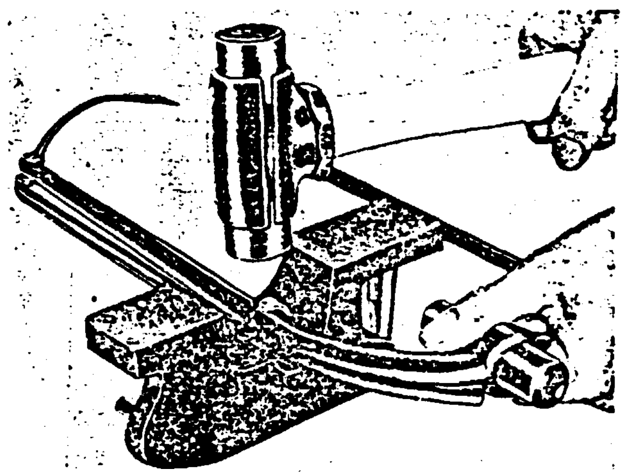


FIG.6

If the leg of the Presser is bent or misshapen, it may be brought back into shape by placing it on the top of the anvil, as shown, and tapping it with the rawhide hammer until corrected.

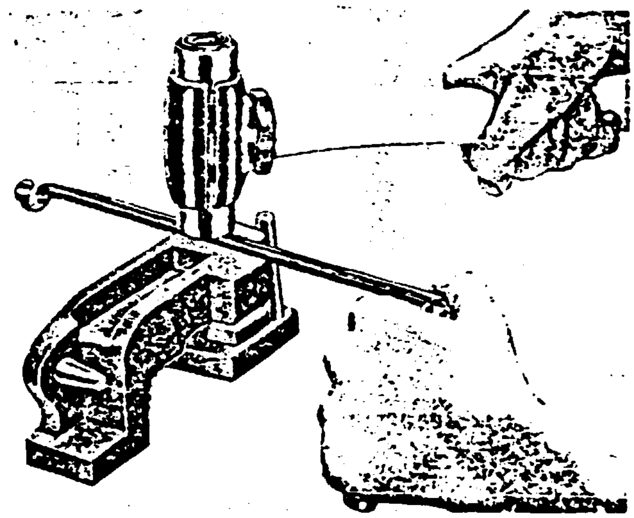


FIG. 7

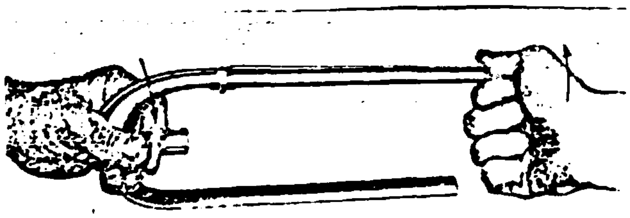
After the Presser has been brought to the correct shape at critical points, it is attached to the leg of the flyer, and the eye closed by a few light strokes of the hammer while the flyer is laid in the "V" of the anvil as shown.

3. ASSEMBLING THE PRESSER TO THE FLYER IN FOUR SIMPLE OPERATIONS

Inspection of flyers in need of repair shows that many of the curls and paddles have been damaged during the assembling of the presser and the flyer. Since it is important that this process, though simple, be properly done, the process employed by flyer makers is illustrated here.

Taking off the presser, Figure 1. Hold the flyer firmly at the top in left hand, solid arm down. Grasp the presser paddle with the right hand and exert upward pressure, the right hand turning from the body, the left hand toward the body. When sufficient pressure has opened the curl, it will drop free from the lugs, thereby allowing the presser to be removed from the flyer without strain.

FIG.1



To reassemble the flyer and presser, Figure 2., take the flyer in the right hand, hollow arm down. Pick up presser in the left hand, with paddle up, and insert end of the hollow arm into the boss of the presser. Continuing to hold the flyer in the right hand, Figure 3, bring the curl of the presser to rest over the slot between the lugs.

FIG.2

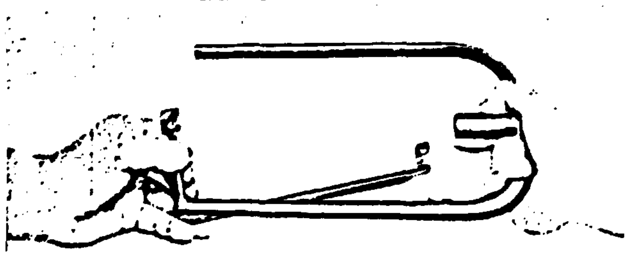
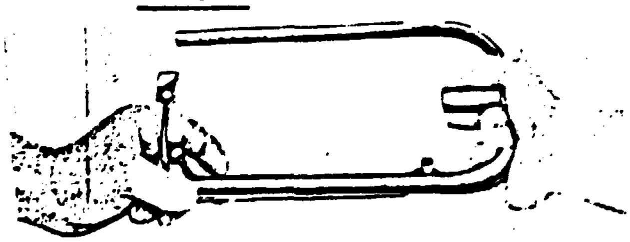
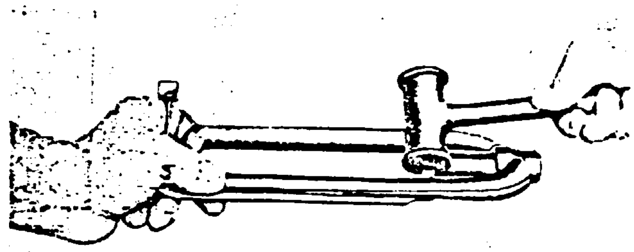


FIG.3



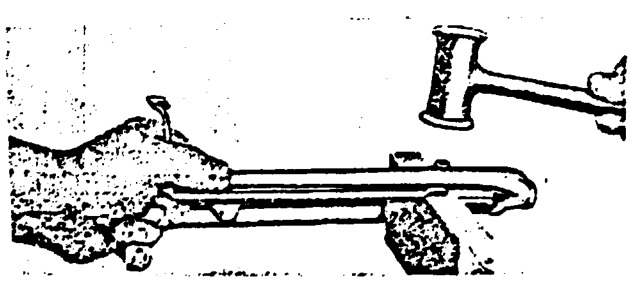
As in Figure 4,transfer the flyer to the left hand with presser in position, and rest the flyer on the bench. Use either a rawhide or a copper hammer to spring the curl of the presser onto the hollow arm of the flyer.

FIG.4



Continue to hold the flyer and presser with the left hand, Figure 5. Place the flat part of the presser curl on a hardwood block. Use either a rawhide or a copper hammer to close the curl around the hollow arm of the flyer, exercising due care to avoid distortion of the slot in the hollow arm. In the event that the presser does not move freely on the flyer, exert a slight pressure on the presser paddle, as shown in Figure 1. In case the presser continues to bind, the difficulty may be traced to the curl cramping in the slot. This condition may be relieved by tapping the edge of the curl one way or the other.

FIG.5



GROUP 3 : A PACKAGE BUILD F 1/1
B PACKAGE BUILD GS

3.A PACKAGE BUILD F 1/1

1. PURPOSE OF THE REVERSING APPARATUS (See Fig.

This is fitted ready for operation in the headstock and performs the following functions:

- Reversing the carriage motion after each lift end to achieve the bobbin shape required.
- Shortening the lift after each reversal.
- Shifting the cone belt after each bobbin winding.

2. PARTS.

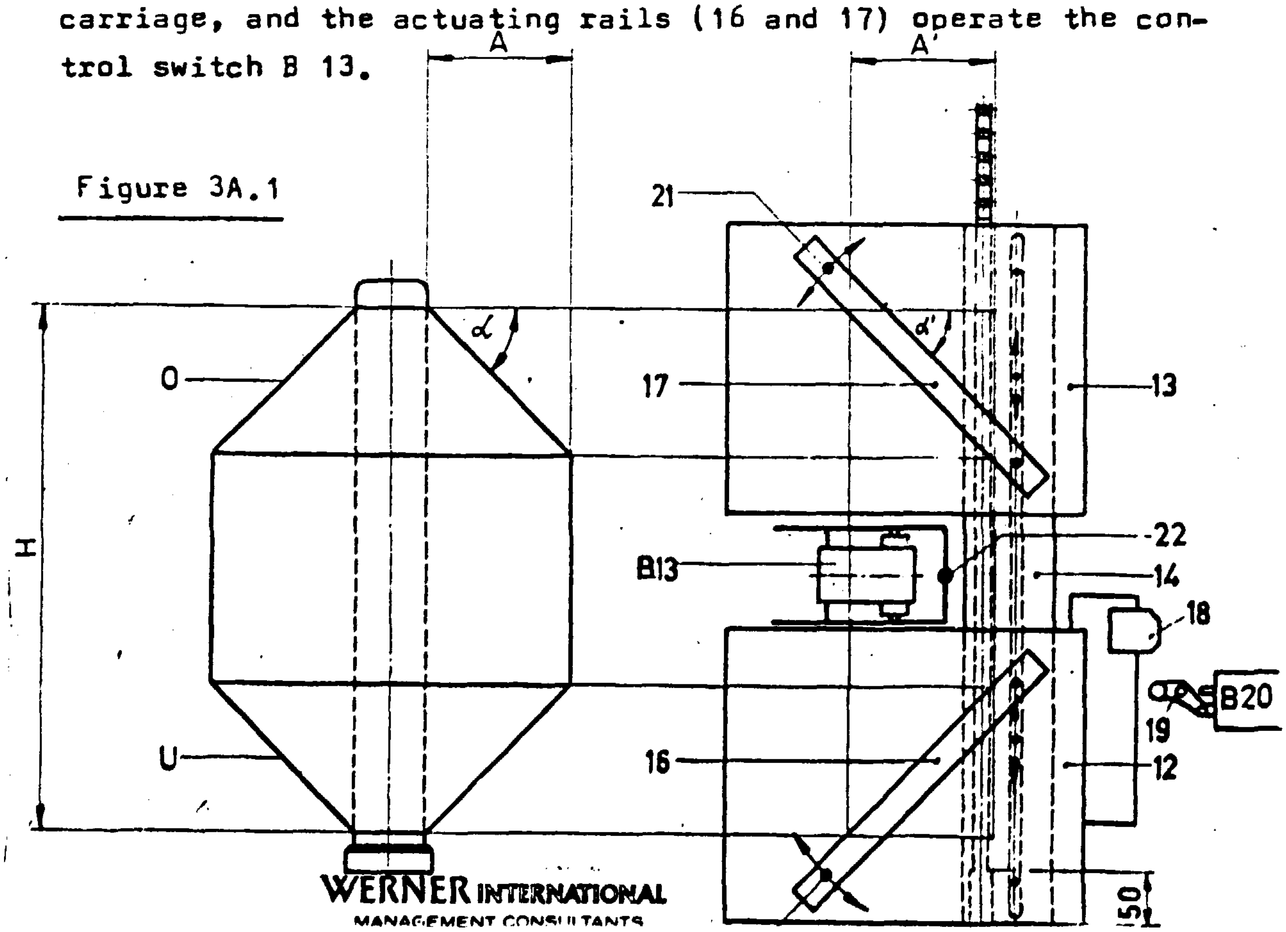
See figures and text.

3. SETTINGS.

1. Builder motion, traverse guides, Fig. 3A.1

The traverse guides (12 and 13) perform the same as the bobbin carriage, and the actuating rails (16 and 17) operate the control switch B 13.

Figure 3A.1



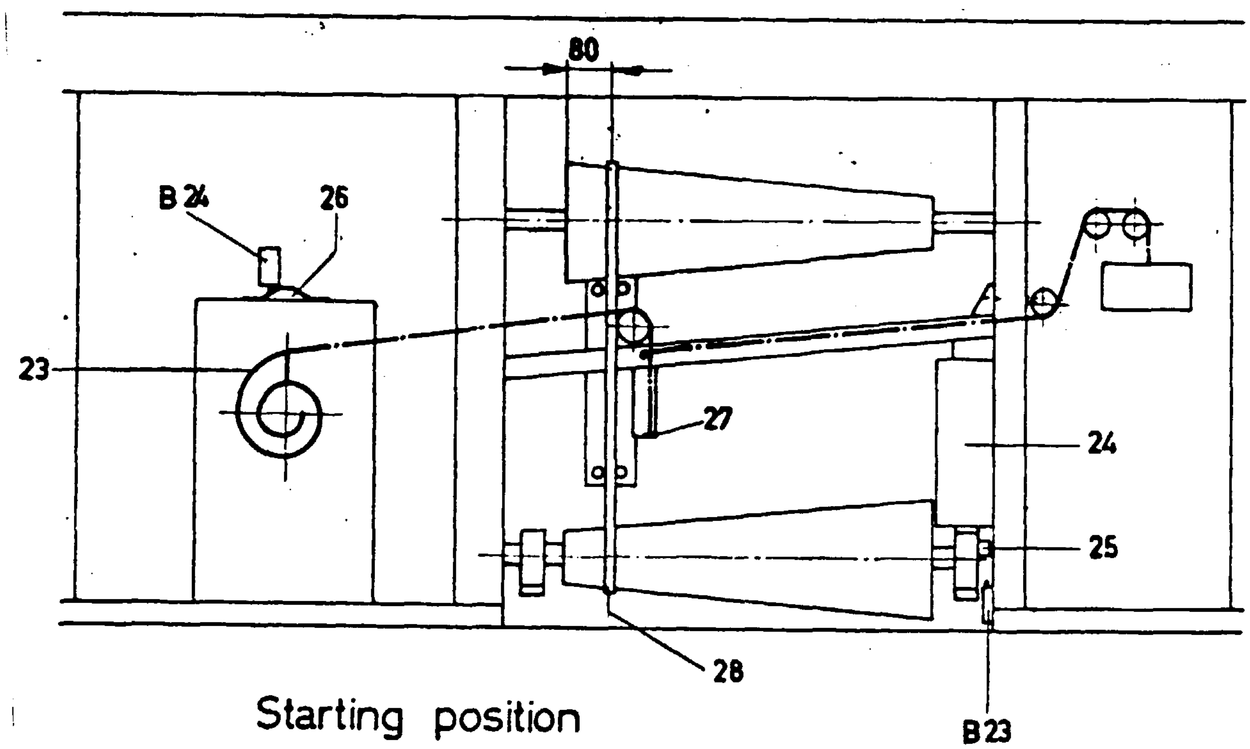
2. Traverse length H.

- Bring the builder motion into the starting position (Fig. 3A.2) with the hand crank on the cam (23).
  The starting position envisages:
  - Cam (23) attitude shown in Fig. 3A.2 (largest radius standing vertical).
  - Cone belt (28) about 80 mm. from end of cone. Readjust length of wire rope with screw (27).
  - Set sctuating plate (26) to limit switch B 24. (starting position = actuating point).
- Mount empty tube and flyer.
- Mark the top and bottom reversing points on the tube.
- Move bobbin carriage with hand crank.
- Bottom reversing point U = bobbin carriage and guide at top. Unfasten guide plate (12) and move it up until pin (22) actuates the control switch B 13.
- Top reversing point O = bobbin carriage and guide at bottom. Unfasten guide plate (13) and move it down until pin (22) actuates the control switch B 13.
- If the lengths of the slots in the supporting tube (14) are not sufficient, the bobbin carriage and with it the guide are to be brought to about middle traverse height. The whole guide must then be lifted at least 50 mm. and shifted in relation to the bobbin carriage by turning the supporting nut (15).

3. Winding position.

The winding position on the bobbin is displaced by shifting the whole guide in relation to the carriage, by turning the supporting nut (15) as described under 2.

Figure 3A.2



Starting position

4. Bobbin shape (conicity).

The cone angle α can be modified by adjusting the actuating rails (16 and 17). Unfasten the screws (20 and 21), and hinge the rails. A larger angle α demands a wider angle α' on the guide and vice versa.

The machines are supplied with straight actuating rails. If a special cone shape is desired, a strip of appropriate shape and about 3 mm. thick may be screwed onto the rails.

Spinning mills attach much importance to roving bobbins of good shape. On one hand the conical ends should be as flat as possible to accommodate a high nett weight, but on the other hand the finished bobbins should not slough off. For cotton an angle of 45 degress can normally be maintained.

5. Starting position, Fig. 3A.3

The limit switch B 20 determines the initial position of the bobbin carriage. It can be set with the lug (18). The machine is stopped by the limit switch B 20 after reaching the predetermined roving length on the stop counter (7), Fig.6. Thus after passing the stop figure (8), whereupon the yellow lamp lighths up, the machine may produce not more than 2 traverse layers before the limit switch N20 stops the machine.

The direction for starting may be reversed by turning the toggle roller (19) on the limit switch B20 by 180 degrees. Winding should start upwards on the bobbin, i.e. with the carriage moving downwards, to prevent layers sloughing off at the top.
Winding is best started from the bottom third of the traverse. on the one hand it ought to be as high as possible so that it is covered over quickly, but on the other hand bobbin changing should not be made difficult by a low position of the carriage.

6. Stop bridge, Figs. 3A.4 and 3A.5

The bridging of the stop motion prevents the machine being switched off around a traverse reversing point by the optical or electronic monitoring (to avoid faulty doffing). But the machine may be stopped at any time with the red "Off" button.

Adjustment:

- Mark bridging zone on the bobbin as in Fig. 3A.4
- Move bobbin carriage with hand crank until the press finger of the flyer is on the marked line.
- Adjust the feeler bolts (29) and (30) until they are up against the actuating rails (16 and 17) and the microswitch B21 responds.
- Same adjustment at the other reversing point.

A bridging zone of about 20 mm. is about right. Make sure that the bridging zone is smaller towards the reversing point than away from it, because allowance must be made for the run-down of the machine (braking time). Should the guide stick because of being canted, the limit switch B26 (Fig. 3A.6) will prevent the carriage from running over. But this limit switch can only be set to the maximum traverse with empty bobbin.

Figure 3A.3

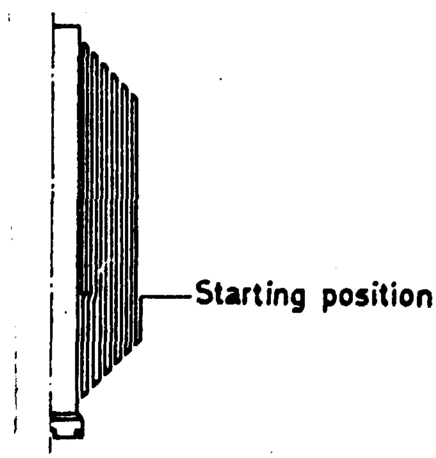


Figure 3A.4

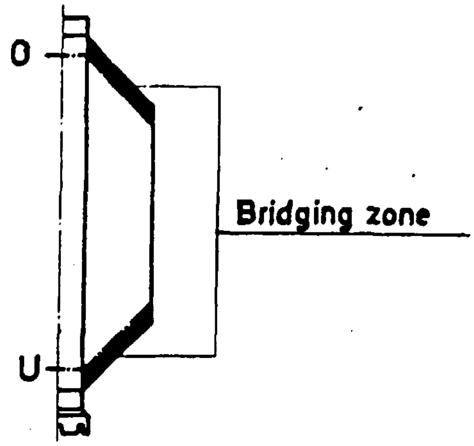
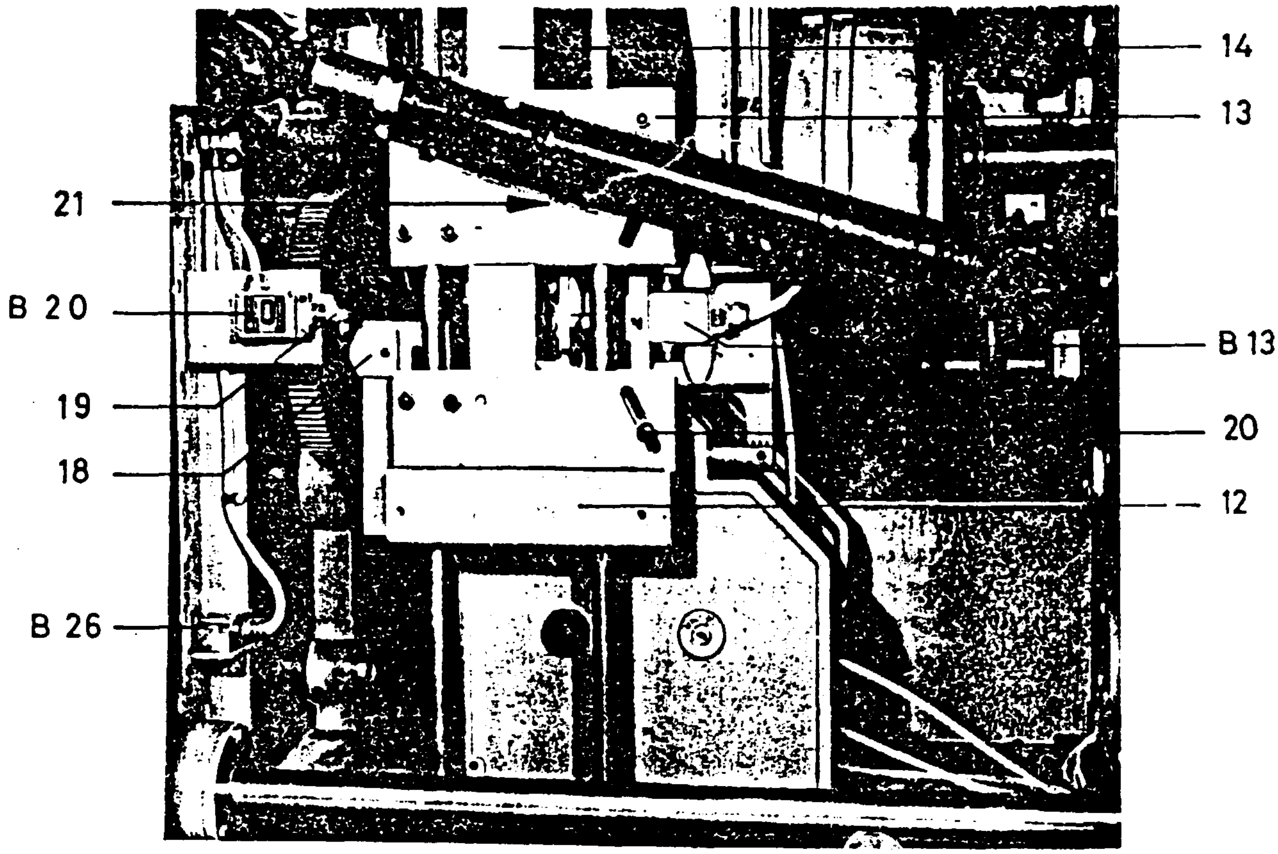


Figure 3A.6



12/13	Guide plates, top and bottom.
14	Supporting tube
18	Actuating lug for starting position
19	Toggle roller of limit switch B 20
20/21	Screws for adjusting bobbin cone
B 13	Control switch for bobbin build and carriage reversal
B 20	Limit switch for stopping at full bobbins (starting position).
B 26	Limit switch for overrunning safeguard (not adjustable).

Overrunning safeguard, Fig. 3A.5

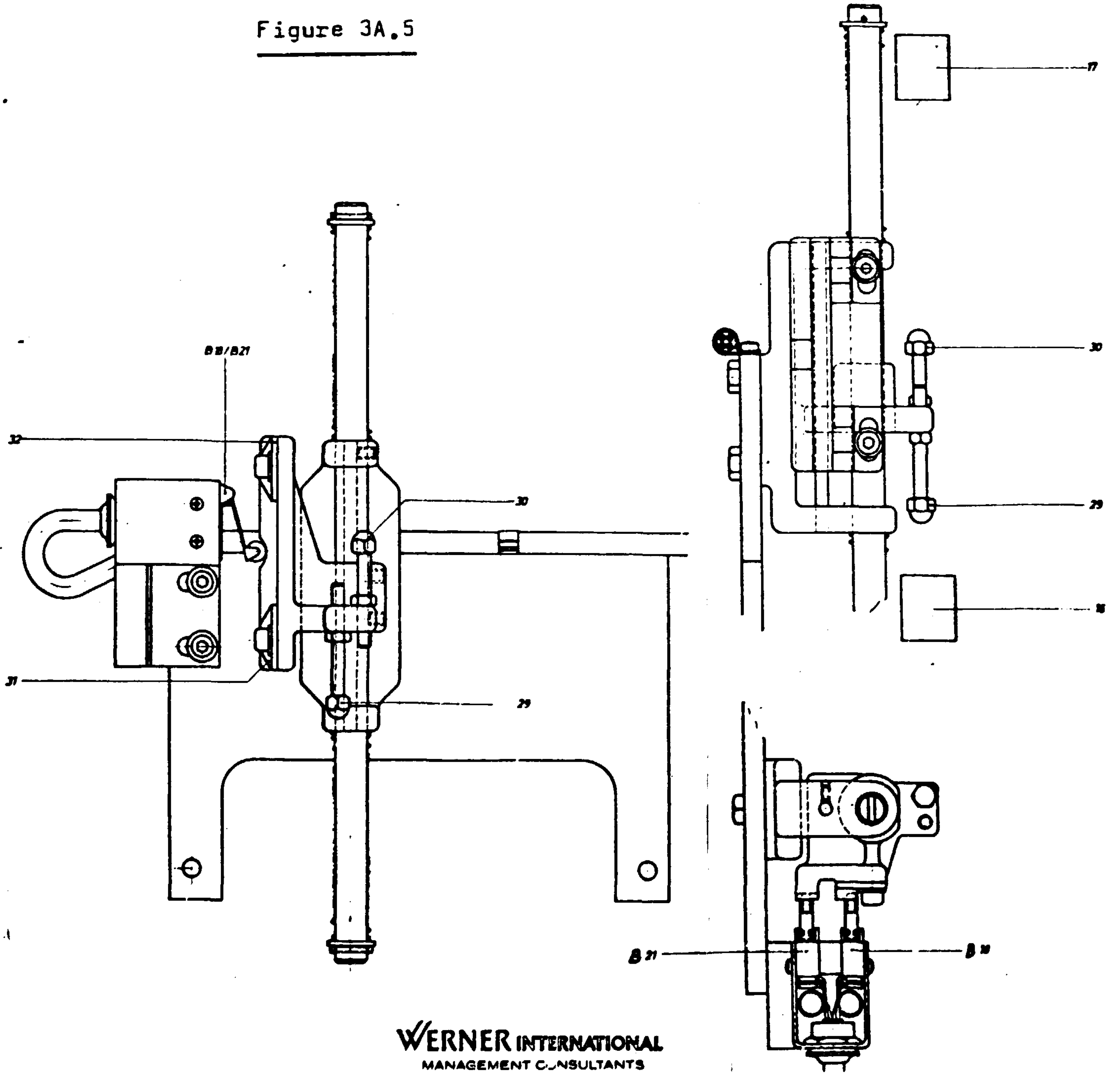
To prevent the bobbin carriage running post the intended reversing point the microswitch B 18 is fitted. If the control switch B 13 fails to act it runs onto the dog (31 or 32) and stops the machine.

Adjustment:

- Move the bobbin carriage with the hand crank until the pin (22) actuates the control switch B 13.
- Shift the lug (31 or 32) until it is up against the roller of the microswitch B 18.
- Same adjustment at the other reversing point.

The adjustment of the overrunning safeguard can only be made after the bridging (point 6) has been adjusted. If the bridging length is altered, the lugs (31) and (32) must be readjusted.

Figure 3A.5



7. Adjusting the machine with material.

7.1 Carriage and traverse change gears.

Bobbins and flyers are mounted on one front and one back spindle at the drive end, and the necessary fibre material made ready at the feed. These two spindles are run with material, to make the preliminary adjustments.

First clean thoroughly all surfaces coming into contact with the fibres, and rub them with chalk powder (rolls, flyers). During the first winding layer, watch carefully that the pull between roll and flyer is loose and even. If it is not, correct at the starting position of the cone belt. The position of the cam (23), Fig. 3A.2, must not be altered for this. If the pull is too strong the cone belt (28) must be shifted a little towards the end of the machine with the adjusting screw (27) on the wire rope, and vice versa. After each correction winding must be started over empty bobbin, until the roving tension is uniform throughout the whole traverse.

If the cone belt has to be moved more than 12 mm. or so from the stipulated position, the cone change wheel K (same pattern as the twist change wheel) must be replaced by one wheel with one tooth more or less. If the belt has been shifted towards the thick end on the top cone, cone change wheel K with one more tooth must be fitted, otherwise one with one tooth less. Repeat the test with the first winding layer until the pull is even over the entire length.

Roving count trials should be carried out at an early stage. For correct settings on the machine the roving count must be right.

With the first winding layer on the hard bobbin, the mean diameter of the layer will be somewhat larger than that of the consequent windings over the soft roving. Hence the roving should be only just under tension for the first layer.

When winding onto the empty bobbin the lift of the carriage (δ_1) must be checked. The roving should be wound on so that the bobbin is hardly visible. The carriage lift is governed by the carriage change wheel W : more teeth mean more lift (Fig. 3A.7).

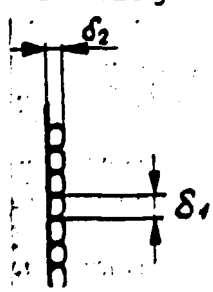


Fig.3A.7

As further layers are wound on, verify that the right traverse change wheel S has been selected. When the ratchet wheel turns half a tooth, the cone belt and cam must be advanced sufficient to ensure the right transmission at the cones for correct winding on the particular bobbin diameter. The thickness of a winding layer (δ_2) may vary somewhat, due to count fluctuation, windings with more or less pitch, use of different twist coefficients, climatic conditions, and the properties of the fibre material being processed. Consequently the traverse change wheel S arrived at by calculation may not be right in every case. If the pull becomes harder with each winding, not enough traverse is being performed. A traverse change wheel with more teeth is needed, or vice versa.

If this preliminary test shows the bobbin take-up to be correct and the roving count to be right, an extended trial is then made . Pairs of front and back bobbins are mounted, two at the drive, two in the middle (or two sets of two pairs if the machine is long), and two at the end. The drafting arrangements are to be saddled only for the spindles in question. Set the stop counter to the desired yardage. Start up the machine with the adjustments shown to be right in the preliminary trials and wind the bobbins full.

Observe the function of all machine components closely while it is working. Check in particular the take-up of the roving and the bobbin build, uniform loose pull during the first winding layer (i.e.correct belt position at the start), correct pitch of the windings on the bobbin, correct traverse length and free end of bobbin after the first winding layer, uniformly loose pull throughout the winding cycle (well chosen traverse change wheel) and uniform shape of the top and bottom bobbin cones.

7.2 Compensation rail.

The compensation rail permits fine adjustment of the roving tension, in other words it has the same effect as changing the traverse change wheel S, though to a lesser degree. This fine adjustment is needed primarily for fine rovings, where altering the change wheel by one tooth would be too much. But variations in tension - caused by fluctuating climatic conditions - can be compensated too.

If the tension should vary irregularly during the bobbin build, this fault too can be remeded with the three-piece compensation rail. Before making this adjustment, make sure that the biggest radius of the cam stands exactly vertical in the starting position, as in Fig. 3A.2. In addition the cone belt must be in the right starting position, i.e. the end of the belt should be about 80 mm. from the end of the cone. only if these basic conditions are met with the compensation rail may be adjusted.

The three-piece compensation rail is divided so that the first part A influences the first quarter of the bobbin, the middle part the second and third quarters, and the last part B the last quarter (Fig. 3A.8). When both pointers are at " 0 ", the rail is straight. Always begin with this setting.

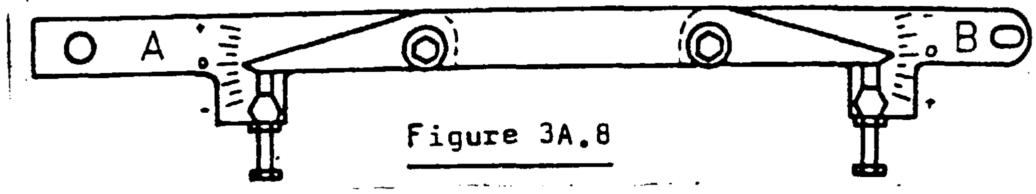
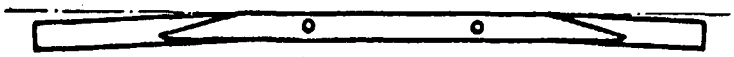


Figure 3A.8

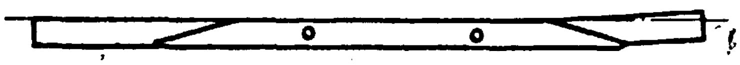
Underneath are a few examples, showing how tension errors during the bobbin build may be corrected.

Too much tension in
2nd and 3rd quarters

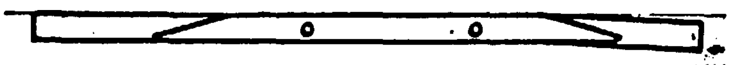
Not enough tension in
2nd and 3rd quarters



Tension too loose
towards the end



Tension too strong
towards the end



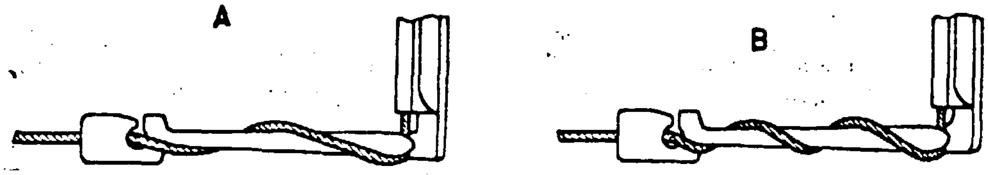
Too much tension
during the 1st quarter

Adjusting the winding tension.

The winding tension on the bobbin depends on the number of wraps round the press finger and the way the roving is introduced into the top of the flyer.
More wraps on the press finger, i.e. roving braked close to the winding-on point, gives harder bobbins and better build for the same tension in the spinning part.

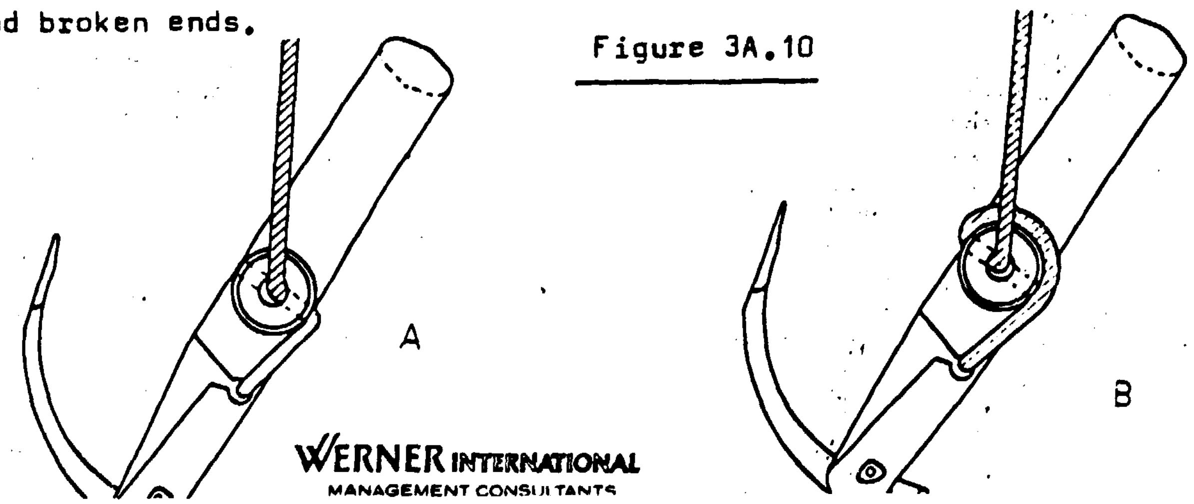
With soft-twisted rovings for all counts, and often for extra-coarse yarns too - such as Ne 0.45 - 0.55s (1310 -1073 tex)- it is advisable to lead the roving straight in as shown in Fig.3A.10A. instead of wrapping it round the top. The roving is then not stressed excessively, ensuring good running.

Figure 3A.11



With large high-speed flyers (such as 14 x 7" for 1200 rpm) for medium to hard twist and medium to fine counts, the roving tension can often be regulated better by using a 3/4-turn at the top of the flyer as in Fig. 3A.10B. This additional wrapping makes the bobbins harder with less variation between them, eliminating differences in bobbin diameter. In this case the tension must be loose, and the roving must sag visibly. Maximum bobbin weights can be achieved in this way. Because the roving is highly stressed by the braking action at the top of the flyer when passing through the flyer tube, with too weak twist this may lead to false draft and broken ends.

Figure 3A.10



Other methods of introducing the roving give very poor twist between flyer and drafting arrangement. The roving flutters, precise adjustment is impossible, wide differences in the bobbin diameters occur, and the running is poor.

The number of wraps round the press finger influences the winding tension and hence the bobbin hardness. The bobbins should not be wound too soft, since this means a loss of weight and thus poorer efficiency.

The wrapping used on the press finger is governed by the strength of the roving, i.e. length and twist. More wraps mean more stressing of the roving, which may end up by causing broken ends.

Fig. 3A.11 shows the usual methods of wrapping. For soft-twisted rovings the method shown in A should be applied, for normal or hard-twisted rovings, B. To increase the bobbin weight with hard-twisted rovings, the top of the flyer can be wrapped in addition (see Fig. 3A.10B).

Make sure that the press finger is not wrapped insufficiently either. Only 1 1/2 finger wraps are employed mainly with weak twist and man-made fibres.

Unfortunately no firm rules can be laid down, because the surface condition, material being spun and room's air condition all exercise a very large influence. Strongly fluctuating climatic conditions for instance may compel a change in the threading-in.

Checking the roving tension.

If there is no one available with the necessary feeling for the roving tension, it is advisable to have a whole roving bobbin sorted through. Sorting is done by comparing the weights of equal lengths from different winding layers. The bigger the roving length taken for comparison, the more exact the result will be, i.e. the better the differences will be pin-pointed. The biggest roving length that can be used for comparison is the length of the first winding layer on the bare bobbin. This length is therefore ascertained, then the same length L is reeled off from each layer and weighed on a precision balance. The value obtained are plotted in the correct sequence on millimetre graph paper; irregularities are revealed unmistakably. It must be remembered, however, that certain faults may have been present in the sliver already.

It is not advisable to test entire bobbins with the Uster instrument, because deviations of the instrument may easily lead to false conclusions. On the other hand instruments with mechanical feeler devices are very good.

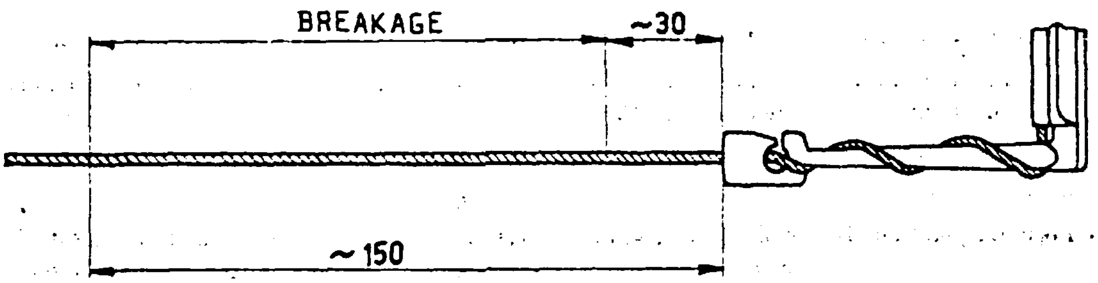
Roving breaks and how to remedy them.

Badly adjusted roving frames may produce disastrous results, and an erector should never fail to observe the machine for a few hours after putting it into commission. The trial run with a few spindles is no guarantee that the whole machine will run satisfactorily.

Broken rovings due to badly adjusted machines are easily recognized because the break is usually 30 - 150 mm. from the press finger (Fig. 3A.12). Owing to the breakage the roving is not entrained further, and causes a second breakage between flyer and drafting arrangement, i.e. the roving remains intact inside the flyer.

Such breakages can always be traced to excessive winding tension or inadequate roving twist, unless the press finger is clogged up. In order to remedy the trouble, the tension must be reduced either by fitting a different traverse change wheel or else by adjusting the compensation rail. If this does not put matters right, fewer wraps must be used on the top of the flyer or press finger. If breakages occur only when the bobbins are nearly full, a correction must be made on the compensation rail (Fig. 3A.8).

If none of these measures is successful, there is nothing left but to increase the roving twist. With big bobbins more twist will not come amiss in any case, because the roving is stressed more on the creel of the ring spinning frame by the heavier bobbin weight.



3.B PACKAGE BUILD GS.

1. PURPOSE OF THE REVERSING APPARATUS (See Fig. 3B.1)

This is fitted ready for operation in the headstock and performs the following functions:

- Reversing the carriage motion after each lift end to achieve the bobbin shape required.
- Shortening the lift after each reversal.
- Shifting the cone belt after each bobbin winding.

The impulse for the motion of the separate elements is given from the bobbin carriage by the reversing slides (9) and rack (11) to the cradle (12).

2. PARTS. (See fig. 3B.2 and 3B.7)

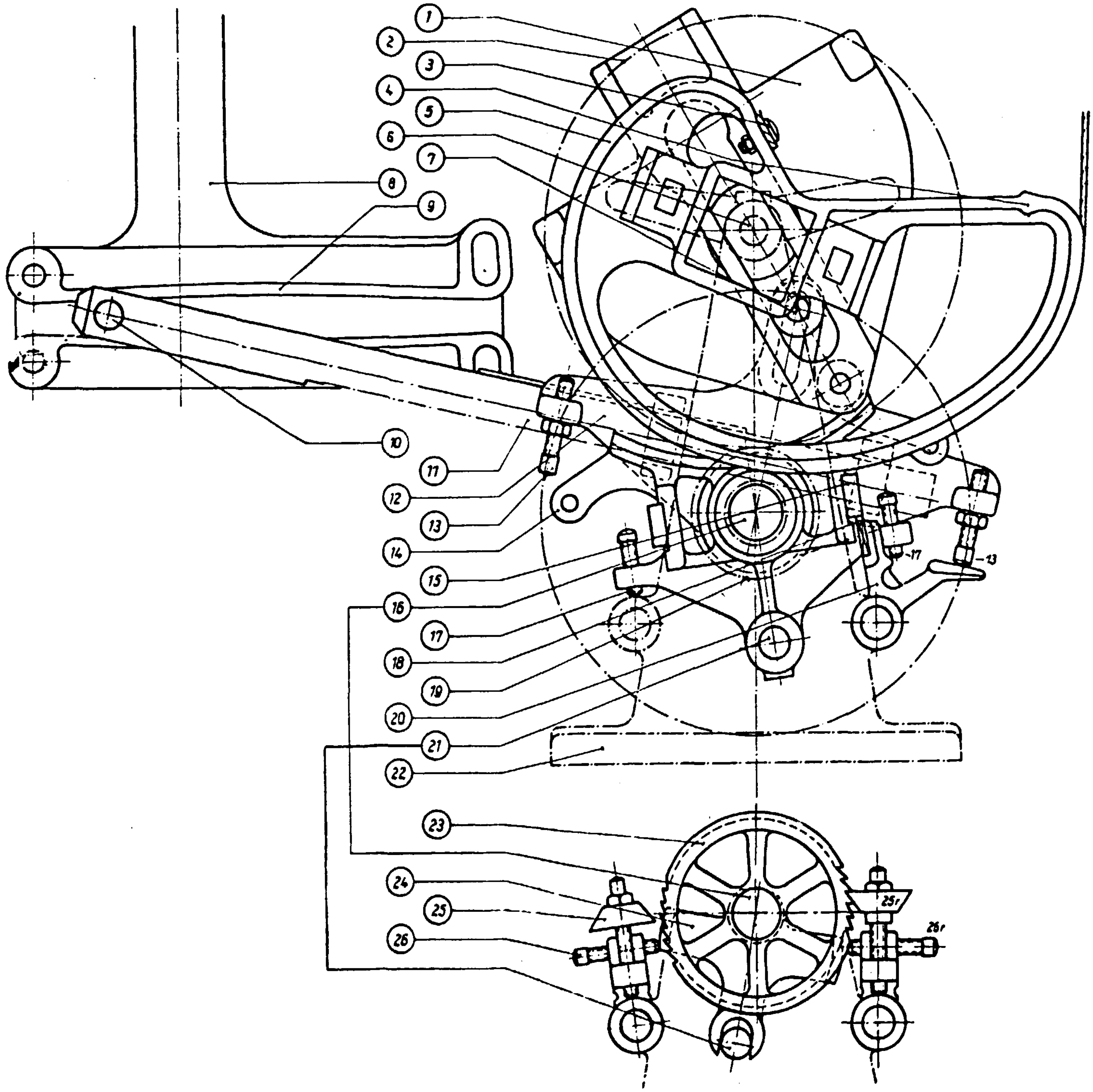
2.1	UPPER CONE	2.10	ENGAGING PIN
2.2	BELT GUIDE	2.11	RACK
2.3	BELT	2.12	CRADLE
2.4	REFERENCE MARKS	2.13	SET SCREW
2.5	SET SCREW	2.14	SEGMENT
2.6	MAIN SHAFT	2.15	RATCHET TEETH
2.7	SUPPORT	2.16	SHAFT
2.8	GUIDE	2.17	SET SCREW
2.9	SLIDE BRACKET	2.20	REVERSING PAWLS.

3. SETTINGS.

3.1 Cone built rack (Fig. 3B.2)

At the support (7) (fixed to the bobbin carriage), the milled guide should stand vertical. Check this with the angle spirit level in direction of the machine axis and adjust, if necessary. Screw on the guide (8)including slide bracket (9). Set the slides with equal opening on both sides and set the centre axia horizontal. Slip the engaging pin (10) through the bore of the rack (11) into the bracket (9) and fix with setscrew. The correct height setting of the guide (8) is achieved as follows:

Figure 3B.1



Mark the centre of the lift on a wooden bobbin (Fig. 3B.3) designed for the speed frame, and attache it in such a way that it is firmly seated on the bobbin driver. Adjust the bobbin carriage so that the centre of the fly pointer coincides with the centre mark of the bobbin. Place the rack (11) (Fig. toward the end of the slides in direction of the headstock. tighten the guide (8) at such a level that the rack (11) is horizontal.

3.2 <u>Reversing pawls (Fig. 3B.1, Item 20)</u>

Mark the two lift ends on the wooden bobbin (Fig. 3B.3), at least 17 mm. from the bobbin ends. Move the carriage fitted with the marked bobbin to either lift end until the finger of the flyer coincides with the lift end. Adjust the relevant set screw (13) Fig. 3B.1, at the pawl (20) so that the segment (14) is released and reversed. By moving the carriage to the other lift end, adjust the setscrew of the opposed pawl (20).

Figure 3B.2

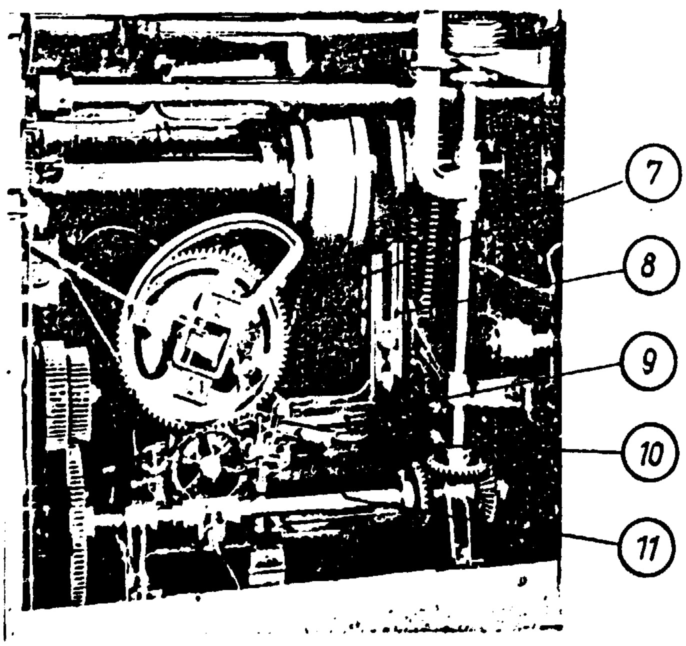
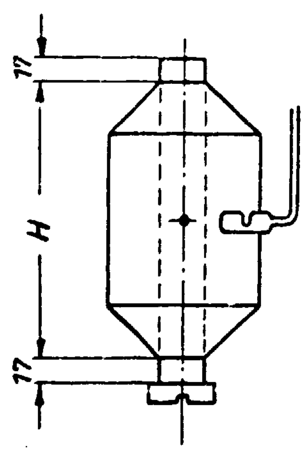


Figure 3B.3



3.3. Segment (Fig. 3B.1, Item 14).

The rest position of the segment is fixed by setscrews (17). They are adjusted in workshop assembly, but are checked over by the erector. It is important that the platelets (18) of the pawls (20) are firmly clinched under the teeth (15) by spring action when the segment (14) is reversed. Any clearance allowed there goes at the expense of sound engagement at the bevel gears for driving the carriage shafts. On this occasion, check the engagement of these gears. The teeth should have a minimum of play.

3.4 Weight over segment (Fig. 3B.1, Item 1).

The static energy of the weight is used to reverse the segment (14). The end position of the contact points are adjusted by the erector. At the end points of the carriage lift, the pressure of the weight on the arch of the segment (14) should be about 10 mm. from the outer edge. The extent of the deflection can be varied by adjusting the pin (7) provided with a roll and located on the centre arm of the cradle (12). Setting it higher makes the deflection larger.

3.5 Pawls of ratchet wheel (Fig. 3B.4).

Owing to the weight on the belt fork and cam, the ratchet wheel tends to turn. It must therefore be alternately engaged by one of the two pawls (25l.and 25r.). One pawl should be 1/4 tooth pitch above the centre horizontal, the other 1/4 tooth pitch below, the former in mesh, the latter about 1 mm. outside the tooth circle.
Drive the carriage upwardly by means of crank (4) (Fig.3B.5), until the setscrew (13 r) (Fig. 3B.1) releases the pawl (20r). At the point,the weight (1) causes the segment (14) to reverse so that the reversing apparatus presents the opposite picture.

Make sure that one pawl (25) has moved right home into the gap and that the opposed pawl points to the centre of the gap at a distance of about 1 mm. outside the tooth circle. Remedy any inconsistency immediately.

Figure 3B.5

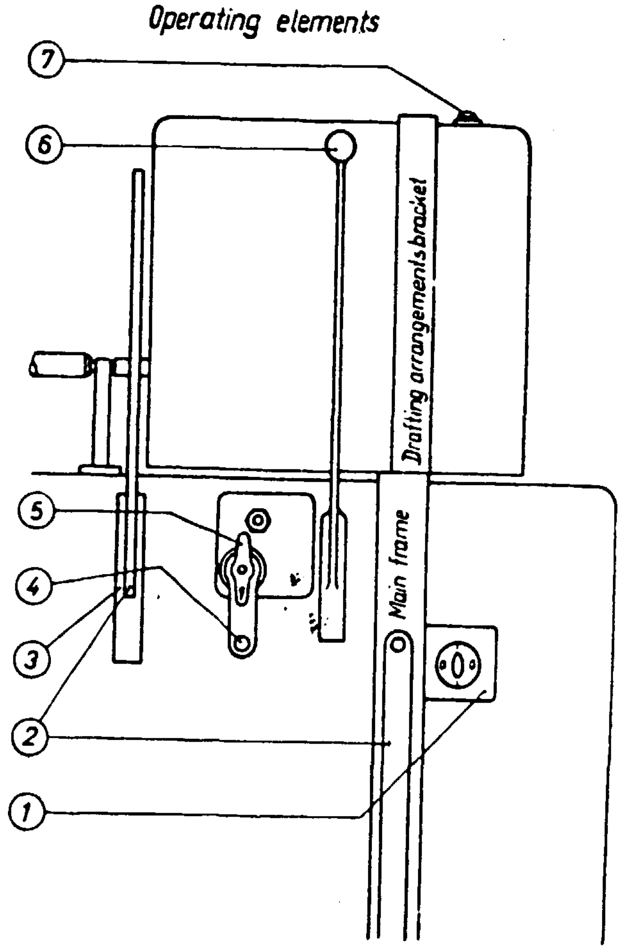
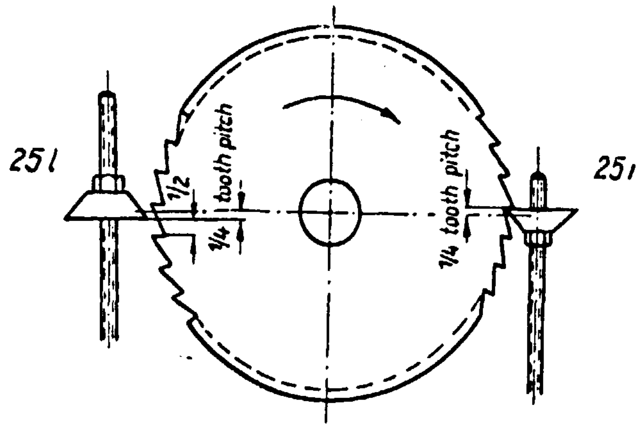


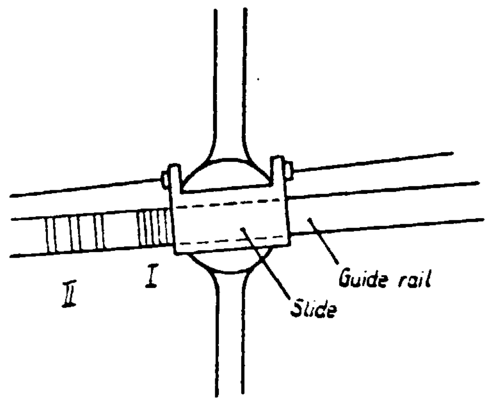
Figure 3B.4



By the reversal of the segment, the pin (21) caused the reversing shaft to shift and engage the opposed gear for reversing the carriage motion. Check this engagement.
Firmly tighten all setscrews and nuts to prevent any element from shifting during operation.

During the test run of the machine and after each ratchet wheel pick, mark some of the picks in pencil on the guide rail. If this discloses unequal spacing (as under (II),the pawls were not properly adjusted. Remedy the fault immediately as it is the cause of false drafts in winding (Fig. 3B.6).

Figure 3B.6



3.6 Cam and belt guide.

The delivery roller of the drafting arrangement delivers the roving at a constant rate. For winding, bobbin and flyer rotate in the same direction, the bobbin leading. The speed difference should be adjusted to ensure even, slack tension during winding-up of the roving.

The diameter of the bobbin increases with each layer, for which reason the bobbin speed should lessen accordingly in order to wind the roving delivered at constant rate. The speed of the bobbin is composed of two factors,viz.

- the principal component from the even speed of the 59-tooth wheel on the main shaft, and
- the variable component of the cone drivers.

The two speeds are added in the differential gearing, and the resultant is imparted to the bobbin drive shaft.
To obtain the correct speed ratio, the generating line for the cones should be a curve. Such rotary bodies, however, present certain difficulties in manufacture. Also, the transmission belt has to move on surfaces of varying inclination during bobbin build-up.

For this reason, Rieter use conical cones. This requires advancing the belt guide at an uneven rate in order to attain the same speeds as with hyperbolic cones. This purpose is filled by the cam (5) secured to the main shaft (6) (Fig.3B.1). The above statement show that the correct setting of the associated elements is of utmost importance for proper winding.

First of all, the connection between cam (5) and slide of the belt guide is to be established with the cable. The data given for the position of the cone belt always refer to its centre.

The cones are provided with a reference mark. This mark represents the basic position for the connection from belt guide to cam. Place the belt with guide on reference mark, arrow of cam exactly horizontal. Connect the cable from the screw on the slide via the guide roll and through the groove in the cam to the securing screw, and tighten this. Attache the counter weight in order to set the entire cable system and the wheels including the ratchet wheel under stress.

3.7 Setting and guiding of cone belt (Fig. 3B.7).

Place the cone belt on the reference mark (4), as mentioned above. This initial position applies for all diameters of the wood bobbins, unless stated otherwise on the gearing diagram.

Make sure that the belt (3) is closely guided only at the incoming end of the upper cone (1), while the other three places are somewhat slack so that the belt can run freely during the winding process.

The belt should nevertheless move parallel to the reference marks (4). If not, the required speed ratio will not be obtained and the winding will not proceed properly. If this is the case, check whether the cone shafts run parallel (unless checked at the time of installation).

Fix the basic position of the belt fork with the setscrew (5). Move the rack (11) (Fig. 3B.1) toward the end of the slides (9), and tighten the setscrew of the 21-tooth gear on the switch shaft (16).
Use oil freely during the running-in period, and check the bearings frequently for heat.

Install the cover not yet placed. Secure the cover panels behind the roller beam to the carriers provided for the purpose. Screw the cover to the end frame and slide the two covers over the drive of the drafting arrangement. A skirting is to be fitted by the carpenter to cover up the space between spindle beam and floor. This skirting should fit tightly to the floor and run parallel to the spindle beam.

Figure 3B.7

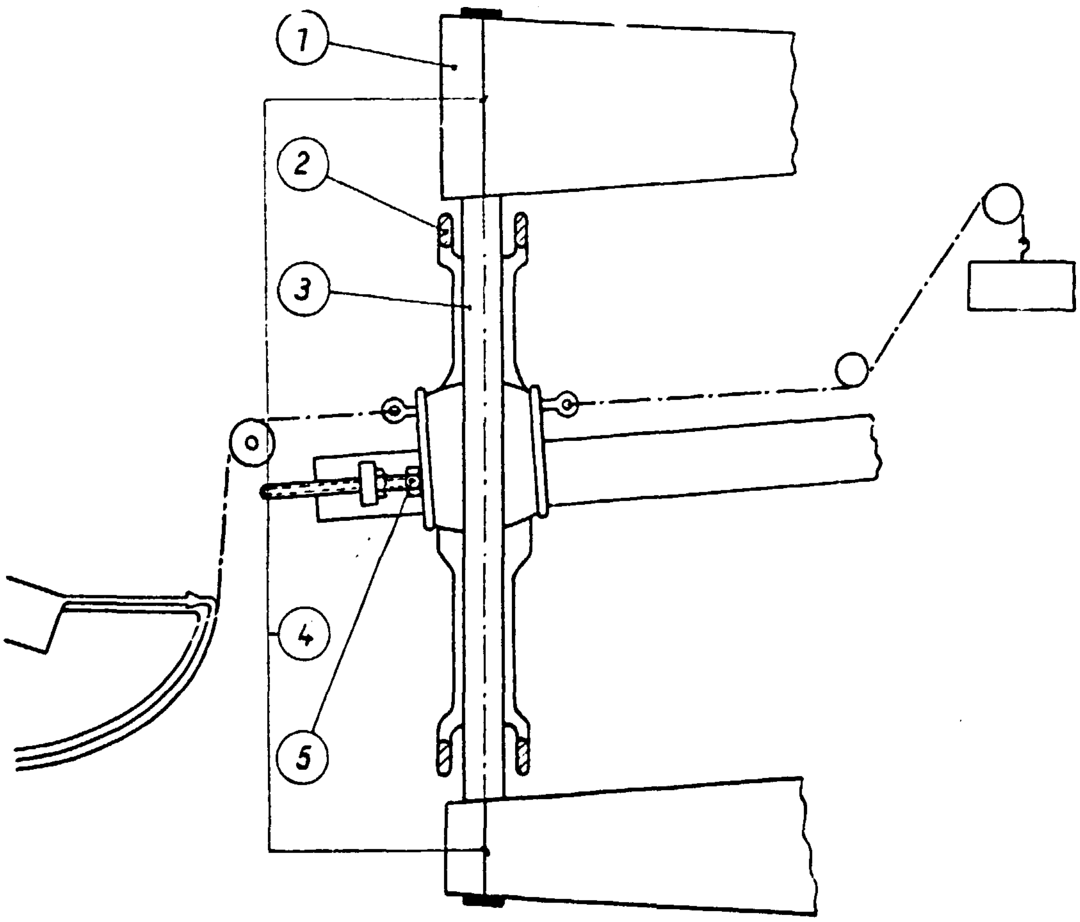


Figure 3B.8

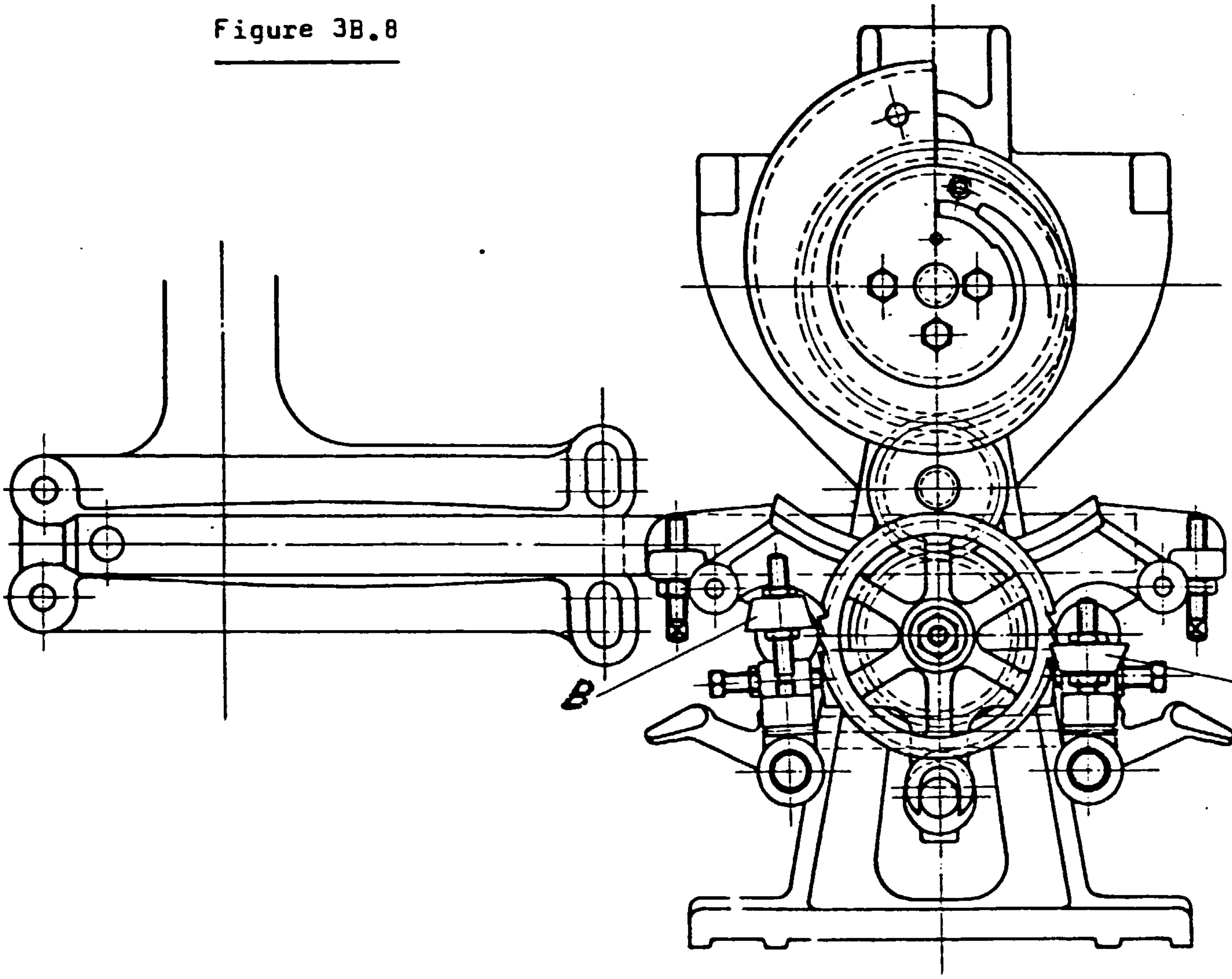
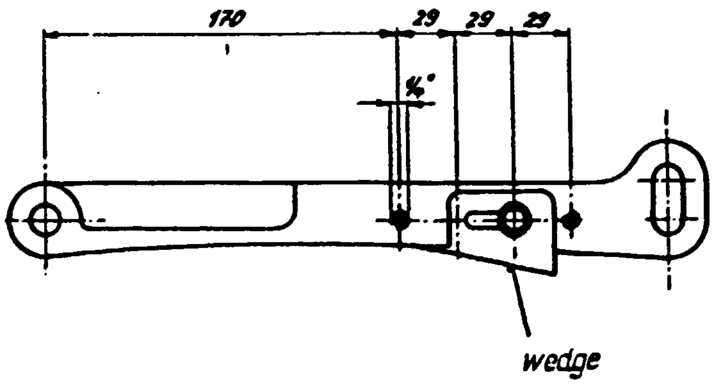


Figure 3B.8a



3.8 Determination of the ratchet.

Yarn tension is regulated by the ratchet throughout the entire build-up. Its adjustment depends no only on material, roving count and twist but also on the threading of the roving into the tip of flyer, the number of press finger wrappings and the flyer revolutions, which have a certain influence on the roving thickness δ 2.

When fitting the ratchet it is important that the locking discs A and B (Fig. 3B.8) are adjusted so that A is somewhat above and B below the centreline. This will make it impossible for any tooth to jump, which can easily happen with incorrect adjustment.

Yarn tension must not be excessive - the roving between front roller and flyer must still droop slightly. With large package sizes it is particularly important to maintain constant yarn tension throughout the whole build-up or still better, have it diminish slightly towards the end. It is not always easy to check this, especially at high flyer speeds. Experience and a sure touch are necessary for satisfactory adjustment, and the fitter or spinning foreman can only acquire these patient trial-and-error.

3.9 Correcting malfunctions of the builder motion.

If the reversal does not funtion properly and the carriage overruns, the following points must be checked:

The chain for rewinding the builder motion to its initial position must be quite loose.

The tilt of the slotted link at the moment of reversal must be adjusted as shown in Fig. 3B.9, so that the reversal is given a powerful impulse. The inclination is varied by shifting the roller B.
The slotted link must have axial play, so that it drops freely at reversal. See Fig. 3B9a, clearance A.

The engagement of the carriage gear with the counter-wheel should have more play than a normal gear mesh. (only engage to about two-thirds deep). This assists the meshing of the bevel gears on the cross shaft, which has to take place at reversal whilst running.

Make sure that the oil pipe does not catch the weights.fitted to the slotted link at reversal.

Figure 3B.9

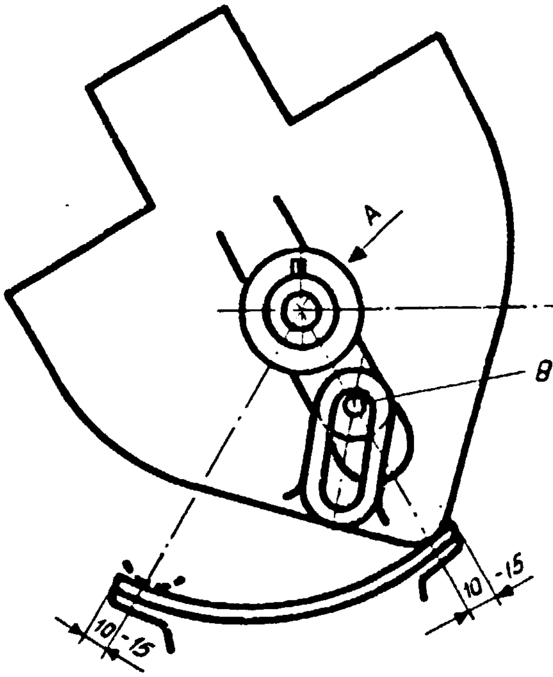
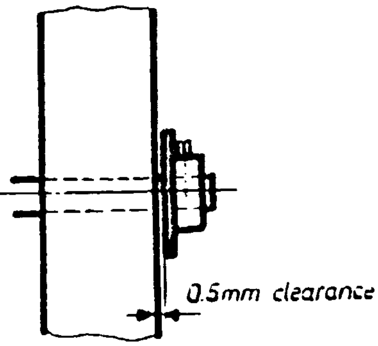


Figure 3B.9a



Ascertain that all rope guide pulleys turn freely, including the tension weight pulleys.
Make sure that all moving parts of the builder motion turn easily and have the necessary play, especially in the bores. If necessary give shafts a light dressing with emery cloth.

3.10 Bobbin shape.

Adjustment of the bobbin cones is done with a pair of shaping rails, as described in Instructions
For a steeper cone the rails are narrowed, i.e. closed whilst for flatter cones they are opened wider.

By adjusting the rails the package cones can be varied by about 15 degrees. Should this not be sufficient in exceptional cases, it is possible to influence the package cones by changing the pinion on the shaft of the reversing ratchet wheel (for shifting the rack). The toothed rack must be properly engaged afterwards, and the cradle on the reversing mechanism has been made adjustable for this purpose. It must be possible to push the rack to and fro without difficulty.

The machine is supplied with only one pinion fitted, having:
- 17 teeth on GS and GN slubbing frames.
- Fewer teeth give a flatter cone and vice versa.

Package cones should be neither too steep nor to flat. Steep cones means loss of weight, whilst constant trouble results with cones that are too flat. Normal cones range between 80 and 90 degrees, with 100 degrees as maximum (Fig. 3B.11).

If a client demands a maximum package weight 3B.12, the flattest cone possible should be selected. To avoid damage to the full bobbins during transport, the cones may be rounded-off slightly towards the end in this case (Fig.3B.12). To obtain this, extra shaping wedges are fitted to the shaper rails; four 1/4" threaded holes are drilled in the rails for fixing them (Fig. 3B.8a). The wedges are adjusted as follows:

First the wedges are omitted. Fill the packages up as far as the diameter at which the rounding-off is to commence. The wedges are now screwed on and set-up to the driving pin in the rack at top and bottom carriage positions. Complete the packages and correct if necessary to obtain more or less curvature by shifting the wedges le't or right. When adjusting the wedges make sure that the shaping rails are fixed far enough apart to preclude jamming of the driving pin, and that the latter never slides beyond the wedges.

Figure 3B.11

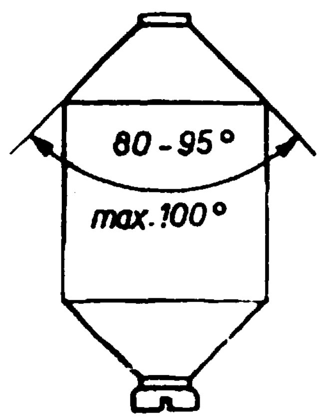
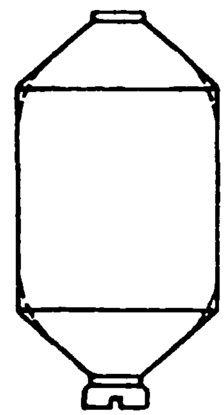


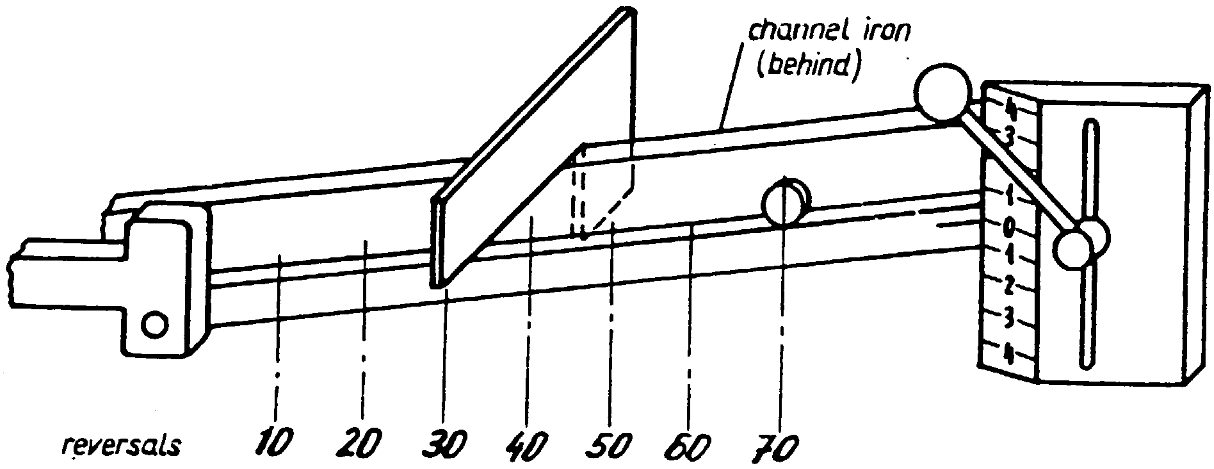
Figure 3B.12



3.11 Compensating rail.

During one doff the compensating rail is repeatedly set in such a way that the tension of the roving does not vary. After every 10 reversals the position of the cone belt must be marked and the deviation of the compensating rail from zero noted, until the package is full (Fig.3B.10)'for right-hand machine, viewed from behind . After doffing these manipulations are repeated with the machine stationary, and the deviations from the straight line, e.g. from the guide rail (channel iron), measured and applied to the compensating rail (Fig.3B.10a). This gives a curve according to which the rail can be altered.

Figure 3B.10



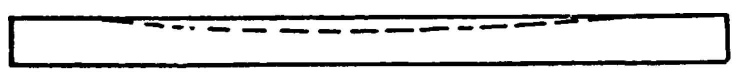
Typical faults and their remedies:

Fault

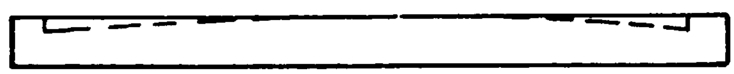
Alteration of rail greatly exaggerated, for right-hand slubbing frame, viewed from behind.

Figure 3B.10a

a) Tension too high at half full bobbin

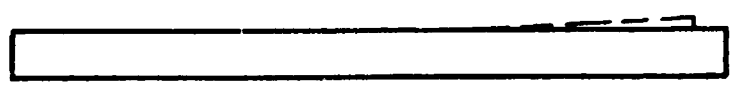


b) Tension too slack at half full bobbin



c) Tension too high towards full bobbin

d) Tension too slack towards full bobbin (fit wedge).



Fault c) occurs most frequently, making itself noticeable by increased ends down towards the end of the bobbin (see Broken rovings and their cure).

3.12 Faults noted and remedied during test spinning.

- Both bobbin ends are too flat, angle w is too large, windings slip off.

  Remedy: (Fig. 3B.13)

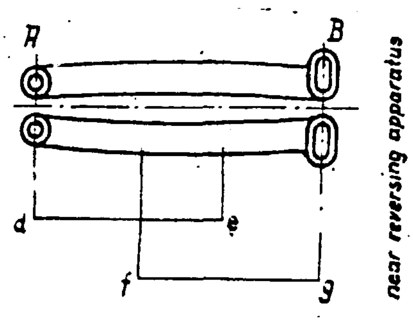
  a) Set the shaper slides close at B (near reversing apparatus).

  b) Shift the stroke of the engaging pin of the rack toward B i.e. transpose the lift d - e to f - g. For this purpose, loosen the adjusting screw on the 21-tooth gear to move the rack, and tighten it after shifting the guide pin from d to f.

  c) In exceptional cases where the measures described under a) and b) prove inadequate, adjust the shaper slides in the following manner:

  Widen the round holes for the securing screws by means of a round file until the two shaper slides can be set apart at A. The space at B should be kept as small as possible so that the guide pin is just about free when the bobbin is full.

Figure 3B.13



- Both bobbin slants are too pointed, angle w is too small.

  REMEDY: Fig. 3B.13

  Open the shaper slides at B until the angle w attains its correct size.

<u>The two slants k1 and k2 are of unequal length</u>.

<u>REMEDY</u>: (Figs. 3B.14 and 15).

a) Adjust the shaper slide bracket.
   Lifting the bracket makes the upper slant (k1) longer.
   Lowering the bracket makes the lower slant (k2) longer.
   When adjusting the bracket, make sure that it does not interfere anywhere at the lift ends.

b) Adjust centre axis m of the shaper slides, m = horizontal position of this axis.
   Inclining this centre axis (0) upwardly makes the lower slant longer. Inclining the centre axis downwardly makes the upper slant longer.

Figure 3B.14

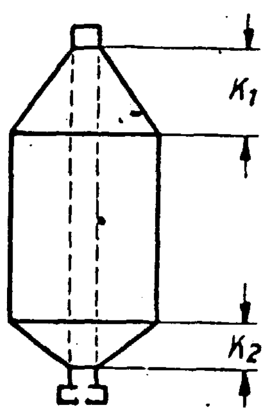
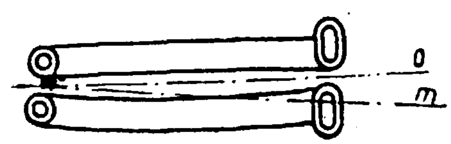


Figure 3B.15



<u>Faulty switch of cone belt</u>.

During reversing action, the cone belt advances slowly instead of jerks.

Locate where the runnin belt brushes against the guide. As mentioned on 3.7, the belt should be pushed ahead only at the incoming side of the upper cone. Also, see whether the cone built rack jams in the cradle guide. If possible avoid increasing the weight on the cable, as this would make it more difficult to reset the reversing apparatus after each doff.

GROUP 4 : CHANGE POINTS.

4.1 Spindle speed.

The diameter of the belt pulley on the motor shaft is normally 149 mm., in exceptional cases 134 mm. To alter the spindle speed the main shaft pulley must be changed, see gearing plan.

Procedure for changing:

- Unfasten motor fixing screws.
- Push motor up and secure with one screw.
- Change main shaft pulley.
- Lower motor and secure screws again.
- The V-belt should be tensioned so that it can be pressed in with the thumb about 2 cm.

4.2 Draft change gear (3) Fig. 4C.1

To calculate the draft change gear (3) see gearing plan. Changing this gear alters the total draft in the draft system. The break draft remains as it is.

Procedure for changing:

- Remove fixing screw of draft change gear (3)
- Unfasten screws (1) and swing out lever (2)
- Change draft change gear (3)
- Swing in lever (2), adjust tooth clearance and tighten screws (1)
- Secure draft change gear with fixing screw.

4.3 Break draft change gear (4), Fig. 4C.1

To calculate the break draft change gear (4), see gearing plan. Changing this gear does not alter the total draft.

Procedure for changing:

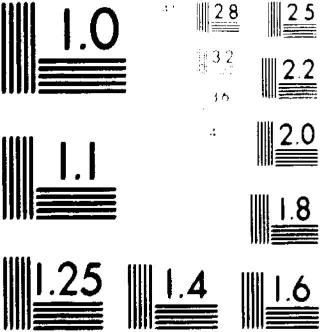
- Remove fixing screw on draft change gear (3)
- Unfasten screws (1) and swing out lever (2)
- Unfasten screws (6) and swing out arm (5)
- Take-off draft change gear (3),distance ring and break draft change gear (4).
- Fit break draft change gear (4), distance ring and draft change gear.
- Swing in arm (5), adjust tooth clearance and tighten screws (6).
- Swing in lever (2), adjust tooth clearance and tighten screws (1).
- Secure fixing screw on draft change gear.

4.4 Creel change gear (8), Fig. 4C.1

With the creel change gear the sliver tension can be altered between the feed roller and creel (see gearing plan).

Procedure for changing:

- Unfasten screws on bearing (9)
- Push back bearing (9) until the creel change gear no longer meshes.
- Unfasten coupling piece (7) and withdraw from shaft.
- Change creel change gear fit coupling piece and tighten it.
- Bring creel change gear (8) into mesh,adjust tooth clearance and secure bearing (9).



MICROCOPY RESOLUTION TEST CHART

Figure 4C.1

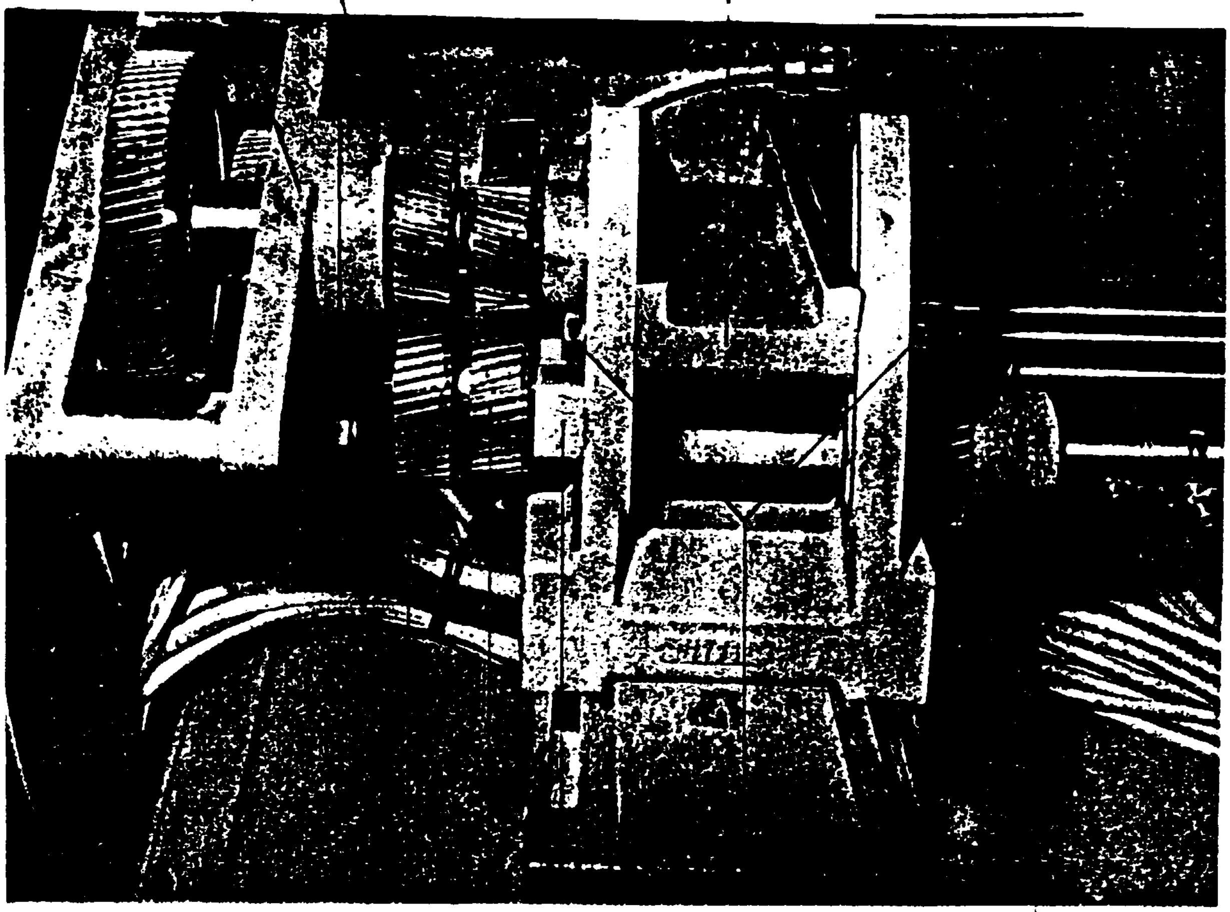
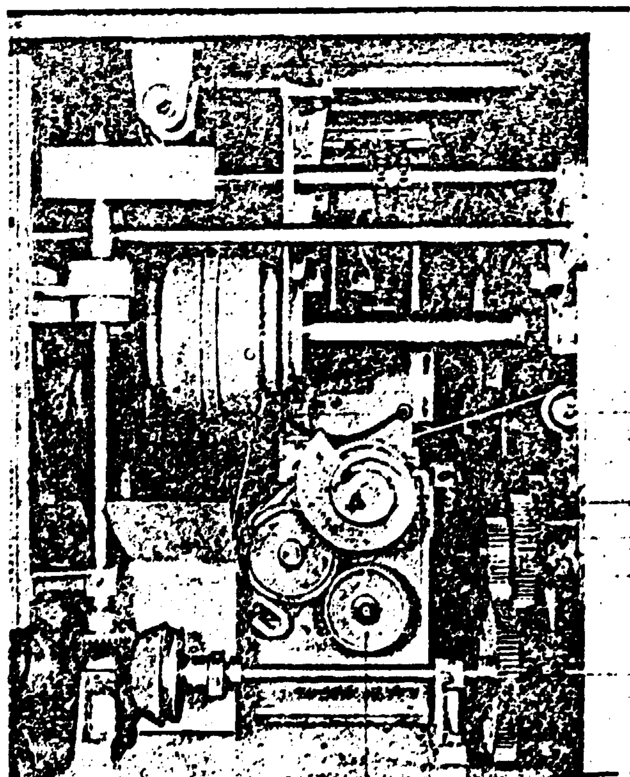


Figure 4C.3



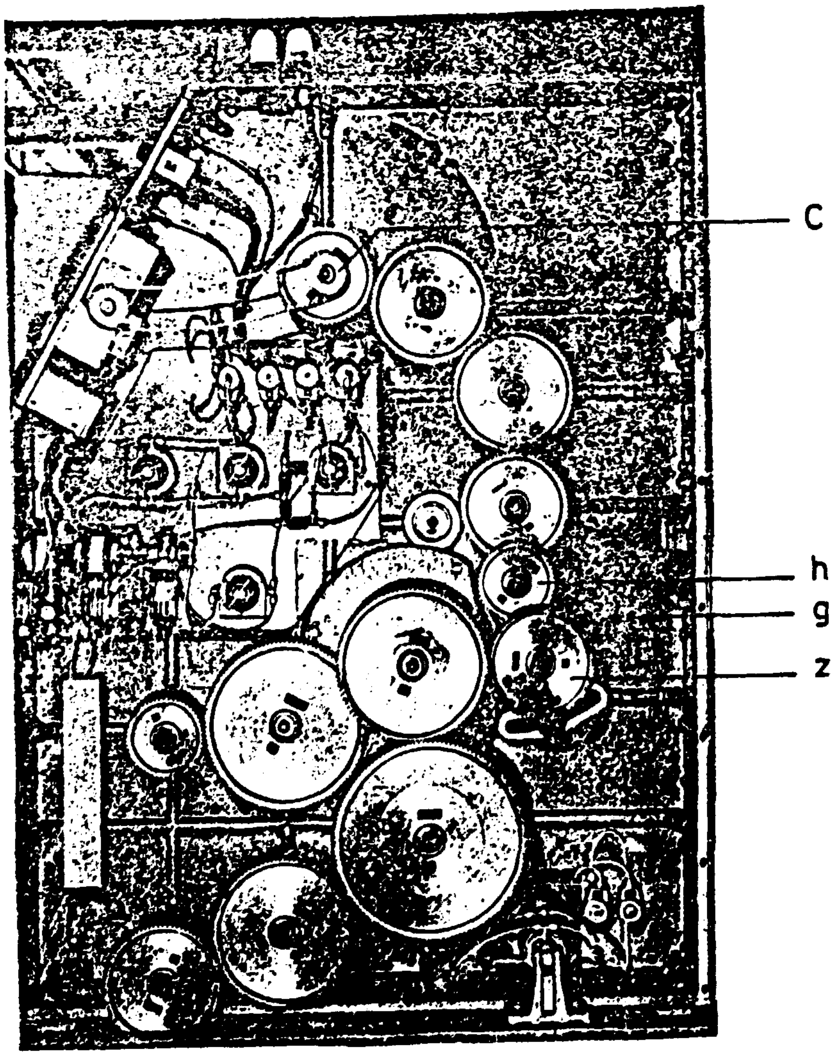
4.5 Twist change gear, change gears g and h, Fig. 4C.2

To determine the twist change gear and gears g and h (constant) see gearing plan and table.The teeth on gears g and h always add up to 112.

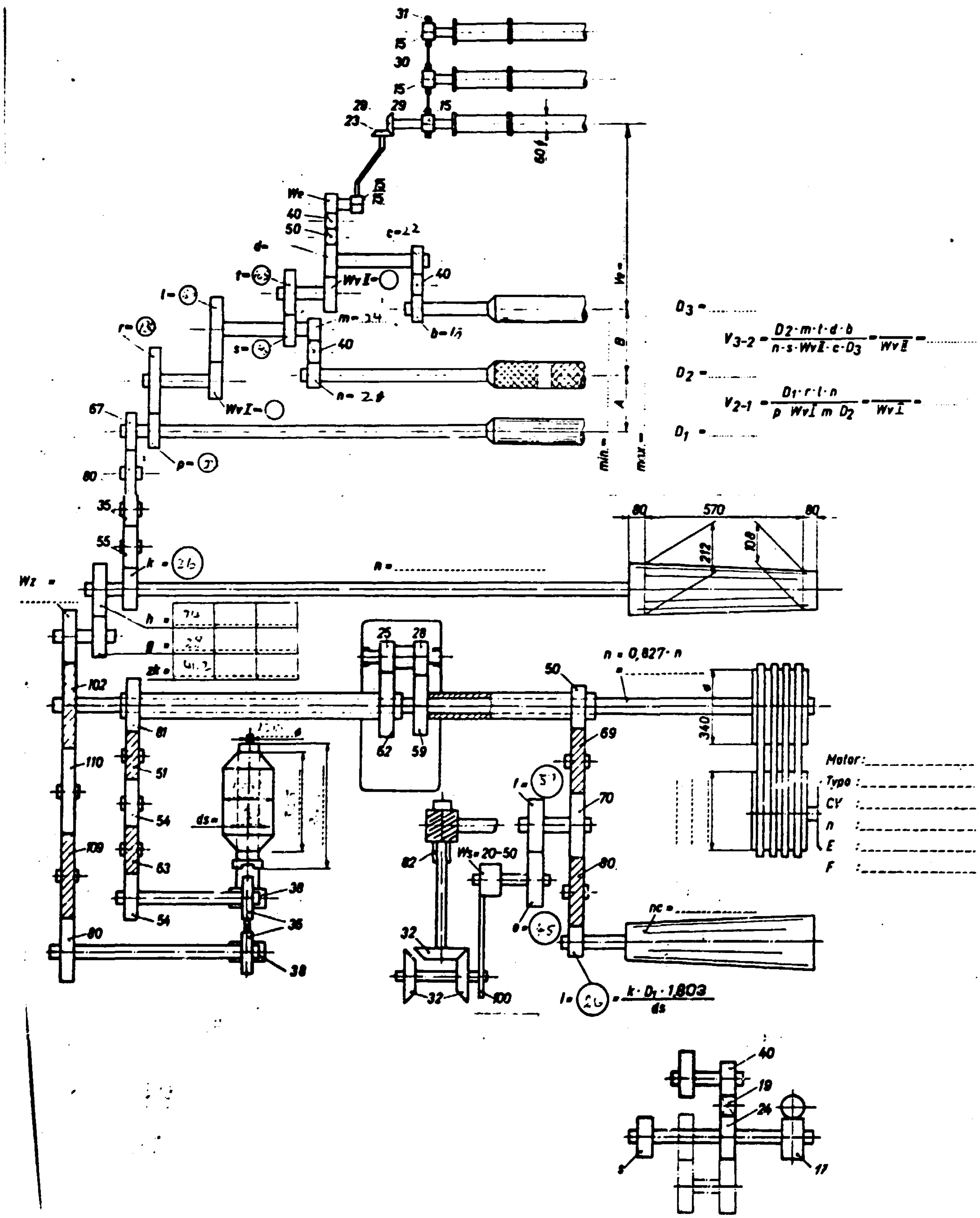
Procedure for changing:

- Remove fixing screws on twist change gear z and on gear h.
- Unfasten screw and swing out twist change gear.
- Twist change gear z and gears g and h can be taken off.
- Fit new gears. Insert distance ring be ween twist change gear z and gear g.
- Swing in twist change gear z, adjust tooth clearance and tighten screw.
- Tighten fixing screws on twist change gear and on change gear h.

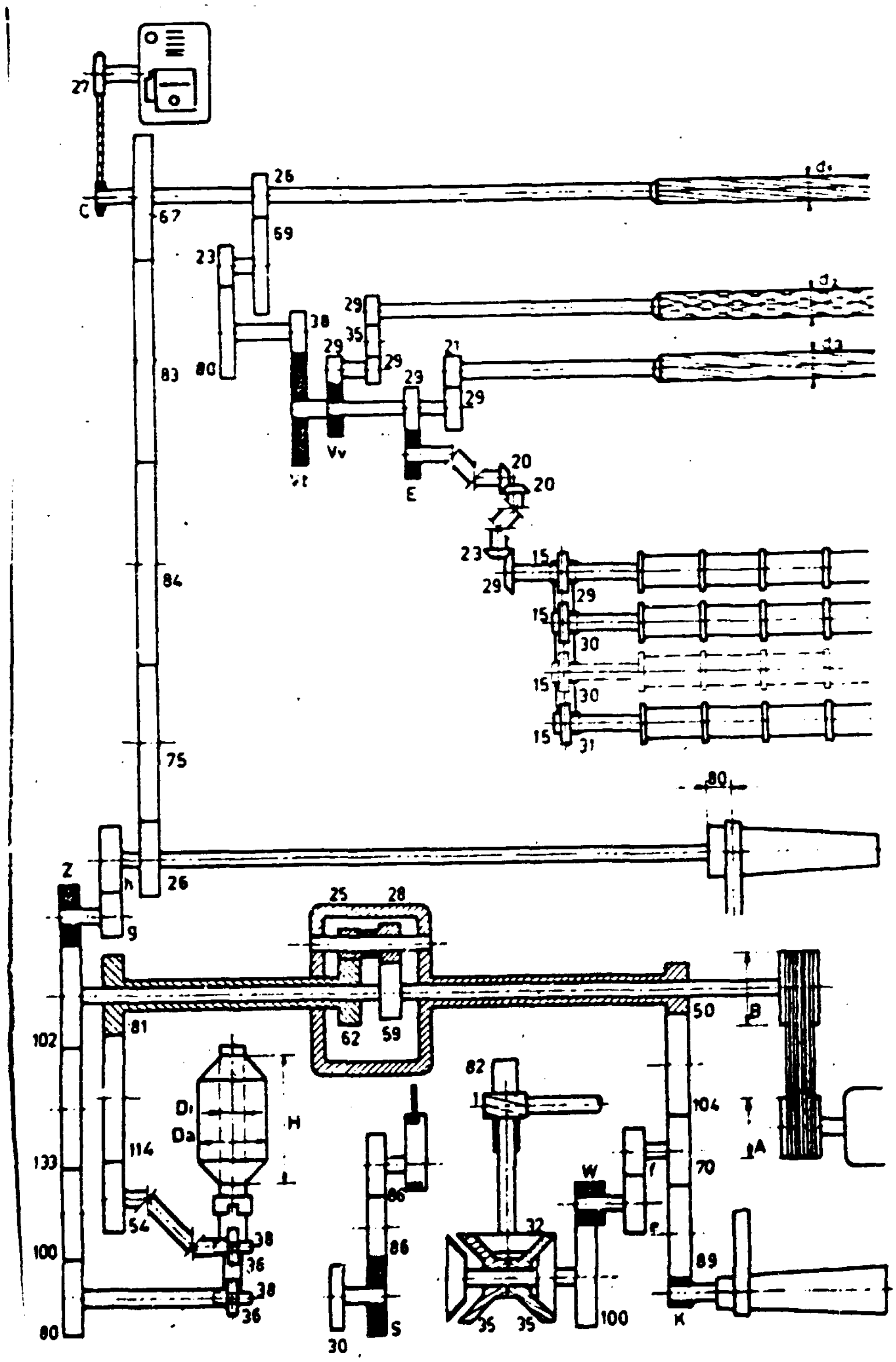
Figure 4C.2



GEARING DIAGRAM ROVING FRAME GS



GEARING DIAGRAM ROVING FRAME F 1/1



4.6 Lay change gear, gears E and F, Fig. 4C.3

To determine the lay change gear and the change gears E and F (constants to lay change) consult the gearing plan, table and nomogram. The teeth on gears E and F always add up to 102. With the lay change gear and the gears E and F the speed of the up and down motions of the carriage are varied. For a particular roving count start with the medium lay change gear and the gears E and F according to the table "Guidelines to determine the lay change gear and gears E/F". The optimal lay change can be established only by trials when putting the machine into operation with material, see Group 3.A, subsection 7.1

Procedure for changing:

- Remove fixing screws from lay change gear (2) and change gear F.
- Unfasten screw (1) and swing out lay change gear.
- Lay change gear (2) and gears E and F can be taken off.
- Fit new gears. Insert distance ring between lay change gear (2) and gear E.
- Swing in lay change gear, adjust tooth clearance and tighten screw (1).
- Tighten fixing screws on lay change gear and on gear F.

4.7 Tension change gear (3), Fig. 4C.3

To determine the tension change gear (3) see the gearing plan and nomogram. With the tension change gear the advance of the cone belt and hence the bobbin speed can be regulated. If the cone belt is to advance more per traverse, a bigger tension change gear must be fitted and vice versa. The figures given by the nomogram are to be regarded as guidelines. The optimal tension change gear can be established only by trials when putting the machine into operation with material, see subsection 3B.7

Procedure for changing:

- Remove nut (4)
- Unfasten lever screw and swing out intermediate gear.
- Exchange tension change gear (5)
- Swing in intermediate gear, adjust tooth clearance and tighten lever screw.
- Tighten nut secure.

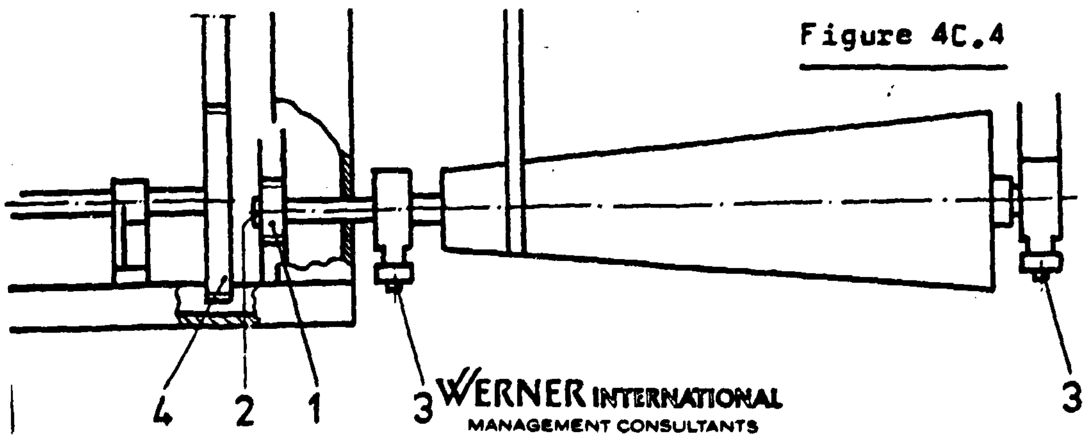
4.8 Cone change gear (1), Fig. 4C.4

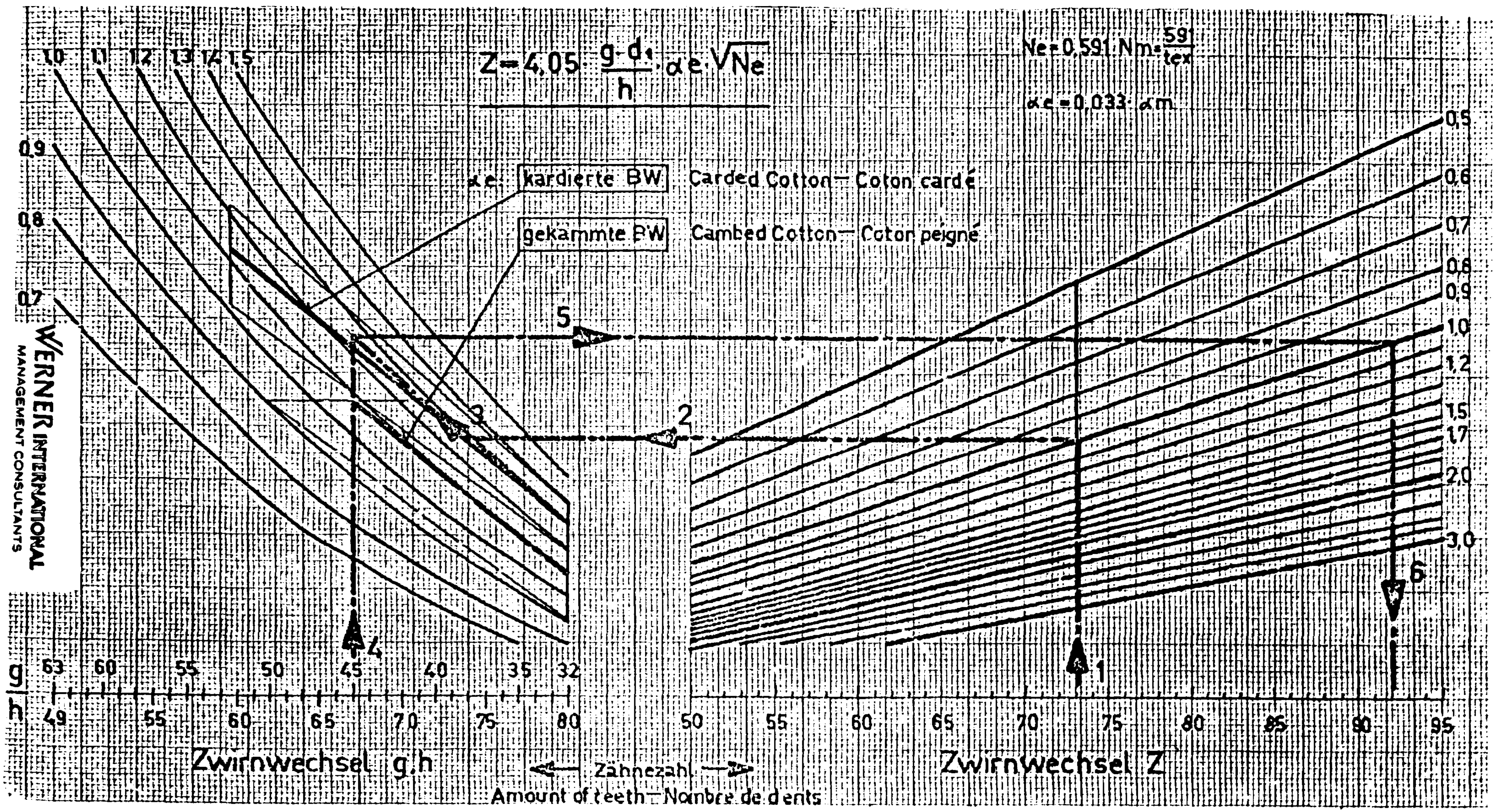
To determine the cone change gear see gearing plan. The cone change gear depends on the diameter of the front roll and the tube diameter. Together with starting position of the cone belt the cone change gear determines the basic speed of the empty tube and hence the roving tension with empty tube. Bigger cone change give higher tube speed and vice versa. normally the number of teeth on the cone change gear with 48 mm. tube diameter is equal to the front roll diameter. This with the starting position of the cone belt about 80 mm.

Procedure for changing:

- Unfasten screw (2).
- Unfasten gear (4) and shift it to the left so that the cone change gear (1) can be brought out.
- Unfasten screws (3) on the two bearings.
- Fit new cone change gear (1)
- Shift cone with bearings and adjust cone shaft parallel with supporting shaft until the necessary tooth clearance is obtained.
- Tighten screws (3)
- Shift gear (4) until it is flush with its mating gear. Tighten the screw secure.

Figure 4C.4



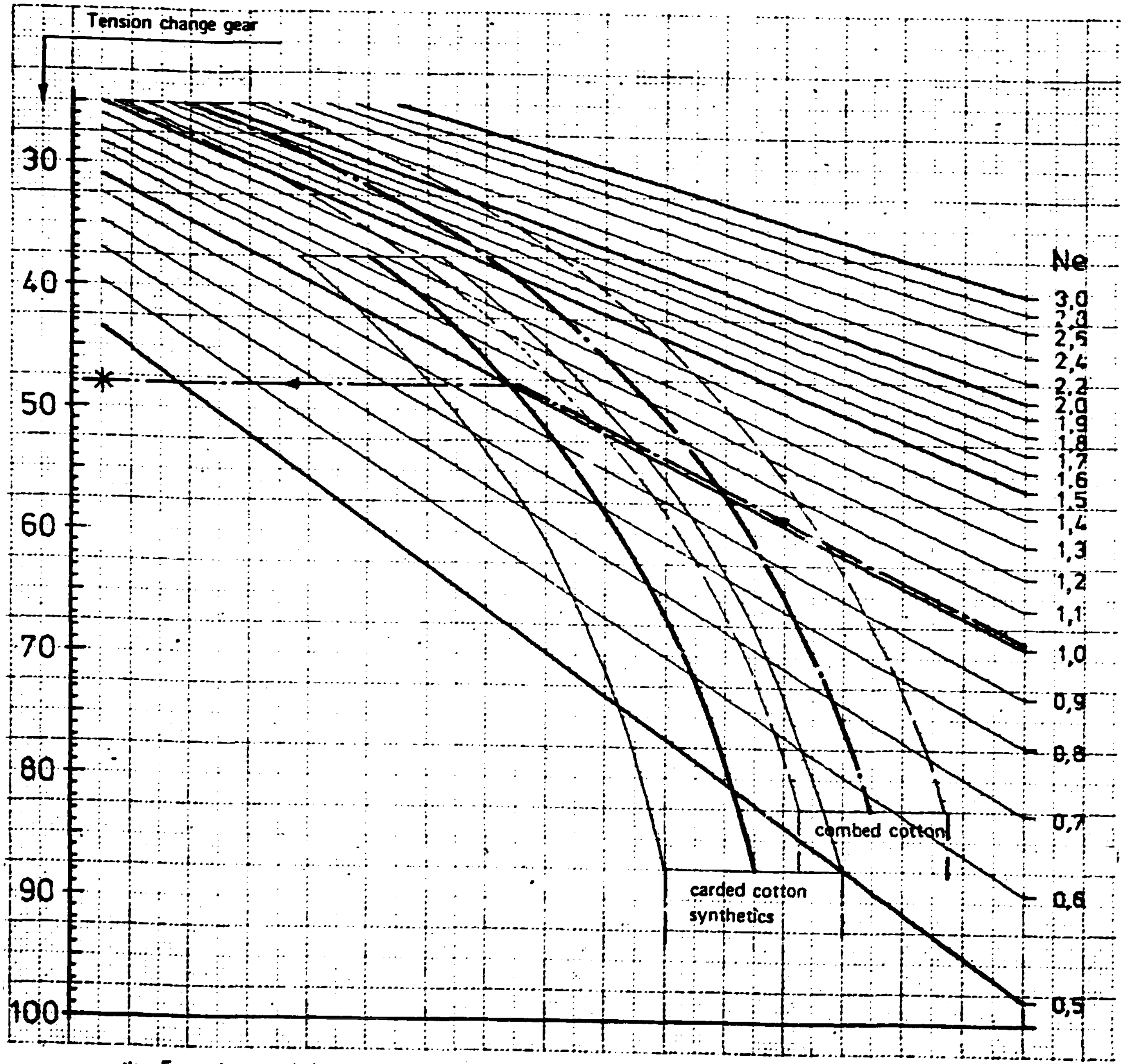


GUIDELINES TO DETERMINE THE TWIST GEARS g.h.Z.

Roller diameter d = 27 mm.

GUIDELINES TO DETERMINE THE TENSION CHANGE GEAR.

BOBBIN DIAMETER 48 mm.



* Example: carded cotton
Ne 1.0 —·—·⟵— tension change gear = 48 teeth

GUIDELINES TO DETERMINE THE LAY CHANGE GEAR AND GEARS E/F

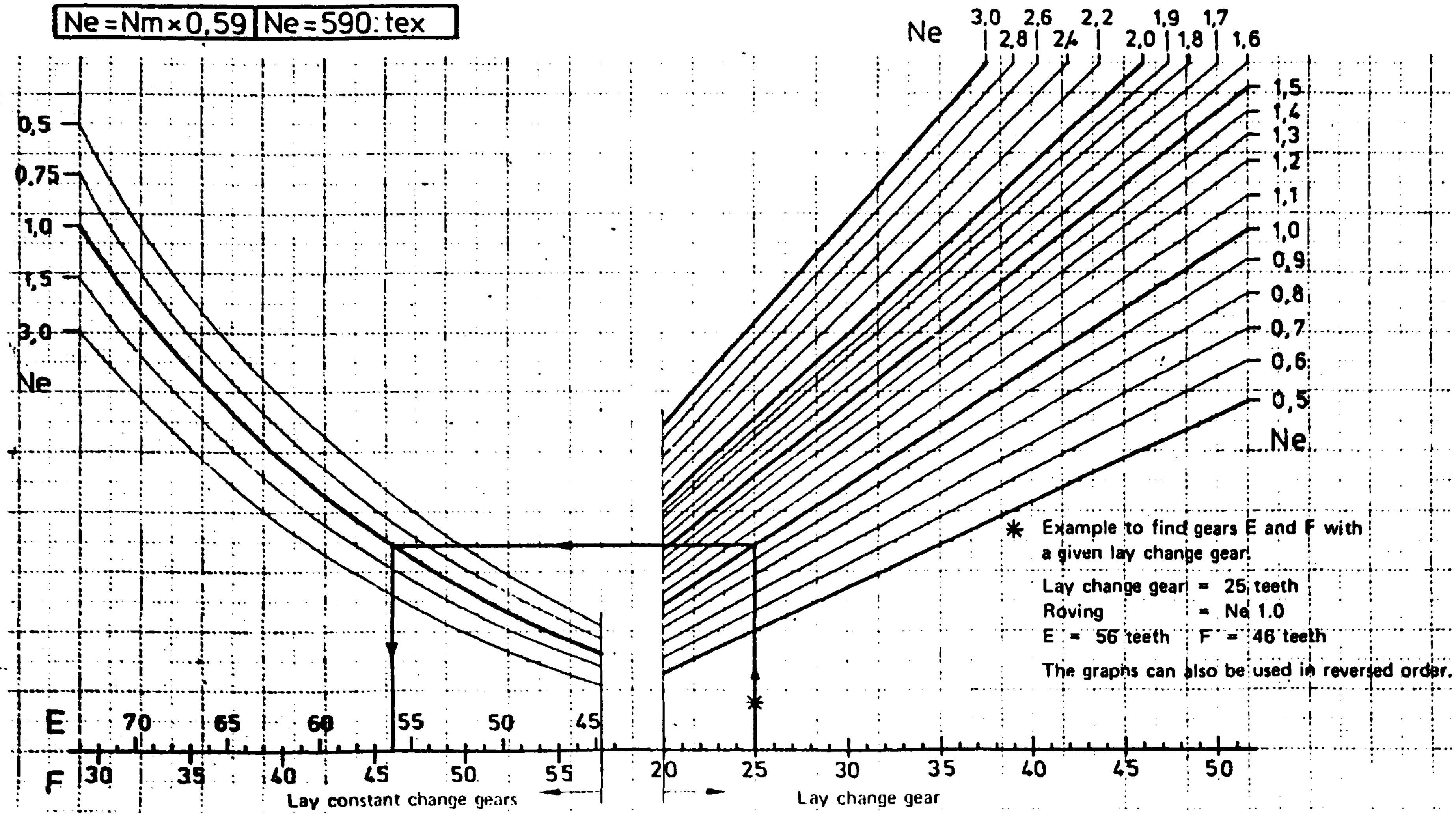
E = 61 F = 41											
Ne	0,5	0,6	0,7	0,8	0,9	1,0	1,1	1,2	1,3	1,4	1,5
Lay change gear	40	37	34	30	30	29	26	24	22	21	20
	42	39	36	32	31	30	27	25	23	22	21
	44	41	38	34	32	31	28	26	24	23	22
	46	43	40	36	34	32	29	27	25	24	23
	48	45	42	38	36	34	30	28	26	25	24
	50	47	44	40	38	36	31	29	27	26	25
		49	46	42	40	38	32	30	28	27	26

E = 73 F = 29														
1,1	1,2	1,3	1,4	1,5	1,6	1,7	1,8	1,9	2,0	2,2	2,4	2,6	2,8	3,0
43	39	36	34	33	31	30	30	29	28	27	25	24	23	22
45	41	38	36	35	33	32	31	30	29	28	26	25	24	23
47	43	40	38	37	35	34	32	31	30	29	27	26	25	24
49	45	42	40	39	37	36	34	33	31	30	28	27	26	25
50	47	44	42	41	39	38	36	35	33	31	29	28	27	26
	49	46	44	43	41	40	38	37	35	33	30	29	28	27
	50	48	46	45	43	42	40	39	37	35	32	30	29	28

Guidelines for lay change gear

These tables and graphs are for carded cotton and synthetic fibres.
For combed cotton 1 – 2 teeth are subtracted, for rayon and bulky synthetic fibres 1 – 2 teeth should be added.

Ne = Nm × 0,59 | Ne = 590 : tex



✱ Example to find gears E and F with a given lay change gear.

Lay change gear = 25 teeth
Roving = Ne 1.0
E = 56 teeth F = 46 teeth

The graphs can also be used in reversed order.

WERNER INTERNATIONAL
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GROUP 5 : A DRAFTING SYSTEM F1/1
B DRAFTING SYSTEM GS

5.A DRAFTING SYSTEM F1/1

1. DESCRIPTION.

The roll stands are simple and functional.
The roll blo s are precision made and the middle and back blocks are fully adjustable in the stand. Roll stands are located at each joint of the bottom roll, the length of which varies according to the gauge of the frame. The stands hold the rolls parallel on a plane of 30 degrees inclined from front to back.
The top arm is loaded pneumatically.
The front and back bottom roll are spiral fluted, the middle or apron roll is knurled.

2. PURPOSE.

The drafting system transport the stock and through progressive higher surface speeds, draw the fibres out and draft them into sliver roving.

3. PARTS.

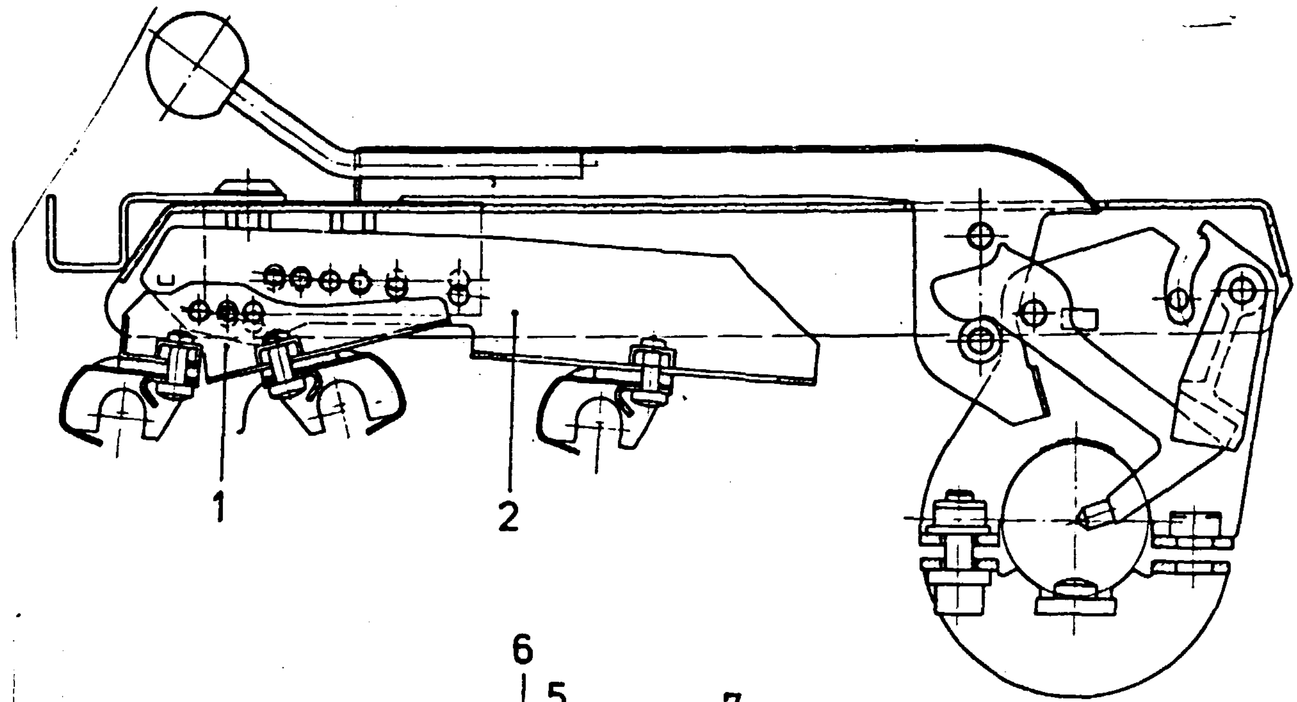
See Figures and Text.

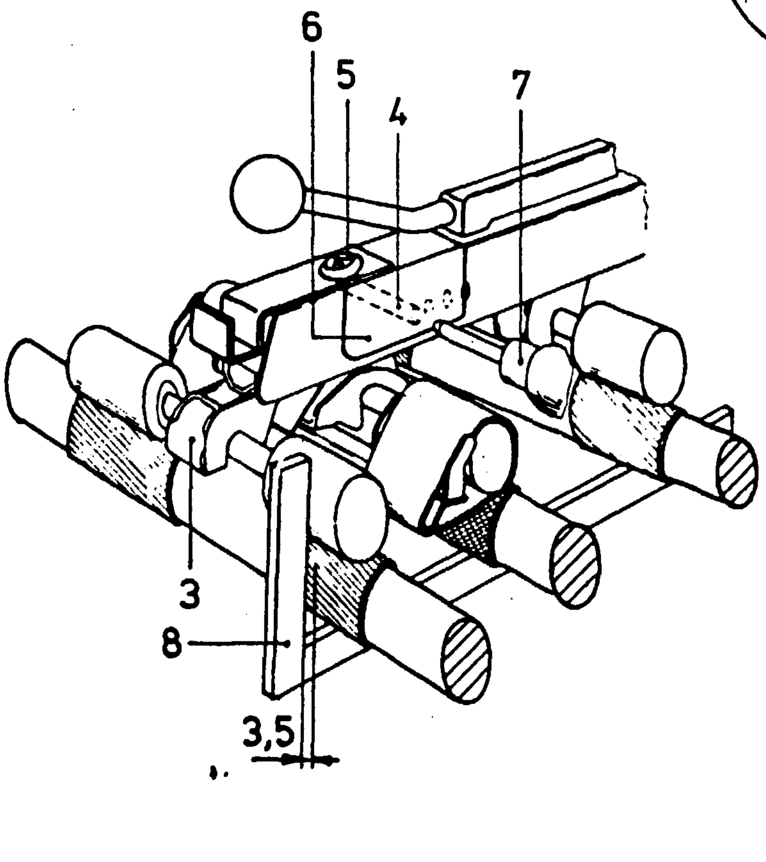
4. SETTINGS.

Loading of the draft system. (Fig. 5A.1)

The draft system loading depends on the hose pressure, the depth of entry "E" and the arrangement of the pins on the distributors (1) and (2).
The hose pressure is 0.8 - 0.9 bar. It must never be so high that the loading of the top front roll shaft exceeds 22 kg.
The loading can be measured with a spring balance suspended at (3).
Before altering the pressure, make sure that the depth of entry "E" and the distributors (1) and (2) are adjusted correctly.
(See subsection for adjusting depth of entry).

Figure 5A.1





Pressure distribution. (Fig. 5A.1)

To obtain favourable pressure ratios with all cradle lengths and nipping distances, three holes are provided on the front distributor (1) and six holes on the rear distributor (2).

Cradle lengths in mm.	Break draft distance 2nd-3rd fluted roll	Front distributor (1)	Rear distributor (2)
36	37 - 50	hole 1	hole 1 (2)
	51 - 75	hole 1	hole 2

If the pin (4) has to be inserted in a different hole on distributor (1) or (2), proceed as follows:

- Unfasten screw (5) and shift cover (6), exposing holes 1 to 6 on distributor (2). If the pin has to be changed on distributor (1), first push out the pin (4) on distributor (2) with the centering grip (7). The entire distributor (2) can be brought out downwards, giving access to the holes in distributor (1).

The following loads are applied to the top rolls when the pins are inserted in accordance with the table above:

Cradle length	With break draft distance	max.loading in kg per axle		
		front	middle	back
36	58	22	13.2	16

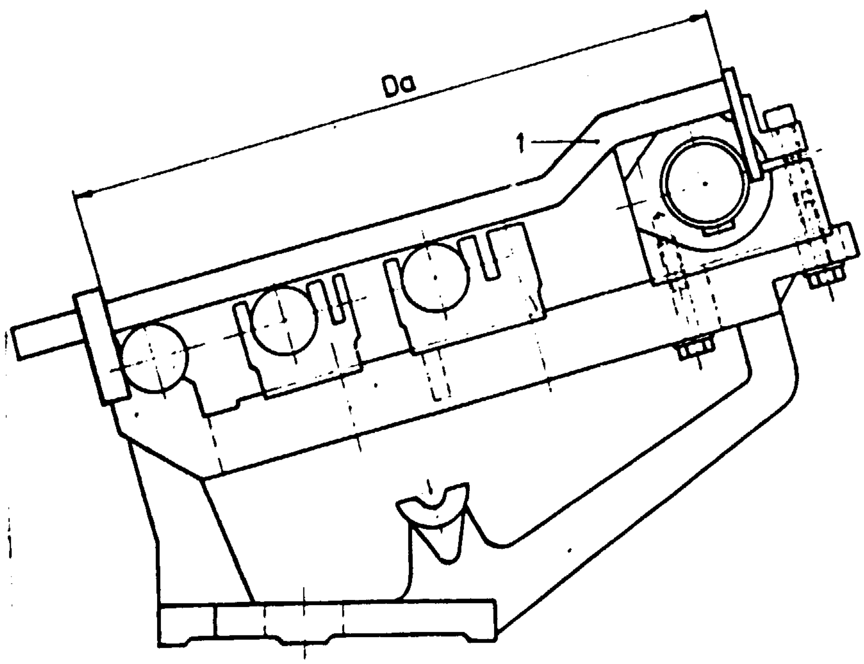
Adjusting the guide tubes, Fig. 5A.2

The position of the guide tubes differs according to the cradle length and the diameter of the front fluted roll. The lengths given in the table are approximate. To adjust the tubes the gauge (1) is used, set to the dimension "Da". It is best to adjust only one tube to the dimension "Da" first, then fit two top arms and adjust the depth of entry "E" to 37-38 mm. When the depth of entry is adjusted, the forward offset of the front top roll should be 2,5 mm. (± 0.3). If this is note the case, the tube distance "Da" must be corrected accordingly. Now adjust all tubes to this dimension "Da". With a forward offset of 2,5 mm the distance between the angle (8), Fig. 5A.2 and the fluted roll must measure 3.5 mm., i.e. 2.5 mm. forward offset plus (top roll radius minus fluted roll radius.

Approximate values of tube distance "Da" :

Fluted roll diameters	Cradle length	"Da"
27 - 27 - 27	36	288.6

Figure 5A.2



Adjusting the bearing saddles on the top arm, Fig. 5A.3

The top arms and the draft system are preadjusted at the works in accordance with the cradle length and the fluted roll diameter (see table).

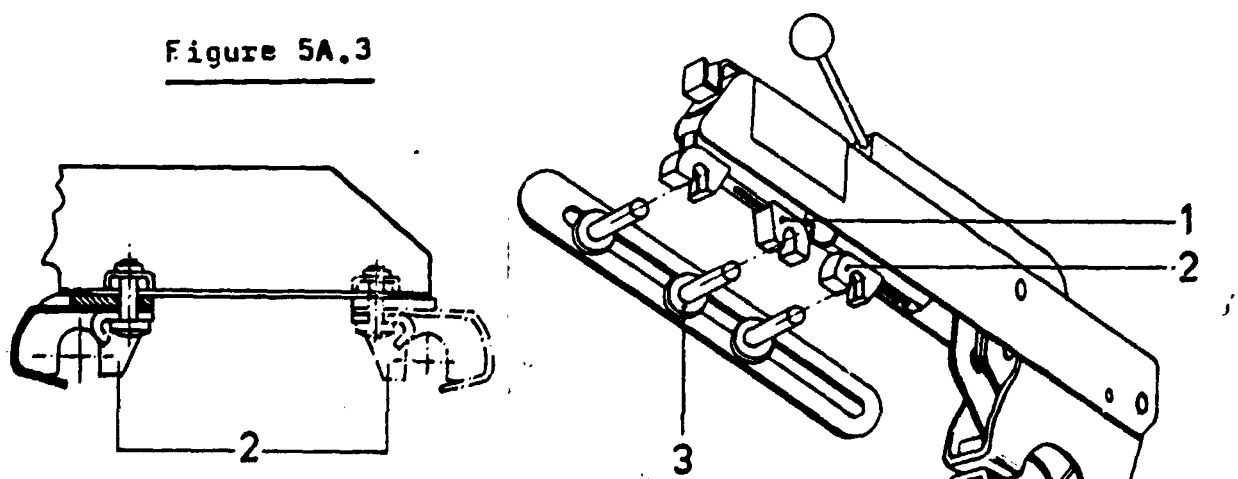
If the fluted rolls are adjusted otherwise than indicated in the table, the bearing saddles are then fixed on the gauge (3), and all other top arms can be adjusted exactly the same. If minimum break draft distances are to be adjusted, it is possible to turn the bearing saddles (2) by 180 degrees. For this the fixing screw must be slackened only slightly. The top roll on the bearing saddle (2) should have about 1 mm. backward offset against the fluted roll. The top roll in the cradle should have 3.5 - 6.5 mm.backward offset against the fluted roll.

Clearance between cradle apron and front roll pair must be 1 - 2 mm. Always make sure that sufficient room is left for the condenser, so that it can move properly and the run of the apron is not obstructed.

Fluted roll and top distances.

Fluted roll dia.	Top roll dia.	Cradle	1st-2nd fluted roll	1st-2nd top roll
27-27-27	29-31-29	F2R 36	44	53
	2nd-3rd fluted roll		2nd-3rd top roll	

Figure 5A.3



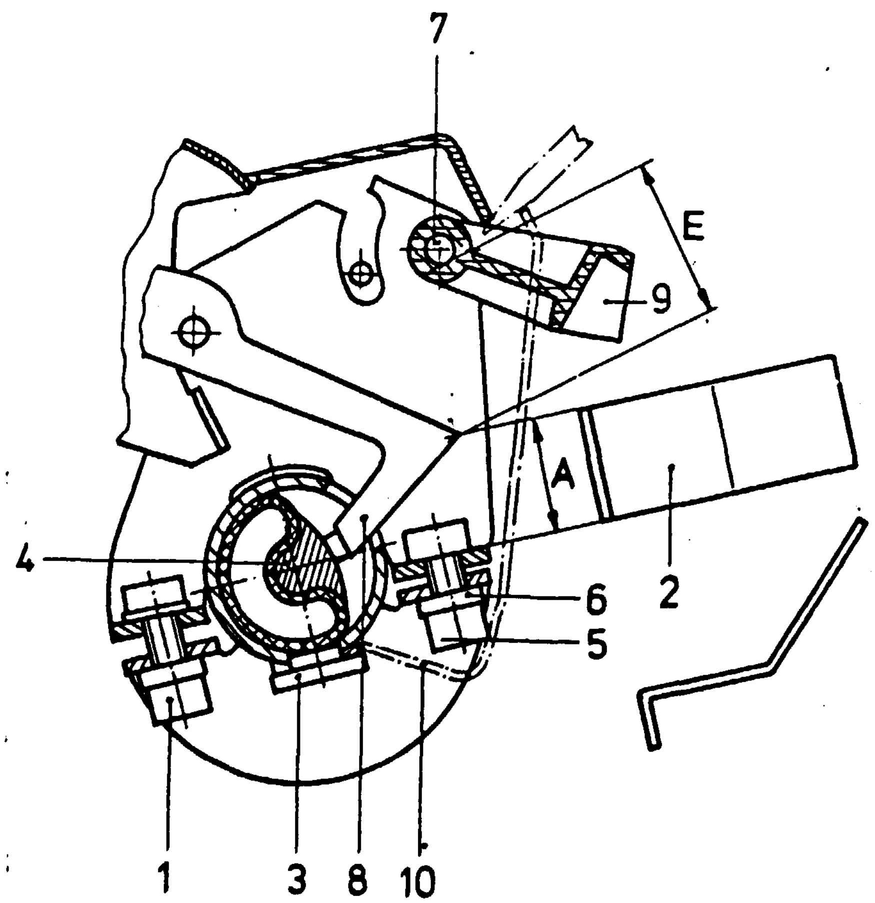
Fitting the guide arms, Fig. 5A.4

Only the screw (1) is fitted on the guide arm. At the work it is set to a particular position with a caulked nut to match the cradle and roll diameter. Screw (1) must not be adjusted yet. With the loose bottom part of the setting piece and the closed arm, push the projecting press thumb (8) through the hole in the guide tube into the hole of the tension strip (4). Press the caulked key (3) in the bottom part of the setting piece into the bottom hole of the guide tube. Insert screw (5) S 21 8 x 25 mm. with washer (6), centre the arm laterally (to the middle of the flutings) and tighten lightly.

To take up the play between the inserted key and guide tube, when tightening the screw (5) the open arm must be pushed strongly back or up by hand.

The screw (5) may be tightened only with the torque wrench to 1 mkp! This torque is reached during tightening when the head of the wrench disengages from the shank with slight click. Do not turn any further after this.

Figure 5A.4



Adjusting the depth of entry "E", Fig.5A.4

The depth of entry "E" from the angle of the thumb (8) to the bottom edge of the pin (7) must measure 37 - 38 mm. This gives the dimension A = 22.5 mm. on the gauge (2) with which the depth is measured. The stop (9) is swung out when measuring. The 22.5 mm. on the gauge (2) gives a depth of entry "E" of 38 mm. The angle of the thumb (8) may be a maximum of 1 mm. higher than the gauge (2) : The depth "E" is then 37 mm.

If the angle is more than 1 mm. higher than the gauge (2), the screw (5) must be unfastened and screw (1) tightened. Screw (5) is then tightenend 1 mkp with the torque wrench. If the angle is lower than the gauge (2), screw (1) must be unfastened and screw (5) tightened 1 mkp with the torque wrench. The depth of entry is always checked with the arm closed and the loading applied.

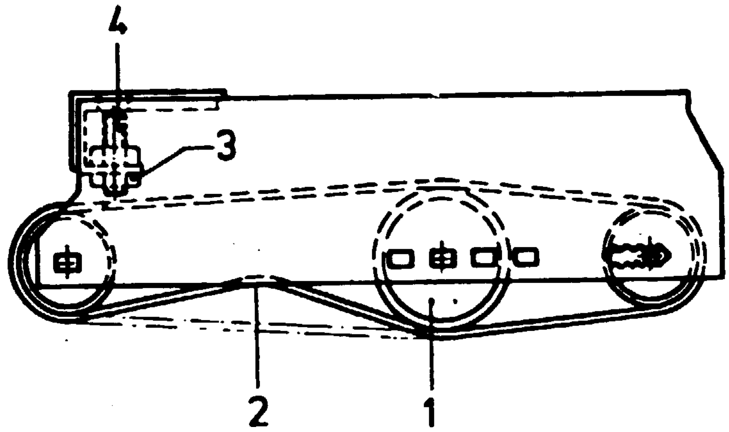
Adjusting the fluted rolls.

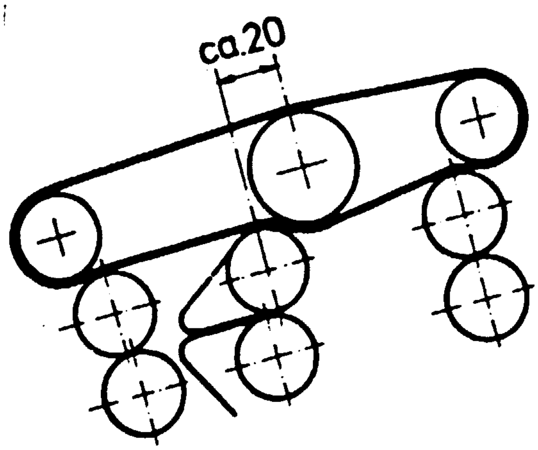
The fluted rolls of the draft system must be adjusted very carefully, so that their true running is not impaired. If the setting of the draft system has to be widened or narrowed more than 3 mm., proceed in stages. Always unfasten 5 to 10 bearings in advance, so that they can give when adjusting. If the adjustment has to be altered by 20 mm. for example, this must be done in 6 or 7 stages, adjusting the rolls about 3 mm. each time. At each of these stages only every fourth bearing is tightened lightly. At the last stage the roll spacing is adjusted exactly and the bearings are tightened up secure.

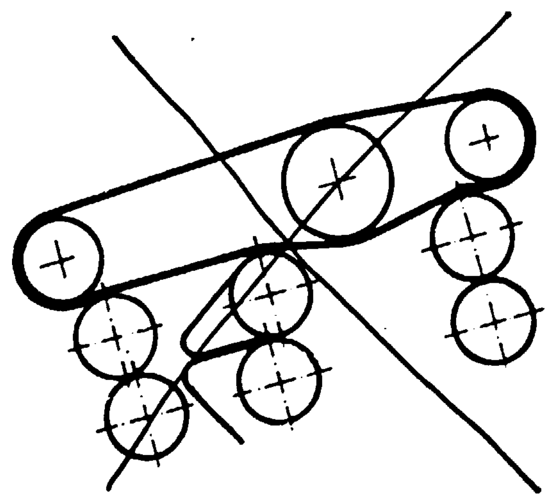
Adjusting the clearer cloths, Fig. 5A.5

The clearer cloths are to be adjusted as shown in Fig. 5A.5
To ensure that the clearer cloth is moved, the driving roll (1) must be positioned about 20 mm. behind the top roll in the cradle. The clearer cloth must not be tensioned. It must be possible to press it in up to the bottom edge of the guide (2). With the screw (4) the clearer must be adjusted so that its cloth touches the front top roll only lightly. Tighten the lock nut (3).

Figure 5A.5







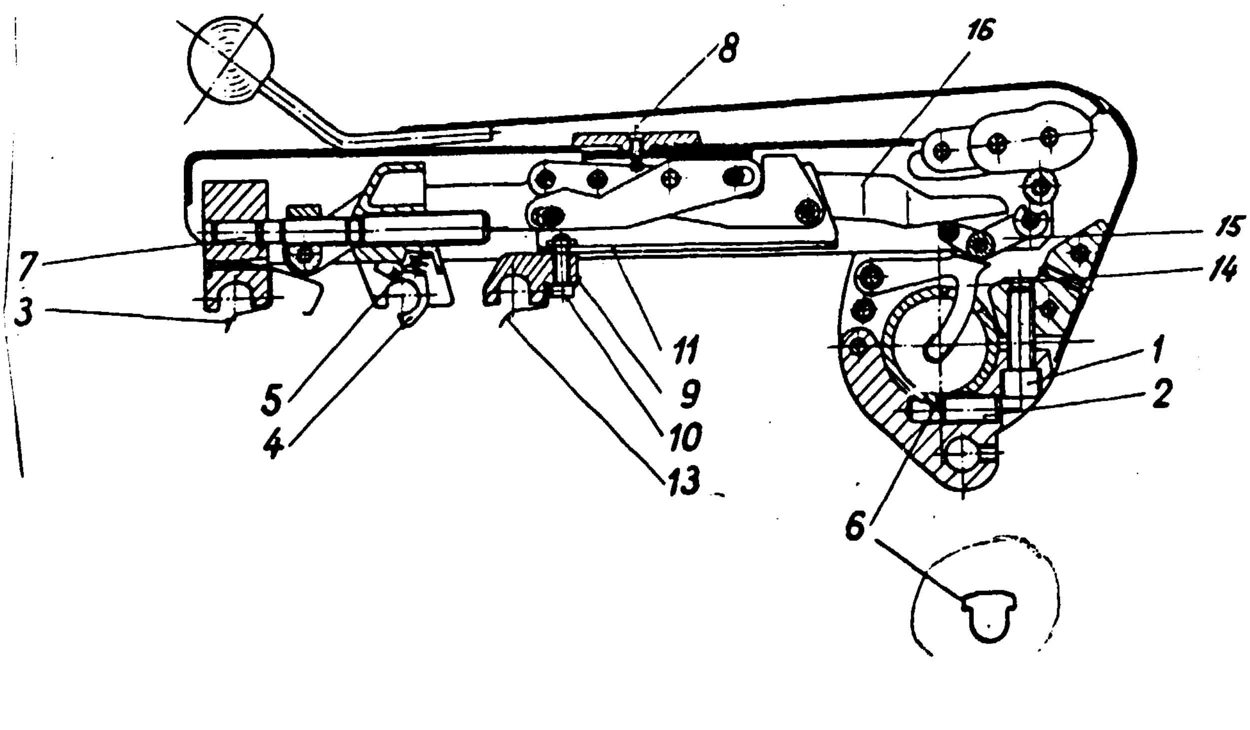
5B. DRAFTING SYSTEM GS.

1. DESCRIPTION.
   Same as 5A.

2. PURPOSE.
   Same as 5A.

3. PARTS.
   See figures and text.

Figure 5B.1



4. SETTINGS.

Adjusting the guide arms, Fig. 5B.1

Insert top rollers in the raised weighting saddles.
The top rollers are held in the saddles by the following parts:

- The 1st line has a retaining spring (3) extending from back to front; the shaft must be pushed from front to rear along the saddle when fitting it.

- The 2nd line has a catch (4) which is pressed down by a spring. (5). Once again the shaft is slipped in by pressing it along the saddle fron front to rear. The catch thus seizes the shaft, and this and the cage can only be released by pressing the catch back with the finger.

- The 3rd line has a retaining spring (3) extending from back to front, it functions in the same way as that of the 1st line.

Care is necessary when fitting and dismantling the top rollers. Press the top roller journals home evenly and make sure that they are not canted, because the soft aluminium die-cast saddles are easily deformed. The same applies when removing the rollers.

Press the top roller journals home evenly and make sure that they are not canted, because the soft aluminium die-cast saddles are easily deformed. The same applies when removing the rollers.

The service pressure is nos adjusted; this can be taken from Table 3, below. After closing the arms these are adjusted with the regulating screw (2) , Fig. 5B.1 to give 6 mm, clearance between the first weighting saddle and the guide arm (Fig. 5B.2). Now tighten screw (1). The setting gauge (Fig.5B.3) with 3 notches is supplied for adjusting the arms. The middle notch corresponds to a clearance of 6 mm., and must coincide with the notch in the front weighting saddle when both sides of the gauge are tight up.

Sin-e the arms tend to drop when tightening the screws (1), a further check is necessary to verify that the 6 mm. clearance is still there. Allowance for the drop should be made when adjusting subsequent arms, so as to obviate the need for re-adjustment.

Guide arm	F S 185 P		
	Air pressure	top roller weighting	
Pressure	at.ga	per axle lbs	kg
minimum	0.70	40	18
normal	0.75	44	20
maximum	0.85	48.5	22

Adjusting the weighting saddles.

The weighting saddles are linked together though individually adjustable, and are housed inside the guide arm, tney have a scale on the outside of the guide arm, enabling every saddle to be adjusted accurately. For this the guide arm should be loaded about 0.2 kg/cm^2, because only then do the notches of the weighting saddles and the scale graduations coincide properly.

With the spindle (7) in the guide arm the main draft distance is fixed first. This depends on the top roller diameter and cage length, and should be adjusted to give 1 - 2 mm. clearance between top roller and apron. Under all circumstances enough space must be left for the condensor, so that it can moove freely and does not impede the run of the apron.

The forward offset is then adjusted. It amounts to 2.5 mm. can be regulated by means of the notch on the front weihting saddle and the offset on the outside of the guide arm. It is fixed with the screw (8) in Fig. 5B.1

Figure 5B.2

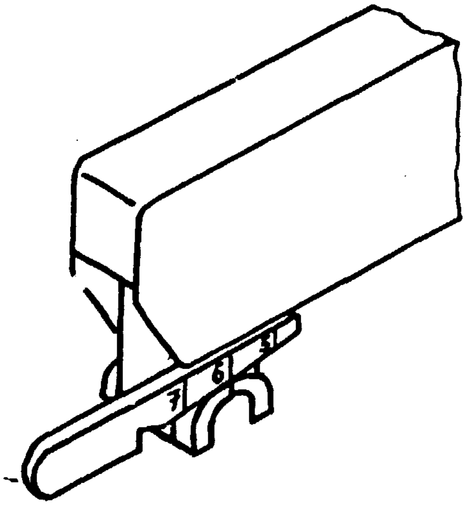
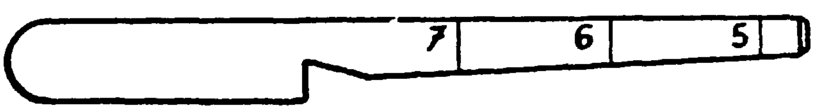


Figure 5B.3



The 3rd weighting saddle (9) (fig.5B.1) is secured with the internal socket screw (10) on the beam (11) belonging to the lever system. It should be placed vertically above the fluted roller; adjustment is effected by means of the scale on the outside of the guide arm.

Adjusting the tension roller.

Insert the apron guide rails (7) and the thread guide rails (10) and (11) with condensers screwed on. Screw covers (12) over ball bearings.

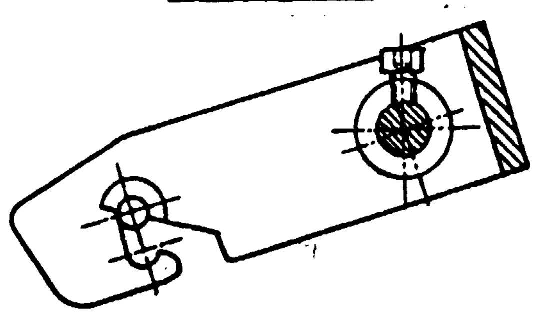
Push tension roller holder with guide bush and spring on to rod, and fit. Distribute holders over claws and suspend tension rollers. Turn aprons by hand at the bottom of the tension roller, set to the claws and suspend tension rollers. Turn aprons by hand at the bottom of the tension roller, set to the claw centres and tighten screw in guide bush. The latter must be roughly vertical (Fig.5B.4) and the aprons then have the correct tension.

Exact alignment of the aprons must be performed once again at the commissioning, with the machine running.

The tension roller holder have nylon bearings, so that the roller journals do not need lubrication.

Fit gears and cover. Do not forget the partition wall between the last roller stand and the gears.

Figure 5B.4



Spring for front bottom roller or board.

The holders (8) (Fig.5B.5) are to be adjusted so that the clearer roller touch the aprons lightly. Excessive pressure will cause deterioration of the roller coverings. Clearer boards should be wiped over lightly by the aprons. When adjusting the holders make sure that the bearing saddles of the 2nd roller line do not shift.

Hold the distance gauge between them before unfastening (on the F2R 36 there is no intervening space.)

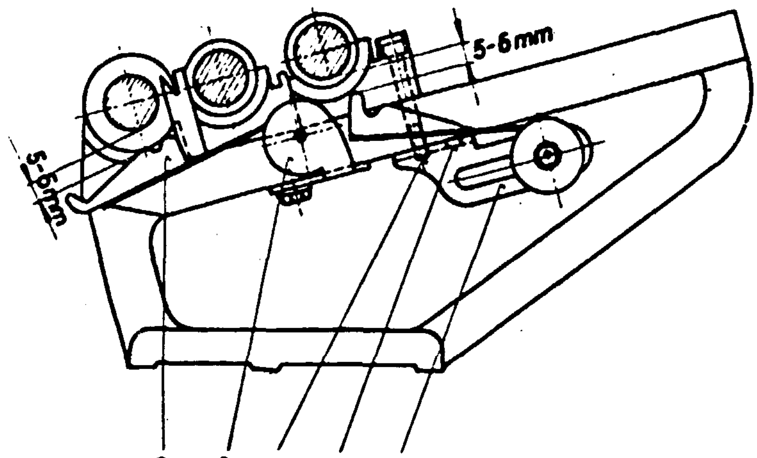
The springs (9) are to be adjusted to give a space of 5 to 6 mm. between roller and clearer roller holder (Fig. 5B.5).

Spring for back bottom clearer roller (Fig. 5B.5).

The holders (16) have two $\frac{1}{4}$ threaded holes. Hole A is for F2R 36 and holde B for F2R 36 (4-roller) drafting arrangement.

On the 3-roller drafting arrangements the springs should be set in the same fashion as described above. On the F2R 36 make sure that the springs do not touch the holder (8). With the other drafting arrangements the back rollers may be fitted vertically below the corresponding rollers, taking care to keep them parallel.

Figure 5B.5



Advantages of revolving clearer cloths.

Good cleaning efficiency is obtained thanks to the slow run inducted by the drive from the 2nd and 3rd top rollers. Moreover the tendency towards lapping often encountered with rollers is almost completely eliminated. Another benefit is the considerable extended stripping intervals made possible.

Adjusting the clearing device.

Satisfactory performance of the revolving clearer cloths depends on a large extent on the adjustment, and special attention should therefore be given to this, especially when processing combed cotton.

The clearer cloths must not be over-tensioned. If the clearer cloth is raised slightly between the front and middle rollers it should be roughly flush with the bottom edges of the side walls (Fig.5B.6a). Regulating is effected by shifting the back roller, by inserting the shaft in the appropriate seat.

The following procedure is adopted for adjusting the clearing devices:

Only about 4 clearing devices are adjusted for a start, in order to ascertain the best position.

The front holder is adjusted in a way that the front roller of the clearing device overhangs the front top roller by 20 to 25 mm. (¾" to 1") (Fig.5B.6b).Regulate the height by means of the adjustable front hook in such a way that the clearer cloth just touches the front top roller. When processing combed material, this adjustment is very delicate, because little rolls are formed which accidentely fall into the roving when the pressure of the cloth is too strong. When processing carded material the clearer cloth is allowed to give a slightly higher pressure on the top roller.

The back holder is adjusted so that the back connecting rod is up against the middle of the holder after raising.

The middle roller, which drives the clearer cloth, is likewise adjustable. Reliable running of the cloth depends on this adjustment. The roller must be fitted to give it about 20 mm. (¾") backward offset in relation to the 2nd top roller, or 20 mm. (¾") forward offset from the 3rd top roller. If the clearing cloth is sufficiently slack it will give a peripheral contact over the 2nd and 3rd top roller, ensuring satisfactory drive. It is absolutely essential that the roller of the clearer device rests on one of the top rollers (Fig.5B.6b) a floated roller (Fig.5B.6c) cannot guarantee a good drive.

It may be possible to improve the contact point of the middle roller by shifting the clearing device backwards or forwards, though care must be taken not to make the forward offset of the front roller too small (min. 20 mm. = $\frac{3}{4}$"). Having adjusted the middle roller the contact between the cloth and the front top roller must be checked once more and corrected if necessary.

It is also important that the clearing device should have equal clearance between the guide arms on either side, and should not catch anywhere raising or lowering.

Check the side walls for parallelism and re-align if necessary.

Figure 5B.6a

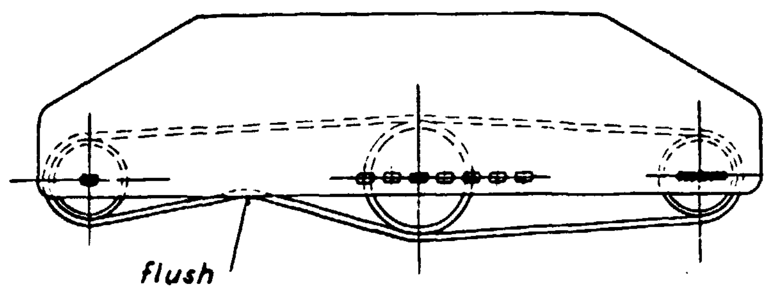


Figure 5B.6b

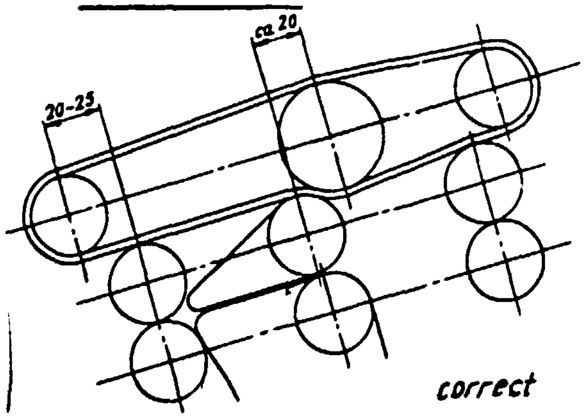
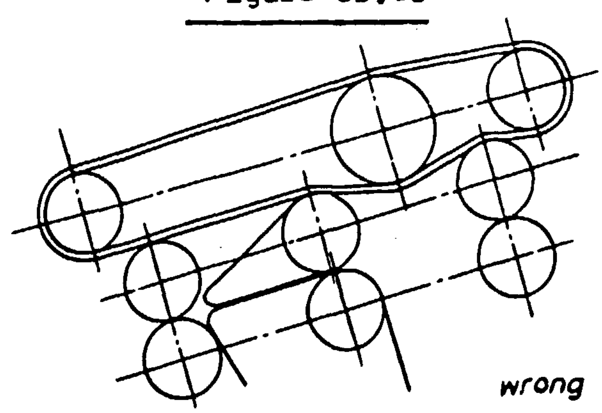


Figure 5B.6c



Checking the drive of the clearer cloth.

The best adjustment is ascertained with a spring balance if one is available. A piece of cord with a hook is tied to the spring balance, and the hook slipped under the clearer cloth. Whilst the machine is running the force needed to stop the cloth is registered (Fig.5B.7a). The Measurements should be repeated a few times over because new cloths are rather stiff and this may cause wide deviations. The force needed to stop the clearing cloths varies a great deal according to the width of the top rollers, delivery speed and draft, and may range from 100 to 600 gr.

Having ascertained the best adjustment it is best to fashion a template, to facilitate adjustment of the front holders (Fig.5B.7b)

Cleaning the clearer cloths.

If the clearer cloths are properly adjusted a felt-like fibre layer is formed, which only has to be removed after weeks or months, depending on the accumulation of fly. No definite instructions can be given regarding these intervals, because the incidence of fly depends on a number of factors such as material, roving count, twist, climatic conditions, etc.

The clearer cloths may be stripped in the following ways:

- The cohesive fibre covering is turn up by hand and removed.
- The fibre covering is stretched off with a piece of card clothing.
- The clearance devices are taken out and stripped by means of revolving drum with stripper clothing, as used for stripping clearer rollers.

Figure 5B.7b

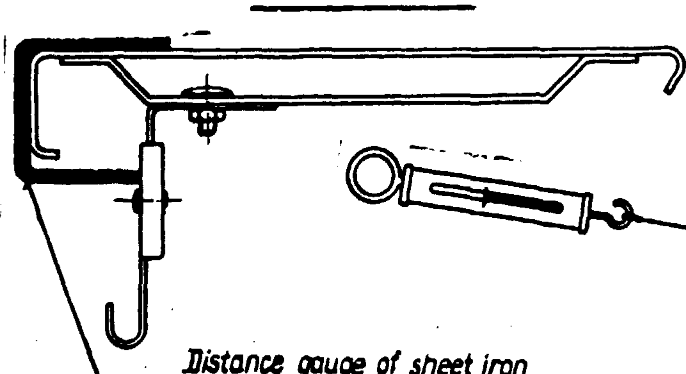
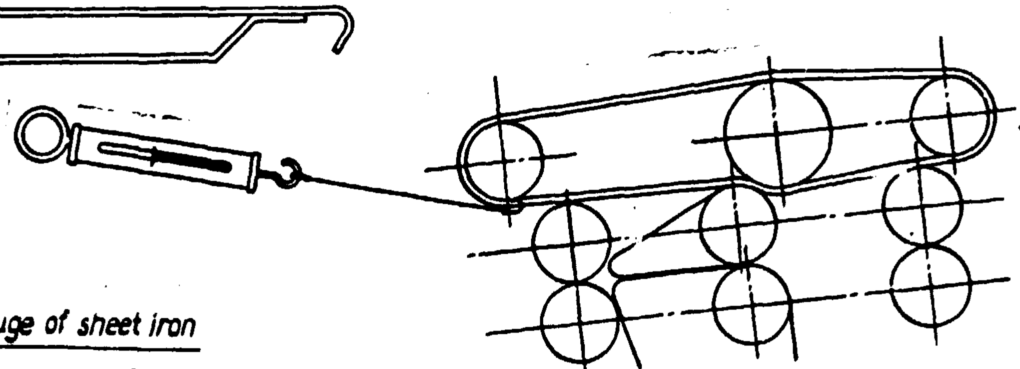


Figure 5B.7a



GROUP 6 : A THE WASTE COLLECTION SYSTEM
B SAFETY DEVICES F 1/1 + G5

6.A THE WASTE COLLECTION SYSTEM.

1. DESCRIPTION.

With the waste collection system the fibres from a broken sliver are sucked into the flute pass on into the main duct then the monitoring channel and through it to the collector unit where they lodge against the screen to wait removal for reprocessing.

Through the monitoring channel item _ flows the aspirated air. As soon as broken roving parts are carried along in the air current, they set off, when passing the monitoring channel, a series of short electrical impulses on the comb electrodes. These impulses via the contacts arrive in the control device item 7, are amplified, rectified and actuate a relay. The latter cuts off the protective motor switch of the frame motor and, at the same time, causes the signal lamp item 11 to flsh. About 10 seconds after stopping the roving frame motor, the control device automatically releases the protective motor switch again, thereby the signal lamp is extinguished. After a further 10 seconds, the unit is ready again for its supervisory function.

2. PART NAMES.

1 Hinged suction tube with nozzles
2 Connecting tube
3 Rubber joint
4 Suction duct
5 Duct-joint
6 Monitoring channel with comb electrodes
7 Control device (control box)
8 Switch box
9 Breakage counter
10 Protective motor switch with mounting frame
11 Signal lamp complete

3. ADJUSTMENTS.

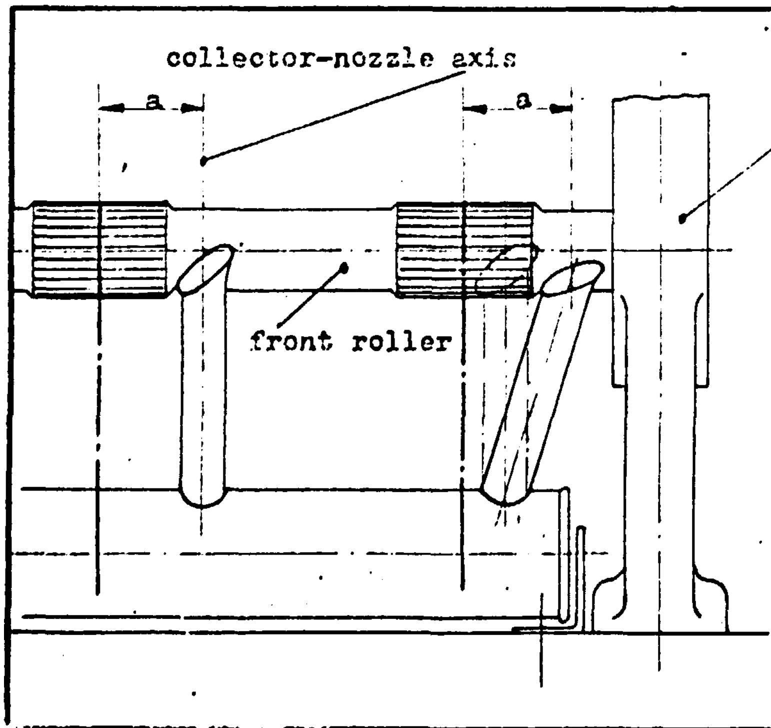
Position of the nozzle.

The suction nozzle opening lies always to one or the other side of the roving. The distance of the nozzle opening to roving depends on the count and is found in table and figure No. 4.

The opening of the nozzle is on the right side of the roving when the flyer arms turn in an anti-clockwise direction the roving passes to the left of the nozzle when the flyer turns clockwise. (as per flow of roving).

Setting of the nozzles.

Whenever the nozzles do not agree in their position with the afore-mentioned table No.4 or whenever after running a further adjustment has to be made, a non-metal rod should be used, corresponding roughly to the inside diameter. To avoid damage to the soldered seam when bending the nozzles, a counter pressure at the base of the nozzle should be exerted.



4

"a" Measurement	roving Nm
ca. 30 mm	from 1,0 to 1,5 Nm
" 25 mm	" 1,6 " 3,5 "
" 20 mm	" 3,6 " higher and finer

"a" Measurement	roving engl.
ca. 30 mm	from 0,6 to 0,9 Ne
" 25 mm	" 1,0 " 2,0 "
" 20 mm	" 2,1 higher and finer

4. POSITION OF THE SUCTION TUBES.

Fitting together of the hinged suction tubes is done in the following manner:

a) Threaded pin M6 x 15 has to be tightly screwed in to the tube end plug.

b) Fit the two rubber rings on the T-piece M 52 x 12.

c) Fit together the two suction tube pieces with a T-piece (Fig. 1 and 2).

d) In case the swivel movement of the hinged suction tube has to be limited a stop-jubilee clip has to be fitted on to the parts of the suction tube. This will be screwed down tightly as soon as the correct nozzle position is determined (Fig. 5 and 6).

e) The connecting tube is fitted into the T-pieces.

Fitting of the complete suction tube to the machine.

Wherever possible, this suction tube should be fitted as one complete unit.

a) Fit connecting tube into rubber joint.

b) Fit 2 rubber break rings, diameter 6,14 x 1 mm. over threaded pins.

c) Move threaded pins on suction tube into the tube supports.

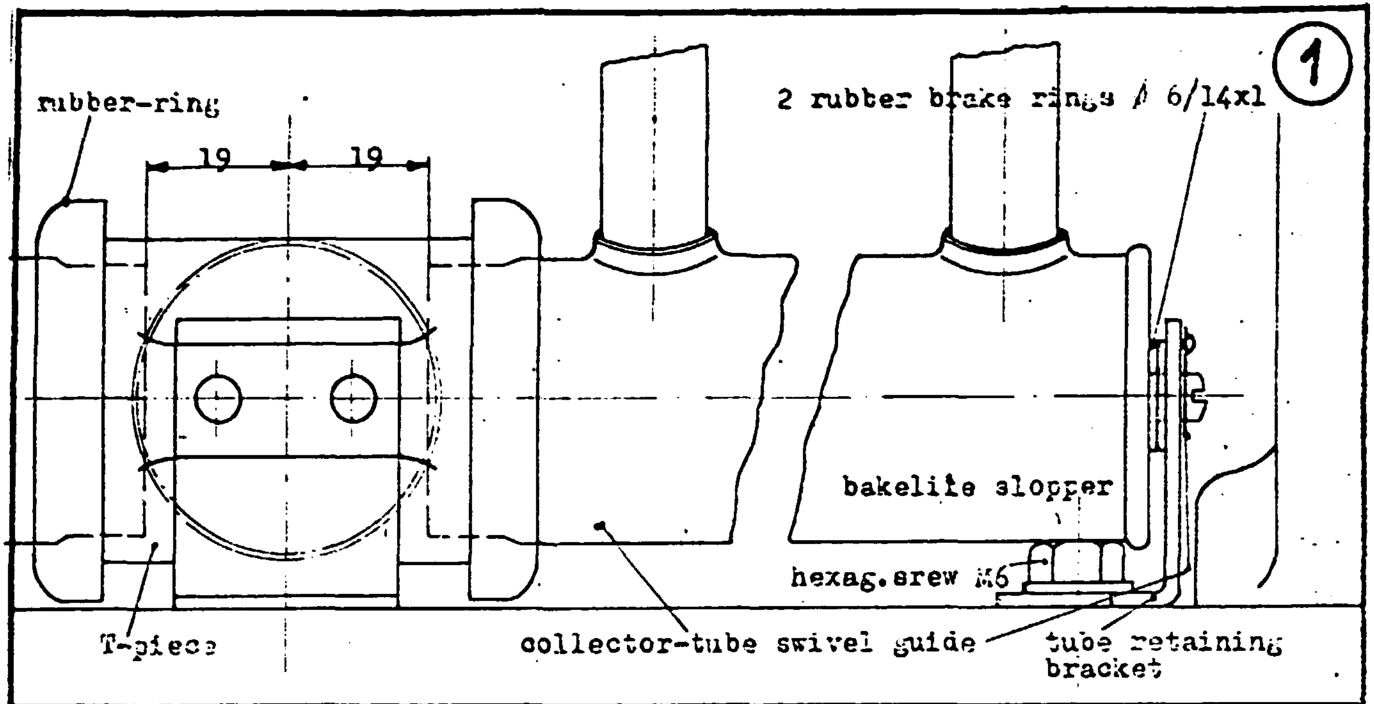
d) Close retaining spring of the suction tube support.

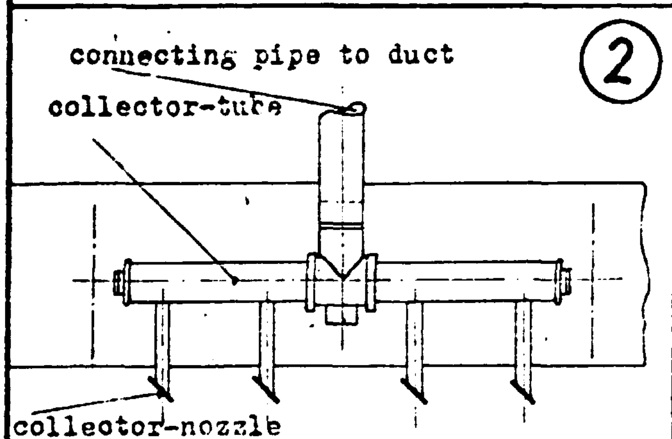
e) Screw down provisionally the T-piece.

On certain speed frame the T-piece has to be tightend down provisionally before the hinged suction tube is placed into the suction tube supports.

Adjusting the sensitivity.

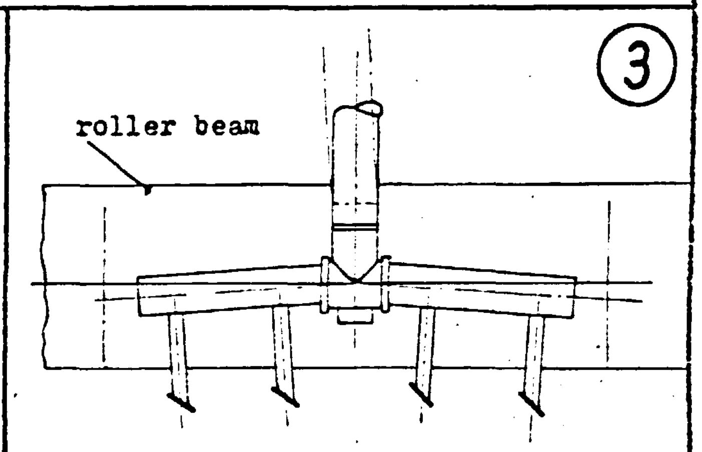
The sensitivity of the assembly can be adapted to the yarn number. When the sensitivity has been properly set, the assembly has maximum selectivity between roving-breaks and fly. Sensivity-mark 5 to 8 corresponds approximately to intermediate yarn numbers (see below).





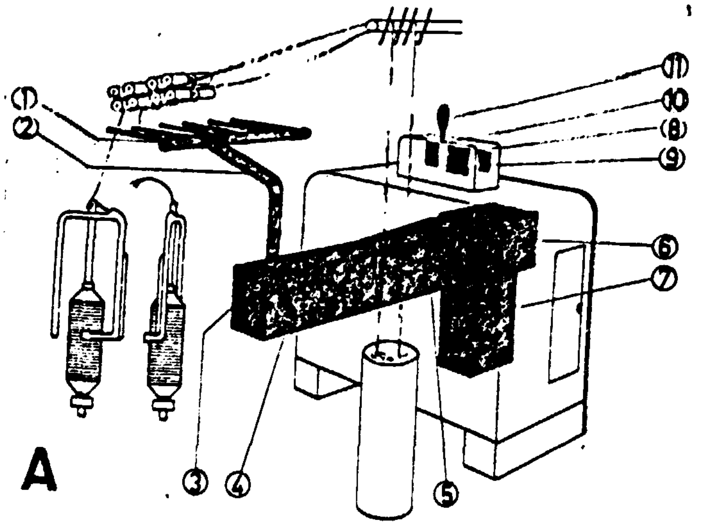
right

Axis of collector-tube parallel to roller beam
connecting pipe to axis of collector tube

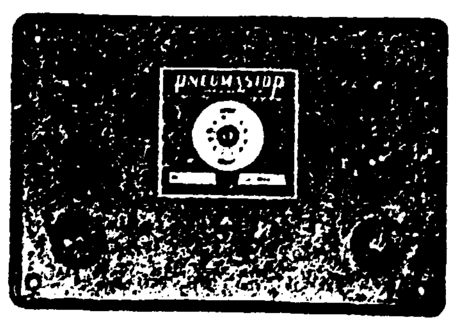


wrong

Must never be fitted in this manner.



A



B

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Sensivity is adjusted by turning the sensitivity regulator on the switchbox (see illustr.B) by means of a screwdriver, The sensitivity of the assembly is subdivided into 12 marks, mark 1 having the lowest and mark 12 having the highest sensitivity.

It is to be recommended that the lowest possible value of sensivity is set, at which the assembly still responds to a roving break. When setting the sensivity, release rovings at the far end of the filter box. Normal reaction should be 4 seconds maximum, 3 seconds maximum for shorter frames.

The regulator for sensivity has to be set as follows, as shown by practice:

Yarn No.	0,6	Setting	4 - 6
	0,8		5 - 7
	1,0		7 - 9
More than	1,0		8 - 12

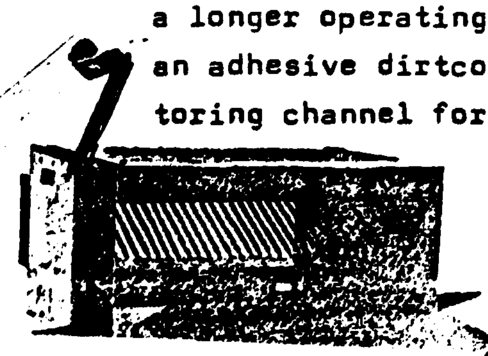
When the relative air humidity is less than from 30 to 40 %, the sensitivity is to be raised.

Cleaning the filterbox and the monitoring channel.

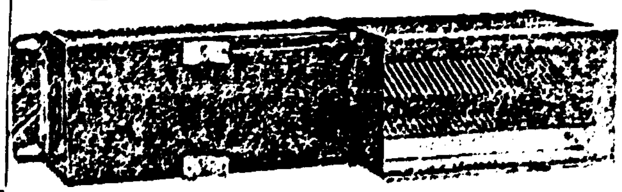
The filterbox has to be emptied at regular intervals. Under no circumstances shall the filter screen be left covered with a thick layer of fibres (about 1 ½") for any extended length of time. To guarantee perfect functioning, the monitoring channel and the nearby parts should be inspected and cleaned after each shift.

Take care that no roving pieces, fibre parts or beards are present in the monitoring channel (illustr. D and E). If after a longer operating time the comb electrodes have accumulated an adhesive dirtcover, they have to be removed from the monitoring channel for cleaning (see illustration E).

E



D



For this purpose, the four retaining screws in the monitoring channel have to be loosened with the aid of a screwdriver, whereupon the combs may be withdrawn while being tipped lightly inwards.
The comb electrodes are cleaned with a soft brush and clean alcohol.
After drying, the electrodes are reset, whereby care has to be exercised that the correct side be chosen. Pay attention to the contact springs when sliding the elctrodes into place.

Maintenance and Cleaning.

1. Check the flutes often for nicks, cuts or burrs around the orifices that can catch and retain fibres. Small burrs or rough edges can be smoothed with steel wool. For larger nicks and cuts, sand with 00 sand paper and then apply Pneumafil flute repair solution 103 or equivalent, which will dissolve the plastic. This solution can be applied with a small brush, such as artists use, until the roughness disappears from the surface of the flute. If the roughness is inside the flute, it can be removed by swabbing with a special mop saturated with 103 solution or equivalent.

2. To clean the flutes, remove them from the frame. Clean with a dry rag, and leave at the roll stand so that each plug will be replaced in the same suspension spring from which it was removed. Soak dirty flutes in luke-warm water to which has been added about one cup of a good liquid detergent to 15 gallons of water. After soaking for about two hours, swab each flute with special flute brush and allow to drain dry. Do not dry with compressed air.

The cleaning schedule for the flutes will vary due to many factors, among them being the kind of stock run. As a general guide, the cleaning schedule should be:

- Cotton................Every Year.
- Synthetics............Every 6 months.

This schedule is, of course, dependent upon mill conditions and if oil; dyestuff, or other solution is added to the fibres, it may be necessary to clean the flutes more often.

3. The accumulating header in main duct seldom needs maintenance or cleaning. However, it should be inspected every six months for any accumulation that might obstruct the flow of air. Place a flashlight where the header enters the collector unit and then go to the opposite end of the frame and remove the end cap from the header. It may be neceaary to use a mirror to get a clear view down the interior of the duct.
if it is necessary to clean the duct, turn the unit on and feed a strong cord or spindle tape into the end opposite the collector unit. The suction will pull the loose end to the collector unit and a clean rag saturated with a good solvent tied to the opposite end can be pulled through to swab out the interior of the duct.

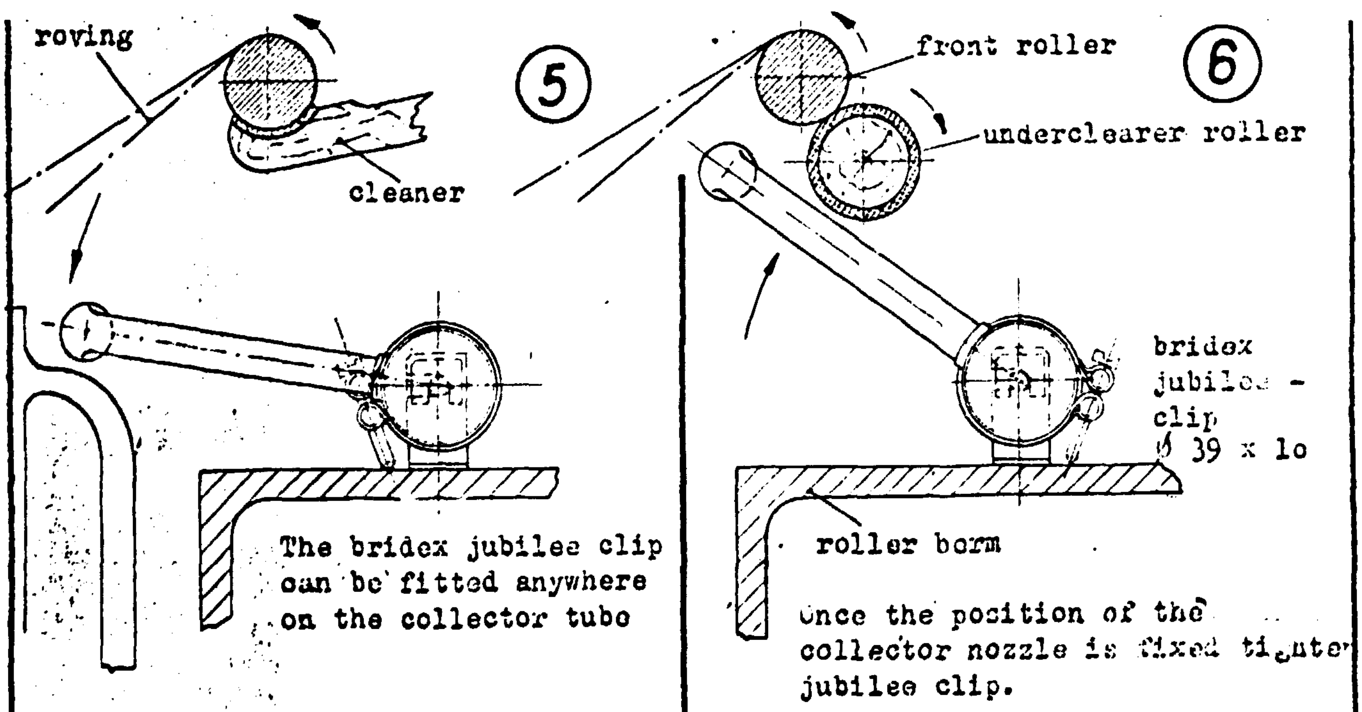
4. The screen should be cleaned with a special screen brush every week. The screens should be washed at least one a year in luke-warm water with about a cup of good liquid detergent added to 15 gallons of water. Let the screen drain dry. Inspect the screen for damage every month and replace immediately if cut or torn.
Whenever the screen or back plate assembly is removed, be careful not to tear or damage the neoprene sponge that is attached to the screen frame and around the collector unit housing. Use a good solvent to clean out the collector unit - do not use water. Keep the inside of the collector unit free of nicks and burrs. Remove any roughness by sanding with light sandpaper or emery cloth and polish with steel wool.

5. The motor is totally enclosed, fan cooled, and has sealed bearings. It reauires no maintenance or lubricant. The motor is protected from overload or abnormal voltage by a heater and has a switch interlocked with that of the frame motor so that in the event one motor overheats both will stop.

If motor stops, check the following for possible cause:

- Low voltage
- High voltage
- Loose switch box connection
- Bad bearings
- Worn insulation
- Excessive vibration
- Clogged ducts or flutes.

The fan should be inspected every six months to one year, dependent upon stock that is being run. If there is an accumulation on the fan blades it should be removed with a good solvent. Remove the fan from the motor shaft for cleaning to prevent solvent seeping into the motor bearings and dissolving the lubricant.



The lower swivel-movement is checked by the bridex jubilee clip.

The upper swivel-movement is checked by the bridex jubilee clip.

6.B SAFETY DEVICES.

1. PURPOSE.

To protect the operators from accidents and avoid damage to machine and material, there are various safety devices operated by end switches. These are fitted to the headstock and connected by spiral tubes with yellow wire. All end switches are connected to a 6-V DC circuit. Directly a switch breaks the circuit, the control current is cut off and the machine stops.

The interior of the end switches can be arranged in various ways so that when the button is pressed, the current is either passing through or interrupted. One of the two cases may be better suited with respect to mechanical operation.

2. PARTS.

2.1 CIRCUIT SWITCH
2.2 ENGAGING COG
2.3 CAMS
2.4 CAMS
2.5 CARRIAGE SHAFT
2.6 DISC

3. SAFETY AGAINST ACCIDENTS (Fig.3B.4).

1. No starting with cones relieved.

When the lever (6) is in vertical position, the cone belt is stressed and it should be possible to start the machine. With the lever in horizontal position, the machine should not start.

2. No starting with top rollers relieved.

Insert the lever (2) into the aperture of the segment (3). When the lever is vertical, the top roller pressure is relieved, when horizontal, loaded. It should not be possible to start the machine unless the top rollers are under pressure.

Figure 6B.1

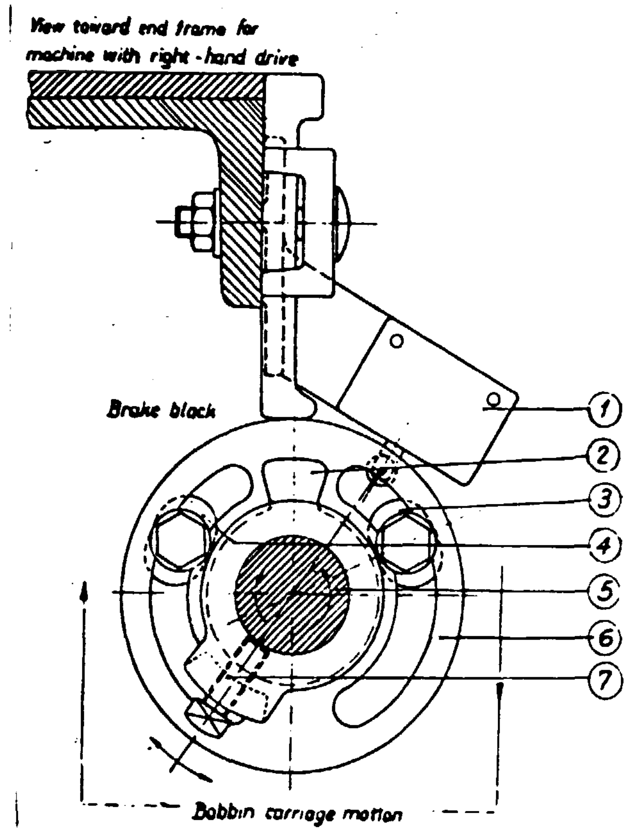
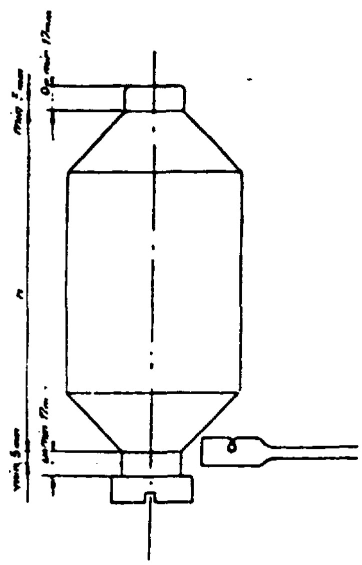


Figure 6B.2



3. Lift safety (Fig. 6B.1)

Checks are best carried-out during the test run of the machine when the carriage is operating. Before the pawl (20) is released in the reversing apparatus (Fig. 6B.3) by the setscrew (13), this should be driven upwardly so that the bobin carriage can move beyond the lift end by at least 5 mm. When the 5 mm. are exceeded, the associated cam on the disc (6) (Fig.6B.1) should release the end switch. if it fails to do so, adjust the cam accordingly but first turn the lock switch!).

Before the motor is switched on, the adjusted screw of the pawl (20) should be returned to its initial position. At this point, the segment is reversed. Now return the bobbin carriage by hand until the end switch at the lift safety device is free. Start the machine again and check the safety device likewise at the other lift end.

4. SAFETY ELEMENTS.

1. Lift safety (Fig. 45, Item 14).

The limit switch (1) (Fig. 6B.1) is fixed to the support on the roller beam in the headstock. The elements operating the limit switch are located on the carriage shaft (5). They will be adjusted during erection.

The two cams (3 and 4) act on the contact of the end switch.

a) If the reversing apparatus should fail, or

b) If the bobbin carriage gets stuck in its downward motion so that the carriage shaft moves beyond the set lift (H), which would cause breakages.

Mark the lift (H) on to a bobbin in accordance with Fig.6B.2. The measurements "u" and "o" should be at least 17 mm. Mark at least another 5 mm. each in excess of the lift (H). Attache the bobbin thus prepared and use it to adjust the cams (3 and 4).

Place the bobbin carriage so that the centre of the finger points to the centre of the bobbin. Bring the stop (7) (Fig. 6B.1) in line with the contact of the end switch (1) and tighten the setscrew.
Tighten the two cams (3 and 4) in the horizontal line by hand, making sure that the engaging cog (2) stands above the two cams.

Drive the carriage upwardly to the bottom lift end H + 5 mm. (Fig. 6B.2). Move the associated cam (3) forwards in the slot of the engaging disc (6) until the contact of the end switch (1) releases. Tighten the nut on the cam. Return the carriage about 10 mm., and also return the engaging disc (6) by hand. Move the bobbin through again toward the lift end to make sure that the contact is released at the required spot H + 5 mm.

Adjust the cam (4) likewise.

2. <u>Cone belt relief safety (Fig. 45, Item 15).</u>

The limit switch is fixed to the front cover sheet in the headstock. The cone relief shaft carries a cam. This should press the button of the end switch when the cone is relieved and should release the button when the belt is stressed.

3. <u>Sliding foor safety (Fig.45, Item 17).</u>

Remove the stop screw for thedoor from the upper rail, insert the sliding door, push it toward the drive panel (running in the guide slot below), and replace the stop screw. The closed panel presses a limit switch maintaining the operative position of the machine. When the door is open, the control current is cut off.

4. <u>Hinged door safety. (Fig. 45, Item 18, and Fig.3).</u>

The door is attached to the jointed levers (1) on the vertical shaft (2) by means of two bolts inside the door. This carries a cam (3) which is to be adjusted in such a way that it presses the associated limit switch when the door is closed. Directly the door is opened, the cam should release the switch, thus cutting off the control current.

It is convenient to make the safety devices of the two doors operative only shortly before starting up.

Figure 6B.3

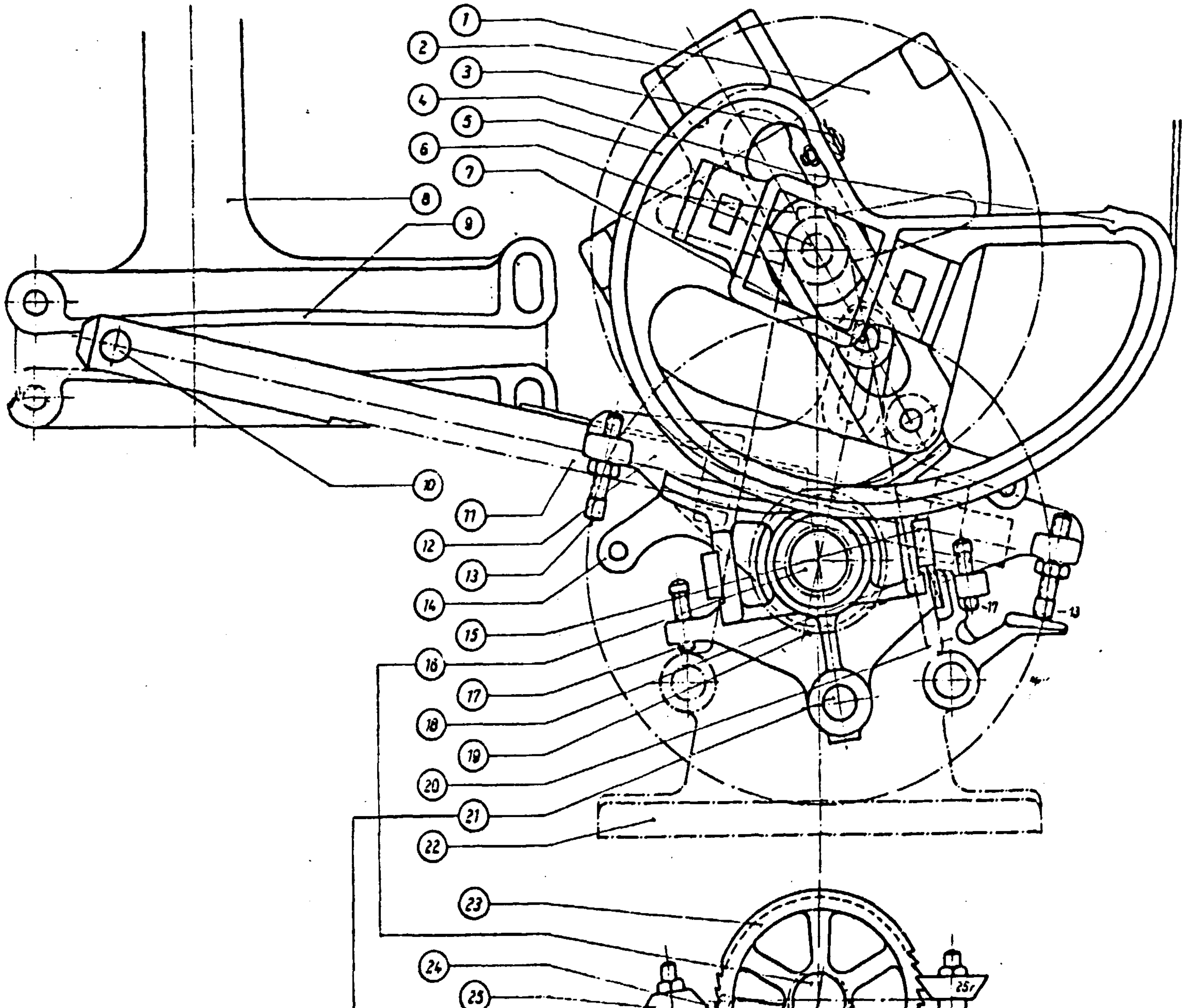
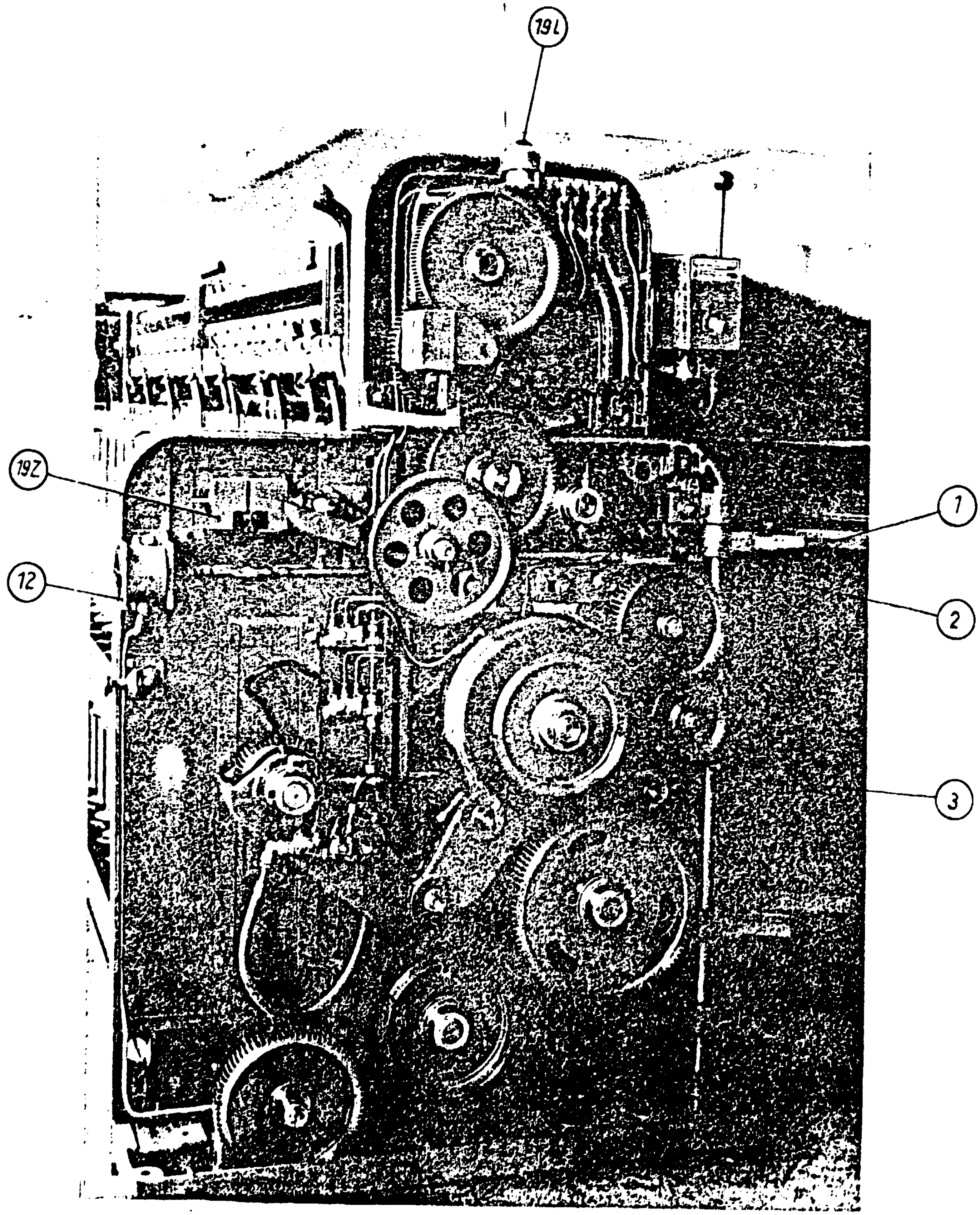


Figure 3.



PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING
3. TROUBLE SHOOTING
4. PREVENTIVE MAINTENANCE
5. FRAME INTERFERENCE
6. QUESTIONNAIRE
7. CHARTS AND GRAPHS

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job planning abilities of the trainee.

b. Method.

The trainee is to walk the section of the Preparation Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.
The suggested number of each defect is as follows :

- Creel	5
- Traverse motion	5
- Flyers	5
- Top rollers	5
- Pressure Arms	5
- Aprons	5
- Trumpets, Condensers	5
- Clearers	5
- Building motion	5
- Bobbin shape	5
- Lift	5
- Tension	5
- Spindle driving gears	5
- Bobbin driving gears	5
	70

2. SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING

There should be sufficient twist in the roving to eliminate any danger of stretching as the bobbin unwinds. In general, where the overhead cleaning is used in the spinning room, additional twist may be quite desirable to prevent the disarray of the fibres in the strand by the air current.

INSUFFICIENT TWIST.

This is a condition which may have serious effects on the production in both the card rcom and spinning room. It may stretch the roving, excessive ends down in spinning, too much fly, and dirty frames. The apparent increase in production as a result of an increase in front-roll speed will probably be off-set by time lost in putting up ends, cleaning flyers and top rolls, and other incidental stoppages.

EXCESSIVE TWIST.

This condition will cause a loss of production as well as possible difficulties in the spinning room where undrafted roving will cause hard ends, grooved rolls, and needless waste and stoppages.
In case where the cotton is not up to standard or where there is an inherent fibre weakness, added twist may be helpful in maintaining production in the card room.
Finally, the longer the staple, the less twist, coarser rovings require less than the finer counts.

LAY.

There have been a large number of mathematical computations concerning the proper lay. However, competent card-room technicians have found that, when the lay is regulated on the first layer to show wood equal to one-half the diameter of the roving between two successive layers, a well-built, solid, and satisfactory bobbin will be constructed.

TENSION.

The regularity and control of the tension has an important effect on the quality of the roving as well as the production and efficiency of the roving frame. Tension is affected by several factors temperature, humidity, the diameter of the strand, and variations therein. For many years, designers and technicians have been seeking a means or assembly for levelling off the effects of these variations to the greatest possible extent.

Since the diameter of the strand of roving of a given weight is affected by the twist, changes in the twist gear must generally be accompanied by a change in the tension gear. Low twist requires a "slacker" tension than normal or hard-twist roving. Tight tensions should always be avoided because stretched and uneven roving will invariably be made. Furthermore, practical experience has shown that roving which has been stretched on the roving frame will also be stretched in the spinning frame creel.

While the first layer of roving is being placed on the bobbin, the tension must be tight enough to assure satisfactory winding on the bare bobbin at the second traverse where at least a portion of the winding will take place on a diameter smaller by the thickness of the half layer resulting from the start of the set. Tension is also affected by variations in bobbin diameter; therefore, bobbins should be systematically checked, at least once a year. Bobbins which are smaller in diameter than the standard will be soft at the start but, in general, will build up their diameter faster than normal until they reach the diameter of the remaining bobbins on the frame, after which tension will be equalized.

If the tension at the finish of the set is too tight, a larger tension gear should be used to eliminate this source of bad roving. The amplititude of vibration, from the nip of the front roll to the top of the front line of flyers, is about 1" to 1 1/2" wide when the tension is correct. If the tension at the start of the set is correct and undergoes a progressive slackening, the chances are that the cone belt is slipping as a result of lack of lubrication of the bobbins, gears, bolsters, and other moving parts driven by the bottom cone through the differential. Variations in tension can also be caused by a worm-out cone belt, lack of tension in the cone belt, or an inefficient or dirty cone belt.

Frequently cone-belt slippage is caused by the lack of lubrication or a poor fit in the bearing on the small end of the bottom cone.

EXCESSIVE END BREAKAGE.

Cut drawing; improper tension; loose couplings on spindle gear or bobbin gear shafting; rolls not set properly or accurately; broken teeth in head-end gearing; loose gearing slipping on shafting; cone belt defective or slipping; traverse motion badly set; roving running off top roll or apron, dirty gearing with roots of teeth with impacted waste; improper humidity. Excessive breakage at single ends is generally caused by worm-out top rolls; a can of faulty sliver, tangled or cut; worn bobbin gear causing jumping bobbins, laps on middle or back rolls, worn, rough, or hollow top rolls.

SLACK ENDS.

Cone belt slipping,carriage not moving uniformly due to faulty traverse motion; bolsters dry or clogged with waste; undersized bobbins; presser not correctly shaped or wrapped; single in the sliver; stretched roving.

SLUBS.

These can be caused by bad piecing at the drawing; drawing frame waste worked into the sliver; an end breaking at front-roll delivery and attaching itself to the neighboring ends; waste accumulating in the flyer eye and leg; dirty clearers; lack of pressure on top rolls.

CUT ROVING.

Rolls set too close for staple; broken teeth in the various gear trains; badly worn cap bars; gears improperly meshed, too deep, or the contrary; loose roll joints; excessive draft, worn top rolls, and lack of lubrication.

CARE OF BOBBINS.

Card-room bobbins are today an expensive accesory and should, therefore,receive the care and maintenance necessary to prolong their useful life and effective use.

Every card room should have the necessary bobbin gauges to assure the use of bobbins with standard dimension of the barrel, top bearing, and gear hole. If the barrels vary in size, it will be almost an impossible task to establish a satisfactory tension throughout the set.

Every time the frame hands make a manual adjustment of the cone belt to correct tight or loose ends, there is bound to be some loss of production and bad work. At least once every year the bobbins should be gauges for barrel dimensions; those which do not pass the "go and no go" test should be sent to the boiler room and destroyed. Wear at the top bearing will cause the bobbin to vibrate while in motion.

This "wobbling" creates many unnoticeable but harmful linear irregularities in the roving. The same effects are the result of worn gear holes. Under no circumstances should roving be removed by cutting with a sharp knife. No matter how carefully the knife is handled, it will not belong before the surface of the bobbin is full of splinters and rough places. The layers of roving remaining on the bobbin, if any should be rolled off.

Finally, the full bobbin doffed from the frame should be carefully packed and arranged in the truck. Throwing bobbins around causes, in the course of time, a lot of tangled bobbins and expensive roving waste. The trucks should be cleaned out every time they are returned from the spinning room, and plainly marked so that they will be used for transporting roving and nothing else.

3. TROUBLE SHOOTING.

The intent of this section is to aid in diagnosing and correcting trouble in the functioning of the Roving frame. To this end, trouble shooting tables have been developed which list trouble symptoms, possible causes, and suggested remedies. In the final analysis, however, the best trouble shooting aid is the thorough comprehension of the Roving frame and its principles of operation.

1. TROUBLE SHOOTING TABLES.

Should trouble occur, check first with the frame tender. His observations will usually aid in quickly diagnosing the source of trouble. If, however, the cause is still undetermined, reference to the following tables should, when coupled with the fixer's knowledge and logical analysis of the situation, result in localizing the source of trouble.

2. PRELIMINARY CHECK.

a) Visual inspection. Observe the three colored indicator lamps located on top of the head-end cabinet. Note which lamp or lamps are lit as an indication of the trouble. Observe the position of the top motion switches and the main power fuse disconnect switch. Check the roving on the bobbins.

b) Visually check for physical damage to such things as the flyers and the drafting system.

3. FUNCTIONAL ASSEMBLY TROUBLE SHOOTING.

Preliminary check.

The following checks must be made before proceeding with the applicable trouble shooting chart. Failure to perform these checks can result in long periods of machine down-time and hours of unnecessary labor.

B. MECHANICAL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Frames does not start (Power on)	Doors or cover open.	Close doors.
	Thermal overload relays knocked off.	Reset overload.
Roving uneven (slubby)	Top rolls not correctly set.	Adjust setting.
	Cots damaged.	Recover
	Top roll binding.	Relubricate or replace.
Layers on bobbin not uniform.	Roving not properly threaded on presser.	Rethread presser.
	Presser damaged.	Replace.
	Presser loose on hinge.	Replace or tighten.
Tension too tight on some ends.	Insufficient roll pressure.	Adjust pressure arm.
	Light sliver.	Correct at drawing.
Tension too loose on	Heavy sliver.	Correct at drawing.
	Plugged flyer tube.	Remove plug.
	Flyer grommet worn, glazed or not turning.	Replace grommet.
Improper tension-general.	Builder improperly set.	Check starting point, starting tension, escapement setting,builder weight.
	Improper lay or tension gears for size roving.	Change lay and/or tension gears.
End ribboning.	Package diameter too small.	Break back end and doff package.
Excessive sliver breaks	Creel not turning.	Check creel drive.
	Creel turning too slowly.	Change sprocket.
	Bad piecings.	Instruct operator.
	Defective sliver.	Check at drawing.

a. Temperature and Humidity.

Often the cause of troubles, which appears to be caused by frame malfunction, is in fact the result of external forces. Temperature and humidity, for example, are effected by the physical location of a frame with respect to windows and doors. A continuous draft will effect the temperature and humidity in a given area, resulting in an abnormal number of ends down, because of the adverse effect on the sliver and roving.

b. Individual Slack Roving.

This would appear to be the result of not enough tension; however, often this is caused by incorrect sliver weight.

c. Lubrication.

Component failure and oil leaks often are caused by the use of inferior lubrication, not enough lubrication, or the use of the wrong type or weight lubricant which does not equal that recommend for prolonged trouble-free frame operation.

4. OVERALL TROUBLE SHOOTING CHART.

The following chart describes the checks that should be made to localize the functional area causing the trouble.

A. OVERALL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roving uneven or produced in slugs.	Overarm weight not correctly set.	Adjust.
	Top Rolls worn.	Replace worn rolls.
Layers or roving on bobbins are not uniform	Defective flyers.	Repair or replace the flyer.
Taper or diameter of package incorrect.	Defective builder.	Refer to Builder Trouble-Shooting Chart

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Excessive sliver breaks	Tension too tight or too slack.	Change tension gear or builder settings.
	Improper lay.	Change lay and/or tension gear.
	Insufficient twist.	Change twist gear.
	Plugged flyer tubes.	Remove plugs.
	Presser improperly threaded,worn or sticking.	Check and correct or replace.
	Defective sliver	Check at drawing.
Cutting ends on start-up.	Lost motion in flyer drive system.	Check gears, key in head-end drive gear.
	Starting too fast	Call the electrician.
Ends slacken at start-up.	Builder not wound back to proper starting point.	Check and, if necessary, adjust
Run over or loop over.	Builder gears packed with lint or set too deeply.	Clean or adjust setting. (Refer to Chapt.5,
	Builder weight obstructed.	Check and correct cause.
	Builder triggers or escapement improperly set.	Check and adjust.
	Frame stopped on change.	If by stop motion, reset traverse limit switch.
	Defective presser	Replace.
Incorrect full package	Full bobbin lint limit switch improperly set or defective.	Adjust or replace.
Excessive presser wear.	Presser run against bare spindle.	Never run frame without bobbins on spindle.
Steel rolls fail to turn.		
	Twist gear out of mesh	Mesh twist gear.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual flyer does not rotate.	Drive gear damaged.	Replace gear.
Excessive flyer vibration.	Flyer out of balance or warped.	Replace flyer.
	Damaged flyer gears.	Replace gears.
Spindles fall or fail to traverse.	Builder in neutral.	Reset builder
	Lay gear out of mesh.	Reset lay gear.
	Defective compound.	Replace compound.
	Defective key or gear drive shaft in main gear case.	Replace key or gear.
Yellow light stays on when frame running.	Low oil pressure.	Check oil level, oil line fittings, oil pump

C. BUILDER.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Taper of package incorrect.	Incorrect setting of the slides.	Adjust.
	Builder weight cable defective.	Replace cable.
Tension on bobbin too loose or too tight; ends down.	Incorrect ratchet setting.	Replace gear.
	Starting tension incorrectly set.	Check adjusting screw.
Package diameter too large or too small.	Defective or incorrectly bobbin knock off switch.	Replace or readjust.

D. SPINDLE AND BOBBIN.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual bobbin fails to rotate.	Bobbin not seated on	Seat bobbin correctly.
	Defective bobbin drive bolster.	Replace spindle.assembly
	Drive shaft bobbin gear defective.	Replace gear.
None of the bobbins rotate.	Defective compound.	Replace compound.

E. FLYER.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual flyer does not rotate.	Defective flyer drive gear on bolster.	Replace flyer gear
	Drive shaft flyer gear defective.	Replace drive shaft flyer gear.
None of the flyers	Defective top universal joint.	Repair or replace universal.
Flyer vibrates and shakes when operating.	Incorrect alignment.	Check alignment.
	Bolster or foot step defective.	Repair or replace bolster or foot step.
	Teeth of flyer gears stripped.	Replace defective gear.
	Flyer out of balance or warped.	Repair.
Excessive wear of presser.	Misalignment of flyers.	Check alignment.

F. DRAFTING SYSTEM.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roving uneven; slugs of roving; ends continue to come down.	Overarm weight not set correctly.	Adjust arm.
	Top roll worn. CAUTION: Never buff the middle top roll.	

G. CREEL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Portion of creel fails to feed sliver.	Creel coupling loose or defective.	Repair or replace coupling.
Entire creel drive fails to operate.	Drive chain or chains defective.	Repair or replace defective chain or chains.
	Change gear for creel drive out of mesh.	Mesh gears.
	Drive shaft or needle bearing defective.	Replace defective shaft or bearing.
Creel rolls do not turn smoothly.	Loose chain.	Reset chain tension.

H. LUBRICATING SYSTEM.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY.
Components in main gear case or builder defective because of lack of lubrication.	Oil level below recommended quantity.	See lubrication schedule
	Incorrect type lubricant.	
	Oil pump defective.	Repair or replace pump.
	Oil lines blocked or open.	
Excessive wear of shafts,flyers,bobbins, and spindle gears.	Oil level below recommended.	See lubrication schedule.
	Incorrect type lubricant.	
Excessive wear of drafting element parts.	Recommended lubrication schedule not followed.	See lubrication schedule.
	Incorrect type lubricant	
	Open or incorrect size oil line.	Repair or replace oil line.

I. BASIC MALFUNCTIONS.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Surface Breaks:	Tension too tight, lay too close or too open.	Change tension gear.
On Bobbin.	Insufficient twist.	Change twist gear.
End Down.	Bad piece-up on sliver.	Piece- up again.
	Poor quaility stock.	
	Stock weight to light.	Replace with correct weight sliver.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Cutting ends on start-up.	Output shaft flyer gear loose or defective.	Tighten gear key; replace gear.
	Top universal joint defective.	Replace defective universal joint.
	Defective compound.	Replace compound.
Ends slack on first on bobbin.	Bobbin tension incorrectly set.	Adjust starting tension screw.
	Frame not wound all the way back.	Rewind ratchet.
Ends too tight.	Bobbin tension incorrectly set.	Check tension bar.
Ends slack while frame is running.	Spring pin sheared in compound.	Replace compound.

4. PREVENTIVE MAINTENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance,the form shown on page 126 has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame,the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

FRAME No.................. Fixer .... Date..............

Standard	Points	
5		A. Creel
10		B. Condensors back,middle,front
10		C. Top rollers
10		D. Pressure arms
2		E. Pressure gauge
10		F. Clearer
10		G. Pneumafil pipe
3		H. Lift
3		I. Traverse motion
10		J. Level of bobbin rail
5		K. Sharpe of roving bobbin
2		L. Condition of V-belts
3		M. Condition of cone drum belt
2		N. Starting position of cone drum belt
5		O. Tension
5		P. Spindle gears
5		O. Bobbin gears
100		

MILL	MAINTENANCE WORK REPORT	

WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE:

Department: Preparation	Type of machine: ROVENG RIETER	Machine No.	Type of maintenance:
Persons per crew:	Expected time:		

CYCLE

·3· MONTHS(12 wks)

No	Machine Part	G	A	R
1	Top rollers			
2	Pendulum arm			
3	Cradles			
4	Aprons top + bot.			
5	Clearers top + b.			
6	Tension rolls			
7	Bottom rollers			
8	Condenser + sliver guides			
9	Traverse bar			
10	Covers			
11	Bobbin rail			
12	Bobbin guides.			
13	Chains + rail pulleys			
14	Spindles			
15	Spind + bob gears			
16	Head stook			
17	Cones			
18	Cone belt			
19	Belt drive			
20	Break			
21	Flyers			
22	Gears			
23	Gap gears			
25	Electr. apparatus			
27	Roving compound			
31	Creel			
32	Lubrication			

No	Machine Part	G	A	R

Yearly (48 weeks)

No	Machine Part	G	A	R
	12 Week maintenance			
1	Top rollers			
2	Pendulum Arm			
7	Bottom rollers			
11	Bobbin rail			
14	Spindles			
15	Spind.+Bob gears			
16	Head stock			
17	Cones			
21	Flyers			
22	Gears			
23	Gap gears			
24	Motors			
25	Electr.apparatus			
26	Bearings			
27	Roving compound			
28	Traverse drive			
30	Levelling			
32	Lubrication			

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING RIETER	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

1. Pressure Top Rolls
   It is necessary to buff the top rolls after 3-4 months in order to have a perfect surface which is very important. In case that the top rolls are still in good condition we recommend to clean them in order to remove the grease and cotton wax and avoid lap ups.
   Attached is a recommended cleaners list.
   Remove the accumulation of fibres on the roller shafts.

2. Pendulum Arms
   Clean only the pendulum arms.
   The setting of them is done yearly.

3. Cradles
   Dismantle the cradles.
   Repair damages and if necessary replace them.

4. Top and Bottom Aprons
   Check the condition of the aprons and clean them.
   Replace the damaged, cut or worn out.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine nd make: ROVING RIETERS	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

5. Top and Bottom clearers

Check the condition and operation of them.
Replace the damaged or defective ones.

6. Apron Tensors

Remove and clean the shafts of the rollers.
Check the condition of the cradles if necessary center them in order to have the apron at the center of the fluted part of the second roll.

7. Bottom Rollers

Clean with a stiff brush the fluted rollers
Remove all dirt from the flutes.

8. Condensers

Check the condensers and inlet condensers
Replace the defective ones. Check if they are of the proper size and if properly tighted.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING RIETER	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

9. <u>Traverse</u>

Clean the guiding rails of the traverse and lubricate with molycote
Check functioning condition
The traverse movement must be 12 m/m

10. <u>Draft Roller Gearing Covers</u>

Clean and adjust if necesary

11. <u>Bobbin Rail</u>

Clean and check the bobbin rail. The bobbin rail must move freely.
Clean carriage guide and apply Molykote.

12. <u>Lift Rail</u>

Clean and check the lift rail and lubricate with graphite

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING RIETERS	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

13. Chains and Rollers

Clean and check the chains, rollers and counter weights of the bobbin rail
Lubricate afterwards
For doing that, support the carriage and let it sit down on supports.

14. Spindles

Check the free movement of the spindles in the spindle collars and lubricate.
If it is tight remove the spindle, clean and lubricate the spindle collar.
Raise spindles, check oil level in foot step bearings.

15. Bobbin and Spindle Driving Gears

Clean the driving gears without dismantling them
Lubricate afterwards

16. Head Stock

Clean thoroughly the head stock without dismantling the parts.
Lubricate afterwards

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING RIETER	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

17. Cones

Check condition of the cones and adjust if necessary.

18. Cone Belt

Check if the belt is not worn out, damaged or cut
Replace if necessary
Clean the inside with a brush or solvent.
Check loading of cone drum belt.

19. Cone belt movement

Clean without dismantling the cone belt movement
Check for the easy movement
Clean and inspect cone belt fork.

20. Brake

Check and adjust the brake (if existing)

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING RIETER	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

21. <u>Flyers</u>

Clean thoroughly the flyers and check the condition of the spindle slot fix if damaged
Align flyer spindles by bringing the flyer driving slots in line.
Thorougly clean the flyers checking the height of the seat on each one.

22. <u>Gears</u>

Clean all gears without dismantle them. Replace the defective ones.
Grease them afterwards.

23. <u>Reversing Gears</u>

Clean without dismantling

25. <u>Electrical Apparatus</u>

An electrician must check the electrical apparatus.
He must also clean with compressed air the electrical panel and check all contacts.
Check the functioning of the photo-cell.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING RIETER	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

27. <u>Differential (roving compound)</u>

    Change the oil.

31. <u>Creel Drive</u>

    Dismantle the covers of the creel drive and clean the gears.
    Check condition of the creel rollers.

32. <u>Lubrication</u>

    Make a general lubrication after the maintenance.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES RIETER	Type of maintenance: YEARLY

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

GENERAL

Repeat all the elements of the 12 week maintenance and also the following:

1. Top Rollers
   Buff the rollers and grease the rop roller bearings.
   Every 2 years clean the beorings with a mixture of 90% gasoline and 10% spindle oil.
   Grease them again once the bearings and clean and dry.

2. Pendulum Arms (Springs)
   Set as follow the pendulum arms:
   a) unscrew the bolt 1
   b) insert the gauge 2 between the ront top and bottom rollers
   c) apply a pressure on the arm with the special key 3 till you cannot move the top roller
   d) screw tight the bolt 1

   see attached design B

7. Bottom Fluted Rollers

   Check and eventually reset the settings of the bottom rollers.
   Check also the distance between the front roller and pendulum arm shaft (it must be 269 mm)
   Using the gauge no.2 the distance must be 298,5 mm.

   See attached Design A.

11. Bobbin Rail
    Check the leveling,reset if necessary.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING FRAMES RIETER	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

14. <u>Spindles</u>

Change the spindle base oil.
Dismantle all spindles and check the spindle collars (base)
Replace the defective ones.

15. <u>Driving Gears</u>

Dismantle, clean, and grease the driving bobbin and spindle gears.
When re-assembling check and set properly the meshing.

16. <u>Head Stock</u>

Dismantle all gear and clean all elements such as shafts, keys, pins etc. Replace the defective ones.
When re-assembling check and set the meshing.

17. <u>Cones</u>

Check the conditons of the bearings and cones.
Clean and grease the bearings.
Repair damages.

./.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES RIETER	Type of maintenance: YEARLY

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

21. Flyers

Clean the inside of the hollow arm and nose (where passes the sliver)
Repair or replace the damaged flyers and presser.

22. Gears

See point 16.

23. Reversing Gears

See point 16.

24. Motors

The electrician will make the yearly revision of the motor
He will clean the inside of the motor and check, rotor, stator and bearings.
Grease the motor bearings.

..//..

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES RIETER	Type of maintenance: YEARLY

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

25. Electrical apparatus

To be revisioned.

26. Bearings

Check all bearings as per instructions of the manufacturer (Rieter)
See attached sheet No. 5
Replace the worn out bearings
Grease afterwards.

27. Differential (roving compound)

Remove the oil and open the compound.
Check gears and keys. Clean the inside, close it and put back fill oil.

28. Traverse Drive

Dismantle the drive, clean and check the parts.
Grease afterwards.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES RIETER	Type of maintenance: YEARLY

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

30. Oil Level

Check the oil level.

32. Lubrication

Make a general lubrication after the maintenance.

Suitable clearners for the top rollers
- clean petrol
- gasoline (boiling point 100 - 130°C)
- methyl acetate
  ethyl acetate

Attention

These cleaners are explosive

Instead the following they d burn

ethylene trichloride
perchlorethylene

FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.
for case b. 10 min.
for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames		: 65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and help the trainee to understand his job.

QUESTIONS:

1. What type of working uniform, suits a mechanic?
   Short sleeve shirt.
   Tight trousers, with leather shoes.

2. What tools will be required for the mechanic?
   Set of : Tool box
   Metric allen keys
   Screw drivers star and flat
   Spanners (open and close)
   Hammer (soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Callipers
   Spirit level

3. How a mechanic should file?
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.
6. Some soft metal pieces should be used in between the jaws of the vise.

4. <u>What are the specifications of the machines</u>?

RIETER 1967 and 1969 -GS and F 1/1.

1. Drafting system: Rieter F.S 155 P 3/3 Double Apron.
2. Drive: V-belt.
3. Lift : 11 1/2"
4. No. of spindles: 96
5. Flyer type: S.Y.C.
6. Builder motion: mechanical/Pneumatic.
7. Type of suction: Pneumatic
8. Clearer rollers: yes.
9. Bobbin size: Ø 48 mm. Length 340 mm.
10. Hank roving running on the roving frames 0.74 C, 1.45 P.V.
11. Hank sliver on various frames: .155, .125,.120.

5. <u>How to stock the lubricants?</u>

Different colours should be used for different lubricants.

6. <u>What are the functions of Roving frame</u>?

To convert sliver into a soft twisted strand , wound on package, for easier handling at ring creel.

1. Drafting.
2. Twisting.
3. Winding.
4. Building.

7. <u>How you classify the lubricants according to use</u>?

Recommended lubricants should be used.

8. <u>What should be the criteria for break down maintenance</u>?

Mechanic should first handle the machine which requires least time, so that, down time is reduced.

9. What are the basic Roving adjustment of Frame?

1. Level and alignment of machine.
2. Motor alignment and belts.
3. Bobbin carriage alignment.
4. Spindle alignment.
5. Bottom roll setting and alignment 45-58 mm.
6. Top roll/Settings : Front + 2,5; Middle : 1 mm.clearance of apron , Back: centr..
7. Top arm pressure adjustment F 1/1 = 22,5 mm., GS = 6 mm.
8. Adjustment of gearing head.
9. Building motion adjustment.
10. Traverse motion adjustment 10-15 mm.
11. Creel tension : 1.0
12. Flyers and pressor alignment & balancing.
13. Adjustment of top and bottom clearers.
14. Spindle and bobbin driving gears alignment
    Spindle: .8.25 mm.
    Bobbin: 10 mm.
15. Adjustment and checking of Pneumatic pressure: 0,8 Kg.

10. What are normal changes required at Roving frame?

1. Total draft change wheel.
2. Break draft change wheel.
3. Creel tension change wheel.
4. Twist and twist carrier wheel.
5. Lay gear.
6. Lifter wheel.
7. Tension gear (ratchet).
8. Top and bottom roller settings.
9. Top roller pressure.
10. Spacers.

11. <u>What the following expressions means</u>?

a. Draft?

b. Twist?

c. Hank Roving?

a. The amount of stretching applied to the thick sliver to produce a roving.

b. The twist means: one inch length of rove is twisted as many times as indicated, e.g. 0.5 per inch.

c. The count of sliver.

12. <u>What is draft and where does it occur</u>?

The draft is the drawing out of the fibres and it takes place in the drafting zone (between back and front rollers).

13. <u>How many spindles per machine</u>?

Depending on machine 96 on GS, 108 on F 1/1.

14. <u>What is the weight of a bobbin</u>?

2 1/2 lbs. approx.

15. <u>What is the weight of a can and how many yards of sliver are in it?</u>

Approx. 20 lbs.

16. <u>How many doffs per can</u>?

Approx. 8

17. <u>How many R.P.M. does the flyer do?</u>

Approximately 900 revolutions per minute.

CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 148) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 150) for recording the performance of the trainee on Preventive Maintenance.

a. <u>The Complete Defect - recognition Schedule</u>.

As explained in the chapter on "Diagnostic Development" (page 111 of Phase II) the trainee has to repair at least five defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
14 reasons x 5 defects.
Per reason = 70 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 148) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day. That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 70 defects within 18 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

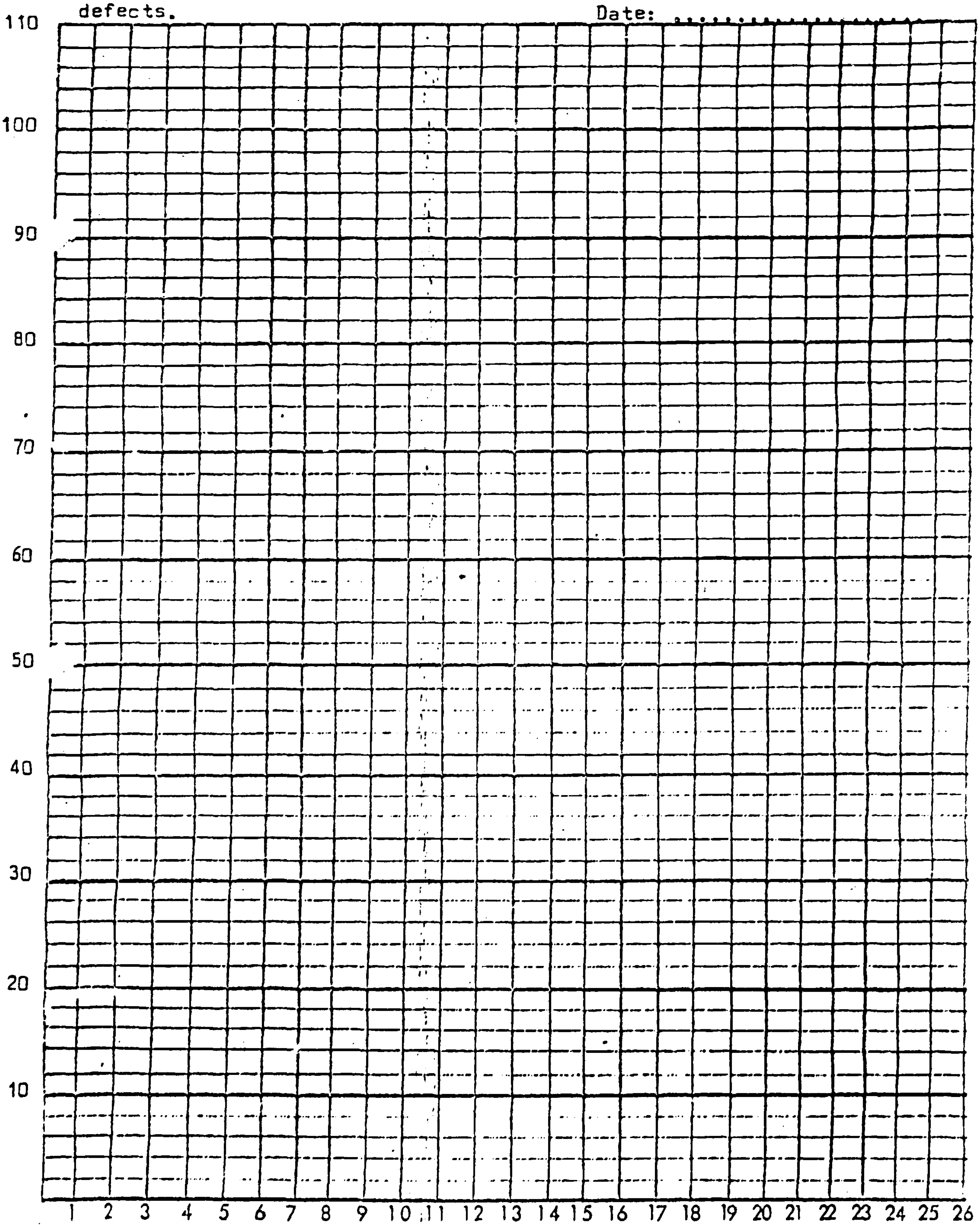
PHASE 2

COMPLETED DEFECT RECOGNITION SCHEDULE

Name: ....

Date: ....

Number of defects.



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b. <u>The Preventive Maintenance Results Efficiency</u>.

In the chapter on "Preventive Maintenance (see page 125 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evauluation on Preventive Maintenance" as shown on page 126of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

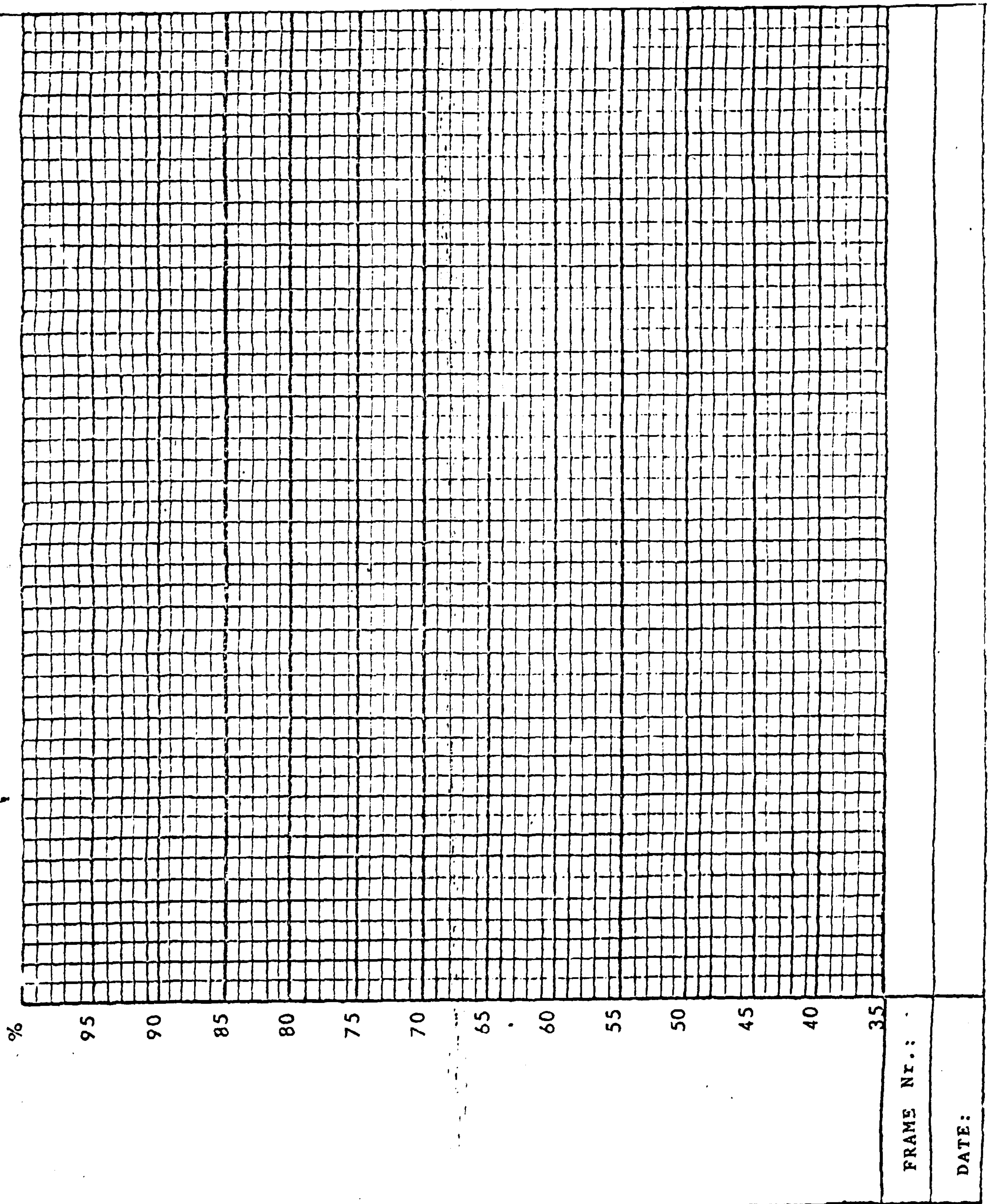
That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

The Preventive Maintenance Results Efficiency.

Name:..........................



ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME IV OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(4 of 10)

FINAL REPORT ON THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME IV OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

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PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

M A N U A L III

W E R N E R A M P S

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

S P I N N I N G F R A M E S F I X E R'S M A N U A L

R I E T E R G-3

Prepared for:

T.I.R.D.C. (UNIDO)

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I N D E X

PERSONNEL SPECIFICATION

Job:	SPINNER FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum 6 months good spinner or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy department.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

SPINNING FIXER'S MANUAL

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months GOOD spinning/roving experience.
The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (6 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is vour ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you. Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.

Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand souarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

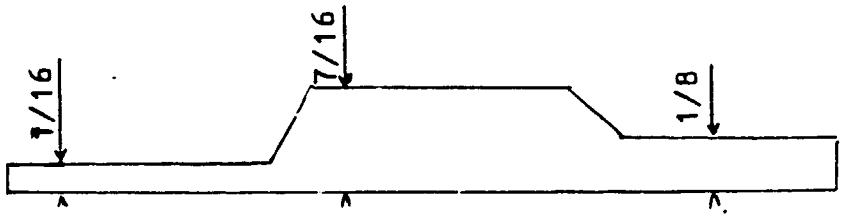
3.8 MANNER TO PROTECT FILES.

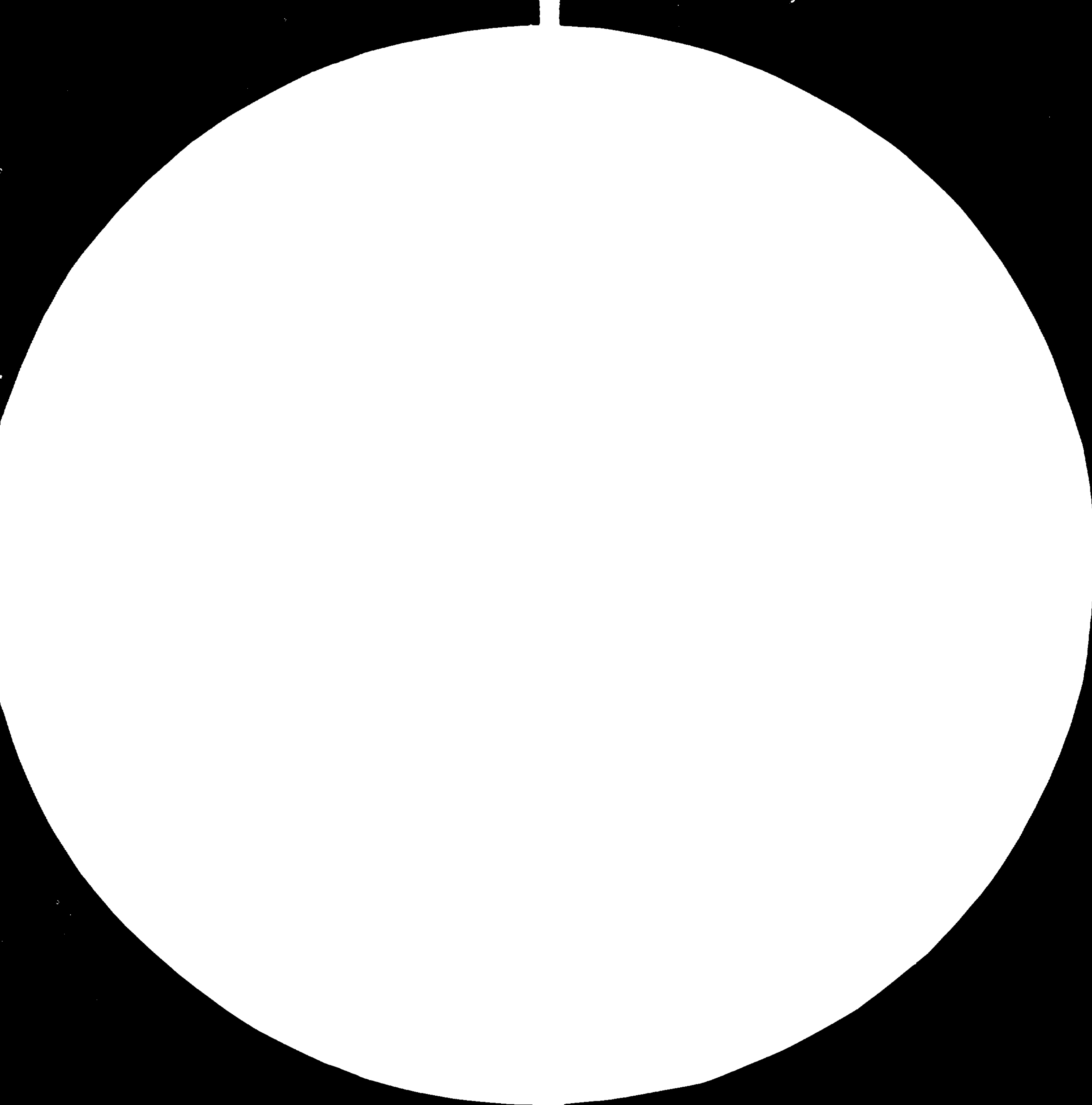
No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

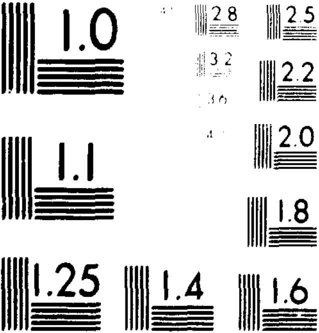
Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.







MICROCOPY RESOLUTION TEST CHART

4. USE OF STANDARD SETTINGS.

The firs+ setting to be learned is the standard setting.
Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.
A fixed position or datum is used, e.g. the position of the top rollers.
Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.
When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

plan or roller

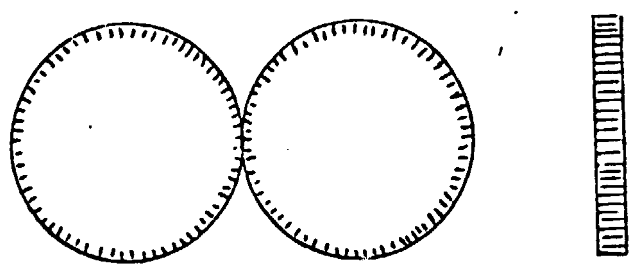
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

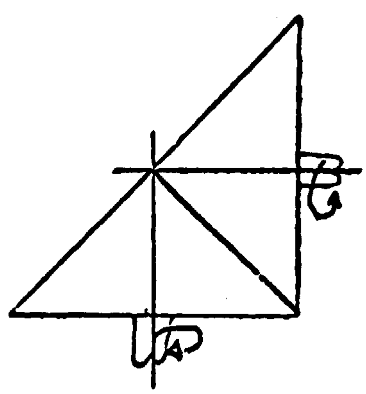
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



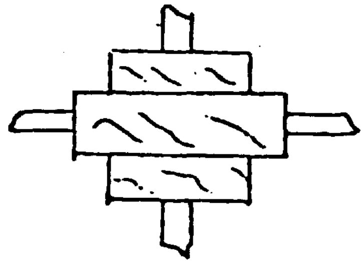
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



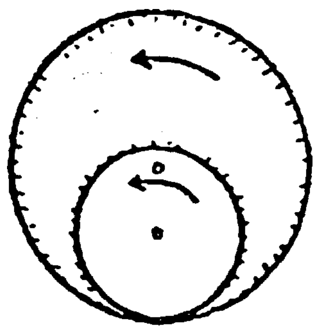
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



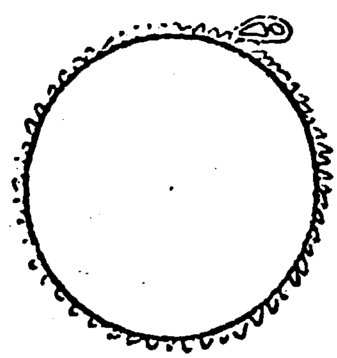
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The r:tion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. 120 Kg.

4 m. 6 m.

190 Kg. 90 Kg.

4 m. ? m.

180 Kg. ? Kg.

4 m. 5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

SPINNING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided in 6 groups:

1. A. DRIVE
   B. DRIVE BELTS

2. A. CABINETS CHASSIS
   B. ROLLER BEAM
   C. CREEL

3. A. ROLL STANDS AND BLOCKS
   B. PRESSURE ARM
   C. TRUMPET

4. A. RINGS
   B. SPINDLES
   C. THREAD GUIDE
   D. SPINDLE DRIVE

5. A. LAY-TWIST GEARING
   B. DRAFT GEARING
   C. BUILDING MOTION

6. A. WASTE COLLECTION SYSTEM.

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all six (6) groups of adjustments so that when complete, the trainee has completely set up six (6) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

1B. DRIVE BELTS.

Operating conditions for V-belts.

To ensure good operation, the following points concerning V-belts should be watched:

1. The belts should not be taut like violin strings. Proper belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 cm. and over.

2. Never use any adhesives. The V-belts should be kept clean and dry, and should be protected from oil and grease. V-belts do not require any maintenance.

3. Forcing the belts over the grooves will damage the pull cord and reduce belt life. For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.

4. Belts and pulleys should not heat up. Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.

5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.

6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.

7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only. The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

1.C. THE BRAKE.

1. DESCRIPTION.

The tin drum brake is accommodated in the inner part of the headstock. It is two-jaw brake deriving its braking.action from spring force.

2. PURPOSE.

To stop instantly the frame (approx. 5 sec.).

3. PARTS.

3.1	Pin	3.14	Front cover
3.2	Tension Springs	3.15	Brake lever
3.3.	Brake jaws	3.16	Bearing at the cross-piece
3.4	Brake cam	3.17	Tin roller wheel
3.5	Weight lever	3.18	Collar pin
3.6	Adjusting lever	3.19	Spindle rail
3.7	Brake weight	3.20	Bearing stand
3.8	Bearing	3.21	Main shaft (Tin roller shaft)
3.9	Set collar	3.22	Bearing
3.10	Pressure spring	3.23	Bearing cover
3.11	Set collar	3.24	Brake disc
3.12	Stop	3.25	Headstock
3.13	Control rod		

4. CONSTRUCTION AND ASSEMBLING.

Fitting the main shaft and the tin roller brake. (see Fig.1C)

The tin roller bearing housing on the headstock (25) as well as the one on the cross-piece (16) are assembled in the factory. on the other hand, the fitter still has to fit the tin roller shaft (21) together with the tin roller wheel (17) as well as to mount the ball bearings and provide them with first-quality grease. The bearing (22) serves to fix the main shaft in the longitudinal direction. The tin rollers are axially guided from here. Mount the inner bearing cover (23), which serves at the same time as a support for the tin roller brake, and tighten it together with the front cover (14) by means of bolts 1/4 x 70. Position the outer ball bearing (16), put on the cover and tighten.

Assemble the tin roller brake in the following order:

a) Insert brake cam (4) and pin (1)

b) Suspend brake jaws (3) with tension springs (2)

c) Slide brake disc (24) on to main shaft (21) and set it at a distance of about ½ mm. from the inner bearing cover (23).

d) Fix weight lever (5) together with adjusting lever (6) on cam stud and tighten.

e) Insert control rod (13) complete with pressure spring (10), bearing spacer, set collars (9 and 11) into the bearing (8) which is secured to the headstock at our works.

f) Screw brake lever (15) with collar pin (18) on to the spindle rail (19). Connect control rod (13) to brake lever (15) and locate it in the longitudinal direction with set collar (9).

g) Mount brake weight (7).

5. SETTING.

Adjusting the tin roller brake: In the operating position, i.e. when it is not braking, the brake cam (4) - as shown in Fig.1C.- must be parallel to the braking surfaces. In this position place set collar (11) against the stop (12). At the same time engage weight lever (5) in the adjusting lever (6) in such a way that the former is horizontal as shown in Fig. 1C. If brake lever (15) is pulled, set collar (12) will release weight lever (5). This will cause cam (4), which is under the influence of the counter-balance, to turn and to press brake jaws (3) inwards against brake disc (24). If brake lever (=5) is disengaged, the brake will be released again.

Figure 1C.

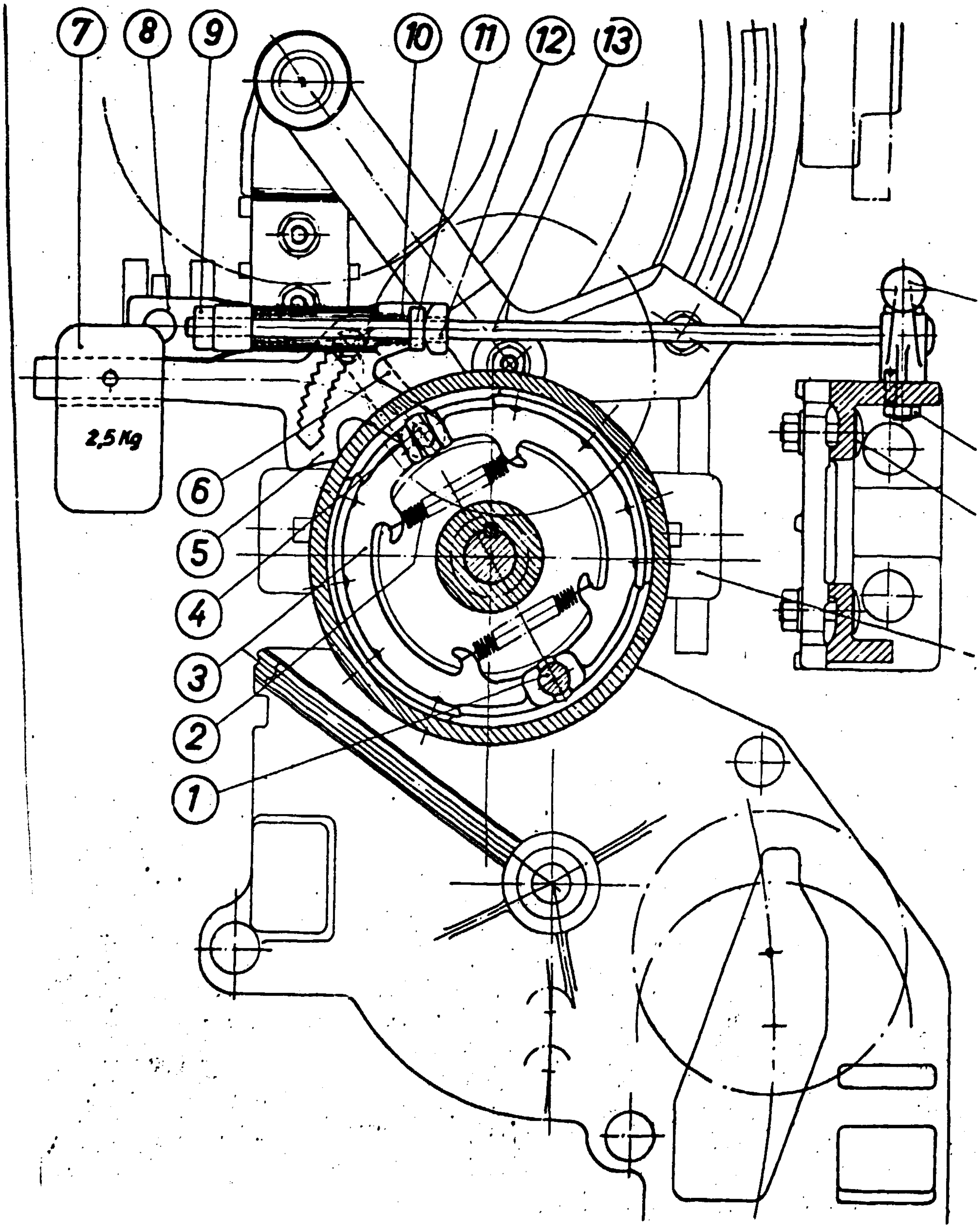
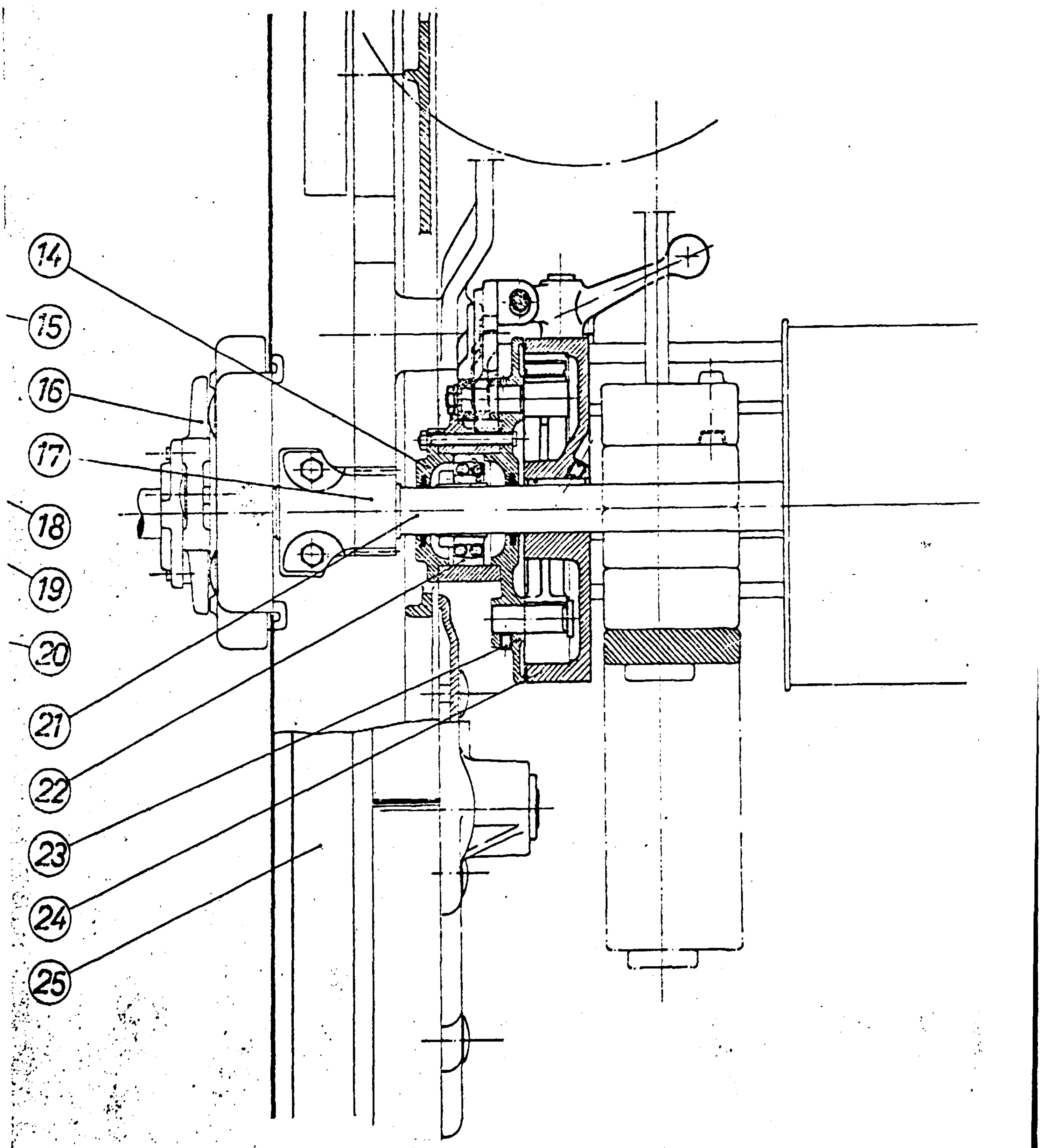


Figure 1Ca.



GROUP 2 : A THE CABINETS - CHASSIS
B ROLLER BEAM
C CREEL

2.A CABINETS.

1. DESCRIPTION.

The head end and foot end cabinets are similar in construction and contour. The lines are clean and simple, with no dirt-catching or hard-to-clean areas. They have tight-fitting access doors that make it easy to reach all mechanisms.

2. PURPOSE.

The head end cabinet contains the draft gearing, twist and lay gearing, builder, windlass and wind down mechanism, and the drive. In the foot end cabinet is housed the waste collector unit.
A separate compartment atop the head end cabinet contains the electric components.

3. CONSTRUCTION.

The cabinets are made of cat iron and finished with baked-on enamel. Each cabinet is designed to house the components in the most efficient arrangement for operation and ease of accessability.

4. PARTS.

4.1 DRAFT GEARING
4.2 TWIST GEARING
4.3 LAY GEARING
4.4 BUILDER
4.5 CAM
4.6 PITMAN ROLL
4.7 WASTE COLLECTOR UNIT
4.8 ELECTRIC CABINET

THE CHASSIS.

5. DESCRIPTION.

The spinning frame chassis is strong, clean and simple. There are no unnecessary parts and the entire assembly is designed and constructed to maximize production and minimize cleaning and maintenance.

The chassis is composed of the samsons, roller beams, and spindle rails.

6. PURPOSE.

The Chassis is the framework or skeleton of the spinning frame and holds all the component parts in their respective positions. In order to perform this function efficiently, the chassis must be made and assembled to close tolerances and must have great stability.

7. CONSTRUCTION.

The chassis parts are made of materials best suited to the individual requirements. The samsons are heavy iron castings, with all contact surfaces milled to close tolerances. Ring rails are made of stamped steel. The roller beams are made of cast iron.

8. PARTS.

8.1 SAMSONS
8.2 ROLLER BEAMS
8.3 SPINDLE RAILS

9. SETTING.

The sections have two samsons, one at the end and one in the centre. They are placed end to end so that th end of the section that does not have a supporting samson butts onto the samson end of the next section. In this way the sections are joined to form a very strong and stable chassis.

When the sections are all joined - but before the connections are tightened - the reel and wire are used to align them. A wire is stretched the full length of the frame along the right hand roller beam and spindle rail. Gauge blocks are used to align and level each section to the others. Vertical adjustments are made by loosening the holding nut on the adjusting screw of the samson foot and running the screw up or down as needed. When an adjustment is made to raise or lower a roller beam, the opposite beam must be checked to see if it has been affected.

After the assembled sections have been aligned, all the connections should be tightly secured. Again check with the gauge blocks to see that no part has been pulled out of alignment as the connections were tightened.

2.B THE ROLLER BEAM.

1. DESCRIPTION.

The roller beam, one on each side of the spinning frame, are special formed channel beams and extend in joined sections the full length of the frame.

2. PURPOSE.

The roller beam serves as a support for the drafting element, its components and accessories. It also forms a part of the framework of the spinning frame and adds strength and rigidity to the upper part of the frame.

3. CONSTRUCTION.

The roller beam is made of cast iron. The individual sections of the beam are accurately sized qnd drilled for precise fitting to the samson post brackets and for the accomodation of the roll stands.

4. PARTS.

4.1 ROLLER BEAM

4.2 SAMSONS

4.3 ADJUSTING SCREWS.

5. SETTING.

Each section of the roller beam is bolted to three samson posts, one at each end and one in the middle, with the exception of the head end and foot end section, which are bolted to two samson parts and to the cabinet plate. When the roller beam is installed, place an 18-inch level across the two beams at, and parallel to, the cabinet and level them by adjusting the cabinet feet.

Stretch the aligning wire from the reel the full length of the frame. With the aligning block check the alignment of the beam lengthwise from one samson to the next.
make any needed vertical adjustments by means of the adjustable feet of the individual samsons.

When adjustments are made to alter the height of a roller beam, the opposite beam will also be affected. To save unnecessary steps, the level should be used to keep both beams at the same height. Raise or lower both feet of the samson to level it before proceeding to the next one.

The roller beams should be level when the right hand spindle rail is correctly aligned lengthwise, but it is best to double check each of these settings and then securely tighten the holding screws. Whenever adjustments are made to the cabinet or samson feet, be sure to tighten the lock nuts of the adjusting screws.

2.C THE CREEL.

1. DESCRIPTION.

The spinning frame creel is the umbrella type in which the roving bobbins are suspended above the drafting element. It is three-way adjustable, has self-locking holders and weighted brakes.

2. PURPOSE.

The creel holds the packages of roving so that the stock is fed into the drafting element smoothly and consistently. The package revolves as the roving is pulled over the roving rods, which minimizes strain, stretch, and breakage.

3. CONSTRUCTION.

The bobbin holders are mounted in slats attached to cross arms. These holders are so constructed that by placing a bobbin on the holder and pushing upward, cams on each side of the holder turn and grip the bobbin firmly. Pushing upward on the bobbin a second time retracts the cams amd the bobbin is released.

The arms are mounted to collars attached to the creel posts. Chrome plated roving rods are optionally attached to split collars on the creel posts or to rods suspended from the cross arms.

4. PARTS.

4.1 BOBBIN HOLDERS
4.2 SKEWERS
4.3 THREAD GUIDE RODS
4.4 SLATS
4.5 CROSS ARMS
4.6 COLLARS
4.7 CREEL POSTS

5. SETTING.

The cross collars are held in place on the posts by socket head set screws. Loosen these set screws and move the collar up or down to get correct vertical position.
The lowest setting consistent with proper operation is best because it makes the creeling chore easier. Each cross arm is attached to the collar by two bolts. A clamp arrangement, locked in place by a socket head cap screw, hold the slats in position on the cross arms. The slats can be moved in or out by loosening these cap screws at each cross arm.

The roving bobbin holders are held in place on the creel slats by lock nuts. The holder can be moved parallel to the frame by loosening the lock nut and sliding the holder in the slat.

The exact position of each holder and its bobbin of roving is dependent upon the gauge of the frame, the size of the roving package, and other local factors. The roving rods can be positioned to guide the roving from the bobbin to the trumpet with the least possible stress and strain.

6. THE CREEL FOR SKEWERS IS MOUNTED AS FOLLOWS: (Fig.2)

6.1 Bolt intermediate brackets for vertical rods (16) to the spring pieces and reinforcing cross-pieces with RB 3/8 x 45.

6.2 The creel bar foot and holder at the headstock is mounted in the latter. Insert the vertical rods (24) and tighten them in the foot and holder.

6.3 Bolt the last pair of creel rods together with their feet on to the filter box or end frame.

6.4 Place intermediate cover plates on brackets (16). Insert screws S 4 $\frac{1}{2}$ x 10 together with special spacers (countersunk), but do not tighten them yet.

6.5 Space the brackets (16) laterally along to the roller beams, starting at the headstock and then tighten RB 3/8 x 45. Next, tighten S 4 $\frac{1}{2}$ x 10, thus fixing the intermediate plate. Mount panel after panel in this manner.

6.6 Place the cross rod holder (23), thread guide rod arms (19) and sheet metal bobbin bracket (18) on vertical rods (24).

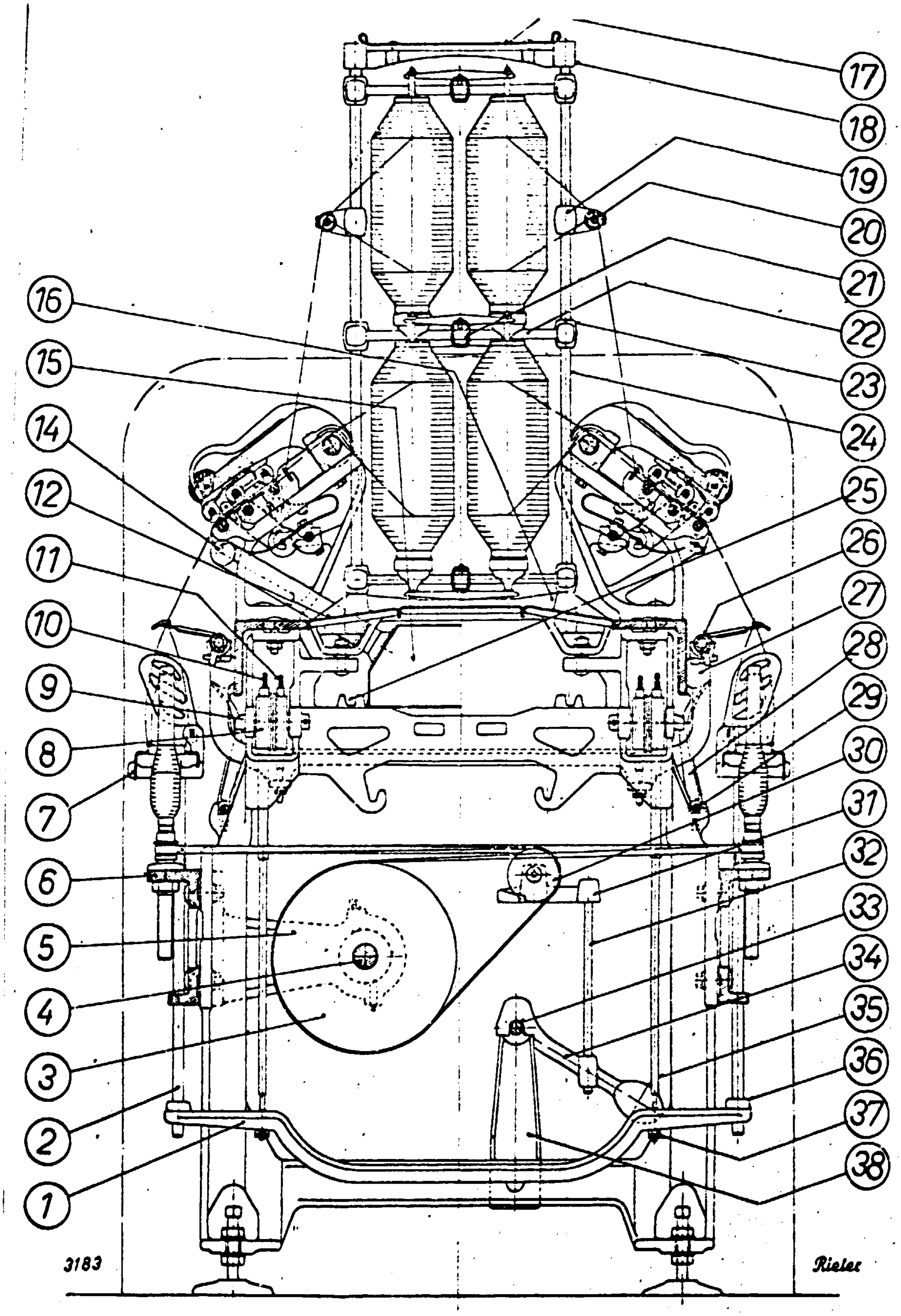
6.7 a) Wooden boards: slide board holders on to cross rods (22), bolt boards to holders with B 2 $\frac{1}{4}$ x 55 and align them with a plumb line.

b) Supporting tubes: insert aluminium tubes (21) together with cross rods (22).

6.8 Draw in thread guide rods (20).

6.9 Adjust creel. The creel skewers should penetrate at the most 15 mm into the boards, tubes or bobbin holders. Set thread guide rods at the same level as the centre of the bobbins.

6.10 Position bobbin plates (17) and lock them to brackets (18) with S 4 $\frac{1}{4}$ x 10 and special spacers (counter-sunk).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GROUP 3 : A ROLL STANDS AND ROLLS
B PRESSURE ARMS
C TRUMPET

3.A ROLL STANDS AND ROLLS.

1. DESCRIPTION.

The roll stands are simple and functional. The smooth surface of the stand is easy to clean. The roll blocks are precision made and the middle and back blocks are fully adjustable in the stand. Roll stands are located at each joint of the bottom roll, the length of which varies according to the gauge of the frame. The stands hold the rolls parallel on a plane of 45 degrees inclined from front to back.

The bottom steel rolls of the spinning frame are 25 mm. diameter. Front and back rolls have helical fluting and the middle, or approm roll is knurled.

2. PURPOSE.

The roll stands support the drafting assembly and the waste removal flutes. The blocks provide a bearing, with a replacable needle bearing, for the bottom steel rolls. The bottom rolls transport the stock and, through progressively higher surface speeds, draw the fibres out and draft them into yarn.

3. CONSTRUCTION.

The roll stands are made of die cast aluminium with contact surfaces milled to exact specifications for the particular application. Roll blocks fit into the slots of the roll stands with space for adjustment of the middle and back roll blocks. The stands are securely attached to the roller beam with cap screws. The blocks are attached to the stands, which are slotted for block adjustments. The bottom rolls are made of steel, induction hardened for service and long life. They will withstand constant pressure without warping. The grooves of the flutes are rolled into the metal under tremendous pressure. The rolls are connected with the threaded end of one roll being screwed into the end of the adjoining roll. The rolls have tapered shoulders which maintain a firm bond.

All bottom steel trolls are ground and polished which leaves smooth, uniform lands.

4. PARTS.

4.1 ROLL STANDS
4.2 BLOCKS
4.3 FLUTED ROLLS
4.4 BEARINGS

5. SETTING.

The roll blocks must be set for the length of staple to be run. If the rolls are spaced too close together fibres will be gripped by the forward rolls before being released by the preceding ones, which will break some of the fibres and cause cockled yarn. On the other hand, when rolls are spaced too far apart the shorter fibres will have a tendency to stray, resulting in uneven yarn.

The roll blocks can be moved backward and forward in the stand by loosening the socket head cap screws and sliding the blocks to the desired position. Use appropriate gauge to space the blocks. Tighten the cap screws securely and recheck when the rolls are installed to be sure there is no misalignment that could cause bind and eccentric motion.
With the front and back bottom steel rolls in position the roll stands are aligned with the reel, wire, and appropriate gauges. First, position the head and foot end stands the correct distance from the front of the roller beam. This setting can be quickly located with a small combination square. Remove the middle bottom roll bearings and stretch the wire the length of the frame along the bearing slots. Align the roll stands both vertically and horizontally. If a roll stand is too high it must be removed and the bottom contact surface filed to lower it. A stand that is too low can be raised by loosening the screw and inserting a special shim between the roller beam and the bottom of the stand.
Mount the rolls in the bearings of the roll blocks. Join each section and securely tighten with the special wrenches. Assemble correct roll necks at each end of assembled rolls. Place bearings in place and tighten holding screws. Check to see that rolls do not bind at any position. Install appropriate gears to head end.

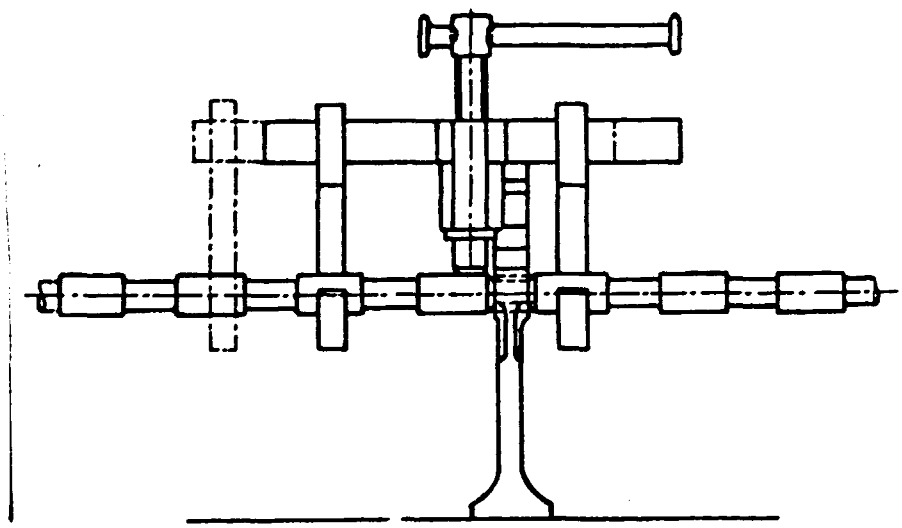
Aligning the delivery rollers.

Every roller fluting is tested under load with a dial-gauge. Care should be taken that the adjacent systems are loaded with at least one weighting arm. Both weighting arms should be closed to check the alignment of flutes in between the weighting arms.

In no case the eccentricity of the rollers at any point should exceed 3/100 mm. If necessary you should align the fluted rollers with the help of the press supplied by us.

When it is necessary to true up above the bearing the straightening press with movabel hooks is used and the press (the central screw) is set close to the bearing either to the left or right, depending where the greatest deflection is..

The play for the back drafting roller should not exceed 5/100 mm.



3.B PRESSURE ARMS.

1. DESCRIPTION.

The top arm is loaded pneumatically and retain the top rollers.

2. PURPOSE.

The drafting system transport the stock and through progressive higher surface speeds draw the fibres out and draft them into yarn.

3. PARTS.

3.1 PRESSURE HOSE
3.2 GUIDE TUBES
3.3 TOP ARM
3.4 BEARING SADDLES
3.5 THUMB

4. SETTINGS.

4.1 Rules for setting the drafting arrangement.

The basic rules for adjusting the drafting arrangements are given in the following:

The front top roller is generally adjusted by the erector when the drafting arrangement is assembled and whereby the overhang of the front roller is set at 3 mm. in all cases. The setting and checking of the overhang with the top arm under weighting is carried out as follows (Fig. 3B.1).

- Bring the flat angle gauge up from below until it touches the drafting rollers (removing clearer roller, Pneumafil, first). Make sure that the angle gauge does not lie up against the pneumatic guide tube at the rear (see fig. 3B.1 "wrong" .
- Measure distance "D", e.g. with caliper gauge.
- Overhang "C" is calculated as follows:
  Radius of front bottom roller plus distance "D", minus radius of top roller 1.

IMPORTANT: Distance between top roller-apron = 0.5 - 1.0 mm.
Offset back of second top roller 2 - 3 mm.
Offset back of third top roller 1 mm.

Figure 3B.1

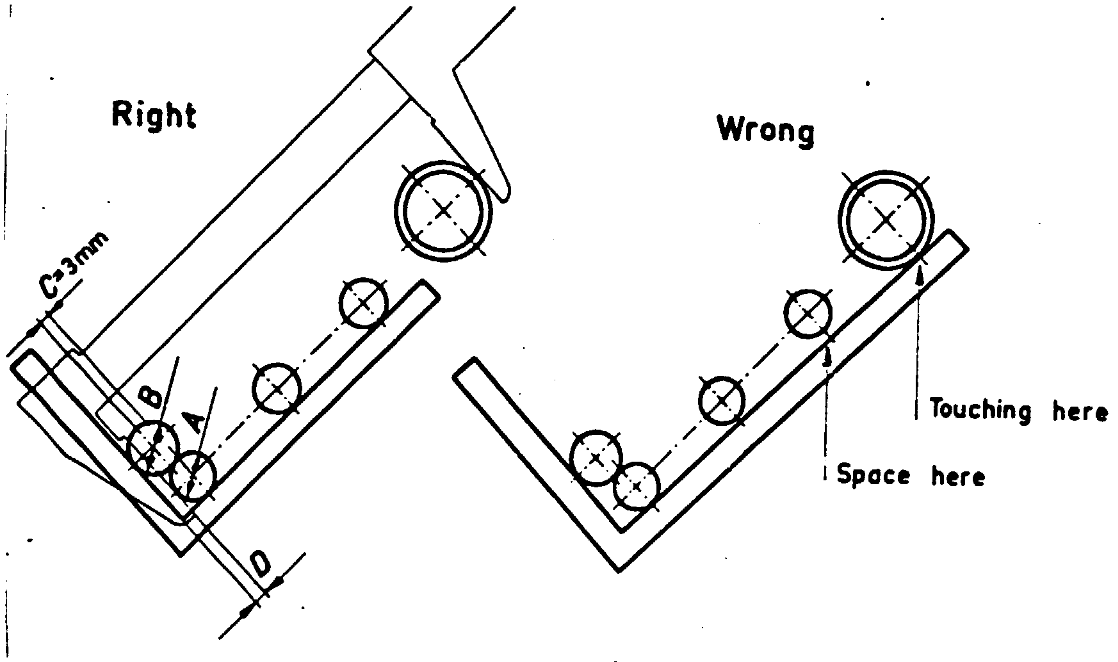
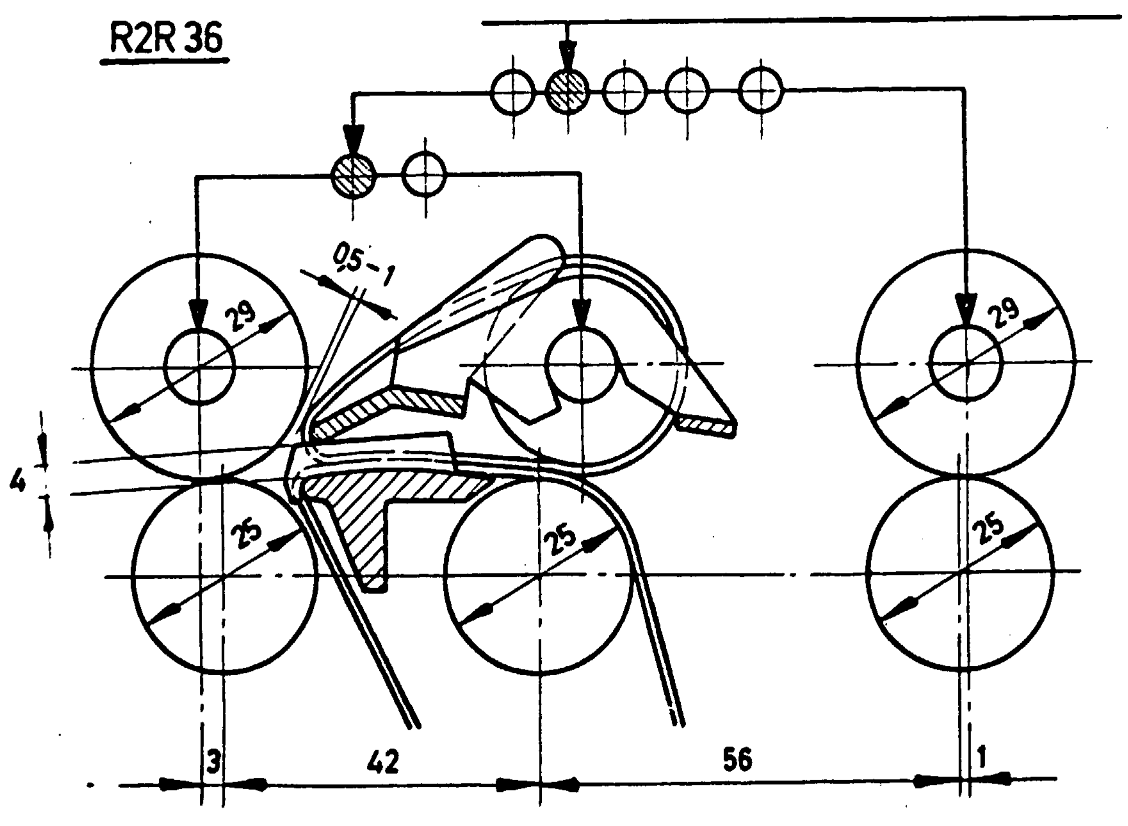


Figure 3B.2



4.2 Distance between nose bars and cradles for R2R drafting arrangements.

Experience has shown that although with thinner spacer plates the best Uster-values are obtained, the drafting arrangement becomes more sensitive and the yarn test results scater.

With the spacer plates indicated in the following Table, the yarn quality is nearly at the peak while the performance of the drafting arrangement is much better.

Thickness of spacer plate in mm, for cradle type R2R 36

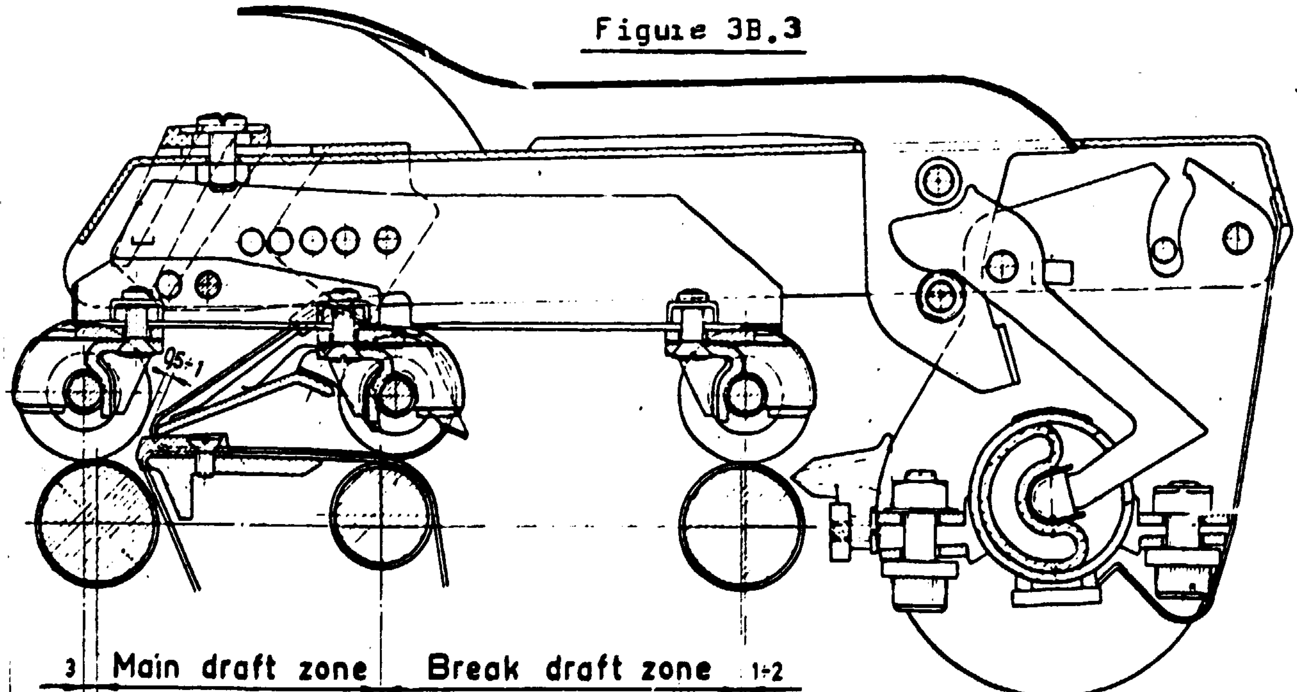
Yarn count Ne	Thickness
upto 24	4 - 5
25 to 50	3,5 - 4,5
over 50	4 - 5

4.3 Pressure distribution in guide arm.

To change the proportion of pressure distribution two distributors are built in the guide arm (fig. 3B.2).

	Front bottom	Rear top
FS 140 P2	2	4
FS 160 P2	2	5

Figure 3B.3



Guide arm type	Cradle length mm.	Break draft in mm.	Position of pin Underlined values = Works setting Fulcrum front bottom	Hole rear top
FS 140,160,185	36	42 - 70	1	<u>2</u>
		over 70	1	3

4.4. Pressure setting for all R2R and R2K drafting arrangements.

Gauge	Pressure in at.ga Guide arm FS 140 P 2 min.	max.
70 mm.	0.8	1.0
80 mm.	0.7	0.9
90 mm.	0.6	0.8

The indicated maximum pressures result in following weighting of top rollers per axle (mean value) :

Delivery	13 - 16 kg
Middle	8 - 10 kg
Feed	12 - 15 kg

4.5 Adjusting the depth of entry "E" (Fig.3B.4)

The depth of entry "E" from the angle of the thumb (8) to the bottom edge of the pin (7) must measure 37 - 38 mm. This gives the dimension A = 22.5 mm. on the gauge (2) with which the depth is measured. The stop (9) is swung out when measuring. The 22.5 on the gauge (2) gives a depth of entry "E" of 38 mm. The angle of the thumb (8) may be a maximum of 1 mm. higher than the gauge (2) : The depth "E" is then 37 mm.

If the angle is more than 1 mm. higher than the gauge (2), the screw (5) must be unfastened and screw (1) tightened. Screw (5) is then tightened 1 mkp with the torque wrench. if the angle is lower than the gauge (2), screw (1) must be unfastened and screw (5) tightened 1 mkp with the torque wrench. The depth of entry is always checked with the arm closed and the loading applied.

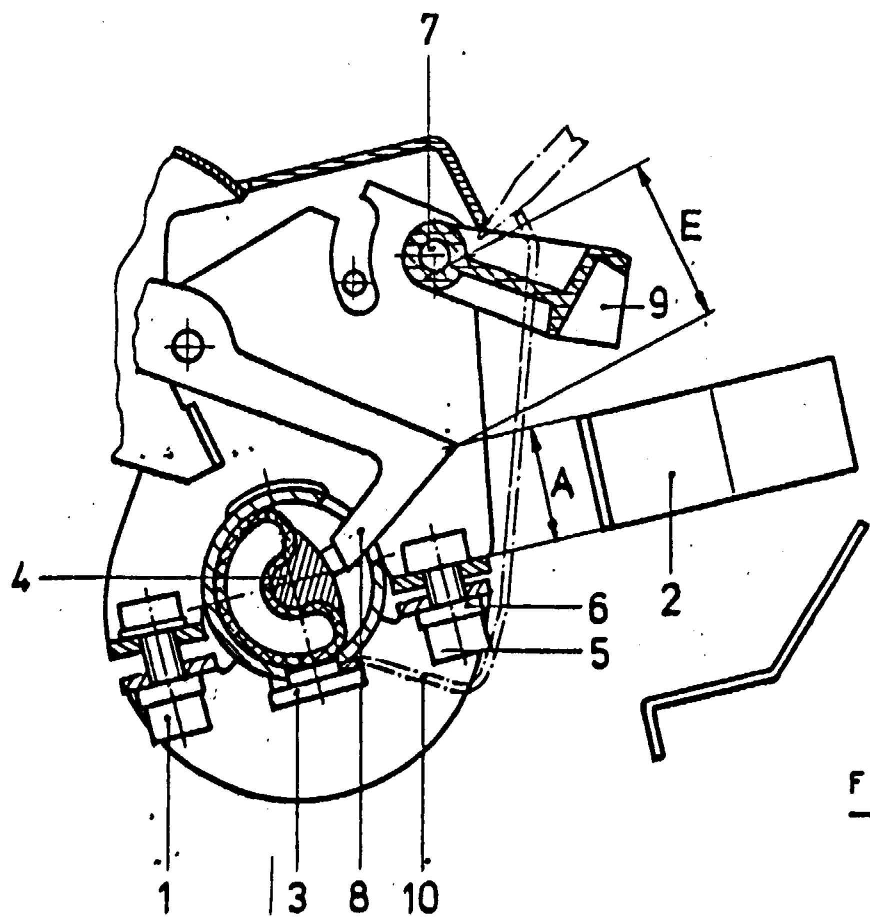


Figure 3B.4

5. SOME IMPORTANT ASPECTS.

5.1 Fluff and fly.

On all double-apron drafting equipment a certain amount of fly will collect inside the mechanism in the couse of time when processing low-grade cottons, causing additional tensioning of the apron and even slowing it down. It therefore requires cleaning from time to time. Even with good material the cage units should be dismantled and cleaned occasionally, especially in spinning mills for fine counts. The inside of the apron should be sprinkled with a little powder when assembled though not whilst running.

5.2 Inserting the cradles on R2R drafting arrangements.

We are always coming across badly fitted cages, in which the top roller shafts have not been pushed all the way into the cage. As a result the apron is under excessive tension and runs badly, leading to faulty yarn, thread breakages and other troubles.

5.3 Inserting the top rollers.

While inserting the top rollers the guide arm should not be pressed upwards as otherwise the danger of deformation exists.

5.4 Grinding of top roller cots.

For achieving good running conditions (elimination slubs) and high quality of yarn periodic grinding of the top rollers cots is very important. The grinding may be advantageously done with the cots on the axle.

IMPORTANT: To remove laps from top rollers do not use knife or a sharp edged hook.

3C. THE TRUMPET.

1. DESCRIPTION.

The Spinning frame trumpet is a funnel-shaped roving guide, attached to a traversing bar, and located just back of the back rolls of the drafting element.

2. PURPOSE.

The trumpets guide the stock into the drafting element. The traversing motion of the trumpets move the stock back and forth so that a groove will not be worn in the cots and aprons, as would be the case if the stock maintained a constant, direct path through the drafting element.

3. CONSTRUCTION.

The trumpet is a one-piece component of molded plastic. Mounted on a traversing bar, it has a slot for longitudinal adjustment. Each trumpet is attached to the trumpet bar with a single screw. The trumpet bar is mounted in slots in the roll blocks and extends, in joined sections, the full length of the frame. The traverse motion consists of a gear, with integral cam, operating from a worm on the back roll and located at the foot end of the frame. An arm attached to the cam and to the trumpet bar imparts longitudinal movement to the trumpets.

4. PARTS.

4.1 TRUMPET
4.2 TRAVERSING MOTION
4.3 TRUMPET BAR
4.4 SLOTS

5. SETTING.

Adjust the trumpet so that the stock will traverse the same distance from each edge of the roll cot. With the bar either the inner or outward limit of its traverse, set the trumpet from the centre of the top roll cot so that on the opposite stroke it will carry the stock the same distance past centre on that side of the cot. Check the trumpet bar and arm to see that there is no bind or lost motion. See that all connections are tight. The traverse must be 12-13 mm.

GROUP 4 : A. RINGS

B. SPINDLES

C. THREAD GUIDE

D. SPINDLE DRIVE

4.A. RINGS.

1. DESCRIPTION.

The ring is mounted in the ring rail. An adjustable traveller cleaner is attached to the ring rail by a single screw. Plastic separators are mounted on a bar, which rests in brackets attached to the ring rail.

2. PURPOSE.

The ring provides a track for the traveller, which guides the yarn as it is wound into the bobbin. The ring rail traverses vertically to place the yarn in predetermined lays as dictated by the builder and lay gearing. Separators prevent the yarn from ballooning into an adjacent end and also confine wild yarn when an end breaks.

3. CONSTRUCTION.

The ring rail is made of stamped steel and the ring is hold in position by a screw.
The separators are made of opaque, semirigid plastic mounted on a bar. The separator bar extends and is supported in open brackets attached to the ring rail.

4. PARTS.

4.1 RING

4.2 RING RAIL.

5. SETTING.

5.1. The ring rail is attached to the lifter bracket at each samson by two screws. To align the rail vertically, place a small combination square on the spindle rail and have it project through the hole in the ring rail.

The height of the ring rail above the spindle rail for this adjustment is immaterial and can be at any convenient point of the traverse. However, the height at all sections of the ring rail must be exactly the same as gauged with the steel square. Vertical adjustment of the ring rail is made by means of the adjusting nuts of the lifter tapes.
Adjust the traveller cleaner so that it just clears the traveller.
The size, shape and weight of the traveller that is used is governed by local conditions such as yarn count, twist, ring diameter, and spindle speed.

5.2. Position of the ring rail at the start of the doff.

a) Mark a few tubes at 10 mm. from the base and put them on the spindles.
b) Unwind completely the winding chain.
c) Turn the cam at the smaller radius in order to have the ring rail at the lowest position.
d) Adjust from the setting screws the ring rail in order to have the top part of the ring at the same level with the mark on the tube.

5.3. Position of the traveller clearers.

a) Determine the heaviest traveller to be used.
b) Push the traveller to the outside. The traveller clearer must be set at 0,2 - 0,3 mm. farther than the traveller.
c) Mesure the distance between the ring and the traveller clearer and make a gauge of the same thickness in order to adjust all other traveller clearers of the frame.

5.3.1 Spacing plate B for flange No.1 - Rings and Rieter - Braecker - Travellers L 1 and LS 1.

Use 2 mm. spacers for travellers No. 8 to 1 to $^{9}/0$.
Use 1.7 mm spacers for travellers No. $^{10}/0$ to $^{26}/0$.

5.3.2 <u>Spacing plates B for flange No.2 Rings and Rieter-Braecker - Travellers M2 and MS2</u>.

Use 2.3 mm. spacers for travellers no. 16 to 11

Use 2.0 mm. spacers for travellers no. 10 to $^{8}/0$

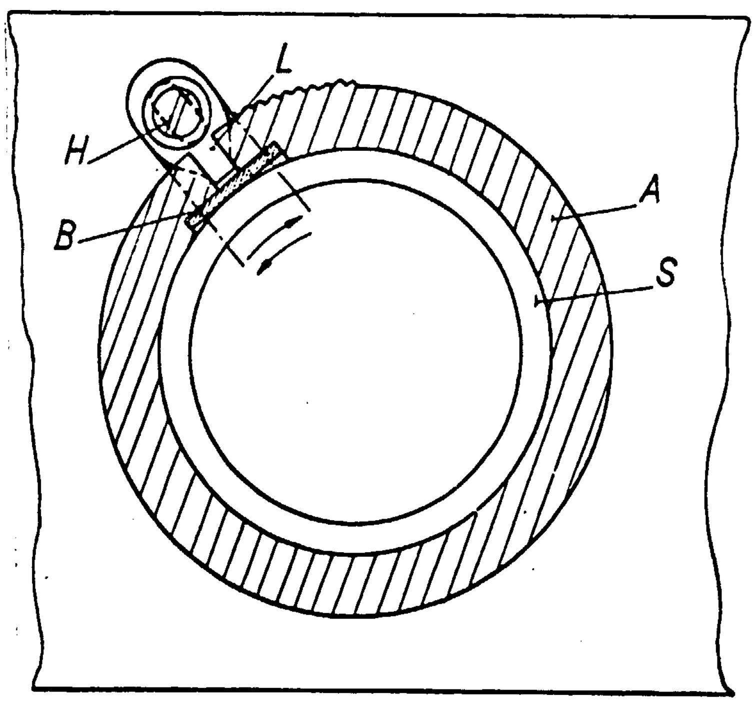
Use 1.7 mm. spacers for travellers no. 9/0 to $^{20}/0$

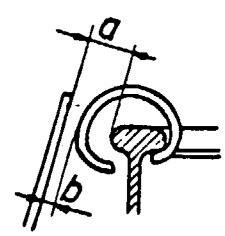
5.3.3 <u>General</u>.

5.3.4 <u>Fixing the traveller clearers</u>.

The traveller clearer "L" is pressed on to spacer B and screw H is tightened. Check whether the traveller clearer L remains in the proper position after tightening screw H.

5.3.5 In case the yarn count is changed considerably to coarser or finer, the traveller clearers have to be reset according to the respective traveller counts. Neglicence results in excessive fluff on the traveller and consequently increases the ends down.





4.B. THE SPINDLES.

1. DESCRIPTION.

The spindles are composed of two parts:

- the mount which is filled with the spindle oil and
- the spindle blade.

The bottom part or mount is fixed with a nut on the spindle rail.

2. PURPOSE.

The spindle holds the bobbin and revolves it to not only wind the yarn on the bobbin, but also to insert twist in the yarn between the bobbin and the front rolls of the drafting element.

3. CONSTRUCTION.

The bottom part or mount has a reservoir oil, a ball bearing at the base and a roller bearing at the top.
The spindle blade can be removed from the base and replaced without disturbing the base or requiring replumbing after it has once been correctly installed.

4. PARTS.

4.1 SPINDLE BLADE
4.2 BOLSTER
4.3 BRAKE
4.4 RETAINING SPRING

5. SETTING.

Clean all contact surfaces of the mount and the spindle rail before installation. Place the mount in the hole in the spindle rail and put the large washer and nut on the threaded bottom part of the mount. With the mount approximately in the centre of the hole, run the nut up by hand until tight. When sleeve mounts are used they are installed directly in the spindle rail and do not require a torque wrench to tighten the rubber. Before plumbing the spindles in this mount it is necessary to install the tapes and operate the spindles for 2 hours. The spindles should be reasonably plumb during this breaking-in-period to minimize damage to the tapes.

If the spindle is equipped with the Swift-Lok brake, place this assembly over the tube and against the lower flange of the whorl. With the brake lever in the off position, turn the assembly until the pin fits into the hole in the centre shaft. Push the lever to the on position to lock the brake in place. Insert the assembled spindle into the mount. Place the washer, beveled side down, on the base of the centre shaft and run the nut hand-tight to hold the spindle in place.

Lower the ring rail and set the top of the ring at the centre of the tube. Put the plumbing disc on the spindle and centre the disc in the ring by moving the mount. Hold the top nut of the mount with open end wrench and tighten the bottom nut securely with box socket wrench.
Have the top nut of all the mounts turned the same way on the rail.

The balloon control rings, when the frame is so equipped, should be aligned when the spindles are plumbed. A special disc fits the top of the plumbing gauge and the ring should be adjusted so that the disc is exactly centered in it. The balloon control ring is attached with two cap screws and is fully adjustable.
Before starting the frame, check spindles to see that there is no bind and that all the locking caps are in position.
The Spinning frame has a covered spindle rail and no covers are used for the individual spindle bases on this frame.
The spindles should be maintained and lubricated as prescribed in the maintenance section.

4.C. THREAD GUIDES.

1. DESCRIPTION.

Pigtail type with slub catcher slots.
Traverses independently of ring rail and balloon control rings.
Tilts individually for piecing or collectively for doffing.

2. PURPOSE.

Holds the yarn in a direct line with the bobbin and helps control the ballooning action of the yarn as it passes from the front roll to the bobbin.

3. PARTS.

3.1 Tappets.
3.2 Thread guide.
3.3 Draw rods.
3.4 Supports.
3.5 Chains.
3.6 Rollers.

4. CONSTRUCTION.

The ratchet mechanism (4) of the cam lever causes the shaft (3) to turn slowly, whereby the chain (2) is gradually wound on to the roller (1) and unwound from the central adjustment roller (6). The rollers (8) and (13), which are arranged on the main rocking shaft (7) are thus also turned and the chains (9) are wound on to them. The draw rods (14) are thereby displaced in the direction of the arrow, i.e. towards to the headstock, so that the chains (12) which pass over the rollers (10) and (15) raise the supports (11) evenly. The thread guides are thus moved upwards together on both sides.

5. SETTING.

Use the thread guide set to align the guide to the spindle. This guide slips over the plumbed spindle and has a point that projects upward through the guide. Have the point of the set touching the back of the loop of the thread guide. The guide bracket should be parallel to the ring rail.
Check this setting with a spirit level. Align the thread guide rod with a combination square placed on the roller beam. The rod can be adjusted at each samson post by means of adjusting nuts that hold the lifter tapes to the lifter brackets.
After the thread guide rod has been levelled it must be set in relation to the other traversing members. This setting will vary with frames of different gauge, length of traverse, and bobbin length. As a general rule, the guide should be about 1-2" above the tip of the bobbin at the lowest point of the traverse.
To set the guides at the correct height above the rails, use the master tape adjustment at the head end of the connecting bar. An adjustment made here will raise or lower the guide rod along the the entire side of the frame except for the short section between the adjusting point and the head end.
A separate adjustment is provided for this section.

NOTE:

When it is necessary to raise or lower the rod on one side of the frame the opposite rod will be affected, so always double-check these settings.
Double-check all settings on both sides of the frame.
To set the thread guide, certain machine makers supply a conical point to be inserted at the top of the spindle.

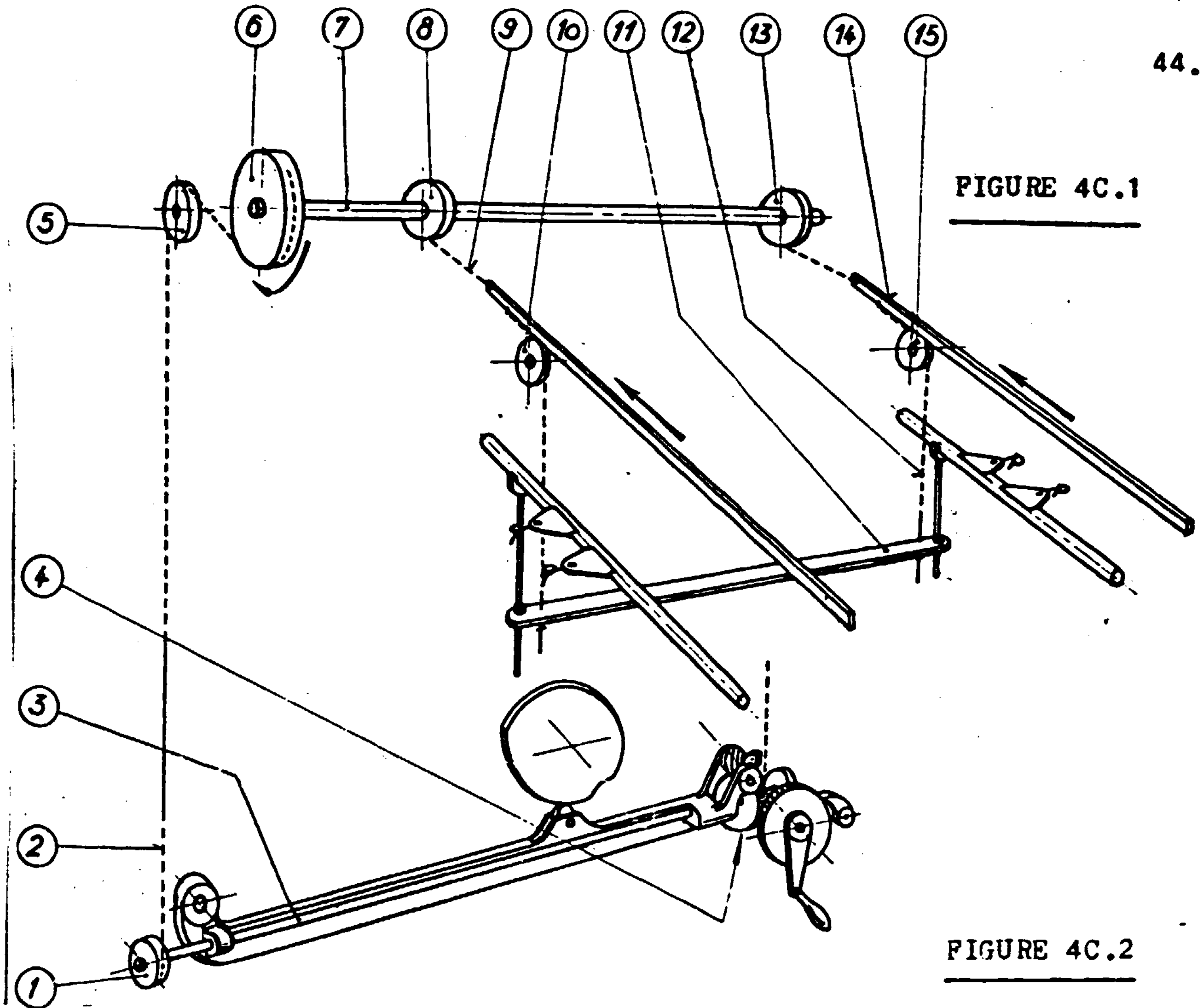
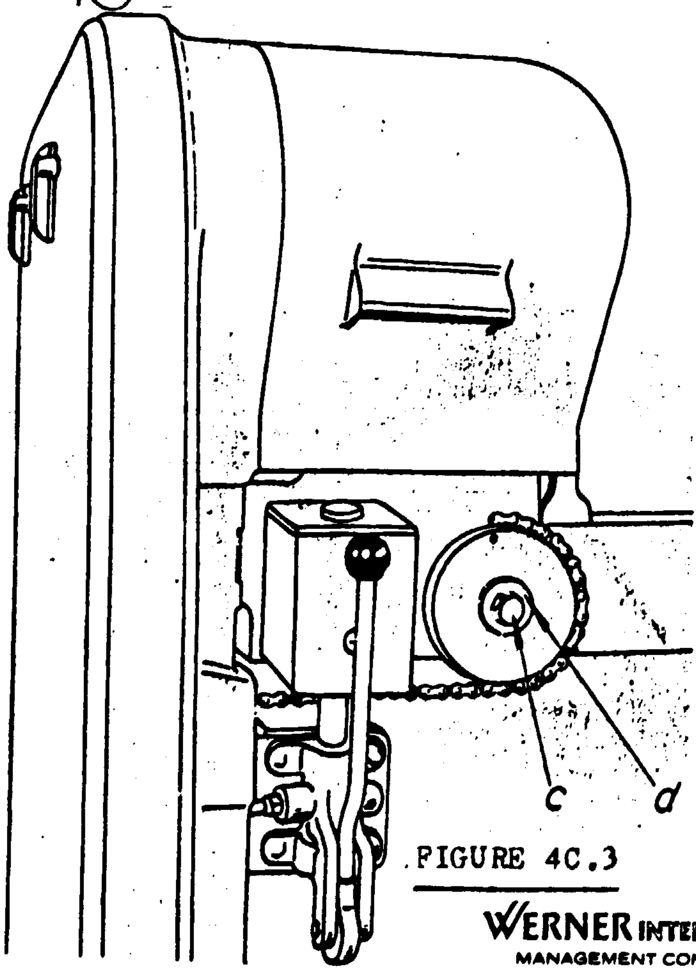


FIGURE 4C.1

FIGURE 4C.2



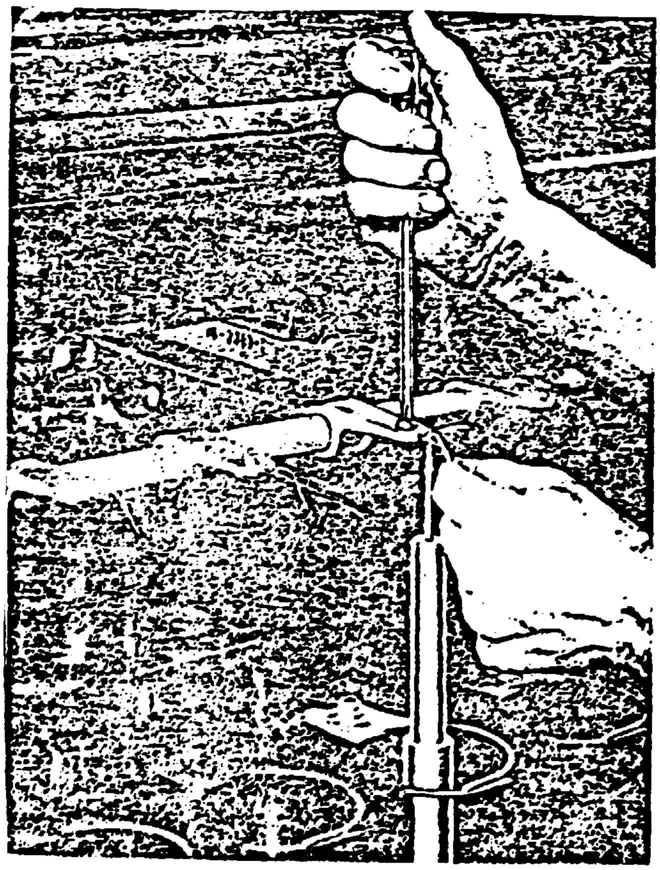
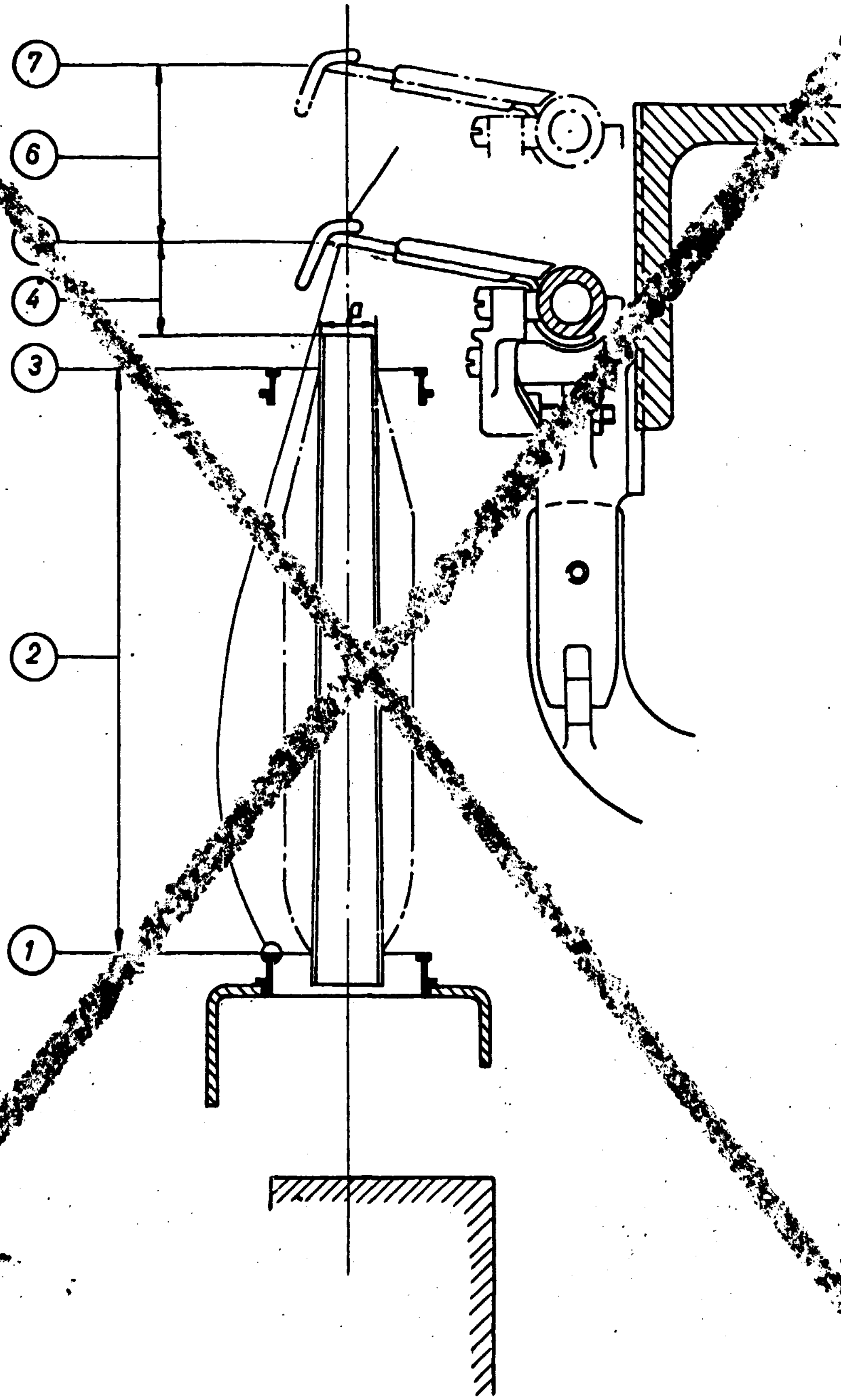


FIGURE 4C.3

FIGURE 4C.4



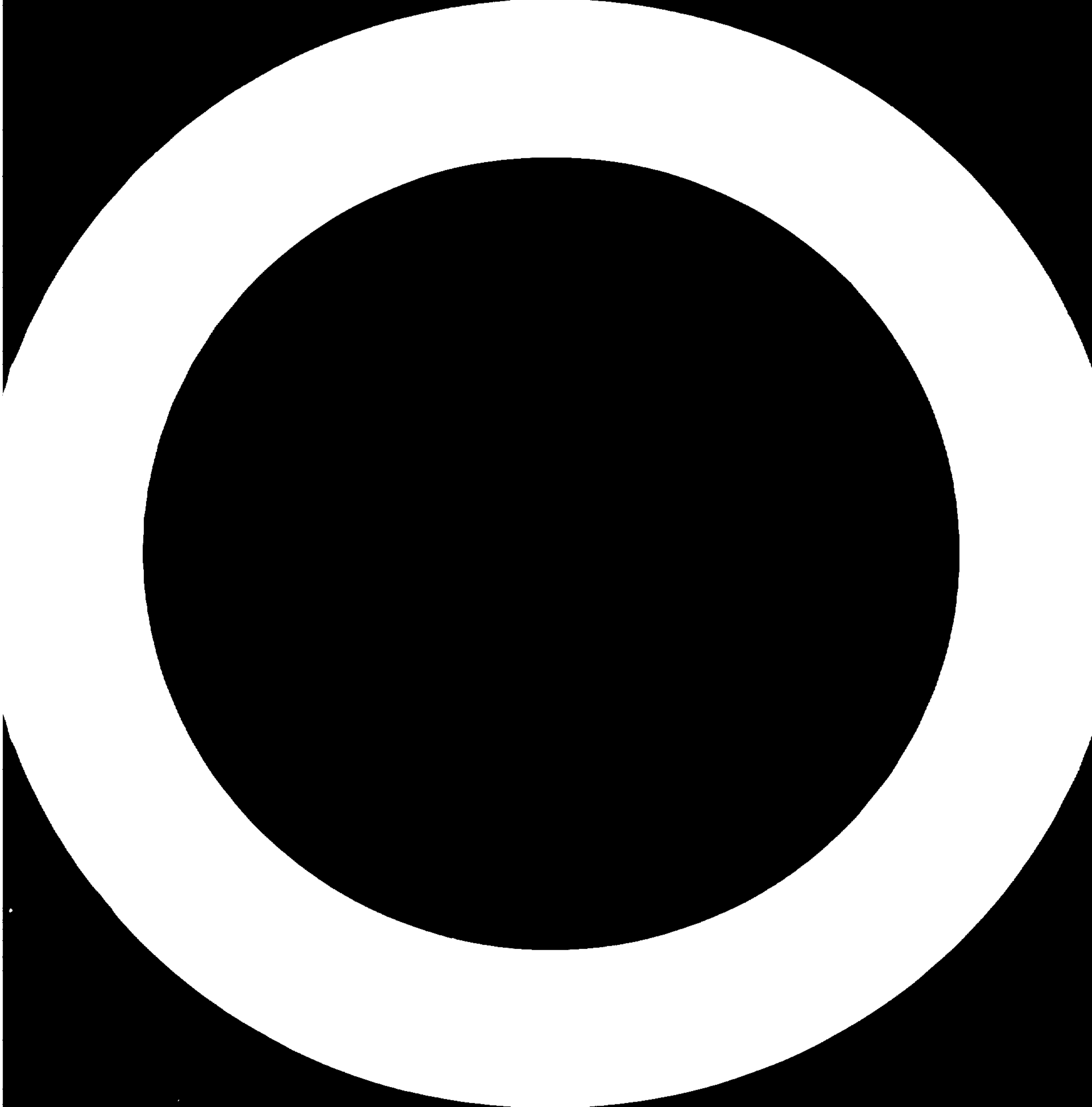
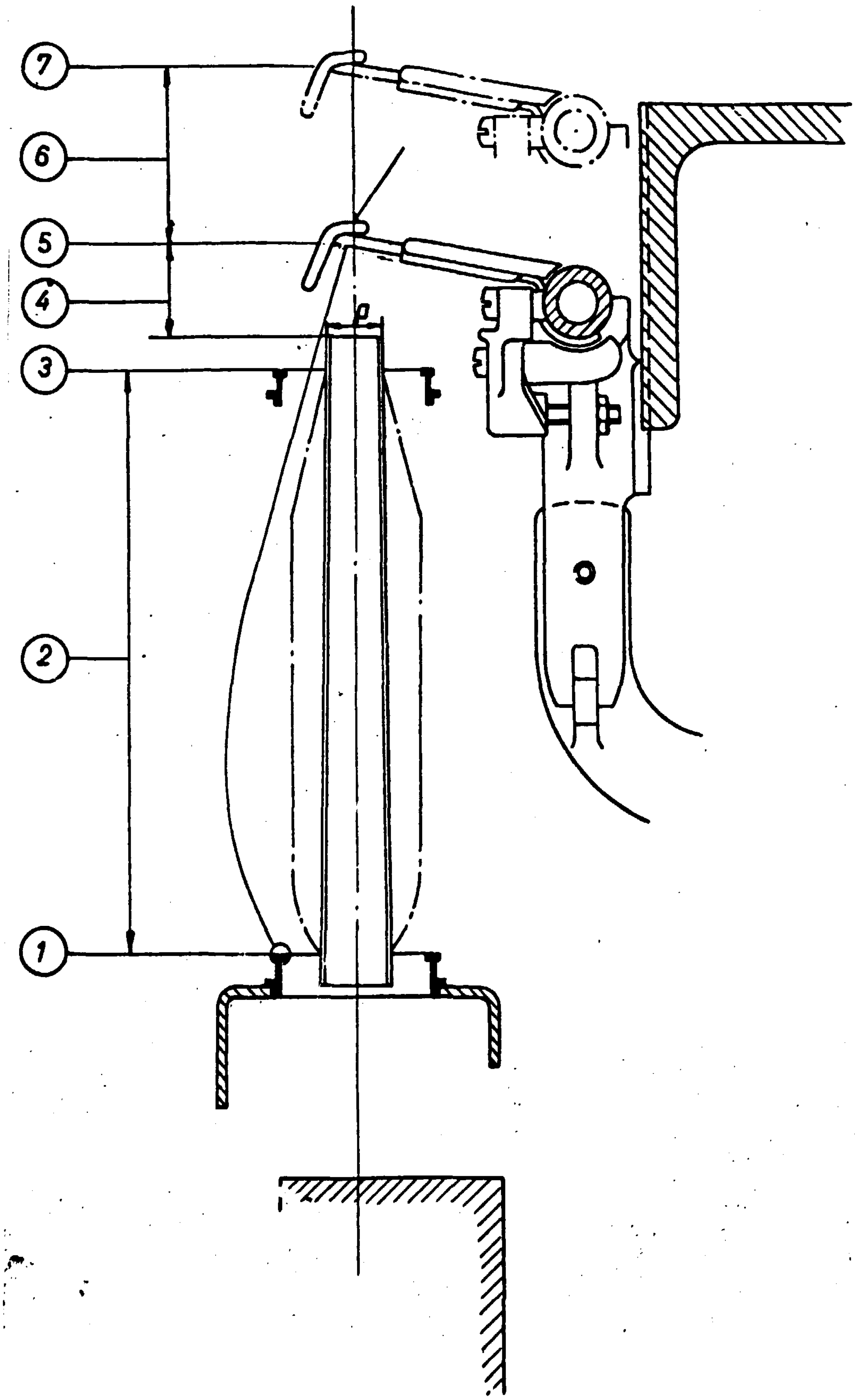


FIGURE 4C.4



4.B SPINDLE DRIVE.

1. DESCRIPTION.

Drive is through tape from a 10"drum mounted on the spindle drive shaft. Four spindles (two on each side of the frame) are driven from each pulley by a single tape. Tape tension maintained by crowned pulleys mounted on reciprocating arms controlled by coil springs or weight.

2. PURPOSE.

The spindles are driven at high speed through this tape drive. one or more of the spindles can be stopped without materially affecting the speed of the other spindles that are pulled by the same tape. The tension pulleys keep the tape under constant, uniform tension so that the speed will be consistently the same for all the spindles.

3. CONSTRUCTION.

The tape jockey apparatus are always arranged on the right-hand side of the frame and the tin rollers, without exception, on the left.

4. PARTS.

4.1 JOCKEY APPARATUS
4.2 TAPE
4.3 TENSION PULLEYS

5. SETTING.

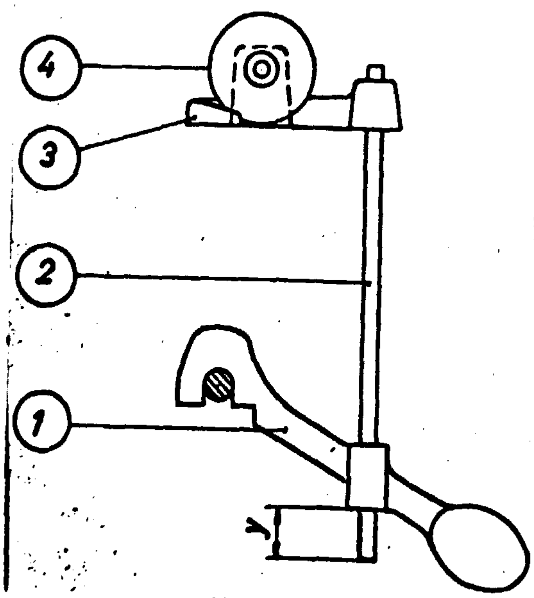
5.1 Adjusting the tape jockey apparatus.

The tape jockey apparatus are aligned for right-hand twist.
The spindle's clockwside direction of rotation is to the right when seen from above and its counterclockwise direction is to the left. This is the initial position for all the following operations:

1. To start with, fit the first two tape sets. To do this, insert the appurtenant 8 spindles, then take the measurement for the tape lengths, draw in the two tapes, sew and position them as described in the following Section "Spindle driving tapes".

2. Accurately adjust the first two tape jockey apparatus with these two trial tapes and make sure that the spindles are running correctly (right-hand rotation = warp twist). The tin roller always revolves outwards. Fix the first stop set collar and tape jockey apparatus on the guide pin. With the standard type fit the first stop set collar, or the first jockey pulley, in the same position on the supporting shaft. Now mount the second jockey apparatus on the supporting shaft and adjust it to the movement of the tape.

3. Turn the tin roller by hand. The tape must run exactly on the centre of the wharve; it must on no account brush against the wharve edges. Adjust the height of the vertical rods zith the complete jockey pulleys until these prerequisites are fulfilled on the two trial apparatus. Now measure off the distance y (see adjacent diagram) on the two trial apparatus. All the other tape jockey apparatus can be set to this measurement as a preliminary task, i.e. the height of all the apparatus is thereby fixed.



4. The jockey pulley must be about 10 mm. away from the drawing tape erd and run exactly over the centre of the tape jockey. The trial apparatus must be displaced accordingly. Then tighten the stop set collars on the supporting shaft.

5. When the spindle driving tape is posioned, the vertical rod must be perpendicular; this should be taken into consideration when the tape length is being determined (see "Spindle drive tapes"). Adjust the stop set collars so that the fitted, normally loaded tape can only be stretched one centimeter beyond the wharve.

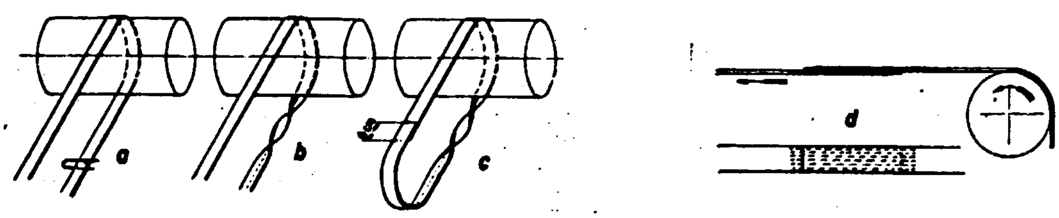
6. The setting of these two jockey apparatus determines that all the other jockey apparatus with a gauge which accurately indicates the lateral displacement of the jockey pulley in relation to the spindles, and tighten the apparatus' stop collars.

5.2 Spindle driving tapes.

The fitted and sewn tape is in the correct position when the vertical rod of the normally loaded tape jockey apparatus is exactly perpendicular. In this position ascertain the exact tape length, allowing for an overlap of 6 cm. Transfer the measurement from this trial tape to a board. Cut all the tapes to this measurement, applying the same amount of tension (about 0,5 kg.).

The tapes are drawn in and sewn as follows (see diagram):

1. Lay the tape round the tin roller like an open belt from the left-hand side of the frame (position a).
2. Turn the bottom end one whole revolution (360 degr.) in a clockwise direction (pos. b).
3. Lay the two tape ends on top of each other for a length of 6 cm (position c) and allow at the same time for the tape's direction of running (position d).
4. Sew the tape ends together with a special sewing machine, drawing the thread well into the tape. Use strong cotton twist, about No. 7 engl., for top and bottom sewing thread.



The spindle drive tape is a small but important part of the spinning frame. Much of the power necessary to operate the frame is used to drive the spindles. The wrong tapes, or tapes that are incorrectly installed, can cause abnormal consumption of power that will affect all the frames mechanisms. For this reason, a tape should be selected that is the correct weight, width, length, and thickness for the particular installation.

Always use the same kind of tape for all the spindles of the frame.

A tape that is too wide will:

1. Curl at the selvages.
2. Place additional load on the drive.
3. Have a short service life.

A tape that is too narrow will:

1. Not have sufficient traction.
2. Cause erratic spindle rotation.
3. Wear out or break prematurely.

A tape that is too long will:

1. Slip on the pulley and whorl.
2. Cause loss of output.
3. Adversely affect yarn quality.

A too-short tape will:

1. Cause undue wear to spindle bearings and tape.tension assembly.
2. Prevent effective control by the tension pulley assembly.
3. Have a high rate of tape failure.

In addition to having the correct tape, it is equally important to have eache tape correctly installed. There are two generally used methods of making the tapes endless.

One is by sewing the splice with a portable sewing machine especially made for this purpose.

The other is by bonding a special tape by inserting a thermosetting strip between the tape overlap at the joint hand heating it with a portable pre-heated unit.

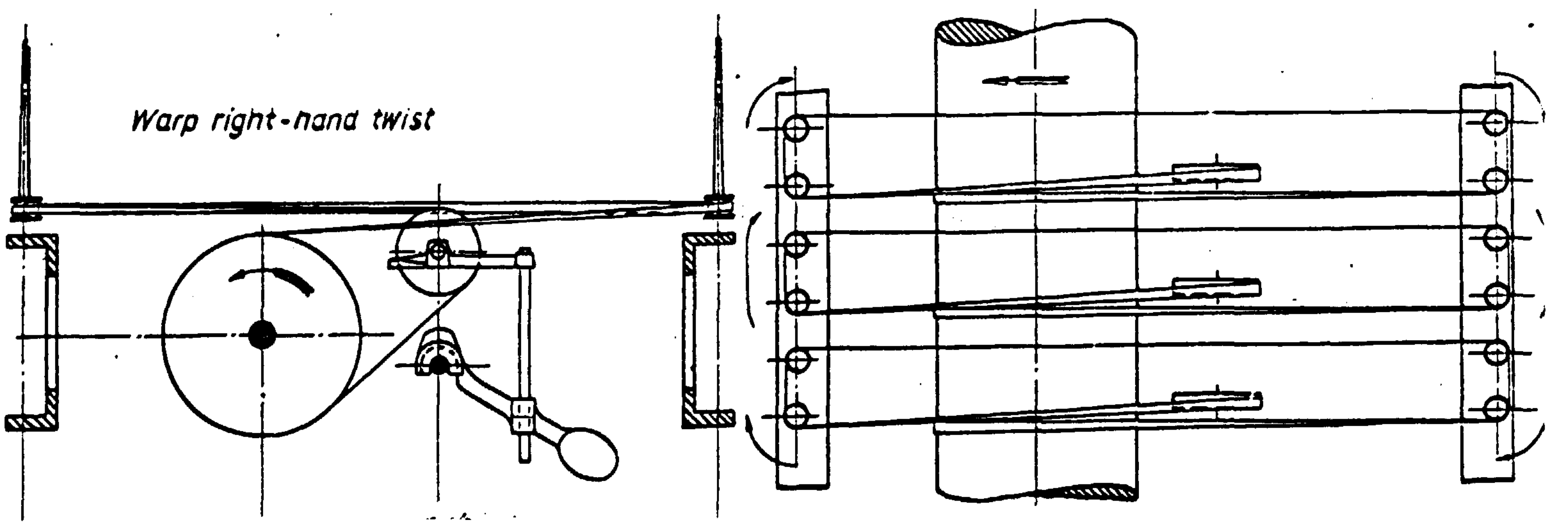
For a bonded joint, have the thermosetting strip the exact width of the tape and longer than the splice. If the strip projects about 1/8" beyond the ends of the tape a full-length bond is assured.

For either type joint, be sure the trailing end of the splice follows the direction of spindle rotation Fig. d.

Arrange the splice so that the trailing edge of the joint will travel away from the whorl.

One side of the tape contacts the drive pulley and the other side contacts the surface of the tension pulleys and spindle whorls. After running a few hours any new tape will have a tendency to stretch. This stretch should be taken into consideration when figuring the length of tape that is needed. However, once the exact length of tape - with allowance for stretch - with a given spindle whorl diameter has been determined, all the tapes can be pre-cut.

For correct tension and maximum efficiency the tapes should be of an exact length that will hold the tension pulley assembly arms in a vertical position.



GROUP 5 : A LAY-TWIST GEARING
B DRAFT GEARING
C BUILDING MOTION

A : LAY-TWIST GEARING

1. DESCRIPTION.

The twist gearing is composed of a train of gears that controls the speed of the front rolls of the drafting system in a predetermined ratio to speed of the spindles.

2. PURPOSE.

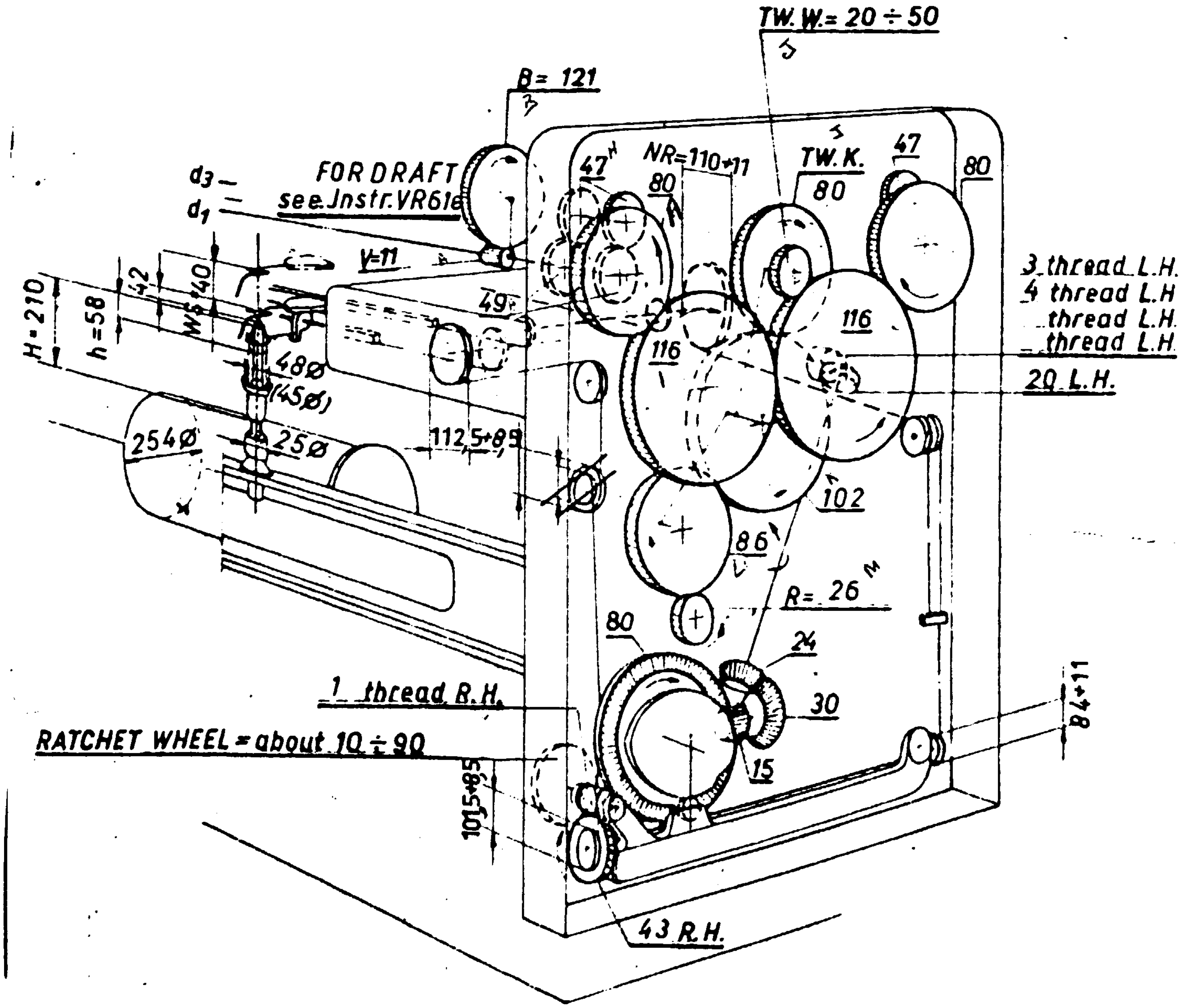
2A. The lay gearing determines the lay of the yarn on the bobbin by controlling the speed of the builder cam. This actuates the ring rail so that a traversing motion places each wrap of yarn in a predetermined position.

2B. The ratio of the speed of the front rolls to the speed of the spindles determines the number of turns of twist that are inserted in each inch of yarn as it leaves the drafting element and is wound upon the bobbin.
Actually, the speed of the traveller as it travels around the ring should be used as the dividend in twist calculations. However, the spindle speed is constant, is easier to figure, and the difference between the two methods amounts to only a fraction of a turn per inch.
Therefore, the spindle speed, rather than the traveller speed, is generally used in these calculations.

3. PARTS.

3.1 LAY GEAR
3.2 TWIST GEAR
3.3 INTERMEDIATE GEARS
3.4 SHAFTS
3.5 KEYS

LAY - TWIST GEARING



4. SETTING

The gears are keyed to the shafts and are held in place by nuts and lock washers. When installing the gears, be sure they are straight, seated firmly on the shafts and that the nuts are securely tightened.

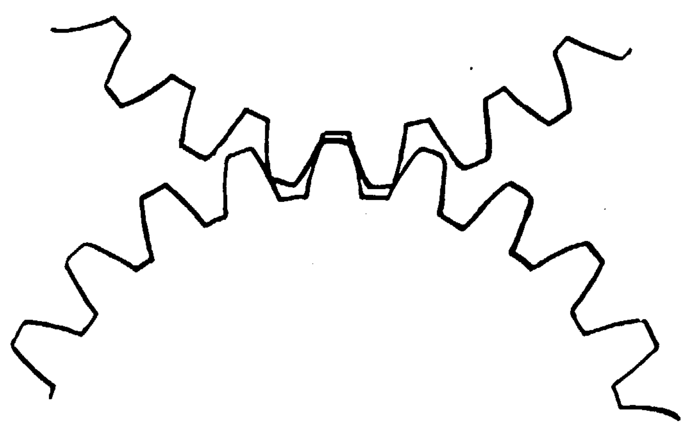
The change gears determine the twist by regulating the ratio of the surface speed of the front rolls to the R.P.M. of the spindles. Provision is made for easy twist reversel. To change direction of twist, the upper, or driven, change gear is meshed to the opposite gear and the frame motor is reversed. An optional reversing switch is available sometimes or the electrician can reverse the motor by changing the lead wires.

When changing the direction of twist, the balloon control rings (when used) must be turned over, unless the frame is equipped with optional reversible rings.

Never turn a gear in mesh with another gear, even by hand, before lubricant is applied to gear teeth. Use only the lubricant that is recommend by the manufacturer and follow the lubrication schedule for all gears of the machine. One of the most frequent faults of gear installation is improper mesh. If the gears are too lightly meshed, lost motion or excessive backlash will be present when the machine is started or stopped. The opposing teeth will make contact at only a part of their working surface. This will cause abnormal wear, chatter, vibration, and possible chipping or breaking of the teeth.

If the gears are meshed too deeply, the teeth will bind. This condition will cause overheating of the gears and bearings, breakdown of the lubricant, drain on the power source, and general inefficiency of the entire machine.

The correct way to mesh the teeth of connecting gears.



5.B : DRAFT GEARING.

1. DESCRIPTION.

The precision cut draft gears are located in the head end cabinet. Drive and change gears are keyed to revolving shafts and intermediate gears are mounted on anti-friction bearings on adjustable swing arm.

2. PURPOSE.

The draft gears drive and control the bottom rolls of the drafting system. By means of different size change gears, the ratio of speeds of various rolls can be changed to give different drafts.

3. CONSTRUCTION.

The draft gears are made with care and precision. The gears fitted to rolls and shafts are spaced for exact meshing. Gears mounted on studs and swing arms have antifriction bearings.

4. PARTS.

4.1 DRAFT GEAR (W1)
4.2 BACK DRAFT GEAR
4.3 SWING ARM
4.4 STUD

5. SETTING.

To thoroughly understand the settings for the various draft gears, a knowledge of the location and function of each gear must be known.

The gearing arrangement is the same for both sides of the frame, so for these instructions we will use one set of gears only, bearing in mind that these gears are duplicated for the other side of the frame. In actual practice the draft gears for both sides of the frame do not have to contain the same number of teeth. That is, the change gears can be different and one side of the frame can have different drafts and thus produce a different yarn than the other side. However, the twist will be the same for both sides. Referring to the gearing diagram, we see that the entire train of draft gears is driven through a train of gears from the spindle drive shaft.

Do not mesh the teeth of the gears so deeply that they bind nor so shallow that excessive backlah will be present.

Mounted on the upper back jack shaft is another gear that transmits drive to the middle bottom roll. Attached to the middle bottom roll is the back draft change gear and an intermediate gear, mounted on antifriction bearings to a swing arm stud, connects it to the driver on the upper back jack shaft.

An intermediate gear, mounted on antifriction bearings to a swing arm stud, connects the drive gear and the back roll gear. A swing arm permits adjustment to compensate for various spreads between the back and middle rolls.

Whenever a gear is change, double check to see that it has the correct number of teeth.

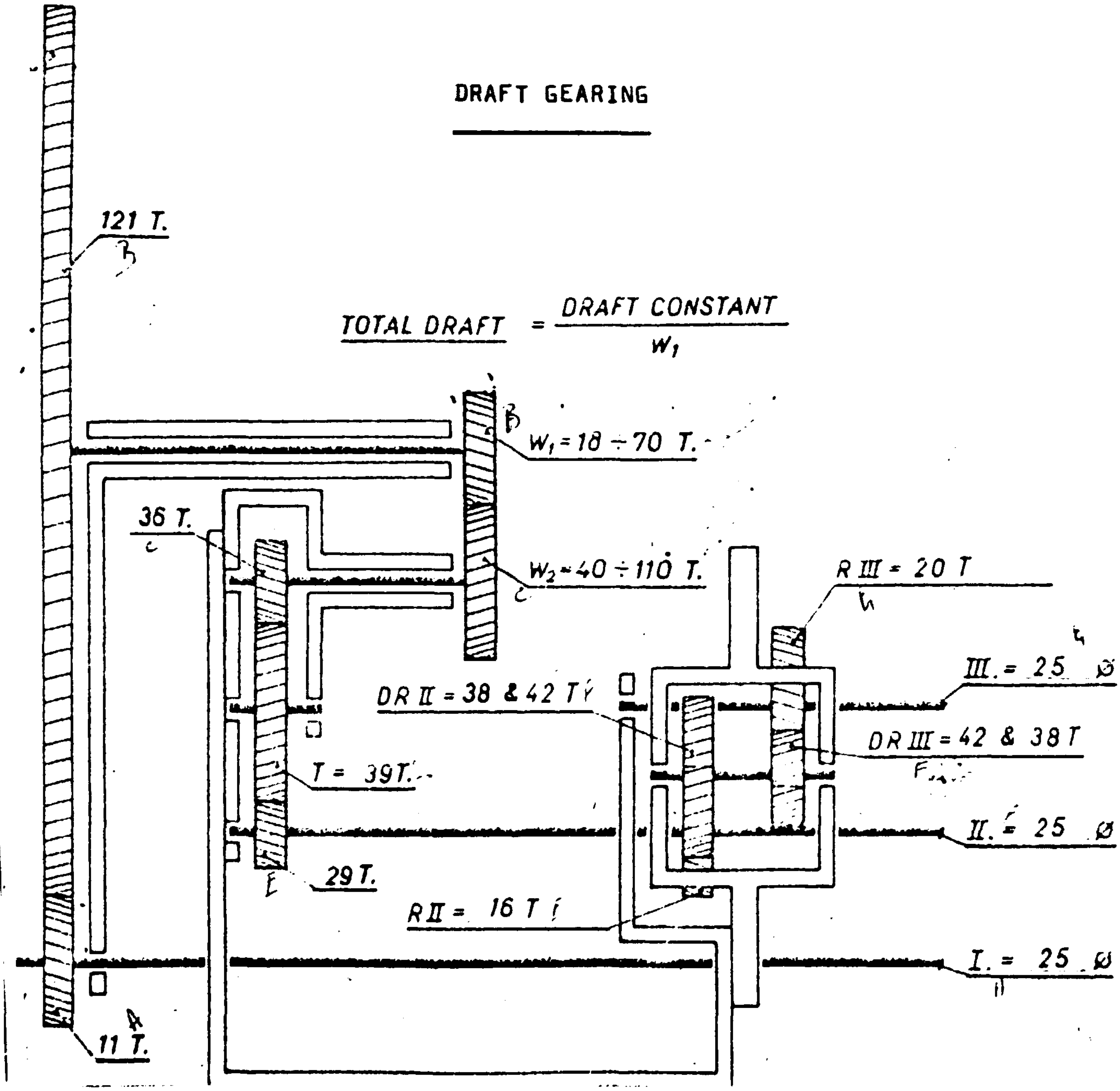
NOTE:

If a gear must be forced from the shaft, do not strike it to drive it off. Use a gear puller.

The gears should fit the shafts, studs, or rolls snugly with no play or looseness.
See that keys and keyways are not worn and that appropriate nuts and washers are securely fastened. Clean the teeth of all gears before installation and lubricate them according to lubrication instructions, before the frame is started.

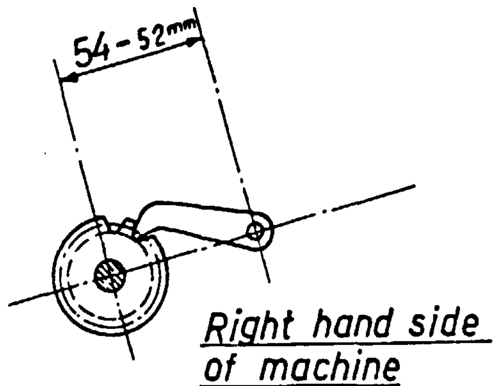
DRAFT GEARING

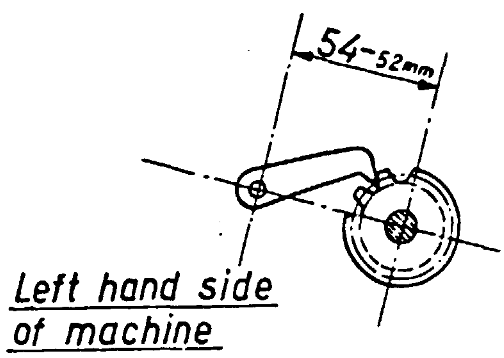
$$\text{TOTAL DRAFT} = \frac{\text{DRAFT CONSTANT}}{W_1}$$

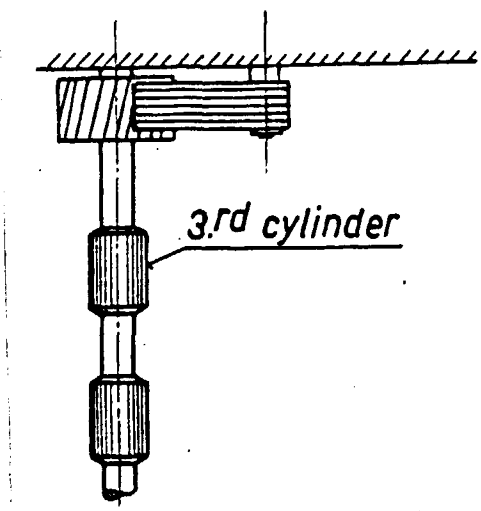


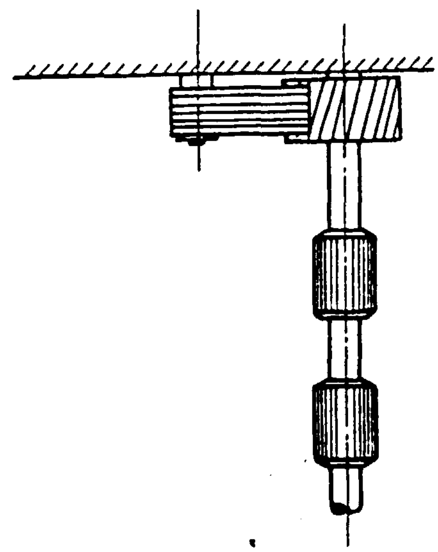
Fitting and adjusting of the holding pawl on the R 100 gearing.

At stoppage, it is necessary to reduce to a minimum the reverse motion of the back cylinder on the R 100 gearing. Therefore the distance between the shaft of the holding pawl and the shaft of the third cylinder (feed cylinder) is to be set to 52 and 54 mm. which is possible in all cases. If the second distance is chosen too big, i.e. if the rear rest for the motion wheel holder is set too much backwards, then the holding pawls do not actuate one after the other. The back cylinder can then be driven backwards by two teeth, which should not happen.









5.C BUILDING MOTION.

1. DESCRIPTION.

The pickmotion is a compact unit. It is located in the head end cabinet between the builder cam and the windlass assembly. There are three types of builder cams for the spinning frames - the filling wind cam for placing the yarn directly upon the loom bobbin; the filling wind cam for placing the yarn upon the warp bobbin or paper tube; the combination wind cam. The lobes of the cams have a long and a short side so that there will be alternate fast and slow traverse strokes.

2. PURPOSE.

The pickmotion regulates the traversing members so that the successive layers of yarn are placed on the bobbin in uniform fashion. For filling wind or combination wind the traverse is raised in increments propotional to the diameter of the yarn, which is placed conically on the bobbin.
The builder cam determines the build or shape of the package of yarn on the bobbin by controlling the position of the ring rail to the spindle for each lay of yarn. The long side of the lobe of the cam causes the ring rail to rise slowly placing the wraps of yarn side by side on the bobbin. The short side of the lobe of the cam permits the rail to descend more swiftly and the wraps of yarn are more widely spaced. Thus the descending wraps have a tendency to tie down the preceding wraps, and prevent sloughing.

3. CONSTRUCTION.

Spinning frame builder cams are scientifically designed for best package construction and they should not be filed or ground to change their contour. The cams are precision made and contact surfaces are machined to close tolerances. The cam is rigidly mounted to the output shaft that extends from the lay gear.

4. PARTS.

4.1 Chain.
4.2 Crank.
4.3 Underwind segment.
4.4 Guide pulley.
4.5 Cam.
4.6 Transmission pulley
4.7 Set screw.
4.8 Adjusting boss.
4.9 Stop pin.
4.10 Ring rail.
4.11 Set screw.
4.12 Draw rods.
4.13 Thread guide chain.
4.14 Chain pulley.
4.15 Pulleys.
4.16 Chain pulley.
4.17 Supporting shaft.
4.18 Journal.
4.19 Worm gear.
4.20 Heart cam.
4.21 Heart roller.
4.22 Cam lever.
4.23 Worm gear.
4.24 Worm gear.
4.25 Winding-on roller.
4.26 Ratchet wheel.

5. SETTINGS.

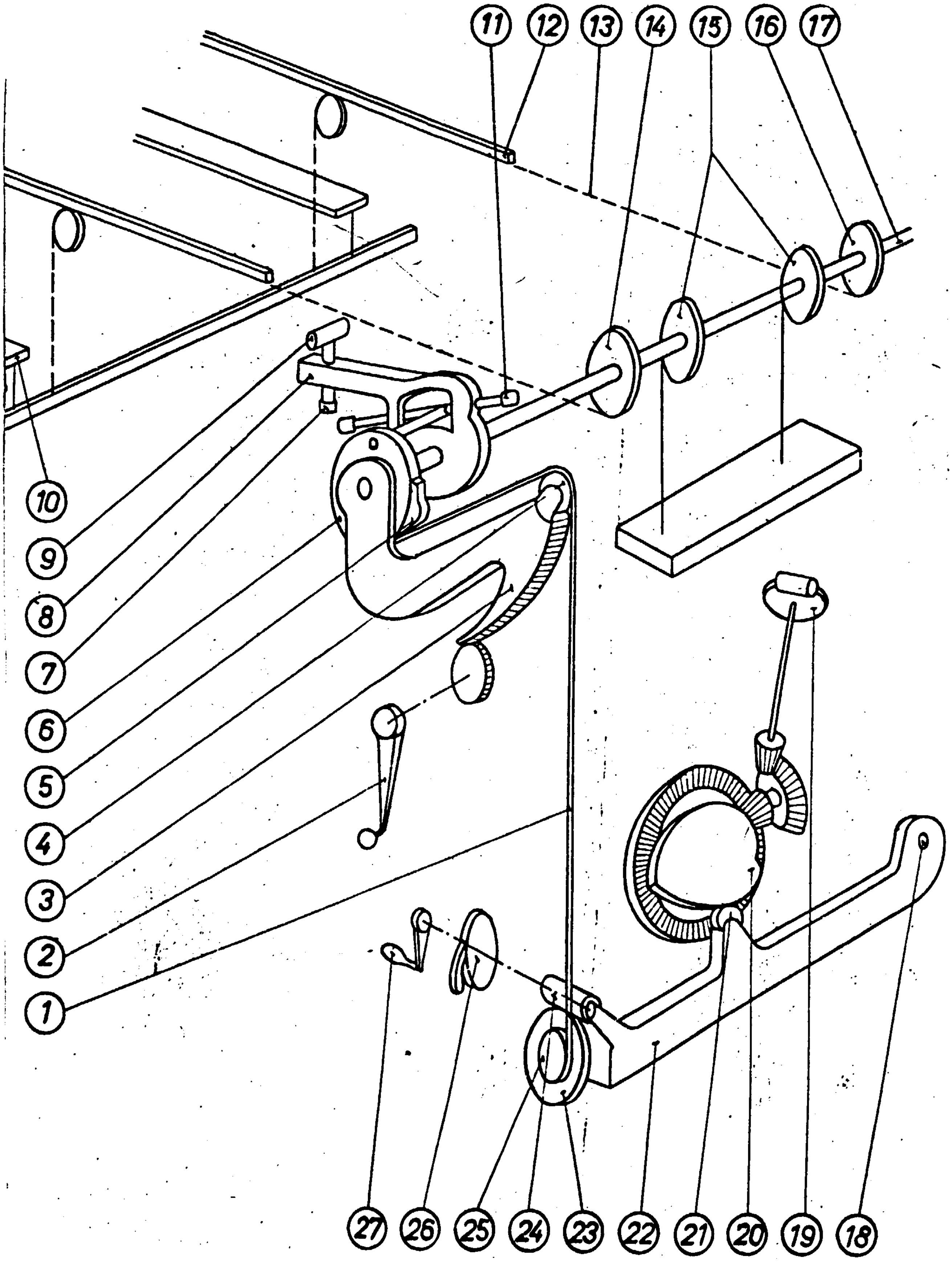
5.1 Ring rail motion.

The mode of operation of the ring rail motion and of the underwinding mechanism is diagrammatically illustrated in Fig. 5.C1 which is explained below:

1. Mounted - and swivellably arranged - on the journal (18) in the bottom of the headstock is the cam lever (22) which is supported by the roller (21) on the heart cam (20). The cam lever carries on its end the winding-on roller (25) to which the draw chain (1) is secured. The chain runs upwards over the guide pulley (4), mounted in the underwinding segment (3), on to the transmission pulley (6) which is in operative connection with the supporting shaft (17). Secured to the pulleys (14 and 16) are the connecting chains (13) which are joined at their other end to the draw rods (12).

2. When turned, the heart cam (20) presses on the heart roller (21) and the cam lever (22) receives a lifting motion which is transmitted via chain (1), guide pulley (4) transmission pulley (6) and chain pulley (14 and 16) to the draw rods (12) and thus to the ring rail (10) which is raised and lowered.

Figure 5C.1



The ring rail is lifted owing to the chain (1) being gradually wound on to the winding-on roller (25). The individual cop chases are thereby shifted higher and higher and the yarn is wound on the tube in regular layers.

3. The chain is wound on to the winding-roller by means of the ratchet wheel (26) which may have 20 to 80 teeth. If a ratchet wheel with more than 80 teeth is needed, the worm gear (23 and 24) in the cam lever must be altered; the decision, however, must be left to us.

4. The cop bottom is shaped by the cam (5) on the transmission pulley (6). At the beginning it presses on the chain (1) and thus causes a certain reduction of the lift. As the chain (1) is increasingly wound on to the roller (25), the cam loses its influence and the lift is transmitted unchanged to the ring rails.

5. For underwinding, the underwinding segment (3) is turned with crank (2), which causes the chain (1) to yield and the ring rails to be rapidly lowered.

6. The diameter of the transmission pulley (6) depends on the ring diameter or the desired length of the cop nose.

7. The worm gear to suit the desired thread length of a cop chase is provided for the drive of the heart cam (20).

5.2 <u>Initial position of ring rails</u>. (Fig. 5.C1)

1. Adjust the cam lever as shown in the figure 5C.2
   a. Set stop in centre of slot and tighten it against the cam lever.
   b. Using the crank, turn worm wheel (23) backwards in the direction of the arrow until the stop pin abuts the stop.
   c. Set the winding-on roller (25) so that the chain lug is in its lowest position and then tighten the two American set screws of the chain roller.

2. Adjusting the underwinding mechanism:

   Position the two hollow set screws (11) for the central setting of the ring rail height so that they project an equal distance on either side. This will bring the stop pin into the middle of the cored hole. (initial position during erection). The ring rails can later be set higher or lower centrally with these two screws; this adjustment is reserved to the operating staff (foreman).

   Position the set screw (7) 3/8 x 50 for the adjustment of the underwinding height in the manner indicated in the figure 5C.3 Final adjustment is effected later with the fixing of the underwinding position.

3. Initial position of the ring rail brackets:

   a. Turn heart cam (20) until the heart roller (21) reaches its lowest position (cam recess) (See fig. 5C.1)
   b. The ring rail brackets must project 60 mm. beyond the spindle rail as shown in the figure 5C.4
   c. In the initial position the distance of the tube length must be maintained between the lower edge of the spindle rail and the set collar on the ring rail bracket, as shown in figure 5C.4. This ensures that the set collar does not abut the bottom of the spindle rail in the topmost ring rail position (when the cops are full . In the case of small tube length this distance may, of course, be larger than the tube length.
   d. Check whether the ring rails are parallel to the roller beam and then, with each ring rail bracket, equalize the distance from the top edge of the ring to the spindle rail by means of the draw chain's lock nuts.

Figure 5C.2

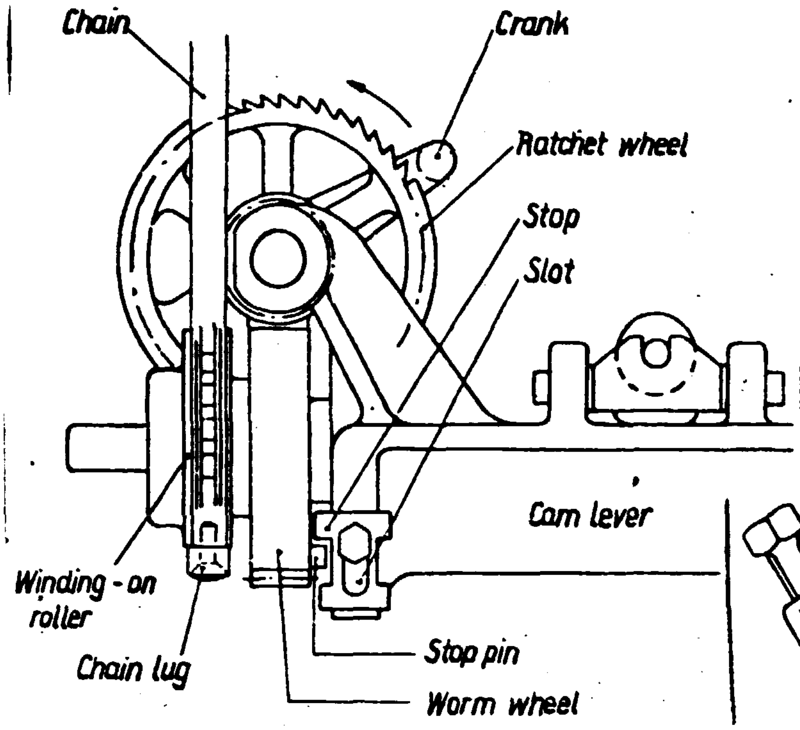


Figure 5C.3

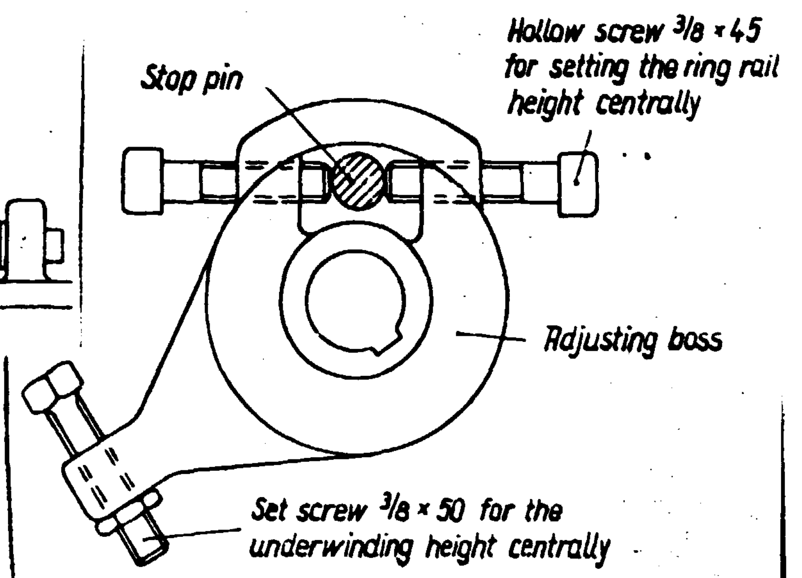


Figure 5C.4

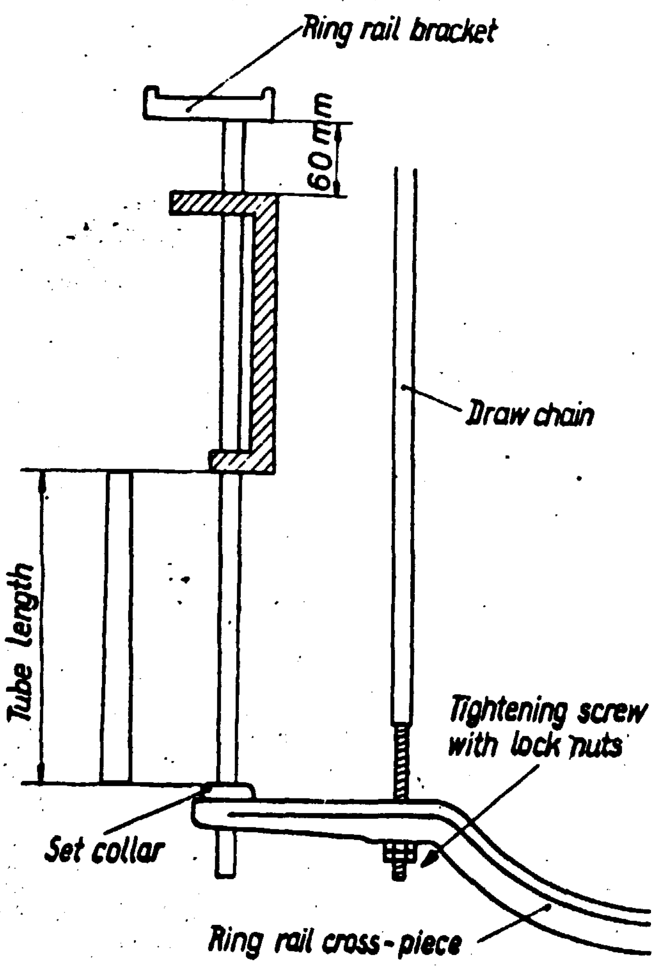


Figure 5C.5

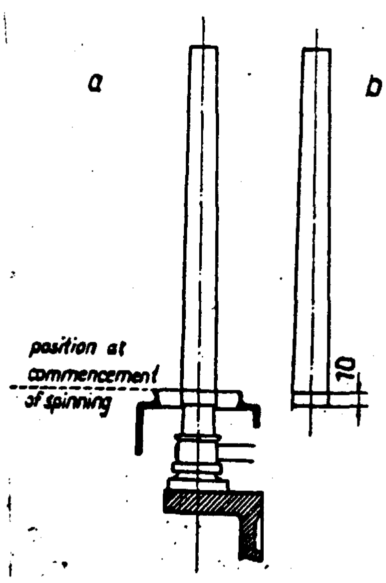
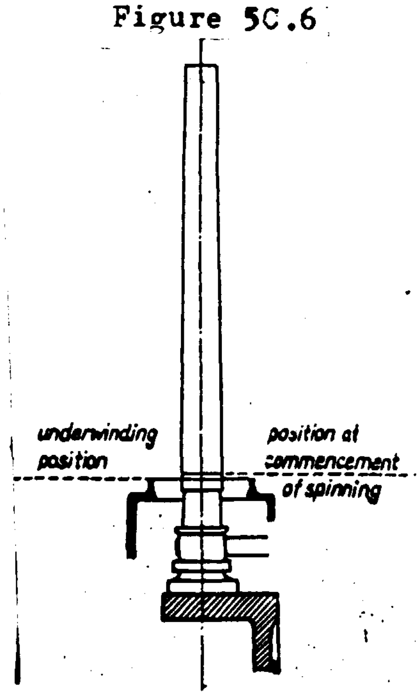


Figure 5C.6



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5.3 Position of ring rails at commencement of spinning.
(Fig. 5C.1)

1. Mark the starting point of the top on a few sample tubes by drawing a line 10 mm. above the bottom edge of the tube as shown in the Figure 5C.5
   Mount these tubes on the spindles.

2. Bring the ring rails into the initial position as described in the preceding section, para 3; i.e. the heart roller (21) must be in the recess of the heart cam (20), whereby the lowest point of the ring rail movement is reached (see Fig. 5C.1).

3. The top edge of the spinning ring must be in the initial position as shown in the adjacent figure. Now set the height of the ring rail centrally with the two regulating screws (11) on the adjusting boss (8). Then tighten both the regulating screws (11) a little.

5.4 Underwinding position (Fig. 5C.1 and 5C.6)

1. For underwinding, the ring rail must be set so low that the thread reserve can be wound on to the tube below the cop bottom as shown in the figure. Underwinding is effected as follows:
   Raise the crank (2) a little with one hand, disengage the releasing lever with the other and then turn the crank in the direction of the arrow, or hold it, until is relieved of load.

2. The set screw (7), in the adjusting boss (8) is used to set the height of the thread reserve on the tube. In the underwinding position this boss rests on the stop pin (9) and supports the ring rails. Toothed segment (3), chain (1) and cam lever (22) are thus released; the heart roller is raised from the heart so that the cop chase motion is disengaged. Now adjust the set screw (7) until the top edge of the spinning ring is the requisite distance below the cop bottom (as per adjacent figure). This distance is 2 to 3 mm. as a rule.

3. Now bring the underwinding mechanism into the operative position again as follows:
Turn the crank (2) counter to the direction of the arrow with one hand and at the same time exert pressure on the releasing lever from above with the other. As soon as this lever snaps into place, the ring rails are again in the operative position.

5.5 Shaping the cop bottom (Fig. 5C.1 and 5C.7)

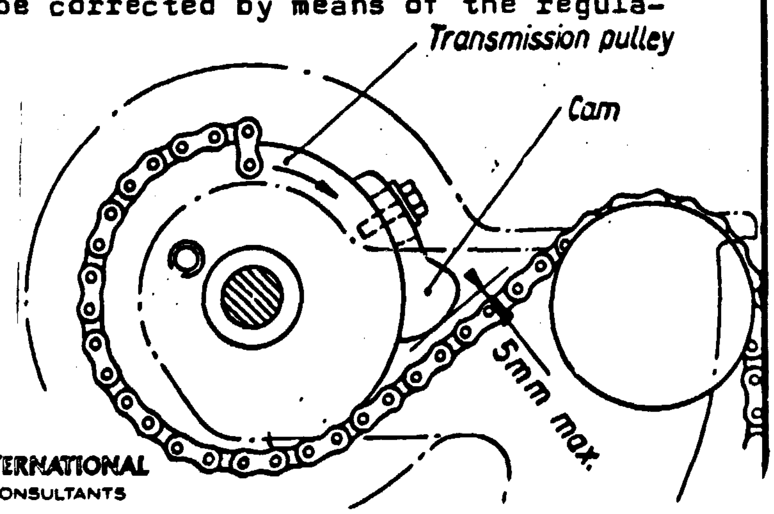
Winding on is described in detail under "Ring rail motion".
The following adjustment must be made for shaping the cop bottom:

1. Bring the ring rails into the initial position, i.e. turn worm wheel (23) in the cam lever (22) back to the stop by means of crank (27) (see also figure paragraph B).

2. Turn heart cam (20) until roller (21) is on the point of the cam, whereby the highest position of the ring rails is attained.

3. Set cam (5) on the transmission pulley (6):
   a. For fine counts of yarn the distance between cam and chain should be 3 mm. as indicated in diagram overleaf;
   b. for coarse counts of yarn the cam should abut the chain.

4. Lower the ring rails again by turning the heart cam, until the roller (21) is in the latter's recess. When the ring rails are lowered, the cam (5) presses on the chain and thus causes a reduction in the lift. Consequently, the ring rails will no longer exactly correspond to the position at the commencement of spinning. Their height must therefore be corrected by means of the regulating screws (11).



GROUP 6 : THE WASTE COLLECTOR SYSTEM.

1. DESCRIPTION.

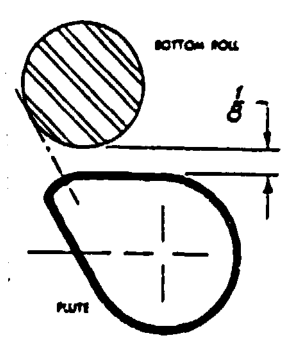
The vacuum system consists of a collector box, a back plate assembly consisting of the screen, fan, fan housing, and motor, an accumulating header or main duct, and a series of flutes.
In operation the fibres from a broken end are sucked into the flute through the orifice, pass on into the main duct and through it to the collector unit where they lodge against the screen to await removal for reprocessing.

2. PARTS.

2.1 FLUTES
2.2 DUCT
2.3 FAN
2.4 SCREEN

3. SETTINGS.

After extended frame stoppage, such as the weekend shutdown, the vacuum system should be started about five minutes before the frame is started to clean all dust and lint from around the orifices.
Both the vertical and horizontal setting of the flute to the bottom steel roll should be precise for maximum efficiency.
Set the top fo the flute 1/8" below the bottom of the roll and far enough back so that the fibres will enter the centre of the orifice without touching either side (see drawing below). The flutes are made to fit the specific gauge of the frame which they are installed and no longitudinal adjustment is necessary.



4. MAINTENACE AND CLEANING.

4.1 Check the flutes often for nicks,cuts or burrs around the orifices that can catch and retain fibres. Small burrs or rough edges can be smoothed with steel wool. For larger nicks and cuts, sand with 00 sand paper and then apply Pneumafil flute repair solution 103 or equivalent, which will dissolve the plastic. This solution can be applied with a small brush, such as artists use, until the roughness disappears from the surface of the flute. If the roughness is inside the flute, it can be removed by swabbing with a special mop saturated with 103 solution or equivalent.

4.2 To clean the flutes, remove them from the frame. Remove the end plugs, clean with a dry rag, and leave at the roll stand so that each plug will be replaced in the same suspension spring from which it was removed. Soak dirty flutes in lukewarm water to which has been added about one cup a good liquid detergent to 15 gallons of water. After soaking for about two hours, swab each flute with special flute brush and allow to drain dry. Do not dry with compressed air. The cleaning schedule for the flutes will vary due to many factors, among them being the kind of stock run. As a general guide, the cleaning schedule should be:

- Cotton ....Every Year.
- Synthetics ....Every 6 months.

This schedule is, of course, dependent upon mill conditions and if oil; dyestuff, or other solution is added to the fibres, it may be necessary to clean the flutes more often.

4.3 The accumulating header it main duct seldom needs maintenance or cleaning. However, it should be inspected every six months for any accumulation that might obstruct the flow of air. Place a flashlight where the header enters the collector unit and then go to the opposite end of the frame and remove the end cap from the header. It may be necessary to use a mirror to get a clear view down in the interior of the duct.

If it is neceaary to clean the duct, turn the unit on and feed a strong cord or spindle tape into the end opposite the collector unit. The suction will pull the loose end to the collector unit and a clean rag saturated with a good solvent tied to the opposite end can be pulled through to swab out the interior of the duct.

4.4 The screen should be cleaned with a special screen brush every week. The screens should be washed at least one a year in luke-warm water with about a cup of good liquid detergent added to 15 gallons of water. Let the screen drain dry. Inspect the screen for damage every month and replace immediately if cut or torn.
Whenever the screen or back plate aeembly is removed, be careful not to tear or damage the neoprene sponge that is attached to the screen frame and around the collector unit housing. Use a good solvent to clean out the collector unit - do not use water. Keep the inside of the collector unit free of nicks and burrs.
Remove any roughness by sanding with light sandpaper or emery cloth and polish with steel wool.

4.5 The motor is totally enclosed, fan cooled, and has sealed bearings. It requires no maintenance or lubricant. The motor is protected from overload or abnormal voltage by a heater and has a switch interlocked with that of frame motor so that in the event one motor overheats both will stop.

If the motor stops, check the following for possible cause:
- Low voltage
- High voltage
- Loose switch box connection
- Bad bearings
- Worn insulation
- Excessive vibration
- Clogged ducts or flutes.

The fan should be inspected every six months to one year, dependent upon stock that is being run. If there is an accumulation on the fan blades, it should be removed with a good solvent. Remove the fan from the motor shaft for cleaning to prevent solvent seeping into the motor bearings and dissolving the lubricant.

If it is neceaary to clean the duct, turn the unit on and feed a strong cord or spindle tape into the end opposite the collector unit. The suction will pull the loose end to the collector unit and a clean rag saturated with a good solvent tied to the opposite end can be pulled through to swab out the interior of the duct.

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- Bad bearings
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- Excessive vibration
- Clogged ducts or flutes.

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. THEORY OF SPINNING
3. DEFINITION OF SPINNING TERMS
4. TEMPERATURE AND HUMIDITY
5. TRAVELLERS
6. TWIST CONTRACTION
7. TROUBLE SHOOTING
8. PREVENTIVE MAINTENANCE
9. FRAME INTERFERENCE
10. QUESTIONNAIRE
11. CHARTS AND GRAPHS

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job planning abilities of the trainee.

b. Method.

The trainee is to walk the section of the Spinning Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.

The suggested number of each defect is as follows:

- Spindles plumbing.	7
- Thread guides plumbing.	7
- Aprons.	7
- Top rollers.	7
- Pressure arms.	7
- Pneumafil tubes.	7
- Trumpets.	7
- Traverse motion.	4
- Building motion.	4
- Separators	7
- Jockey pulleys.	7
- Bobbin holders.	7
- Brakes.	7
- Ring rail level.	7
	92

2. THE THEORY OF SPINNING

The spinning operation consists of taking one or more strands of fibre, drawing these individual fibres out, twisting the resulting yarn, and placing it upon a bobbin. The spinning frame contains all the necessary mechanisms to perform these basic operations as well as auxiliary motions to perform various supplemental functions.

A creel holds the bobbins of roving, which are strands of fibres with just enough twist to hold them together. (In some spinning systems such as the Saco-Lowell Spinnster the roving process is omitted and sliver is pulled over similar creels from cans.)
The stock passes through guides and into the back rolls of the drafting element. The bottom rolls of the spinning frame are made of steel and have helical flutes and the top rolls have contact surfaces covered with cots of rubber or of a resilient synthetic material. The middle rolls have aprons to better transport and control the stock.
The bottom rolls are positively driven by suitable gearing, with change gears to vary the speed for different kinds or counts of yarn. The top rolls are hold by a pressure arm (spring or air pressure) and are pushed against the steel bottom rolls. Thus, as the bottom rolls revolve, the top rolls cling to them and are also rotated while exerting a constant pressure on the yarn that is passing between the rolls.

The stock enters between the back top and bottom rolls, passes through a drafting zone, and is gripped by a second pair of rolls. These latter rolls are revolving faster than the former ones, which tends to partially rearrange the formation of the fibres. The individual fibres that have been released by the back pair of rolls are pulled forward and, since they are now moving at a faster pace, they slide forward in the strand. The fibres that are still gripped by the slower moving back pair of rolls are straightened by the action of the fibres moving past them and they are in turn fed into the middle rolls when released by the back ones.

An apron passes over the second, or middle, bottom roll and over a bar near the front roll. A similar apron and bar, mounted in a cage, operates with the top roll. These aprons serve to transport the fibres evenly between the rolls and hold them in orderly arrangement for the final drafting, which takes place between the middle and front pair of rolls.
The front pair of rolls is revolving much faster than the preceding pair and the fibres are drawn out to their final form. So you can see that the size of the spun yarn is determined by the size of the fed stock and by the speeds of the various rolls. In the first drafting zone (between the back and middle rolls) it is possible to draw the stock out 1.19 to 1.6 times its original length. In the final drafting zone (between the middle and front rolls) this elongation is greatly extended and it is possible to have a total draft of from 9.9 to 40.
Draft is defined as the proportion of the stock delivered to stock fed. For instance, if the total draft is 20 it simply means that for every one inch of stock fed into the back rolls there will be 20 inches of drafted stock delivered by the front rolls.

The ring rail traverses vertically in a predetermined pattern so that the wraps of yarn are placed upon the bobbin in a symetrical fashion.
To bind the fibres together and strengthen the yarn, the strand must be twisted after it leaves the front rolls and before it is placed upon the bobbin. This twisting is accomplished by having the spindle, which supports the bobbin, revolve at a high rate of speed.
Since one end of the strand is held by the front rolls and the other end is attached to (and is a part of) the package on the bobbin, each revolution of the bobbin would insert one turn of twist to the yarn if the yarn remained stationary.
If the bobbin only revolved fast enough to wind the yarn as it came from the front rolls, no twist would be inserted. In order to twist the yarn the bobbin must revolve much faster than the yarn is wound upon it. This is where the traveller plays such an important part in the spinning process.
The traveller is pulled by the strand of yarn that passes through its loop and it is free to revolve around the ring. Therefore, it follows the revolutions of the bobbin when there is enough tension on the yarn to overcome the weight of the traveller and its friction with the ring. But as yarn is fed from the front rolls, sleck is created and when the drag of the traveller overcomes the tension of the yarn the traveller overcomes the tension of the yarn the traveller lags behind the bobbin. If the traveller were to rotate at the same speed as the bobbin there would be no yarn wound on the bobbin and each revolution would insert one turn of twist.
As the yarn that is fed from the front rolls slips through the loop of the traveller it is wound upon the bobbin and twist is still inserted to the yarn at the rate of one turn per revolution of the traveller. For a clearer picture of just what happens, here is a hypothetical example: A 16s yarn is being produced through a drafting element that has a 1" dia. front bottom roll operating at 163 rpm and the yarn is wound upon a 9/16" dia. bobbin to form a 1 1/4" dia. package when full. The bobbin is mounted upon a spindle that operates at 9,000 rpm and the traveller is mounted upon a 1 1/2" dia. ring.

Roll dia. x pi x rpm = 512" yarn delivered per minute.

$$\frac{512}{\text{Dia. bobbin} \times \text{pi}} = 289$$ (Wraps/min. 1st wrap and laps traveller lags behind bobbin)

$$\frac{512}{\text{Dia. package} \times \text{pi}} = 130$$ (Wraps/min. last wrap and laps traveller lags behind bobbin)

9,000 - 289 = 8,711 (RPM of traveller, 1st wrap)

9,000 - 130 = 8,980 (RPM of traveller, last wrap)

$\frac{8,711}{512}$ = 17 (Turns per inch, 1st wrap) $\frac{8,870}{512}$ = 17.3 (Turns per inch, last wrap)

1 1/2" x pi x 8,711 = 41,028" (Minimum distance traveller orbits to wind 512" yarn on bobbin)

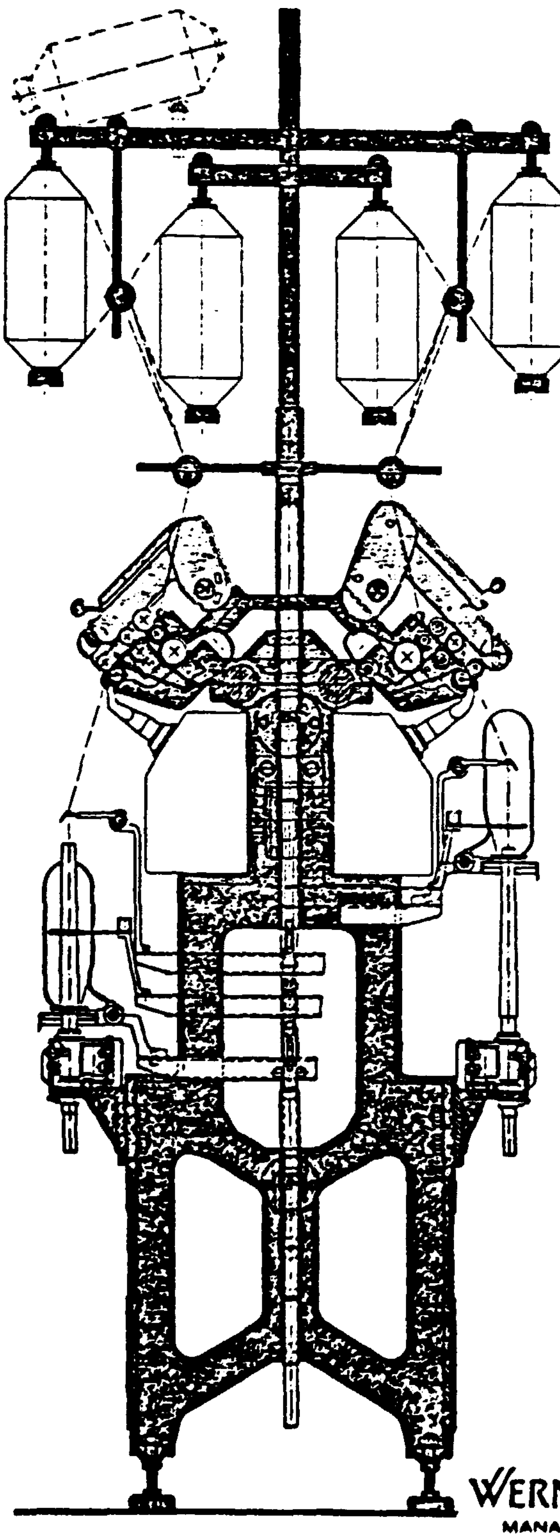
As can be seen from the foregoing figures, there is a variation in the rpm of the traveller from empty to full bobbin and a corresponding variation in the turns per inch (TPI). However, this variation is so slight that it is not discernible in the finished yarn.

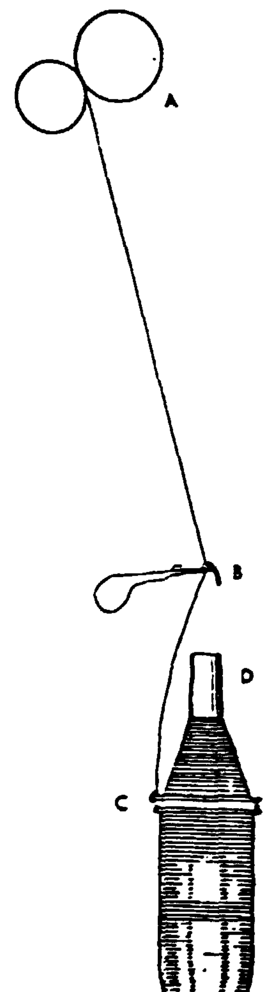
There is another factor connected with twist that materially affects the yarn. As the yarn is twisted it contracts, the amount of contraction increasing proportionately to the TPI and the counts of the yarn. In the preceding example the contraction would amount to about 2.98 %. See contraction table on next page .

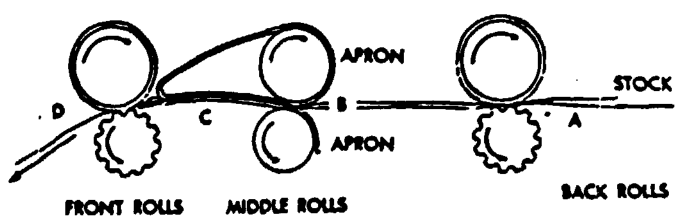
The amount of twist that can be inserted in the yarn ranges from 7.3 to 52.5 Turns per Inch (TPI). The amount of twist is controlled by a pair of twist change gears located in the head end cabinet, which regulate the speed of the front rolls in relation to the speed of the spindles.

Basically, this covers the theory of spinning.

However, there are other parts of the frame that are necessary for the doffing, cleaning, lubrication, and other functions incidental to this final process of converting raw material into spun yarn.







3. DEFINITION OF SPINNING TERMS

ACTUAL DRAFT

Draft based upon the ratio of weight delivered to weight fed, or length delivered to length fed.

ANGLE OF YARN PULL

The angle of the yarn from the traveller to the surface of the bobbin on the spindle.

BOBBIN WIND

The arrangement of the yarn on the bobbin.

BREAKING STRENGTH

The number of pounds of pull required to break a skein of yarn (120-yard skein wound on reel with 1 1/2 yard circumference equals 80 ends of yarn).

COEFFICIENT OF VARIATION - CV %) -

A value obtained by use of the Uster CV Integrator to denote the variation in the evenness of a test sample of sliver, roving, or yarn. It is also used for other tests such as breaking strength of yarn.

CONSTANT

A figure evolved from a number of factors, such as train of gears, that can be used to shorten the mathematical calculations needed when changing output, twist, draft, and other variables.

COT

Covering of rubber or other resilient material on the bosses of the top roll that compress and hold the stock during drafting.

COUNTS (Cotton)

A method of numbering roving or yarn based on weight in pounds per hank of 840 yards, in which one hank of 1s yarn or roving weighs one pound.

FORMULA: $\dfrac{\text{Number of Hanks in Quantity}}{\text{Weight in Pounds of Quantity}}$ = Counts.

CREEL

Rack-like device for holding bobbins of roving and for feeding the strands of stock evenly to the back rolls.

DOUBLE ROVING YARN

Yarn composed of two strands of roving.

DRAFT CONSTANT

A number derived from a number of factors, such as gears and rolls, that is used as a short-cut to figure needed draft change gear.

EFFICIENCY

The actual production of the machine expressed as a percentage and based on continuous (100 %) production.

EQUIVALENT COUNTS

The single equivalent of a ply yarn; the counts of a yarn in one numbering system as expressed in the equivalent of another system.

FILLING YARN

Yarn, usually of lower twist than the warp, that is placed on bobbins or quills for insertion in the loom shuttles.

GOUT

Foreing matter in yarn that usually causes an enlarged or undrafted section.

HANK (Cotton)

840 Yard length of roving or yarn.

HANK ROVING (HR)

Designation of the size of roving and based on the weight in pounds of one hank (see COUNTS)

LAY

The number of strands of yarn or roving that will lay side by side in an inch. Usually referred to as lays per inch or coils per inch.

LEFT-HAND SIDE OF FRAME

The side to your left as you face the end of the frame, from the head end.

MECHANICAL DRAFT

Draft based upon the ratio of the surface speed of the delivery roll to the surface speed of the feed roll.

NEPS

Small knotted or tangled clumps of cotton fibres.

PLUMB THE SPINDLE

Align the spindle to the ring rail.

PRODUCTION CONSTANT

A standard number for each yarn count, which can be multiplied by the diameter of the front roll times the RPM of the front roll to give the 100 % production in pounds per spindle hour.

RELATIVE HUMIDITY

Expressed as a percentage, it is the ratio of the actual presence of existing water vapor to the maximum possible presence of water vapor in the atmosphere at the same temperature.

RKM

Strength of yarn expressed in Kms.

FORMULA: $$\frac{\text{Ne} \times \text{Avg. Breaking strength of 50 cm. in gr.}}{1.000 \times .59} = \text{RKM.}$$

RIGHT-HAND SIDE OF FRAME

The side to your right as you face the end of the frame, from the head end.

ROVING

Strand of slightly twisted fibres prepared for the drafting element of the spinning frame.

S-TWIST

A direction of twist in yarn that coincides with the middle portion of the letter S. Also called left-hand or reverse twist.

SETTING

The location and proper setting of the vital parts of a machine with their relation to each other.

SINGLING

A section of yarn with one or more strands of roving or sliver missing.

SLUB

A soft, thick, uneven place in the yarn that forms a defect but is sometimes purposely made to produce novelty yarn.

SOFT TWIST

A twist below the standard required turns per inch for a given yarn.

SPINDLE TWIST

The actual turns made by the spindle while the front rolls are delivering one inch of stock.

STANDARD ATMOSPHERE

Air that is maintained at a relative humidity of 64 % and at 70 degrees C)

STAPLE

The average length of the fibres in a given quantity. As a general classification, short staple fibres range from the shortest spinnable length to 1 1/2" and fibres longer than 1 1/2" are classed as long staple.

STOCK

Material in process.

TRAVERSE

The lateral distance between reversal points in the building of a package of yarn or roving; the maximum lateral distance that the traversing members will move; the traversing mechanism.

TWIST OR TURNS PER INCH (TPI)

The number of turns of twist inserted in one inch of yarn or roving.

TWIST CONSTANT

A constant based on cylinder, or spindle pulley speed, front roll speed, and the gearing arrangement of the spinning frame that can be devided by the desired turns per inch to give the size twist change gear that is needed for a given yarn.

TWIST MULTIPLIER

A constant number, which can be multiplied by the square root of the counts or hank roving to obtain the required twists per inch of yarn or roving.

WARP YARN

High-twist yarn that is to be placed on beams and threaded through the drop wires, heddle eyes, and reeds of the looms in the weaving process.

WHORL

The spindle pulley

WRAPS

The number of lays of yarn placed on the bobbin during each stroke of the traverse.

Z-TWIST

A direction of twist in yarn that coincides with the middle part of the letter Z. Also known as right-hand twist or regular twist.

4. TEMPERATURE AND HUMIDITY

Atmospheric conditions have a decided effect on textile materials, especially during processing. For this reason it is essential that the temperature and moisture content of the air within the mill be controlled. The exact degree of temperature and percent relative humidity that is best will vary, but for most spinning installations air temperatures ranging from 78 to 84 degrees F and relative humidities between 45 and 55 percent will give satisfactory results.

Temperature alone - unless in extremes of hot or cold - does not have a great effect on the fibres. However the temperature dictates the amount of moisure the air will hold in suspension and, therefore, temperature and humidity must be considered together.

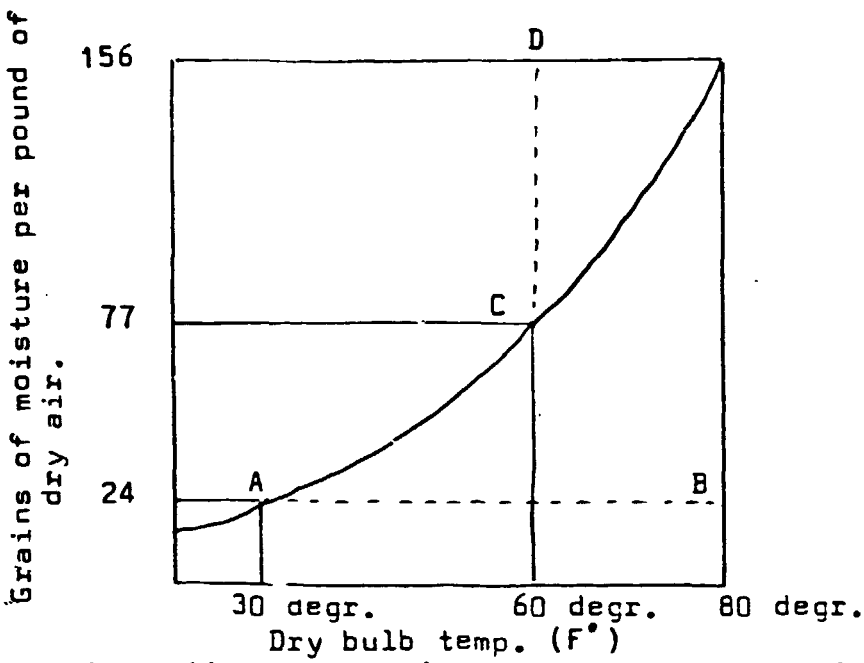
Fibres, especially cotton, are very sensitive to moisture. If the air is dry, the fibres quickly lose their natural moisture. They become brittle, have a tendency to curl, lose cohesiveness, and become hard to control in the drafting process.
On the other hand, they quickly absorb moisture from the surrounding air and if there is an excess of moisture, the fibres become limp, cling together, and make drafting difficult.

Moisture content of the air also has other effects. When the air is extremely dry, frictional surfaces of the machines discharge static electricity, which adversely affects the spinnability of the fibres. Too much moisture in the air causes condensation and the damp surfaces of rolls and guides cause lap-ups and chokes.

In the mill, moisture content of the air is usually expressed in percent relative humidity. This term denotes the amount of moisture actually present in the air as compared to the amount of moisture the air would contain if thoroughly saturated at the same temperature. Air has measurable weight, which varies according to temperature and moisture content. At 70° F. 13.34 cubic feet of dry air weighs one pound.

Moisture content of the air is in vapor form and is invisible until it condenses. The warmer the air, the more moisture it will keep in suspension. Air becomes thoroughly saturated and the moisture begins to condense when the moisture content reaches the dew point.

For a better understanding of this subject, consider the accompanying chart. (see next page).



At 30° F the air is thoroughly saturated when it contains 24 grains of moisture per pound of dry air (A).

The relative humidity is 100 %. If we heat this air to 80° without losing any of the moisture, we will have the conditions shown at B. Since the dew point of the air at 80° permits a moisture content of 156 grains per pound of dry air, we have 24/156 or 15 % relative humidity.

If we saturate this air at 80° F. by adding the additional 132 grains of moisture per pound of air, we will again have 100 % RH and a much greater amount of moisture. Suppose we now cool this air to 60°, which has a moisture content at dew point of 77 grains per pound of air. All the moisture betweens points C and D, or 79 grains per pound of air will be removed from the air through condensation.

For optimum running conditions in the spinning room, the best relationship between temperature and moisture content of the air should be determined for the particular application and then controlled within as narrow limits as possible.

5. TRAVELLERS

The selection of the correct traveller for a particular installation is made difficult by the many variable factors involved. Here are just a few of the factors that must be considered.

The count of the yarn is a major factor because the weight of the traveller must be compatible with the weight of the yarn.

The twist inserted in the yarn can offset some of the weight difference because a high-twist yarn has less bulk and, therefore, less air resistance than a low-twist yarn.

The type of fibre must be considered because different fibres react in different ways while passing from the drafting element to the bobbin.

The spindle speed affects the action of the traveller - an increase in spindle speed will have the same effect, within certain limits, as adding a heavier traveller.

There are actually two kinds of forces acting on the traveller; they are:

1. Tangential Forces, which are (a) tangential component of yarn pull caused by the bobbin as its pulls the traveller around the ring, (b) backward pull of yarn due to air resistance, and (c) frictional resistance between traveller and ring.

2. Radial Forces, defined as (a) centrifugal force acting radially outward (b) weight of the traveller acting downward, (c) radial component of the yarn pull caused by the bobbin, acting radially inward, and (d) radial component in the balloon force, acting upward.

It can be seen that with all these forces acting on the traveller a slight variation in some controlling factor such as change in yarn count or spindle speed may cause one force to complement the effect of another force or it may cause them to become the very antithesis of each other.

Local conditions such as humidity, the condition and contour of the ring flange, the shape of the traveller and its position in relation to the ring, all have a definite effect on the traveler's behaviour.

Although it is hard to arbitrarily pick a traveller for a particular installation (there are 28,000 different sizes and types) the requirement for a suitable traveller are easily definable.

1. The traveller must exert enough braking force on the yarn to cause it to wind smoothly and firmly on the bobbin.

2. The traveller must not place enough strain on the yarn to cause end breakage or to stretch it beyond its elasticity regain.

3. The circle of the traveller must be large enough to accommodate the yarn and not become loaded with fly.

4. The traveller must not be so large or unbalanced that it rides the ring flange unevenly or skips against the side of the ring.

5. The traveller must be of a size and shape that will not generate excessive frictional heat and thus shorten the service life of traveller and ring.

A handy formula to help select the correct weight traveller when changing yarn count is:

Multiply the weight of 10 of the travellers presently used by the yarn count and divide by the count of the yarn to be spun, which will give the correct weight of 10 travellers recommended for the change.

Example:

30s yarn is being spun with a 6/0 traveller and change is to 20s yarn.
From the table on next page 74 we see that 10 No. 6/0 travellers weigh 30 mg. therefore

$$\frac{30 \times 30}{20} = 45$$

Referring again to the table we find that 10 travellers weighing 45 mg. are designated as 2/0 and so we change to this size traveller for the 20s yarn.

However, it must be remembered that many variable factors must be considered in addition to yarn weight. Tests should be made after any change to see if the traveller that is selected is actually the best one in practice as well as in theory.

SIZES OF RING FLANGES		
FLANGE	WIDTH	OUTSIDE DIAMETER OF RING
No. 0	3/32"	3/16" Larger than I.D.
No. 1	1/8"	1/4" Larger than I.D.
No. 2	5/32"	5/16" Larger than I.D.

TABLE OF NUMBER AND WEIGHTS OF REINERS FURST C AND EL SPINNING TRAVELLERS FLANGE 1 AND 2

WEIGHT OF ONE TRAVELLER IN Mg.

No.Size	Weight in mg.	No.Size	Weight in mg.	No.Size	Weight in mg.
20/0	9	5/0	32.5	11	185
19/0	10	4/0	35	12	205
18/0	11	3/0	40	13	220
17/0	12	2/0	45	14	235
16/0	13	1/0	50	15	250
15/0	14	1	60	16	265
14/0	15.3	2	70	17	280
13/0	16.5	3	78	18	295
12/0	17.5	4	85	19	310
11/0	18.8	5	95	20	325
10/0	20	6	105	21	340
9/0	22	7	115	22	355
8/0	24	8	130	23	370
7/0	27	9	145	24	385
6/0	30	10	165	25	400

6. TWIST CONTRACTION

In order to produce the most accurate computations with reference to the production of spinning frames, the effects of contraction on the strand of fibres delivered by the front roll should not be overlooked. It is also well to consider the effect of this contraction on the draft.

For instance, if the contraction is 5 % and a draft of 20 is required to produce a give yarn from a given hank roving, the actual draft will be 21.0527 if the yarn on the spindle is to be spun true to count. This means that the actual poundage passing through the nip of the front roll is 5 % less than calculated. In other words, if the contraction is 5 %, the strand of yarn passing through the front roll is not 20's but is 21.0527's. Assuming that at the end of the day the hank clock read 8 hanks, you would actually be producing on 480 spindles 182 pounds, whereas if you figured on No. 20's yarn, the corresponding figure would be 192 pounds. In other words, there is a difference between the theoretical and the actual of 10 pounds per frame for an 8-hour shift.

Finally, the practice of neglecting the effect of contraction on the inserted twist leads to another error.
Assume that the mill wishes to produce a yarn with the final twist on the basis of a certain twist multiplier TM. If they do not increase the front roll speed in the same ratio as the contraction in the final yarn, the twist in the yarn on the bobbin will be T X C, where T equals the calculated twist and C is the percentage of contraction.

TWIST CONTRACTION TABLE

Showing Percent of Yarn Contraction for Twist Multipliers from 3 to 5

Twist Multiplier	Percent of Contraction	Twist Multiplier	Percent of Contraction	Twist Multiplier	Percent of Contraction
3.00	3.10	3.70	4.95	4.40	6.80
3.05	3.25	3.75	5.08	4.45	6.93
3.10	3.40	3.80	5.20	4.50	7.05
3.15	3.53	3.85	5.35	4.55	7.20
3.20	3.65	3.90	5.50	4.60	7.35
3.25	3.78	3.95	5.60	4.65	7.48
3.30	3.90	4.00	5.70	4.70	7.60
3.35	4.03	4.05	5.85	4.75	7.73
3.40	4.15	4.10	6.00	4.80	7.85
3.45	4.28	4.15	6.15	4.85	8.00
3.50	4.40	4.20	6.30	4.90	8.15
3.55	4.55	4.25	6.43	4.95	8.28
3.60	4.70	4.30	6.55	5.00	8.40
3.65	4.83	4.35	6.68		

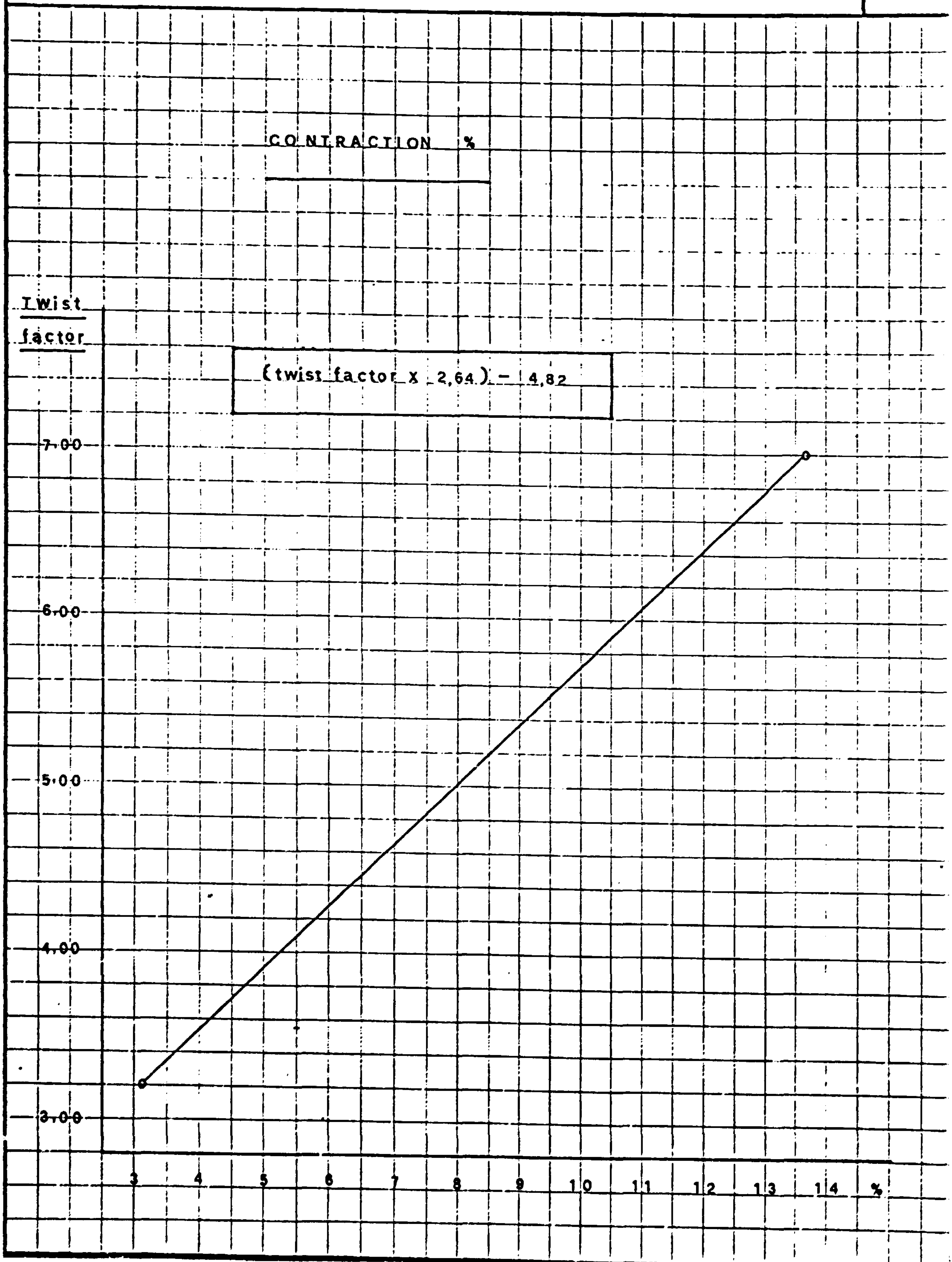
The above table is very useful when making calculations to determine the correct draft gear to use when it is necessary to control accurately the number of yarn on the bobbin. To do this there are two simple calculations involved as follows:

$$1.\ \text{Total Draft} = \frac{\text{Yarn Count X (1.00 + Contraction)}}{\text{Hank Roving at Back}}$$

$$2.\ \text{Actual Draft Gear} = \frac{\text{Draft Constant}}{\text{Total Draft}}$$

By using the following formula it is possible to determine the contraction quickly and accurately. The results obtained by using this formula agree closely with those shown in the table.

$$\text{Percent contraction} = (2.64 \text{ X Twist Multiplier}) - 4.82$$


CONTRACTION %
Twist factor
(twist factor x 2,64) - 4,82
7.00
6.00
5.00
4.00
3.00
3
4
5
6
7
8
9
10
11
12
13
14
%

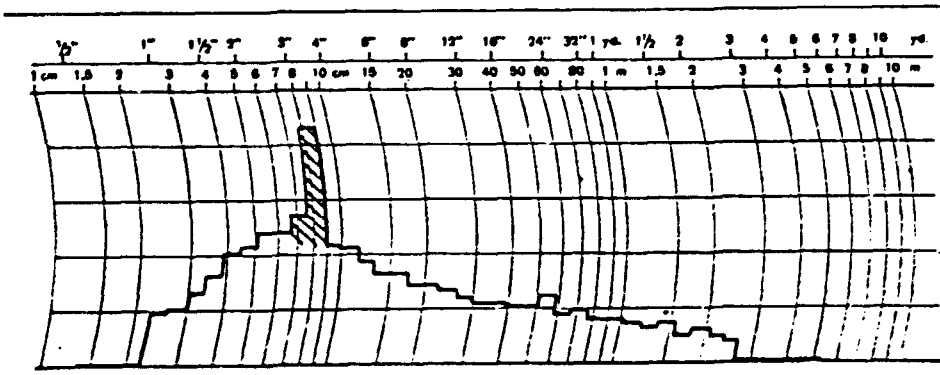
7. TROUBLE SHOOTING WITH THE SPECTROGRAPH

Most mills are equipped with - or have the services of - a testing laboratory. When this laboratory contains a Spectrograph, its charts, known as Spectrograms, can be a very useful tool for tracing the cause of yarn faults to their source. To understand how the Spectrograph works, we'll use an example of mechanical screening.

To sort similar objects of a different size such as apples, oranges, or lumps of coal, the aggregate is moved over screens that have different size openings or mesh. The objects first pass over the fine mesh, which permits the smallest particles to fall through and into bins. As the remaining objects move along, they pass over increasingly larger openings and they fall into bins as they come to openings that will admit them until the largest objects fall through the largest holes in the screen.

The Spectrograph operates on the same principal except that it uses wave lengths instead of concrete objects and electronic "memory" bins in which to store them. When yarn has been run through the Evenness Tester, a button is pushed and all the signals caused by yarn variation at each weave length fall into their respective bins and are recorded on the Spectrogram. An examination of the Spectrogram will then show the pattern and magnitude of any repetitive variations in the yarn.

Look at the Spectrogram below. It has steps known as drafting waves and peaks showing mechanical faults. The drafting waves can usually be levelled out to some extent by improving the the drafting to better control the fibres, but they cannot be completely eliminated. The peaks caused by mechanical faults can be eliminated by tracing these faults to their source and taking corrective action.



A mechanical fault will have a repetitive effect on the yarn at a specific wave length and thus will show as a well-defined peak or chimney on the Spectrogram. The chart shows the wave length of the fault and thus the machine part that is responsible for the yarn variation can be located.

For example, a fault shows on the Spectrogram at a point between the wave length of 3" and 3-1/2" on a sampling of yarn from a Spinomatic. The circumference of the front roll of this frame is 3.1416" and thus the fault is easily traceable to the front roll or its driven gear.

There are two methods that can be used to find the offending machine part after its wave length has been shown by the Spectrogram. One is by calculation and the other is by use of a tachometer. To use the calculation method, it is necessary to have an accurate gearing diagram of the machine showing the number of teeth in each gear and the roll diameters. A table can then be devised showing the wave length for each of these parts.

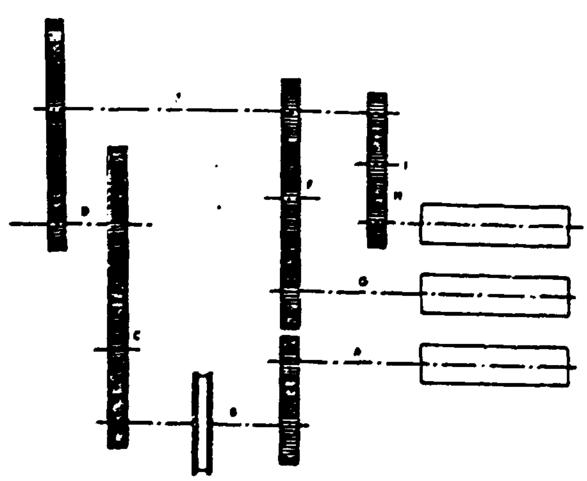
By the tachometer method, a direct check is made at the machine. The output speed of the front rolls is determined in inches per minute. The wave length of the fault, as shown on the Spectrogram, is then divided into this output rate to give the RPM of the offending part. The parts approximating the speed thus shown can be checked with the tachometer to pinpoint the source of the fault.

From these charts a table can be devised to show the wave length or frequency for each part of the drafting element of your spinning frame. Use the actual number of teeth in the change gears of your machines for T and B of the formulas.

From the table and the Twist multiplier you are using obtain the figure for twist contraction (C in the formulas).
For this purpose, use the figure in the right hand column, which is 100 % minus percent twist contraction.

No.1 - For 1" Bottom Front Roll T = Total Draft Change Gear B = Back Draft Change Gear C = 100 % - Percent Twist Contraction		
KEY	1450 Constant	791 Constant
A	$3.1416 \times C$	$3.1416 \times C$
I	$\frac{4555.3 \times C}{T}$	$\frac{2485 \times C}{T}$
G	$\frac{(1450)}{\frac{3.36\times(T)\times C}{\frac{(105)}{(B)}}}$	$\frac{(791)}{\frac{3.36\times(T)\times C}{\frac{(105)}{(B)}}}$
B	$\frac{4.8 \times C}{T}$	$\frac{4.8 \times C}{T}$
C	$\frac{312.4 \times C}{T}$	$\frac{312.4 \times C}{T}$
D	$\frac{471 \times C}{T}$	$\frac{471 \times C}{T}$
E	$\frac{2128.9 \times C}{T}$	$\frac{1161.1 \times C}{T}$
F	$\frac{1633.7 \times C}{T}$	$\frac{1320.5 \times C}{T}$
H	$\frac{6025.1 \times C}{T}$	$\frac{3288.6 \times C}{T}$

No.2 - For 1-3/8" Bottom Front Roll T = Total Draft Change Gear B = Back Draft Change Gear C = 100 % - Percent Twist Contraction		
KEY	1452 Constant	792 Constant
A	$4.32 \times C$	$4.32 \times C$
I	$\frac{4561.6 \times C}{T}$	$\frac{2488.1 \times C}{T}$
G	$\frac{(1452)}{\frac{3.36\times(T)\times C}{\frac{(105)}{(B)}}}$	$\frac{(792)}{\frac{3.36c\,(T)\times C}{\frac{(105)}{(B)}}}$
B	$\frac{4.71 \times C}{T}$	$\frac{4.71 \times C}{T}$
C	$\frac{313.5 \times C}{T}$	$\frac{313.5 \times C}{T}$
D	$\frac{473.1 \times C}{T}$	$\frac{473.1 \times C}{T}$
E	$\frac{2136.3 \times C}{T}$	$\frac{1043.7 \times C}{T}$
F	$\frac{2371.8 \times C}{T}$	$\frac{1227.7 \times C}{T}$
H	$\frac{9682.2 \times C}{T}$	$\frac{4280.3 \times C}{T}$



TROUBLE SHOOTING CHECKLIST

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
1.0 DRIVE.		
1.1 Frame won't start	Interlock switch open Motor overheated Main switch off Waste collector motor overheated	Check cabinet doors and close securely Allow overload relays to cool. Reset. Turn switch on Clean out waste collector ducts and screens. Reset overload relays.
1.2 Frame stops too slowly	Brake rheostat set too low Friction disc worn Oil or grease on brake friction surface Rheostat points corroded	Set rheostat to next higher number Replace disc Clean with solvent Turn rheostat knob full cycle and back to original setting.
1.3 Frame stops too quickly	Brake rheostat set too high Foreign substance on friction surface	Set rheostat to next lower number Clean with solvent
2.0 BOBBIN FORMATION		
2.1 Erratic Ring Rail Traverse	Broken lifter tape Not enough counter-balancing Uneven counter-balancing Bind between brackets and guide rods	Replace tape - find and remedy cause of breakage Adjust torsion bar Adjust compensating roll Check eccentric bushings and adjust Clean out any lint accumulation between bushings and rods
2.2 Bottom too short and too full	The nose touches too much on the chain	Keep off the nose from the chain
2.3 Bottom too small in diameter and length	The nose works too little	Bring closer the nose
2.4 Cone too long	Traverse of the ring rail too big. The pitman roll is too small	Change the pitman roll with a bigger one
2.5. Cone too small	Traverse of the ring rail too small. The pitman roll is too big	Replace the pitman roll with a smaller one. $D = \frac{5198.4}{\text{Traverse}} - 8.5$

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
2.6 Sloughing-off bobbins	Too much yarn delivered for the traverse of the ring rail	Increase the speed of the ring rail
2.7 Rapid movement of the ring rail, not enough yarn on the bobbin	Not enough yarn delivered for the traverse of the ring rail	Decrease the speed of the ring rail
2.8 Low conicity of the bobbins and too empty bobbin at the bottom	At the start of the new doff the lever of the cam does not return till the block stop.	Adjust the lever of the cam till it reaches the bloc stop.
2.9 Too empty bobbin at the bottom	The doff starts too low	Adjust the beginning of the doff (10 mm.)
2.10 Certain bobbins are dirty and the yarn looks shafed	The traveller touchs on one side, the spindle is off centre.	Plumbs the spindle
2.11 Soft Package	Traveller too light Tape slipping Bobbin turning on spindle	Change traveller Clean or replace tape Replace bobbin
2.12 Hard Package	Traveller too heavy Worn ring Foreing accumulation on ring	Change traveller Replace ring Clean ring with solvent
2.13 Oversize package	Heavy roving Incorrect picks Builder arm stroke too short Lay too close Soft twist	Replace roving Re-set ratchet shield on pick motion Check for slippage Lengthen stroke Change lay gears Change twist gears
2.14 Undersize package	Incorrect picks Light roving Lay too open Builder arm stroke too long	Re-set ratchet shield in pick motion Change roving Change lay gears Shorten stroke

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
3.0 TOP ROLLERS		
3.1 Uneven Yarn	Worn out cot	Buff or replace .
3.2 Embossed cots	Bushing not properly positioned on the arbor	Position properly the bushing and check also all the other ones .
3.3 Worn out points of the arbors	Badly positioned bushing on the arbor	Replace them.
4.0 THREAD GUIDES		
4.1 The balloon is not properly centered and is touching one side of the tube	The thread guide is not properly centered	Adjust the thread guide
4.2 The balloon is centered but is touching the top of the tube	Too close distance between thread guide and spindle	Adjust the distance
5.0 RESERVE		
5.1 The reserve is too high or too low	Bad adjustment of the mechanism	Adjust the mechanism
5.2 The reserve is too big or too small	The length of the yarn is too big or too small	Adjust the mechanism or the brake
5.3 Too many breaks during the winding of the reserve	Wrong move	The ring rail must come down smoothly
6.0 YARN BREAKS		
6.1 Single End down	Defective roving	Replace and return defective roving to card room
	Bad top roll cot	Buff or replace
	Bad middle apron	Replace
	Lint under apron	Clean out
	Thread guide out of line	Reset
	Spindle out of plumb	Plumb spindle
	Worn ring	Replace ring-check and remedy cause of wear
	Worn traveller	Replace traveller-check ring flange for roughness
	Rough or warped bobbin	Replace bobbin

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
6.1 (cont'd)	Trumpet out of line	Adjust trumpet
	Roving holder sticking	Clean out-check bearings and replace if needed
	Too much traverse end play	Eccentric bushings worn - replace or adjust
	Too much longitudinal end	Check eccentric bushings at 6th samson for longitudinal end play - adjust or replace
	Apron tension roll out of	Adjust roll
	Apron tension roll sticking	Clean out or replace
	Top roll bearing worn	Replace bearing insert -check roll gudgeon
	Spindle lagging	Check spindle brake-Check spindle bearings-Lubricate or replace
	Spindle tape slipping	Clean or replace tape-check tape tension roll
7.0 YARN DEFECTS		
7.1 Uneven yarn	Roll spread too wide for staple length	Re-set drafting rolls
	Erratic ring rail traverse	See item 2.1
	Wrong break draft	Change break draft gear
	Incorrect gap between top and bottom aprons	Change tensor spacer washers or studs
	Defective roll cot	Buff or replace
	Roll sticking	Check roll and bearings-clean or replace as needed
	Accumulation of lint under apron	Clean out
	Bad movement of the aprons and wrong splicing	Change aprons and glue them properly
	Vibration of bottom rollers and not set down properly	Check and adjust the bottom roller bearings
	Other causes	See item 6.0
7.2 Yarn too light	Wrong draft gear	Change draft gear
	Singling	(double roving only) piece-up roving
	Wrong hank roving	Replace roving
	Stretched roving	Check roving bobbin holder
7.3 Yarn too heavy	Draft too low	Adjust to higher draft -
	Doubling	Remove extra end of roving
	Wrong hank roving	Replace roving
	Bad quality of roving sliver. Bad piecings	Improve the quality of the roving sliver
	Wrong adjustment of the traverse	Adjust the traverse of the trumpets
	Dirty frame	Keep cleaner the frame.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
7.4 Formation of loops at the start up.	Wrong move at the stop of the frame	The frame must be stopped when the ring rail comes down
7.5 Yarn with less twist on certain bobbins	Spindles without oil Tapes too big Bad top rollers	Lubricate the spindles Shorten the tapes Change the top rollers.
7.6 Hairy and rough	Humidity too low Wrong travellers Very high draft Vibration of the spindles	Increase the humidity Change traveller size Change Hank roving Lubricate the spindles
7.7 Slubby yarn	Foreign matter	Check for fly Clean out waste collector orifice or duct
	Roving out of condenser	Replace roving in condenser
	Insufficient top roll pressure	Adjust the pressure arm
	Incorrect break draft	Change gears
	Incorrect roll settings	Re-set rolls
	Incorrect tensor spacer washers or studs	Change washers or studs
7.8 Uneven yarn count variation	Wrong stretch on the creel	Change bobbin holders
	Insufficient pressure on the back top roller	Check the pressure arms
	Blocked trumpets	Check the trumpets
	Dirty or bad lubrication of the drafting rollers	Clean and lubricate the rollers
	Variation of the humidity	Keep instant temperature and humidity
	Twist variation due to long tapes	Replace the tapes
	Bad top or bottom aprons	Replace the aprons
7.9 Oiled and dirty bobbins	Too much spindle oil	Lubricate the spindles as per instructions.
	Oiled rings	You must never oil the rings
7.10 Cockled yarn	Incorrect tensor washer or stud	Change washer or stud
	Drafting rolls set too close for staple length	Re-set rolls
	Break draft too low	Change gears

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
8.0 <u>TRAVERSES</u>		
8.1 Uneven tension of the yarn, too high end breaks	Fly on the travellers The traveller is set too far	Adjust closer the traveller clearer
8.2 The travellers are buzzing, too many end breaks of the yarn, worn out travellers, bright rings and traveller clearers	The traveller clearer is set too close	Adjust further on the traveller clearer
9.0 <u>RINGS</u>		
9.1 On certain rings the tension is too high. Too many yarn breaks.	Dirty rings Uneven surface of the ring	Clean the rings with Petrol and wipe them with a dry cloth. Replace the worn out ring
9.2 Too much tension of the yarn	Too high speed for new rings	Run with lower speed till the break-in of the rings, and coarser count if possible.
10.0 <u>SPINDLES</u>		
10.1 Top part of the spindle gets off the base.	Bad position of the retaining Hook	Clean or adjust the Hook
10.2 Tapes damaged on the edges	Tapes are touching the sides of the whorl	The tension pulley is adjusted too high or use more tight woven tapes
10.3 Tapes are damaged by the brake of the spindle	Bad position of the brake with regard to the bottom part of the whorl	Replace the brake
10.4 Spindles vibration	Oil level too low Worn out spindle blade Badly fixed spindle sleeve	Add oil Replace the blade Mount properly the sleeve.

8. PREVENTIVE MAINTENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance, the form shown on page 98 has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthright passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame, the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF SPINNING PREVENTIVE MAINTENANCE.

FRAME No.................. FIXER...................... DATE................

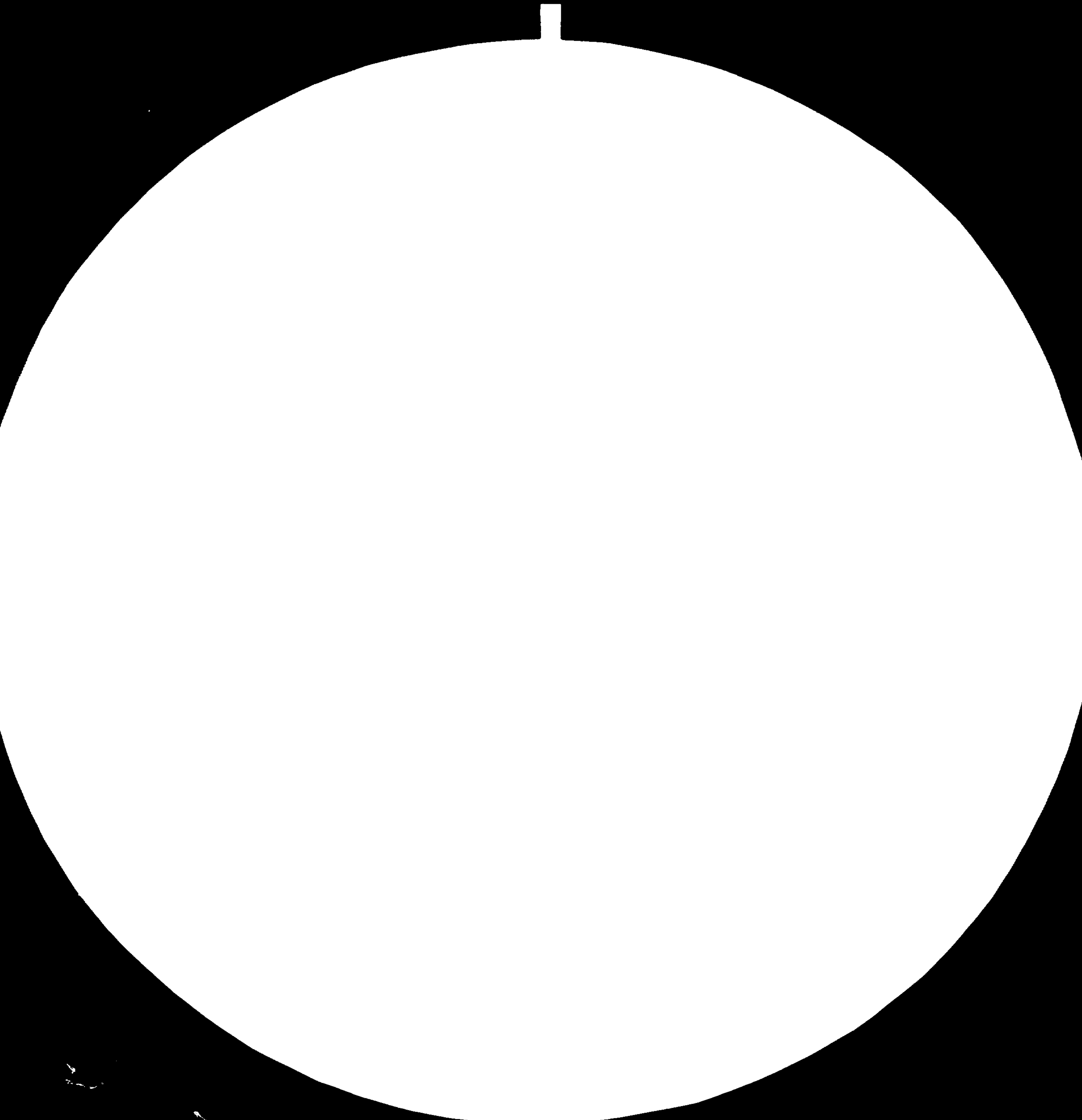
Standard	Points	
5		A. Roving guide bar
10		B. Bobbin holders
4		C. Traverse motion
3		D. Trumpets
10		E. Pressure Arms
7		F. Top rollers
8		G. Aprons
5		H. Pneumafil pipes
5		I. Spindles plumbing
5		J. Thread guides plumbing
5		K. Traveller clearers
5		L. Jockey pulleys
5		M. Spindle tapes
5		N. Separators
3		O. Brake
5		P. Gearing
5		Q. Building motion
2		R. Condition of V-Belts and Drive
3		S. Pressure gauge
100		

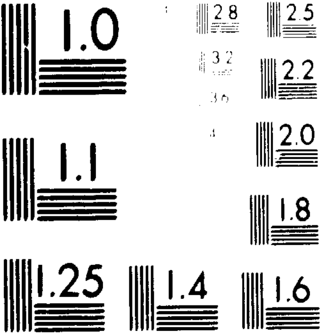
MILL	MAINTENANCE WORK REPORT	99.
WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE :

Department: SPINNING.	Type of machine: RING SPIN.RIETER	Machine No.	Type of maintenance
Persons per crew:	Expected time:		

CYCLE

4 MONTHS										YEARLY				
No	Machine Part	G	A	R	No	Machine Part	G	A	R	No	Machine Part	G	A	R
1	Creel										All jobs listed under 4 months maintenance, and in addition:			
2	Creel(bob.hold.)													
3	Roving traverse													
4	Clearers													
5	Top rolls									1	Creel			
6	Top roll cots									5	Top rolls			
7	Craddle									6	Top roll cots			
8	Top aprons									10	Pendulum arms			
9	Spacers									11	Flut.bott.rolls			
10	Pendulum arms									14	Tension rollers			
11	Fluted bottom R.									15	Drafting gears			
12	Bott.roll bear.									16	Build.cam & gear			
13	Bottom aprons									17	Head stock gears			
14	Apron tens.pull.									19	Ring rail			
15	Drafting gears									21	Travell.clearers			
16	Build.cam & gear									22	Spindle rail			
17	Head stock gears									26	Spindles			
18	Separators									27	Cylinder			
19	Ring Rail									28	Tape tens.pull.			
20	Pokers									31	Filter screen			
21	Traveller Clear.									32	Flutes			
23	Thread guide bar									33	Duct			
25	Spindle breaks									38	Bearings			
26	Spindles									39	Motors			
29	Tapes									40	Counter			
30	Suction									41	Doors and covers			
31	Filter screen									42	Machine levell.			
32	Flutes									43	Chains			
34	Rubb.flute conn.									44	General			
35	Central lubr.sys									45	Lubrication			
36	Coupling (clutch)													
37	Electrical app.													
38	Lubrication													





MICROCOPY RESOLUTION TEST CHART

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

2. Creel

Clean all the bobbin holders.
Adjust them and replace them if necessary.
Clean the slots and treat them with Molykote or lead powder.

3. Roving Traverse

Check the roving guides and replace the damaged or missing ones.
Check the sliding and levelling of the bar.

4. Clearers

Remove and clean the clearers. Check condition of the felt and send the defective ones to the workshop for replacement.

5. Top Rolls

Remove all fly and waste from the shafts.
Eventually use a roller picker.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

6. Top Roll Cots

Check the condition of the top roll covers.
Clean or send to the worshop to check the wear down.
Buff eventually
Replace the cut or damaged cots.

7. Cradles (apron cages)

Remove and dismantle the cradles.
Clean the waste and remove with a cloth the wax from the nip of the cage.

8. Top Aprons

Clean the dismantled aprons (inside and outside). Wash them if necessary.
Replace the damaged ones, worn out or cut.

9. Spacers

Check and replace the missing and wrong ones.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

10. Pendulum Arms (Pressure Arms)

Clean only with a brush.
No need to adjust the arms during this maintenance.

11. Fluted Bottom Rolls

Clean the flutes with a stiff brush in order to remove all impurities from the flutes.

12. Bottom Roll Stand Bearings

Remove all fly from the bearings and check their condition.
Grease lightly the bearings before replacing them on the stands (only for plain bearings)

13. Bottom Aprons

Clean the inner part of the aprons and replace the damaged or cut ones.
Take out and clean the guide bars.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

14. Tension Pulleys for Aprons

Check the pulleys and hangers.
Clean and adjust them. Check condition.
The adjustment must be made in order to have the apron running in the middle of the fluted part of the second bottom roll.

15. Drafting Gears

Clean thoroughly without dismantling the gears.
Replace the damaged or worn out gears.
Check the meshing of the gears and grease afterwards.

16. Building Cam and Gearing

Same as Point 15.

17. Head Stock Gears

Same as Point 15.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

18. Separators

Check condition and if properly fixed.
Replace the damaged or missing ones.
Adjust them if not properly positioned.

19. Ring Rail

Clean the ring rail and rings.
Clean and check the driving chains.
CAUTION: The carrier tapes must be properly on the guide rollers.

20. Pokers

Clean with a roller picker all the pokers.
Remove dust, fly and accumulated waste.
Lubricate them with molykote or graphite.
The pokers must be always clean and slide without bumping.

21. Traveller Clearers

Check the traveller clearers and replace the damaged or missing ones
The setting of the clearers is done yearly, however the ones
which are off position should be adjusted.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

23. Thread Guide Bars

    Clean the bars and check the thread guides.
    Peplace the defective ones.
    Clean and check the chains and drive.

25. Spindle Breaks

    Check all breaks. Replace the missing ones and repair the ones which can be repaired.
    Adjust those which are not in position.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make:	Type of maintenance: 4 months
Ring Spinning Frame Rieter	

Working minutes:	Persons per crew:	Down time in hours:
	4 persons	6 hours

26. <u>Spindles</u>

Check the oil level on some spindles.
If the level is too low, refill the whole frame.

29. <u>Tapes</u>

Replace the damaged or missing ones.
Check whether oositon of the tapes tension devices is correct.
Clean the tape tensioning devices and jockey pulleys.

30. <u>Suction</u>

Ask the Lab to check the depression.
The results must be as follow:
- near end : min. 80 mm of water
- far end : min. 50 mm of water

Advise the maintenance supervisor if these values are not obtained.

31. <u>Filter Screen</u>

Clean with a brush.
Check condition and replace if damaged.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

32. <u>Flutes</u>

Check condition of the flutes and clean them outside.
Fix or replace the damaged ones.
Check and if necessary set the off positioned flutes.

34. <u>Rubber Connections of the Flutes</u>

Check if they are properly fixed.
Replace the damaged, cut or missing ones.

35. <u>Central Lubrication System</u>

Check the system and replace the damaged pipes and connections.

36. <u>Coupling (Clutch)</u>

The coupling is a cluth disc type.
Check the clearance between discs it must be 8 mm. with new disc.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: 4 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

37. Electrical Apparatus

Ask an electrician to check the electric plant.

38. Lubrication

Make a general lubrication afterwards.

39. Motors.

Check condition of V-Belts.Replace if necessary (full set)
Check tension of V-Belts.Readjust the motor if necessary.
Check whether the belts run straight.Readjust if necessary.

MILL	DESCRIPTION OF THE WORK TO BE DONE 109.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

General:

Make the same as per the " months maintenance and also the following:

1. Creel

Check settings and levelling.
Remove all fly from the guide bars and bobbin holders.
Check whether bobbin holders rotate easily

5. Top Rolls

The roller shop must grease the arbors.
The machine maker recommends every 18 months but due to the fact that the drafting 20 Ne is full of fly, we recommend to grease the arbors yearly.
Every two years wash the arbor bearings. For the purpose use a mixture of 90% clean benzine and 10% of spindle oil.

6. Top Roll Cots

Buff the rolls in the roller shop.
Important: The diameters must be exactly the same.
Eventual differences result into breaks and bad quality yarn.
Once in position, the top rolls must be completely parallel to the bottom rolls.

10. Pendulum Arms

Check the pressure and settings of the arms.
Follow Rieter instructions manual.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

11. Fluted Bottom Rolls

Rolls with Plain Bearings
Check also excentricity of front bottom bolls,tolerance 0.03-0.05 mm

Rolls with Needle Bearings

Do not remove the rolls from the stands to avoid bending.
Tight the rolls on the stands to prevent them to fall down.
Clean the rolls with a stiff brush and pomice stone and remove all impurities from the flutes and bearing sides.
Grease the bearings afterwards.
Check the excentricity of the front roll,tolerance 0.03-0.05 mm.

15. Drafting Gears

Dismantle all gears,clean and check all shafts,keys,screws,etc.
Check condition and replace damaged or worn out parts.
Put on again and check the meshing of the gears (a play of a few tenths of mm. between them is necessary).
Grease during and after putting them on the gears.

16. Building Cam and Gearing

Same as Point 15.

17. Head Stock Gears
Same as point 15.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: yearly	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

19. <u>Ring Rail</u>

Check and adjust if necessary the winding starting point.
Follow instructions as per No. 2 and No. 3.

21. <u>Traveller Clearers</u>

Check the settings. See atacched instructions No. 4.

22. <u>Spindle Rail</u>

Check and adjust if necessary:
- beginning of winding
- automatic winding down

26. <u>Spindles</u>

Check oil level and add if necessary.
Every 2 years change oil completely.
Centre the rings with the spindles running.
Centre the threade guides and adjust the height.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: yearly	
Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

27. Cylinder

Clean, check and repair if necessary the cylinders.
Tighten all screws.

28. Tape Tension Pulleys

Clean thoroughly and check condition.
Grease every 2 years.
Replace missing or damaged parts.

31. Filter Screen

Remove the filter screen. Wash it in soapy warm water. Rinse it with cold water and dry it with compressed air.
Replace the screen only when it is dry.

32. Flutes

Wash the Flutes.
Check position of the flutes and adjust if necessary.
The flutes must be parallel to the front roll and the distance between them must not be over 3 mm.
Fix or replace the damaged ones.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

33. Duct

Clean the inside of the duct and check if the joints are hermetically closed.

38. Bearings

Check and grease all bearings.
Replace the damaged or worn out.

39. Motors

Job to be done by an electrician.
Clean with compressed air rotor and stator wash bearings and replace them if damaged or worn out.
Grease the bearings and check the motor running (rotation)

40. Counter

Clean and check condition of the counter.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

41. <u>Doors and Covers</u>

Check and adjust if necessary all doors and covers.
Safety depends, for the greatest part,of the good condition of them.

42. <u>Machine Levelling</u>

Check the levelling of the machine with a spirit level and adjust if necessary. Also check with a wire the lining.

43. <u>Chains</u>

Check the stretch of all suspension chains. Shorten them if necessary or replace the damaged ones. Lubricate with spray. Previously clean thoroughly the chains with a piece of cloth. Remove the impurities fly and fibres, and spray them especially on the inside part and pins.

44. <u>General</u>

Clean, fix, adjust or replace also the parts which are not described above.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Ring Spinning Frame Rieter	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

45. Lubrication

Make a thoroughly lubrication after the yearly maintenance.

14. Tension rollers

Clean and lubricate with graphite or Kluber paste Altemp Q.

WERNER

9. FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.
for case b. 10 min.
for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames:		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

10. QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and to help the trainee to understand his job.

QUESTIONS :

1. <u>What type of working uniform, suits a mechanic</u>?
   Short sleeve shirt.
   Tight trousers
   with leather shoes.

2. <u>What tools will be required for the mechanic</u>?
   Set of : Tool box
   Metric allen keys
   English allen keys
   Screw drivers star and flat
   Spanners (open & close)
   Hammer(soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Callipers
   Spirit level

3. <u>How a mechanic should file?</u>
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.
6. Some soft metal pieces should be used in between the jaws of the vise.

4. What is the make and model of machine?

Make : RIETER G-3

Model :1967 and 1969.

5. What are the specification of machine?

Drafting system: R-2R36 RIETER 3/3 double apron pneumatic pressure

Drive: V-belt

Spindle assembly: tube spindle

Lift: 210 mm.

Ring Ø : 45 mm.

Flange: No. 1

No. of spindles: 516, 484

Spindle gauge: 75 mm.

Spindles per box: 6

Type of suction: Pneumatic

Spindle tape & size; 3 yds.length, 13 mm. wide

Bobbin size and type: 230 mm. length Ø 22-26 mm.

Doffing system: Manual

Traveller type: C type

Counts running on various frames : 21, 30, 24, 30 P.V.,40 P.V.

Creel: Skewer and bobbin holder

6. What are the functions of ring frame?

1. Drafting
2. Twisting
3. Winding
4. Building
5. Conversion of roving into the yarn.

7. <u>What are the basic adjustments of ring frame?</u>

Level and alignment of the machine.

1. Motor alignment/Belts.
2. Adjustment of jockey pulleys
3. Meshing of gears
4. Plumbing of creel: $\frac{\text{Spindle gauge x No. of bars}}{2}$
5. Roving guide bar adjustment: in centre.
6. Bottom roll setting: 43 - 53
7. Bottom roll alignment and polishing
8. Top roll/Settings: Front + 3; Back -1; Middle: Apron 1 mm. clearance.
9. Top arm pressure adjustment
10. Top arm settings:(centre)
11. Traverse motion adjustment 12-15 mm.
12. Roving trumpets alignement
13. Thread guide plumbing, and lappet distance 44 mm.
14. Spindle plumbing.
15. Traveller clearer adjustment 2 mm.
16. Ring rail levelling
17. Lappet rail levelling
18. Setting of builder motion.
19. Adjustment and cleaning of suction flutes, pneumafil box and duct.
20. Brake adjustment
21. Adjustment checking of Pneumatic pressure.

8. <u>What are the normal changes required at ring frame?</u>

1. Total draft change wheel
2. Spindles speed
3. Twist wheel
4. Ratchet wheel
5. Lifting wheel
6. Traveller size
7. Traveller cleaner
8. Bottom roll settings
9. Top roll settings.

How to stock the lubricant?
Different colours should be used for different lubricants.

How you classify the lubricants according to use?
Recommended lubricants should be used.

What should be the criteria for break down maintenance?
Mechanic should first handle the machine which requires least time, so that, down time is reduced.

9. What is the drafting zone and its purpose?
The drafting zone enables us to draft or stretch the thick roving into a fine yarn.

10. What is: the yarn count, the twist?
The yarn count is a measure for the fineness of the yarn, that is to say: Yarn count of 1 means that 840 yds.weight 1 lb.or as an example a 20,s means that 20 x 840 = 16'800 yds or 9.5 miles of that yarn weighs 1 lb.

The twist means that one inch length of yarn is twisted so many times as indicated. TPI 12 means 12 turns per inch. The higher the twist the stronger the yarn.
The lot indicated a certain quantity of a type of material, shade, count, twist.

11. What are the processes after spinning?
Winding, reeling or twisting.

12. How many spindles per machine?
In Mill I, we have 516 spindles per machine.
In Mill II, we have 484 spindles per machine.

13. What is the average weight per cop?
115 grams.

14. What is the average weight per bobbin?
1.000 grams or 1 Kg.

15. How many cops per roving bobbin?
Around 12 cops per roving bobbin.

16. What is the average time to fill a cop?
It is around 4 hours for 21's count.

17. What is the average time to run off a roving bobbin?
It is around 48 hours.

18. What is the spindle speed in RPM?
Average 11,800 RPM.

19. What is the traveller speed in meters sec.?
30 m./sec.

20. What are the particulars on the ticket?
Quality, date, count, machine number, twist, weight.

21. What is the function of Pneumafil?
When an end is broken, the Pneumafil sucks in the outcoming roving in order to prevent lap rolls, spinner's double and other anomalies.

22. Why must the spindle be clean before putting on a new tube?
In order to ensure the correct position of the tube.

23. Where do we get new travellers from?
From the boxes kept on the machines or the shift foreman.

24. In what way do you replace broken or damaged aprons?
There are spare aprons on the apron drive roller.

25. In what way do you dissemble and assemble the draft elements?
Demonstration.

11. CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 125) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 127) for recording the performance of the trainee on Preventive Maintenance.

a. <u>The Complete Defect - recognition Schedule</u>.

As explained in the chapter on "Diagnostic Development" (page 72 of Phase II), the trainee has to repair at least 4 to 7 defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
14 reasons x 4 - 7 defects.
Per reason = 92 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 125) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day. That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 92 defects within 18 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

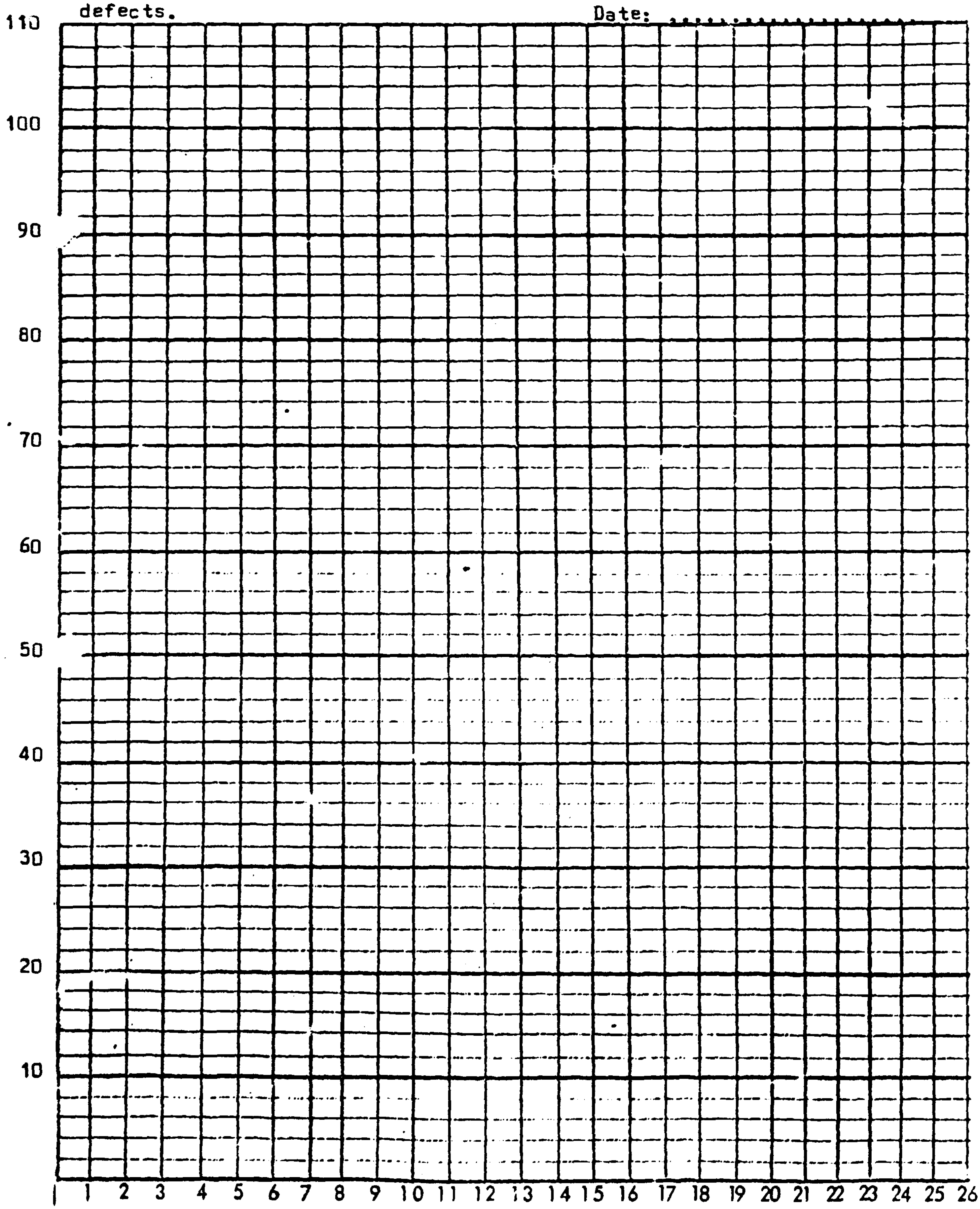
PHASE 2

COMPLETED DEFECT RECOGNITION SCHEDULE

Number of defects.

Name: ....

Date: ....



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b. <u>The Preventive Maintenance Results Efficiency</u>.

In the chapter on "Preventive Maintenance (see page 97 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evaluation on Preventive Maintenance" as shown on page 98 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

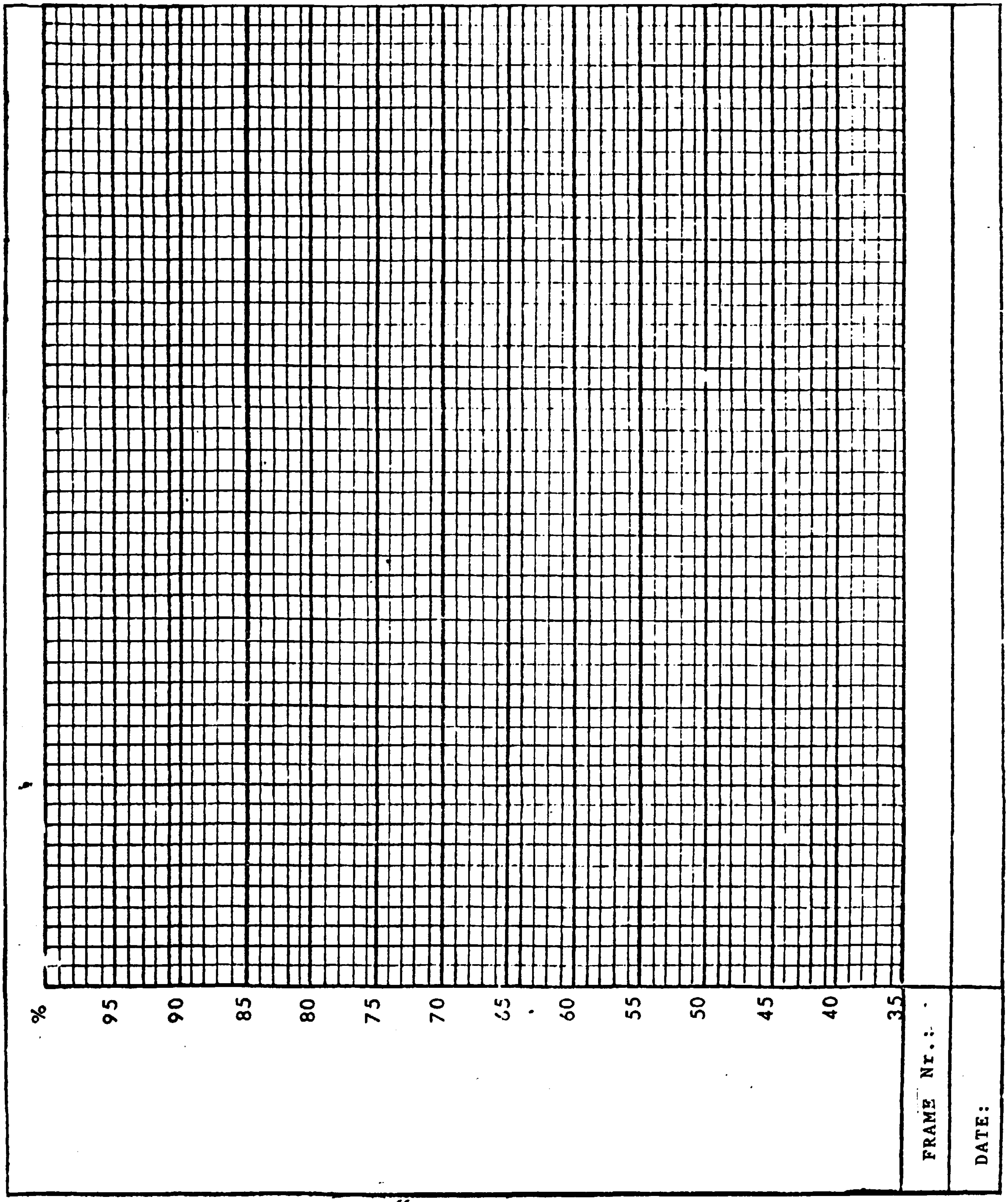
That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

The Preventive Maintenance Results Efficiency.

Name:............................



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(5

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME V OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(5 of 10)

FINAL REPORT
ON
THE DEVELOPMENT OF A
TEXTILE TRAINING SYSTEM
IN PAKISTAN

VOLUME V OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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M A N U A L IV

W E R N E R A M P S

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

L O O M F I X E R ' S

M A N U A L

P I C A N O L - P R E S I D E N T - 1 9 6 9

CC - 44"

CM - 52"

CL - 103"

Prepared for :

T.I.R.D.C. (UNIDO)

KARACHI - PAKISTAN.

Prepared at :

M.FAROOQ TEXTILE MILLS

KORANGI - KARACHI

Prepared by :

WERNER INTERNATIONAL

BRUSSELS - BELGIUM

NEW YORK - U.S.A.

SEPTEMBER 1980

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

CONTENTS

PERSONNEL SPECIFICATION

Job :	LOOM FIXER
Sex :	M Age : 20 - 35
Experience :	Minimum 6 months good weaving on full set.
Physique :	Capable of working in cramped positions 8 hours per day, in humid, noisy weaveroom.
Hands :	No disabilities or missing joints, no stiffness.
Feet :	No disabilities.
Eyesight :	Good near and distant vision.
Temperament :	Stable, conscientious, responsible.
Attitude :	Willing to learn.

		Recommended	Minimum
Dexterity :	B	7	6
Form-Boards :	B+	9	7
Perception :	B	6/22	4/17

GENERAL

A. OUTLINE :

1. OBJECT

The object of this training course is to prepare loom fixers as quickly as possible to run complete sections.

2. SELECTION

Prospective fixers are best chosen from weavers with at least six (6) months good weaving experience. The recommended test results are shown in the Personnel Specifications.

3. TRAINING COURSE

a) This course covers the following aspects :

1. Knowledge.
2. Manual Skills.
3. Diagnosis.
4. Production fixing - preventive maintenance.

b) The learner fixer course is divided into two (2) phases and is designed to accommodate two (2) fixers at a time.

4. INSTRUCTOR

The Instructor should have two (2) trainees at a time and he will be with them full time until the end of the course.

5. GENERAL

The most important exercise is diagnosis. The most important benefit of training is improved quality. This will largely be achieved by the better understanding of how the loom works and by the use of standard settings and methods.

B. INTRODUCTION TO LOOM FIXING :

1. PURPOSE

To help you become a good fixer as quickly as possible, if this is your aim, follow the instructor's advice and you will get there quickly. If this is not your aim, decide quickly what it is you wish to do.

2. INSTRUCTION

The instructor is here to help you, not to chase you. Any question of discipline will be taken up with the Training Supervisor.

3. METHODS

The methods taught you, are those we believe, best at the mill. If you can improve on them, your suggestions will be welcomed. Discuss your proposals with the instructor so that everyone can benefit from improved methods. Please do not adopt new settings without asking. 2 other shifts have to work on your set. Always use gauges where possible since the settings by feel will vary from fixer to fixer and will have an adverse effect on the quality, product and efficiency.

4. TOOLS

The tools recommended to you will make the work easier. Get the right ones and look, after them.

5. SAFETY

Yours is a responsible job. Whenever possible, stop the loom before adjusting, cleaning and lubricating it. Follow these rules :

1. Short sleeves, no loose clothing.
2. Non-slip, safety shoes.
3. Sharp tools sheathed.

6. QUALITY

The quality of the cloth depends primarily on the adjustment of the loom. Once cloth of second quality has left the loom, there is little which can be done to correct it. 90 % of seconds are caused by loom faults attributable to loom fixing.

7. WORKMANSHIP

Looms should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

8. TRAINING COURSE

During the training you will pass through the following parts :

1. Machine knowledge, principles & settings.
2. Weaver's training exercises (if required).
3. Quality recognition.
4. Loom fault diagnosis.
5. Production fixing (flagged looms) and preventive maintenance.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each fixer will do every exercise under the instructor's supervision.

9. MEASUREMENT OF PROGRESS

Progress of the trainees through the various groups of loom settings and diagnostic skills will be plotted and charted. The instructor must be completely satisfied with the work performed by the trainees, before he considers any exercise or parts of any exercise completed.

C. DUTIES OF THE LOOM FIXER

The duties of the loom fixer are as follows :

1. Repair looms stopped for mechanical reasons.
2. Check, adjust and restart looms flagged by weaver for quality faults.
3. Check out and start all looms with new warps.
4. Check and adjust all looms for which red tickets have been issued by the Cloth Room.
5. Perform daily and weekly maintenance on his section of looms, as laid down.

D. FIXER'S TOOLS :

The following tools should be in the possession of the fixer :

-Screw driver - small 5 mm
-Screw driver - large 8 mm.

- Pair grasp plyers
- Pair reel plyers.

- Hammer - ball-peen - small
- Hammer - ball-peen - 1 lb. + 5 lbs.

- Hacksaw
- Leather punch
- Pocket knife
- Scissors
- Read hook
- Steel tape - 6 ft. x 1/16".

- Hand drill

- Wrenches, open end in mm :

6 X 7	13 X 17	32 X 36
8 X 9	19 X 22	17 X 17 (sp.)
10 X 11	24 X 27	

- Wrenches - box end in mm :

14 X 17
19 X 22
24 X 27

The following tools are also needed :

Allen key wrenches, et 3-4-5-6-8

Gauges : front box B 8067 - 2mm - see p.22-23

Back box BE 2152

shuttle feeler. B 8080 - 8 mm + B 8067 - 2mm

shipper handle B 8067 - 2mm

front centre lay

pick cam locating

pick lay timing.

Streight edge, long

Gear puller.

Each fitter should have the maker's setting instructions for the looms he will be expected to fix.

After changing settings on a loom it is always a good rule to turn loom 1-2 picks by hand to examine the function of the readjusted mechanism.

E. BASIC MECHANICAL PRINCIPLES

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern. When the adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER :

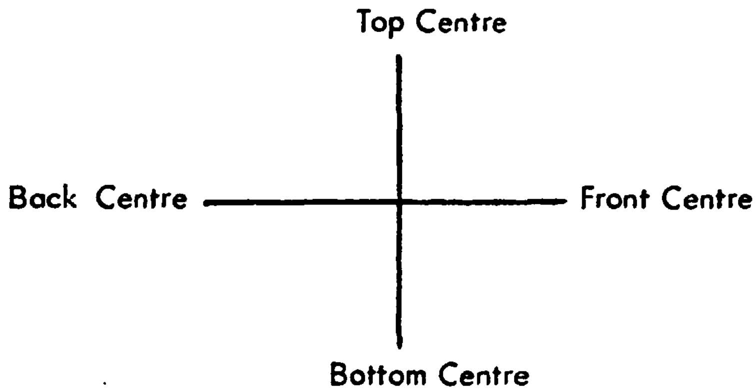
The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER :

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted :

Shafts :

Each loom has a crankshaft and a camshaft. Note the following positions :



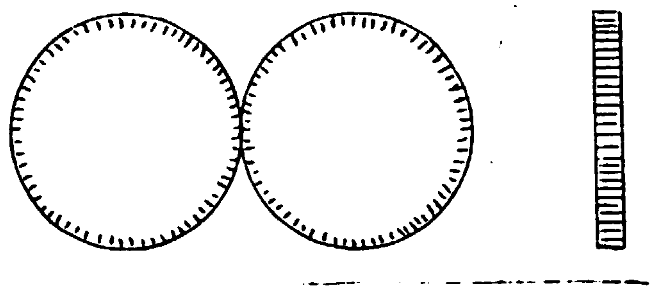
Supporting the shafts are :

Bearings : plain or roller

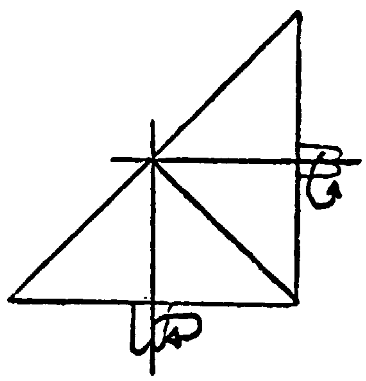
without adequate lubrication, the bearings will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears : Note the following types of gears and find examples on the looms.

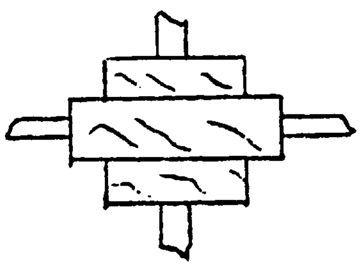
Spur gears : Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



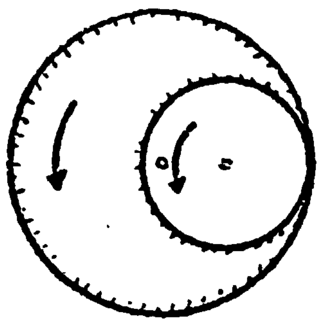
Bevel gears : Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



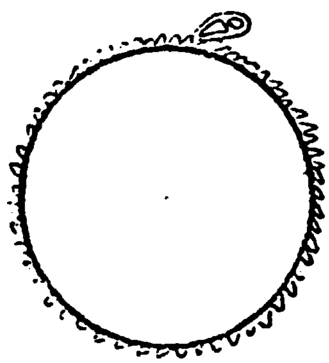
Worm gears : Worm gears transmit power between shafts at 90°. Usually, there is a large reduction in speed between the 2 shafts.



Internal gears : Internal gears are used to give speed reduction on the same looms.



Ratchet gears : Ratchet gears change a reciprocal motion to a circular motion.



Cams :

Cams are used to convert a rotary motion to a lifting motion.

Levers :

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point.
This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. 120 Kg.
4 m. 6 m.

180 Kg. 90 Kg.
4 m. ? m.

180 Kg. ? Kg.
4 m. 5 m.

3. CONTROL OF POWER

Power in the looms is controled by :

1. Brakes.
2. Clutch.
3. Straps and box leathers.
4. Springs.

4. USE OF STANDARD SETTINGS

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points : before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made. A fixed position or datum is used, e.g. the position of the lay or reed.

Tolerances : It will be found that variations in the setting have different points on the loom. The allowable tolerances at each setting should be thoroughly understood to prevent wasted time and work.

F. LOOMS SPARE PART QUALITY CONTROL SYSTEM

The availability of spare parts is sometimes a problem, and parts are often local manufacture. Accuracy of loom setting depends upon the quality of the parts, therefore the following control procedure has been developed.

At the beginning of a loom fixer training course, this control system should be introduced as one of the first steps.

PROCEDURE :

1. PARTS TO BE MADE BY THE MILL WORKSHOP

   For each batch a job card must be filled out (see example).

   In order to ascertain uniformity, it is advisable to let one person compress the sand of each mold needed to produce the required number of parts. Equally, one person should make the impression in all the molds required.

   For identification - write no. in mold or punch no. in part (ref. no. = job card no. + date).

   PROCESS FLOW IN THE FOUNDRY

   a. Make mold
   b. Make impression
   c. Casting
   d. Cleaning
   e. Inspection

e) Inspection should be done at each stage, in addition a formal inspection by supervisor (or preferably by person from QC. dept. or ind.eng. dept.) each part must be checked and job card must be signed.

   It is better to reject a faulty part early, before too much work is wasted.

PROCESS FLOW IN WORKSHOP

(Sequence depends upon part being made)

a - SHAPPER
b - MILLING
c - DRILL
d - LATHE
e-- SAWING
f - WELDING
g - FILING
h - INSPECTION

h) INSPECTION
(same as for foundry inspection).

Faulty parts should be returned for returned for reprocessing, if possible. The parts should be corrected by same person who made the fault. The whole batch, excluding rejects, must be kept together through each process.
Inspection must be critical so only perfect parts are transfered to central stores.

ACTION

- check all fixtures
- everybody who handles parts must be quality minded, and if they see defective parts, reject and show to supervisor. Do not process defective parts, better to reject.
- every person to measure to 1/1000" accuracy
- make library of specimen/standard parts as reference, paint orange or other bright colour
- make shelves for fixtures and standard parts.

INSPECTION AT CENTRAL STORES
Each part entering central stores must be checked before accepted. Each part to be measured against standard master part in central stores (must never be removed from central stores).

Under no circumstance must defective parts enter the central stores. Inspector to sign job card. Central stores inspector and workshop foreman must work well together to solve this important problem.

2) PARTS MADE OUTSIDE
The final inspection must be carried out as for parts produced by mill workshop.
Rejected parts not to be paid for, but returned for correction.

3) ORIGINAL PARTS FROM LOOM MAKER
Quality of parts need not be checked, only quantity and type ordered.

GENERAL

Before implementation, a meeting should be held, to explain the details of the new procedures and job card. Strong support to and control of workshop foreman should be given to emphasise emportance. Every week management must check results.

PROCEDURE FOR FILLING OUT JOB CARD
The workshop foreman fill out job card after receipt of requisition from spare parts store.
1. Write job card no. same as req. no.
2. Date of writing job card
3. Name of part
4. Part no - loom makers no. and mill no. — From requisition
5. No. required
6. Fixture no. should be same as part no.
7. Delivery time - Est. by foreman according to urgency and workload in workshop.
8. Foreman estimates to produce more parts than ordered to allow for rejects
9. Remarks from stores or workshop foreman
10. Date finished
11. Signature — To be written by person who made part
12. No. of good parts passed

13. Date inspected
14. Sign of inspector
15. No. passed

To be written by inspector

16. Sequence of process, to be written when job card is issued
17. Make X at faulty process
18. Remarks of cause of rejection
19. Date inspected
20. Sign. of inspector
21. No. of parts accepted
22. Remarks from weaving sub-stores of loom fixer.

To be written by foreman

T.I.R.D.C. KARACHI	NO. 1	SPARE PART JOB CARD	DATE 2	WERNER BRUSSELS

NAME OF PART	PART NO.	NO. ORDERED
3	4	5
FIXTURE NO.	DELY. TIME	NO. TO BE PRODUCED
6	7	8
		REMARKS
		9

PROCESS		DATE FINISH	MADE BY	NO PASSED	INSPECTION AT CENTRAL STORES FAULT	REMARKS
MOLD MAKING		10	11	12	17	18
IMPRESSION		"	"	"	"	
CASTING		"	"	"	"	
CLEANING		"	"	"	"	
INSPECTION	INSPECT / SUPERVI	13	14	15		
	SEQUENCE	10	11	12	17	18
SHAPPER	16	"	"	"	"	
MILLING	"	"	"	"	"	
DRILL	"	"	"	"	"	
LATHE	"	"	"	"	"	
SAWING	"	"	"	"	"	
WELDING	"	"	"	"	"	
FILING	"	"	"	"	"	
INSPECTION	INSPECTOR / SUPERVISOR	13	14	15	DATE 19	SIGN 20 / NO OF PCS. ACCEPTED 21

REMARKS WEAVING SUB-STORE OR LOOM FIXER

22

TRAINING SYSTEM

1. THE INSTRUCTOR WILL SHOW HOW TO DISMANTLE AND REPLACE THE PARTS OF EACH GROUP.

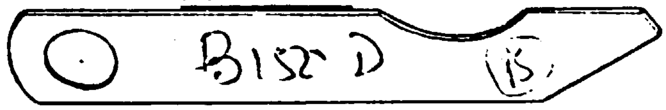
2. THE TRAINEE AT HIS TURN WILL DISMANTLE AND REPLACE THE PARTS OF EACH GROUP.

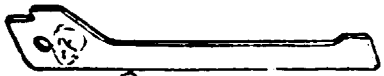
3. THE INSTRUCTOR WILL CREATE INCORRECT SETTINGS AND THE TRAINEE MUST ADJUST THEM PROPERLY. ALWAYS ONLY ONE SETTING AT A TIME.

4. THE TRAINEE LEARNS THE NAMES OF THE IMPORTANT PARTS OF EACH GROUP.

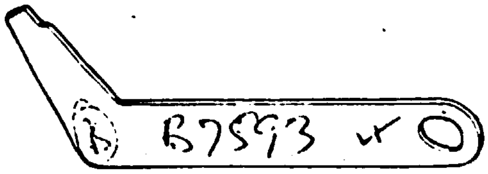
III. PHASE 1

12 GROUPS OF SETTINGS.

1 

2 

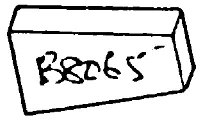
B152 A



3

4 

PS



5

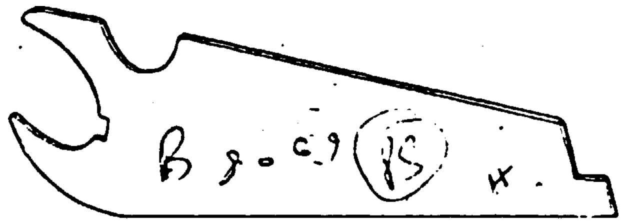
4.1

6 

PS

7 

B 8068

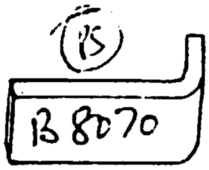


8

6.13

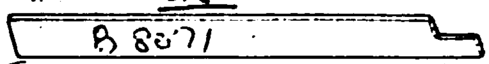
5mm

PS

9 

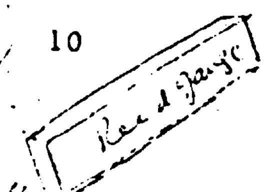
6.7

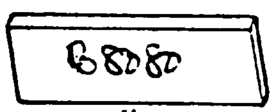
6.8



PS
10

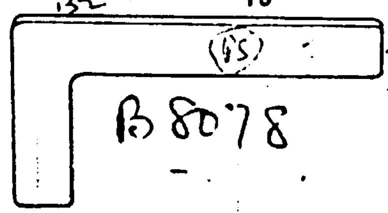
B5 = 8773, 74, 75
A, A1, A3 = B1
B2
C1+C2



11 

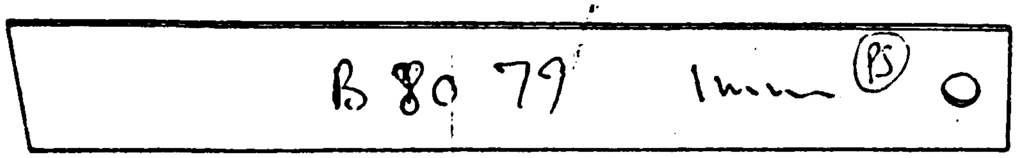
PS

4.8 8mm

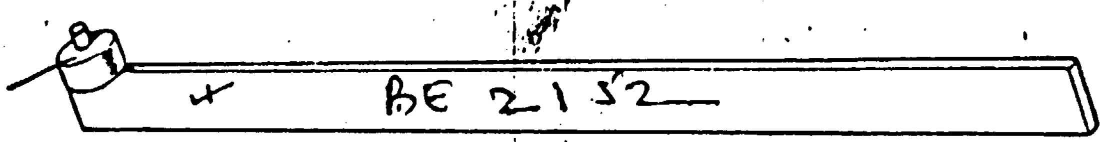


12

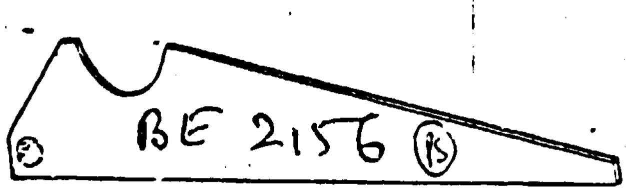
8mm / shall

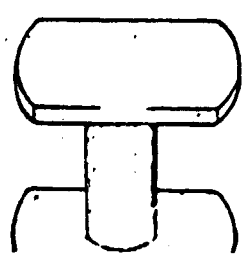
13 

4.11

14 

PS

15 


16

THE GAUGES. Check condition of gauges before use.
Do not use "tight"gauge setting (allow a little play).

1. Gauge for setting the cylinder and for adjusting the length of the crankshaft battery side.

   No. B 150 D for shuttle of section 50.75 x 34.5/33.5
   No. B 9178 for shuttle of section 53.5 x 36.5/35
   No. B 9176 for shuttle of section 47 x 33/31

2. Gauge No. B 152 A for the setting of the length of the crankshaft feeler side.

3. Gauge No. B 7593 to set the support of the Unifil hammer.

   It is however necessary to use gauge B 9179 in the case of shuttle of section 53.5 x 36.5/35 if the extremity of the sley battery side bears the No. B 6496 for shuttles of 430 to 450 mm. or the No. B 8616 for shuttles of 460 to 470 mm.

4. Gauge No. 8064 used for setting the brake.

5. Wedge No. B 8065 for box setting.

6. Gauge No. B 8067 for setting of the box front.

7. Gauge No. B 8068 for lifting screws of the daggers.

8. Gauge No. B 8069 for picking pinion wheel.

9. Gauge No. B 8070 for setting of the pick.

10. Gauges Nos. B 8071 to B 8077 for setting of the pick.

11. Gauge No. B 8080 for tip of the controller.

12. Gauge No. B 8078 for tip of controller length 99 mm.
    No. B 8227 for tip of controller length 103 mm.

13. Gauge No. B 8079 used for height of the picker, for setting of pick stick guide and position of the temples in relation to the reed.

14. Gauge for box settings :

    No. BE 2152 for shuttles of section 50.75 x 34.5/33.5
    No. BE 2678 for shuttles of section 47 x 33/31
    No. BE 2681 for shuttles of section 53.5 x 36.5/35

    It is however necessary to use the gauge BE 2152 in the case of shuttles of section 53.5 x 36.5/35, if the extremity of the sley feeler side bears the number B 6166 for shuttles of 430 to 470 mm. and if the extremity of the sley battery side bears the number B 6496 for shuttles of 430 to 450 mm. or the No. B 8616 for shuttles of 460 to 470 mm.

15. Gauge No. BE 2156 for the position of the weft-fork cam.

16. Gauge N° B 20678 for adjustment of the sliders bars on the mechanical warp stop, with a clearance of 18 mm.

Part 1 - Phase 1.

a. Purpose

To give the trainee the technical knowledge of the loom and to give experience in making the various loom settings.

b. Method

Major loom settings are divided into 12 groups :

1. A. Clutch
   B. Brake
   C. Motor.

2. A. Crankarm
   B. Square reed.

3. A. Boxes
   B. Protector or dagger motion.

4. A. Shuttle
   B. Picking motion.

5. A. Side fork
   B. Mechanical feeler. + electronic feeler (Barco)
   C. Change control.

6. A. Battery (magazine)
   B. Pirn change.

7. A. Shuttle eye cutter.

8. A. Back rest. + whip roller
   B. Let-off.

9. A. Drop wire stand.
   B. Warp stop motion and timing.

10. A. Tappets and treadle.

Harness setting and timing.

11. A. Temple.
    B. Temple cutter.

12. A. Take-up motion.
    B. Cloth stand.

Trainee to go through first group of settings in Training Centre. The instructor dismantles the loom part involved and re-assembles it, thereby naming the parts. Then the trainee dismantles the ~~part~~ and re-assembles it under the guidance of the instructor and applies the agreed settings

When trainee thoroughly understands settings, he is to go to the Weave Room and make his first group of settings on one loom. If the instructor is satisfied with his performance, trainee is to go back to the Training Centre and go through the breakdown on the second group of settings.
When the trainee thoroughly understands the second group of settings, (as shown as for the first group), he is to go to the Weave Room and make these settings on the loom which was set up on the first group plus one additional loom, and making both the first and the second group of settings. This procedure will be followed through all twelve (12) groups of settings so that when completed, the trainee has completely set up twelve (12) looms.

Key points :

1. Problem looms have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands settings and performs with quality.

Tempo

To complete Phase 1, it should require 12 to 18 days in the Training Centre and 30 to 35 days in the Weave Room.
This, of course, can vary depending on the ability of the ~~trainees~~ and the condition of the looms on which the exercises are carried out.
retraining takes about 1/3-1/2 of training new workers.

NOTE :

This Phase 1 of the loom tuners training has been specifally prepared for :

T.I.R.D.C.(UNIDO)
KARACHI

The adjestments for the looms are those recommended by the maker :

PICANOL
BELGIUM

in their manual for CC-CM-CL Looms

IMPORTANT REMARK :
All the loom problems in that manual can only be created by wrong settings of that particular motion.

Phase 1 of the training

Group 1 : A. Clutch.

B. Brake

C. Motor.

1.A. Clutch

1. Function :

Transmits driving power of motor to the loom.
Do not dismantle - crankshof gear wheel from hub.

2. Parts :

2.1	Protector cap.
2.2	Fixed driving clutch disc.
2.3	Clutch plate
2.4	Clutch springs Centre ring.
2.5	Sliding driving clutch disc.
2.6	Clutch finger pins.
2.7	Clutch fingers.
2.8.	Clutch fingers guard.
2.9	Shipper arm fork.
2.10	Motor stand.
2.11	Clutch driving cone.
2.12	Connection rod.
2.13	Clutch release lever spring.
2.14	Clutch release connection rod.
2.15	Shipper arm fork pin.
2.16	Outboard crankshaft bearing.
2.17	Handwheel.

3. Assembling the clutch :

Examine each part for wear.

a) Place protector cap on the crank shaft fly wheel.

b) Fit fixed driving clutch disc on the crank shaft fly wheel with 3 bolts. Handtighten first to achieve even adjustments, then tighten securely (check if disc is straight tight).

c) Position crank shaft gear wheel with clutch plate machined head side on inside side plate of fly wheel with 3 bolts, handtighten first, then tighten evenly and securely. - clean clutch lining.

d) Position stop ring with rounded side facing the crank shaft fly wheel.

e) Position sliding driving clutch disc. Ensure that springs are positioned into corresponding holes in fixed driving clutch disc.

f) Whilst holding sliding driving clutch disc in position fit clutch finger pins.

g) Fit clutch fingers.

h) Position clutch finger guard with attached case on shaft. Ensure that clutch fingers go over cone.

i) Replace motorstand with supplementary cam shaft bearing (bottom shaft)

j) Replace outboard crankshaft bearing.

k) Replace shipper arm fork.

l) Connect shipper arm with connection rod.

m) Replace clutch release lever spring.

n) Replace clutch release connection rod.

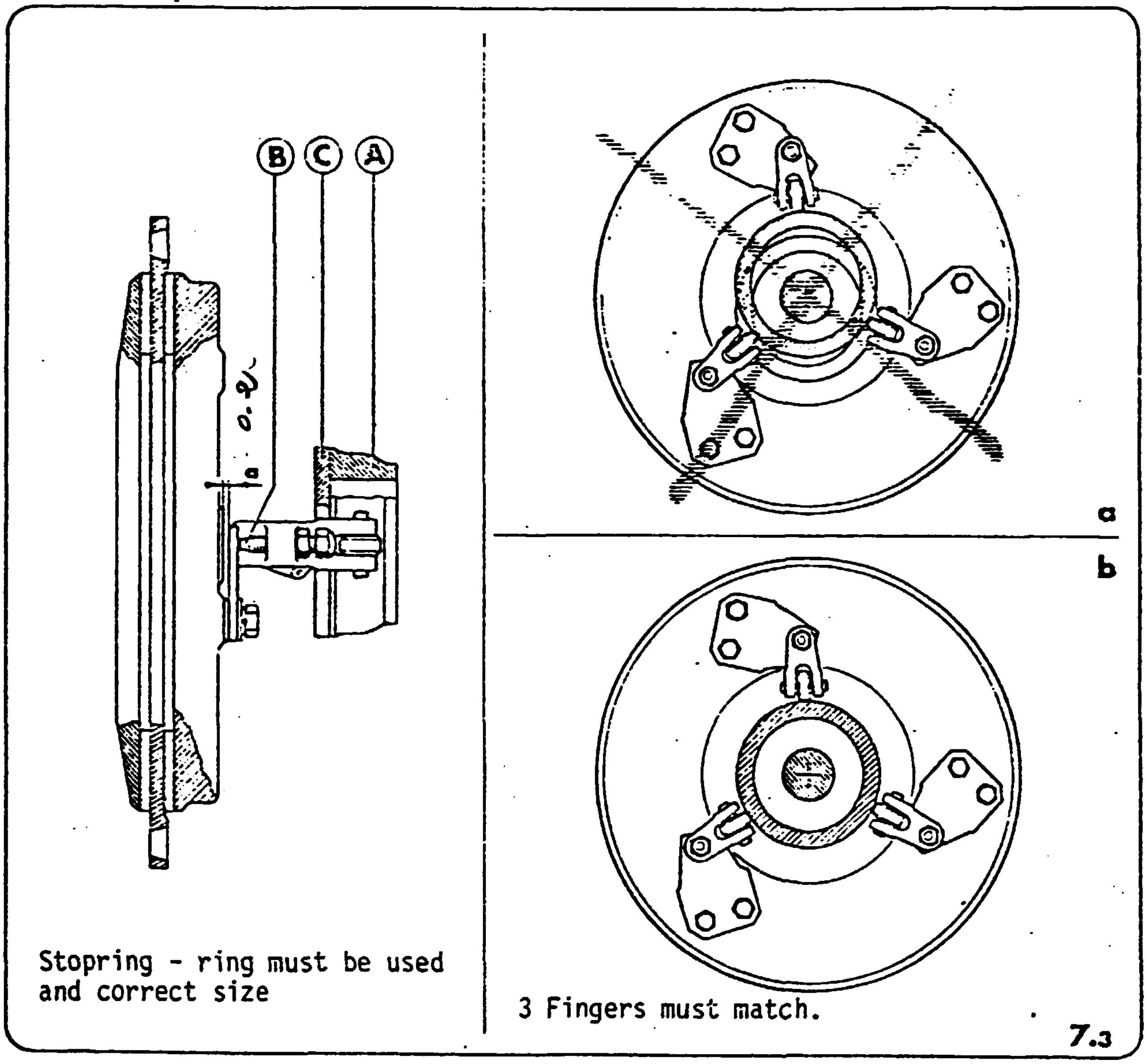
o) Replace shipper arm fork pin. Starting handle in "on" position.

p) Tighten set screws on shipper arm fork pin.

q) Replace handwheel on key-way in shaft.
Stop ring dia.

4. Adjustments :

a) Tension by the three fingers (Fig. 7.3)



Stopring - ring must be used and correct size

3 Fingers must match.

a.1. The loom is engaged position (clutch handle towards the weaver).

a.2. Adjust the position of the floating ring "A" by means of the screws "B" so that the floating ring is perfectly centred relative to the centring ring "C". There must remain nevertheless a clearance "a" of at least 0,2 mm (drop wire) between the spring plates and the clutch plate.

a.3. Lock the locknuts.

Note : Fig. 7.3.a. : incorrect adjustment.
Fig. 7.3.b. : correct adjustment.

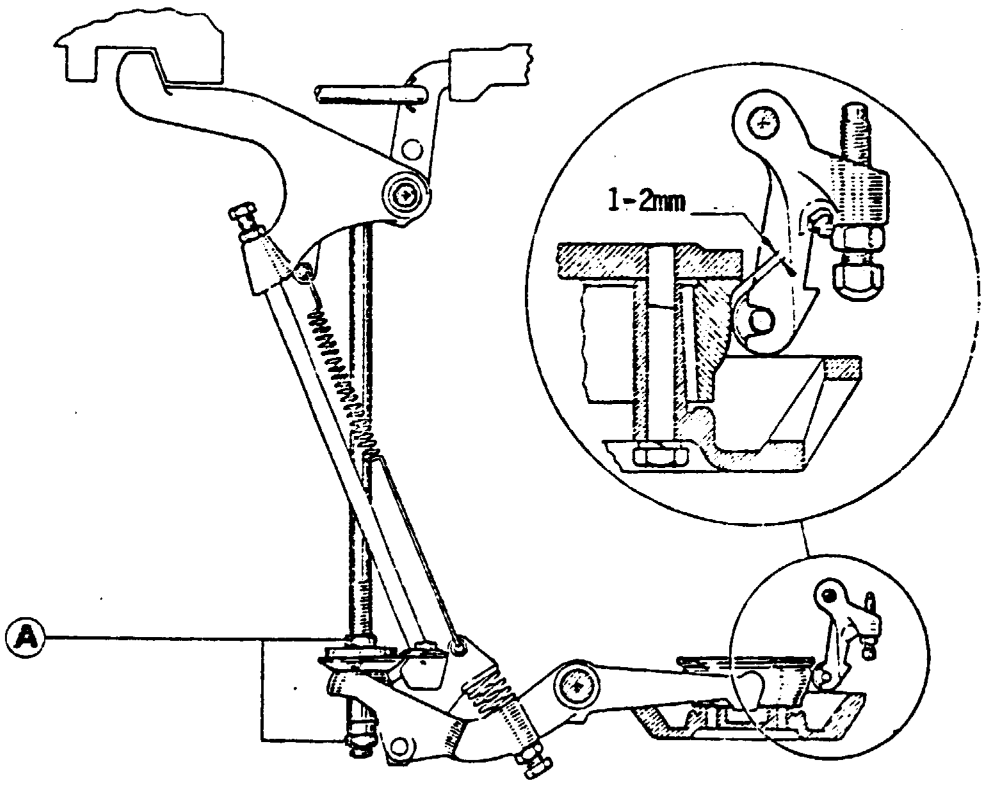
Before starting the looms, test that flywheel is running free when loom is disengaged.

b) Position of the fingers on the cone (Fig. 7.4)

b.1. The loom is in the engaged position.

b.2. Adjust the position of the fingers by means of the nuts "A" in order to have a clearance of 1-2 mm.

b.3. Tighten the 2 nuts properly.



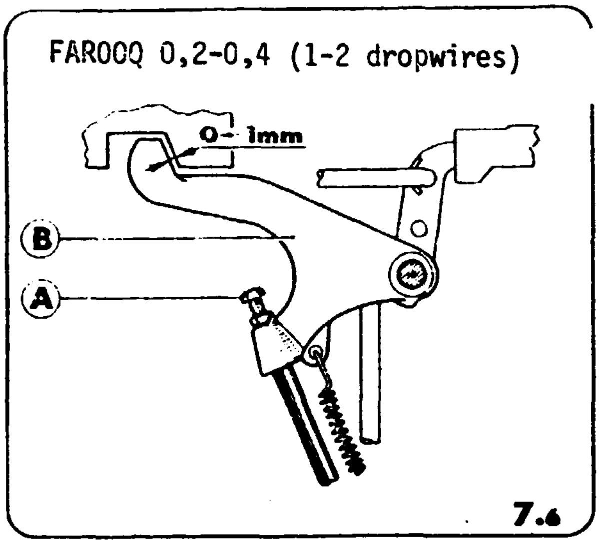
7.4

Remark :

The aim of this adjustment is to keep the loom engaged and has nothing to do with the clutch friction which is given above. Thus, if the clearance is more than 2 mm and the fingers remain on the taper of the cone, there results an axial stress which might cause release at the wrong time. If on the other hand the ring is adjusted without the 1 mm clearence, release is delayed and the cone may become overheated.

To check the clearance it is necessary to release the loom and to re-engage it.

c) Clearance of quick release lever (Fig. 7.6)

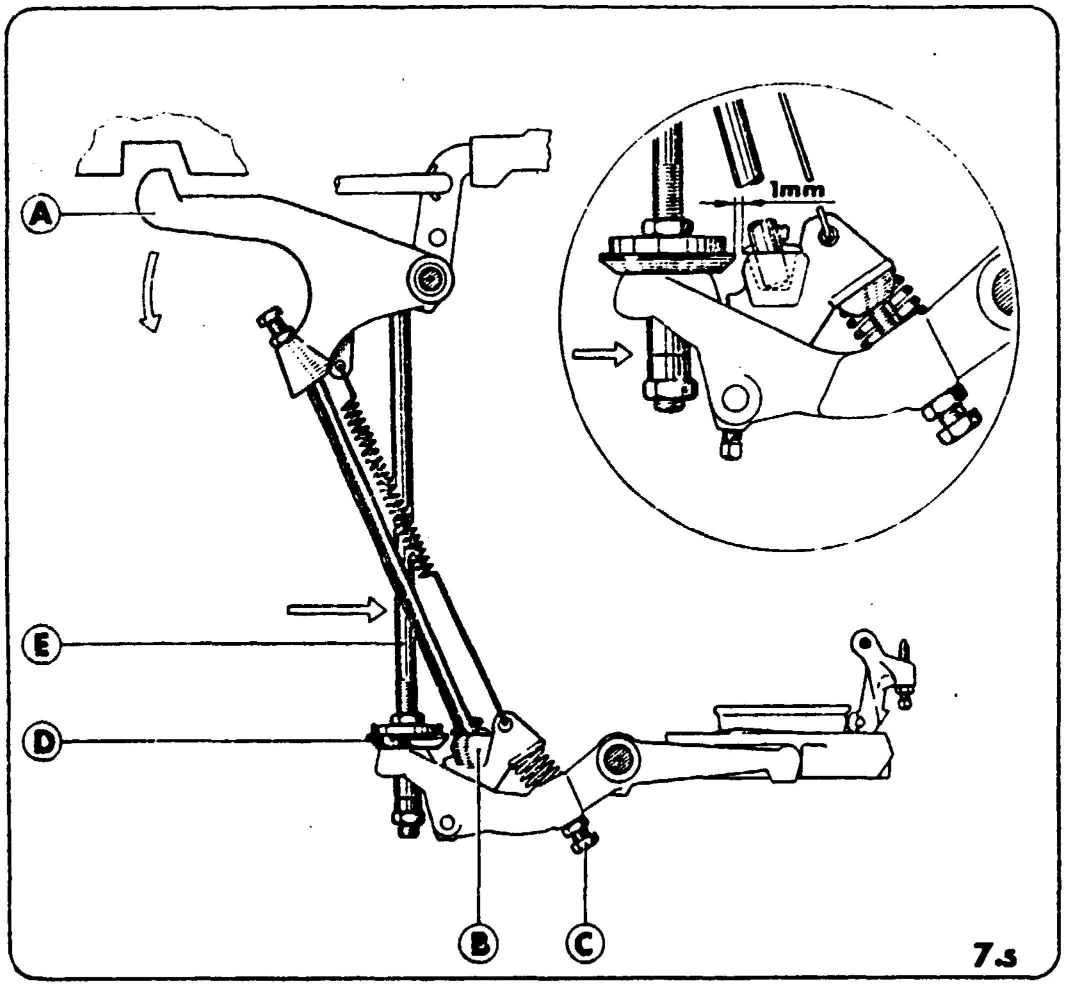


c.1. Place the starting handle in the engaged position.

c.2. By means of screw "A" adjust for a clearance of between 0 and 1 mm between the release lever "B" and the frog.

TAKE CARE THAT THE LEVER NOWHERE TOUCHES THE FROG.

d) Quick release ratchet (Fig. 7.5)



d.1. Place starting handle in the "engaged" position.

d.2. Pull the lever "A" backwards until the ratchet "B" leans against the adjusting screw "C".

d.3. By means of the screw "C" adjust a 1 mm clearance between the ratchet and the ring "D", doing this as the rod "E" is pushed towards the rear as shown by the arrow.

d.4. Check the setting by engaging the loom and pulling the lever "A" to release the loom. The ratchet "B" should pass in front of the ring "D" with a clearance of 1 mm. (exact)

5. Loom problems created by clutch

a. Not enough friction.

1. Bang off.
2. Low loom speed.
3. Clutch disc hot.

b. Too much friction.

1. Lever hard to pull on.
2. Lever hard to knock off.
3. Break shipper levers.
4. Trip motor.
5. Damage reset switch.

1 B. Brake

1. Function :

Ensures a gentle braking action when the brake is applied so as to avoid the shuttle leaving the box.

2. Parts :

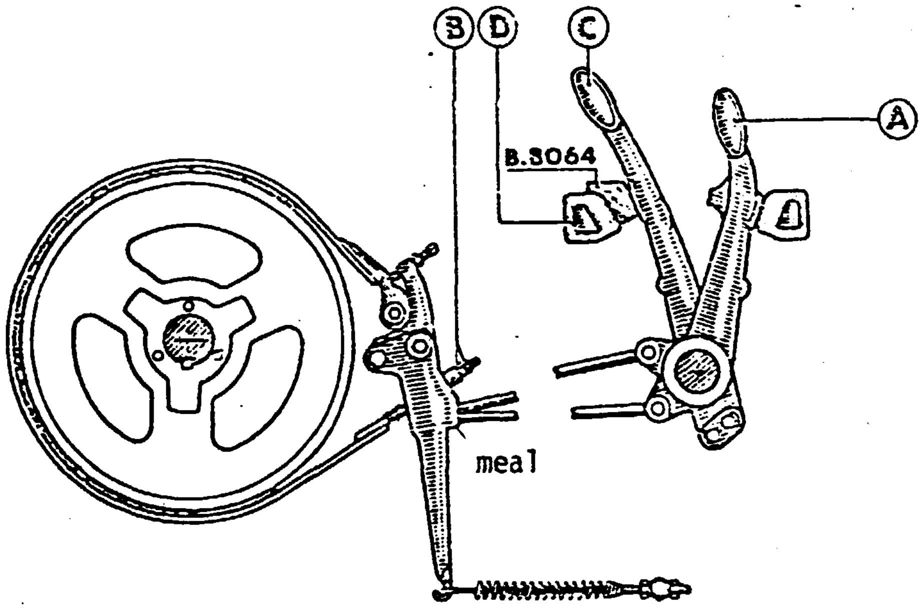
2.1 Brake band
2.2 Brake lever
2.3 Spring
2.4 Drum
2.5 Brake handle

3. Assembling the brake :

a.) Pick up the brake band and ensure that the band and the drum are dry and clean.
b.) Position end of band with spring into brakelever.
c.) Position head of band on brake lever bracket stand. Replace screw.
d.) Replace bush on threaded end of brake band. Replace the 2 nuts.

4. Adjustments :

a.) Length of brake band (Fig. 8.1)

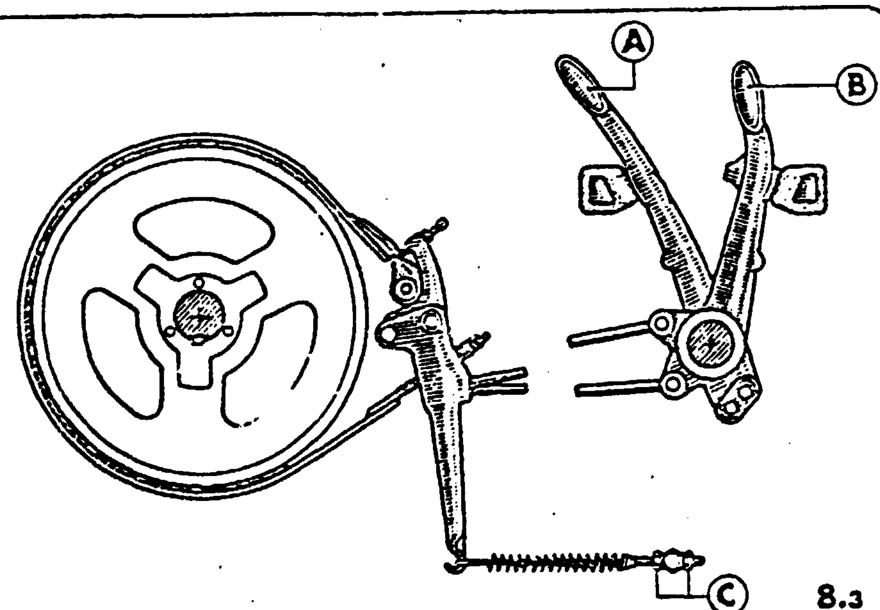


8.1

a.1 Brake handle "A" towards the weaver.

a.2 Adjust by means of the nuts "B" so that the gauge B.8064 mav rest between the. starter handle "C" and its stop "D". Lock the locknut.

b.) Tension of brake spring (Fig. 8.3)



8.3

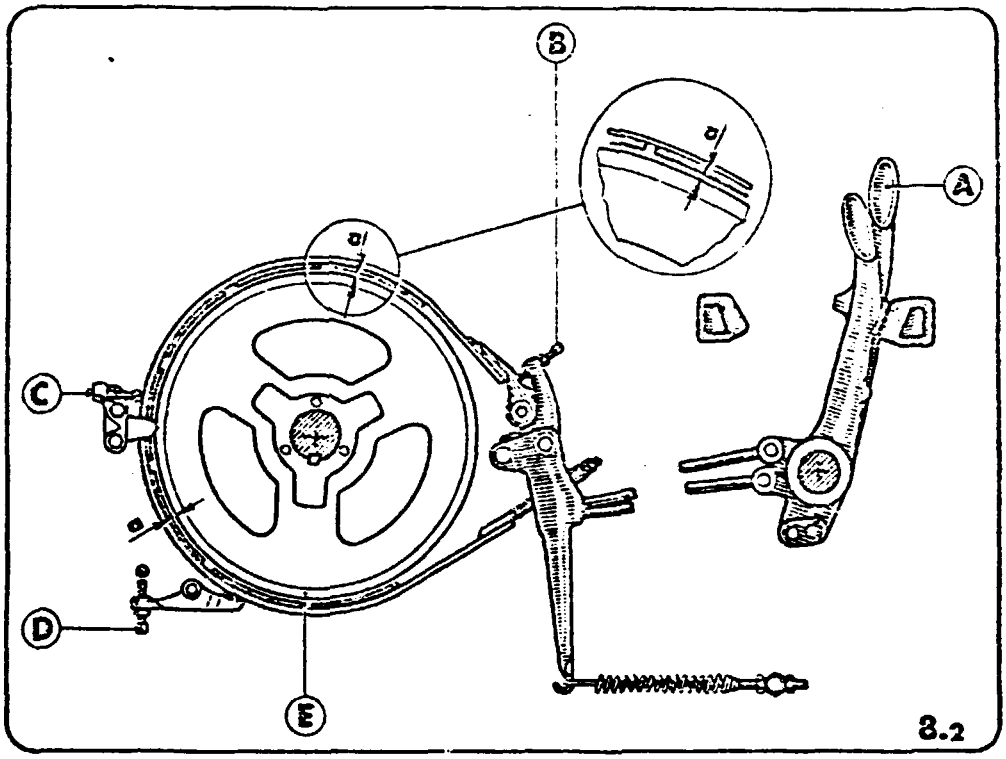
b.1 The starting handle "A" is in the "disengaged" position.

b.2 The brake handle "B" is towards the weaver.

b.3 By means of the 2 nuts "C" stretch the spring 15 mm relative to its free length.(14-16 mm)

Note : Clean brake drum and check lining.

c.) Clearance between drum and band (Fig. 8.2)



8.2

c.1 Starting handle "A" towards the weaver.

c.2 Spread the clearance around the periphery of the drum "E" by means of the adjusting screws "B", "C" and "D". With a drop wire (2mm exact) (pin) from the warp stop motion verify that there is a clearance all around between the drum and the brake band. Try to turn loom with brake on and off.

Notes :

- There should be no heating of the band when the loom is working.
- Grease and oil are "poison" for the brake.
- If the loom fails to stop quickly enough, gradually increase the spring tension.

5. Loom problems created by brake :

a. Too tight :

1. Running hot, causing :

1.1. excessive wear

1.2 fire hazard

1.3 hard to turn by hand

1.4 strain on friction

1.5 trip motor

1.6 low loom speed

b. Too loose :

1. Not stopping correctly

2. Warp breaks

3. Wrong weave (indexing for next pick)

4. Strain frog springs

5. Weaver must level harness

6. Mis-matched picks

7. Bad start ups.

1. C. Motor

1. Function :

Provides driving power for loom.

2. Parts :

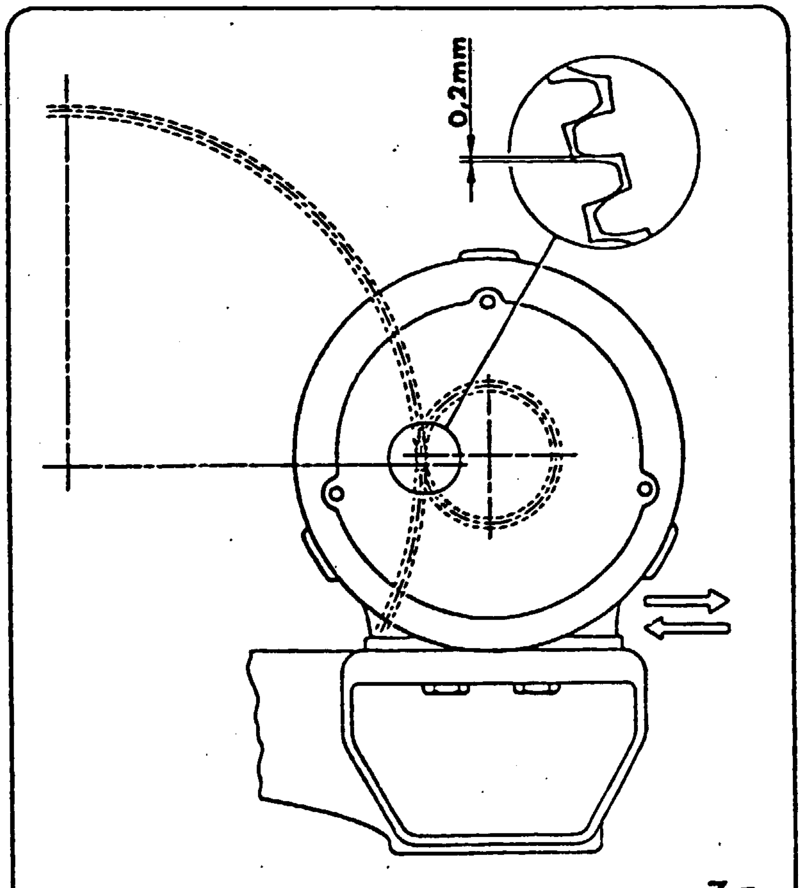
2.1 Motor

2.2 Driving pinion

3. Adjustments :

a.) Replace motor on its stand.

b.) Clearance of the motor pinion (Fig. 7.7)



7.7

Slide the motor on its base in order to have a clearance of ± 0,2 mm between the gears. (Normal clearance of the gears.)

AN ABNORMAL CLEARANCE CAUSES NOISE, PREMATURE WEAR AND LOSS OF POWER.

Group 2 : A. Crank arm
B. Square reed

2 A. Crank arm

1. Function :

Transmit the rotating motion of the crank shaft to the back- and forwards motion of the sley.

2. Parts :

a. Crank arm shim
b. Crank arm end cap
c. Spacer
d. Grease nipple screw
e. Nylon connection
f. Sley connection rod spindle

3. Assembling the crank arm :

a.) Position loom 45 ° before dead center
b.) Position crank arm shim in crank arm end cap on shaft.
c.) Place crank arm assembly in crank arm end cap. Insert arm from side position ensuring shims are in correct position.
d.) Place spacer in position.
e.) Replace 2 screws; long screw in spacer, short screw in bottom of cap. Tighten by hand.
f.) Replace special bolt and locknut.
g.) Replace grease nipple screw.
h.) Tighten long and short screws in cap.
i.) Position loom 45 ° past dead center.
j.) Replace nylon connection (with nipper upwards) in crank arm slot.
k.) Replace sley connecting rod spindle; tighten nut.

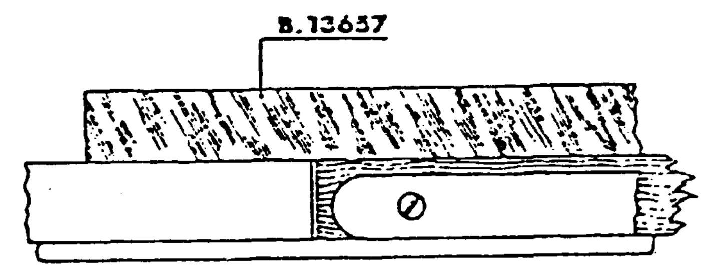
4. Adjustments :

Note : Before making any adjustments, make sure that the F.S. and B.S. crank-arms are assembled in the above described manner.

a.) Race board and bottom of box plates in one line (Fig. 3.2)

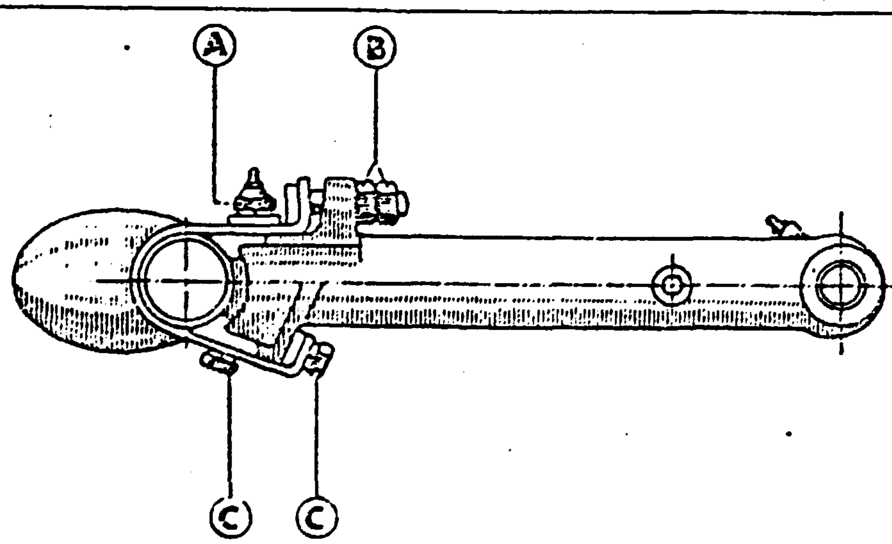
The race-board should be in line with the bottom of the box plates. This can be checked by means of gauge B.13657 on the B.S. and F.S.

Upon arrival of a new loom the surface of the race board can be either too high or too low caused by large variations in atmospherical conditions.



3.2

b.) Adjusting the F.S. and B.S. crank arm big end clearance. (Fig. 3.3)

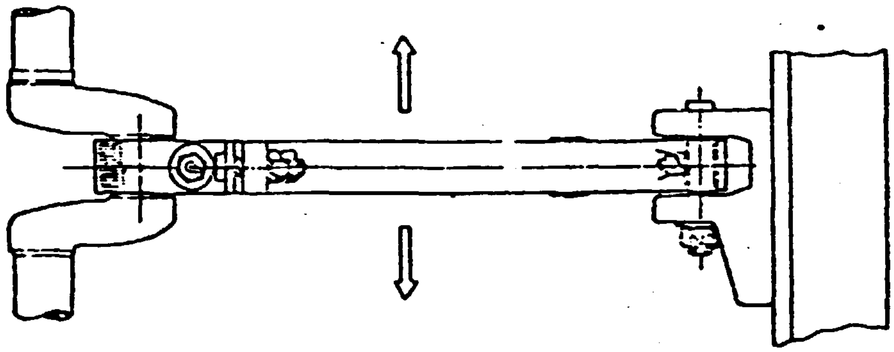


3.3

- Loosen the bolt "A".
- Adjust the bush clearanc with the bolt, nut and locknut "B" until the minimum clearance is obtained. This clearanc must not be felt by hand.
- Tighten the bolt "A" to f the crank arm and cap.
- The fixing bolts "C" rem tight during the adjustment.

<u>Checking</u> : In order to avoid heating of the crank arm ensure that :

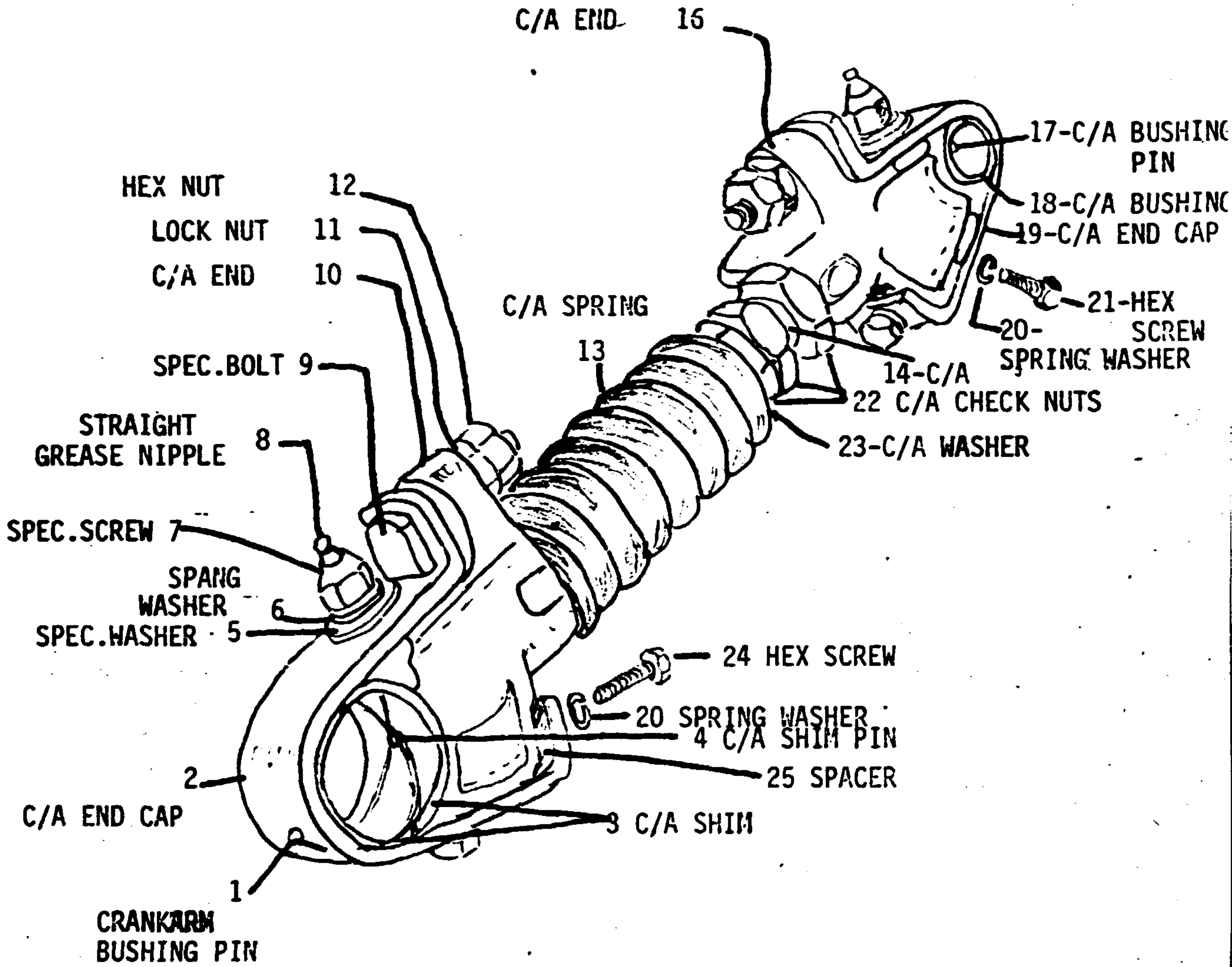
- the whole crank arm is free to move sideways (Fig. 3.4)
- there is the minimum amount of play lengthwise.



3.4

SPRING TYPE CRANK ARM

PICANOL-PRESIDENT



ADJUSTMENT OF SPRING TENSION

CL-CM	5 TURNS
CC	3 1/2 TURNS

5. Loom problems created by the crankarm.

a. Shim too tight :

1. Fire hazard
2. Cut groove in crank arm
3. Hard to turn by hand
4. Strain friction
5. Strain motor
6. Cause bang off.

b. Shim too loose :

1. Uneven beat up
2. Broken picks
3. Thin places.

2 B. Square reed and sley

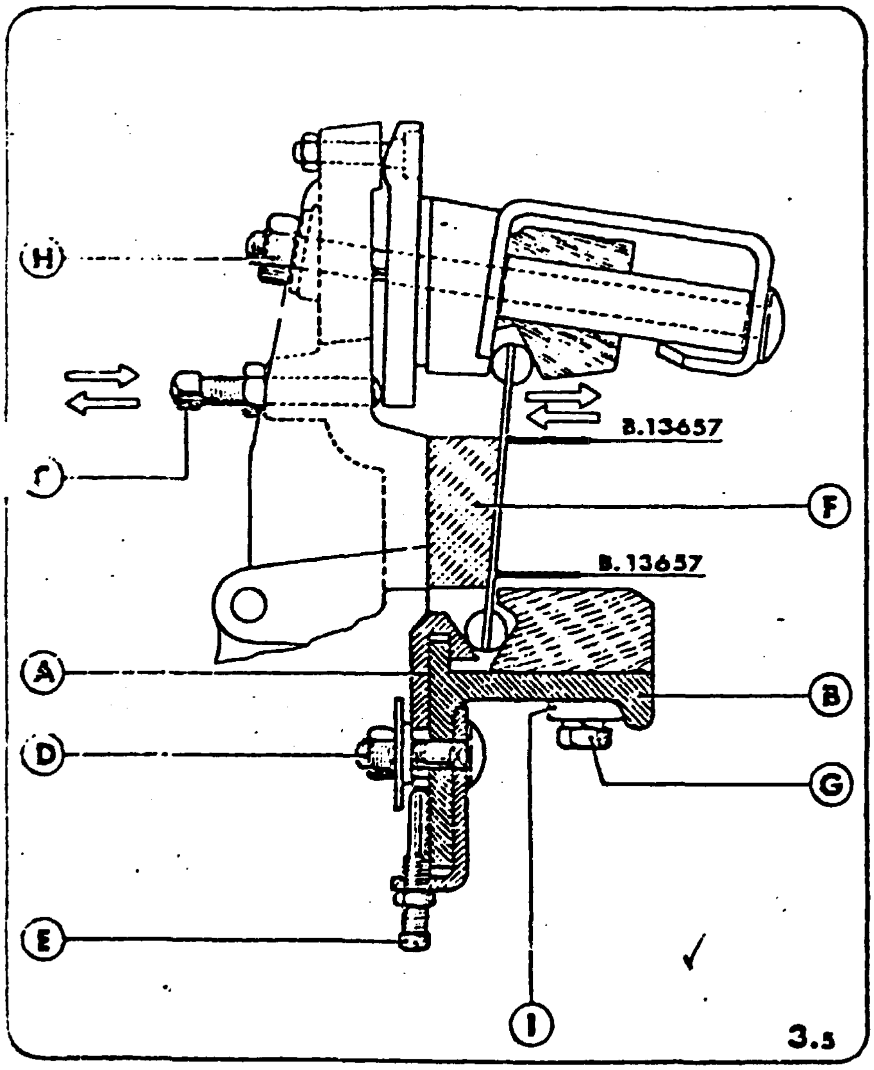
1. Function :

Ensure a correct shuttle flight and consequently a perfect operation of the loom.

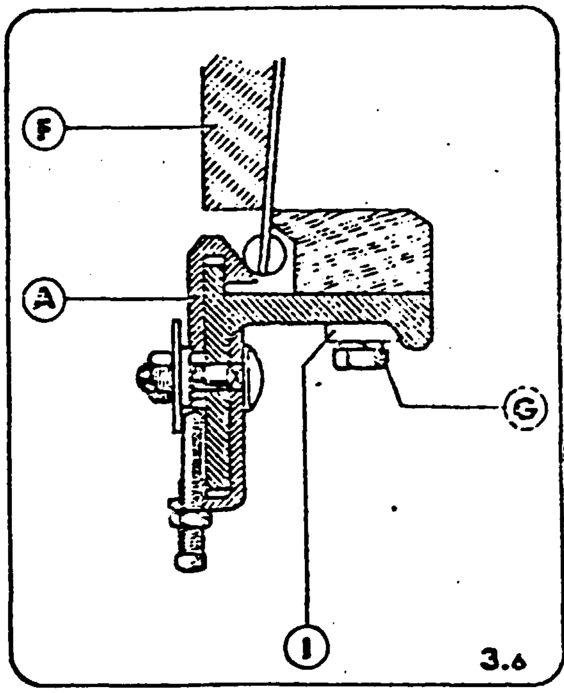
2. Parts :

a. Reed
b. Reed holder
c. Race-board
d. Hand rail

3. Assembling the square reed and the sley



3.5



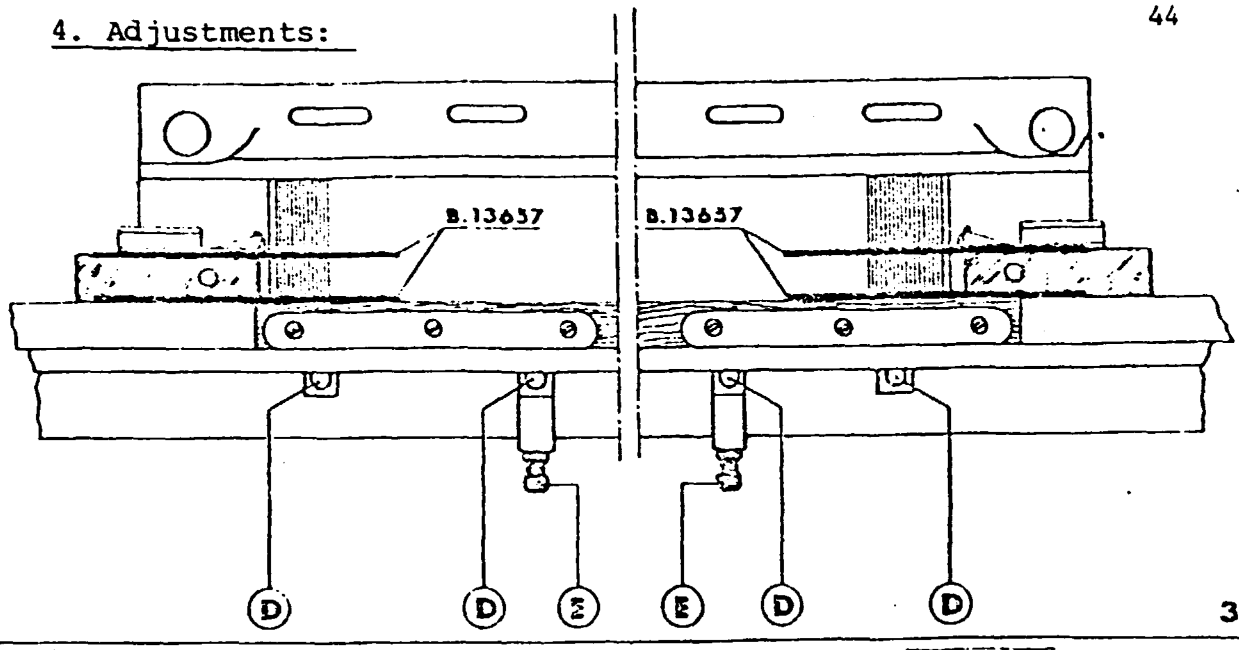
3.6

a.) Ensure that the sley is lined with the boxes.

b.) Line up race-board with the angle iron "B" on which it is fitted (Fig. 3.5 and 3.6)
Partly tighten nuts.

c.) Place reed in the center and sley cap in position ensuring that hand rail plate is in propre position by means of screw "C".

4. Adjustments:



3.7

Alignment of reed with raceboard "away from the reed" (Fig. 3.5 and 3.7

a) The lower part of the reed is adjusted by moving vertically the reed holder. Begin with the F.S. adjustment.

   1) Slacken the bolts "D" of the reed holder "A" except the last but one on the B.S. (where the adjusting screw is).

   2) Raise or lower the reed holder by means of the adjusting screw "E" until the reed is in line with the box-back "F" (the hand-rail follows the vertical movement whether the reed is free or a pressure is exerted against it). Check with gauge B.13657. If there is too much reed movement bring the race-board forward if the reed wants to move forward, and bring the race-board backward when the reed wants to move backward.

      In order to do this, slacken all the bolts "G" except the last one on the side opposite to where one is working.

   3) Tighten the last but one nut (F.S.) on the reed holder.

b) The upper part is adjusted by moving the hand-rail about horizontally (Fig. 3.5)

   1) Slacken the nut "H" (F.S.)

   2) Bring the reed in line with the box-back by means of the adjusting screw "C". Check with gauge B.13657.

   3) Tighten the nut "H".

   4) Check for alignment both the upper side and the lower side of the reed and the box-back "F" and rectify if required.

Proceed in the same way to adjust the opposite or B.S. of the loom.
Then tighten all the nuts. Reed angle, use shuttle to measure.

3 A. Align boxes

1. Function :

To ensure that the shuttle starts off and is received perfectly.
The floating swell provides a smooth braking of the shuttle.

2. Parts :

2.1 Boxplate
2.2 Floating swell
2.3 Floating swell guide
2.4 Floating swell finger
2.5 Pushers (Nylon)
2.6 Shuttle release rod
2.7 Shuttle release rod bearing
2.8 Shuttle release rod stop

3. Assembling the box :

3.1 Replace the plate of 5°
3.2 Replace box back plate, bolt on top of plate
3.3 Assembly floating swell guide ensuring that the spring and nylon pushers are in position.
Position two bolts plus nuts in floating swell. Do not tighten.
3.4 Replace box front with bolts and nuts. Do not tighten.
3.5 Replace shuttle release rod.
When replacing it, position on rod :

3.5.1 shuttle release lever stop
3.5.2 three floating swell fingers
3.5.3 shuttle release rod bearing.

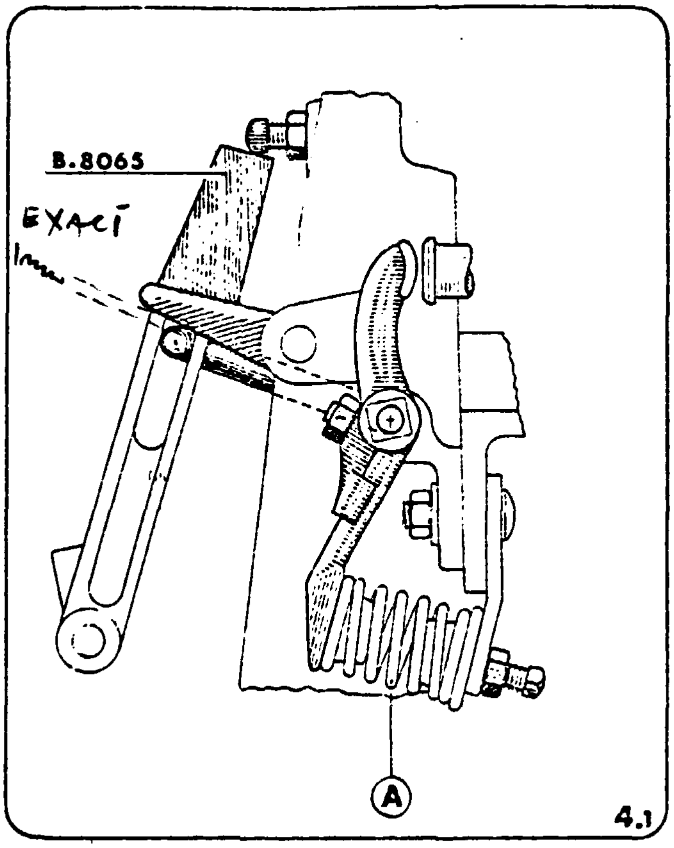
3.6 Ensure that spring seats are in release

3.7 Tighten box front

3.8 Replace connecting rod

4. Adjustments :

In order to facilitate the adjustments an intermediate piece B. 8065 is placed between the lever and the screw as shown on fig. 4.1

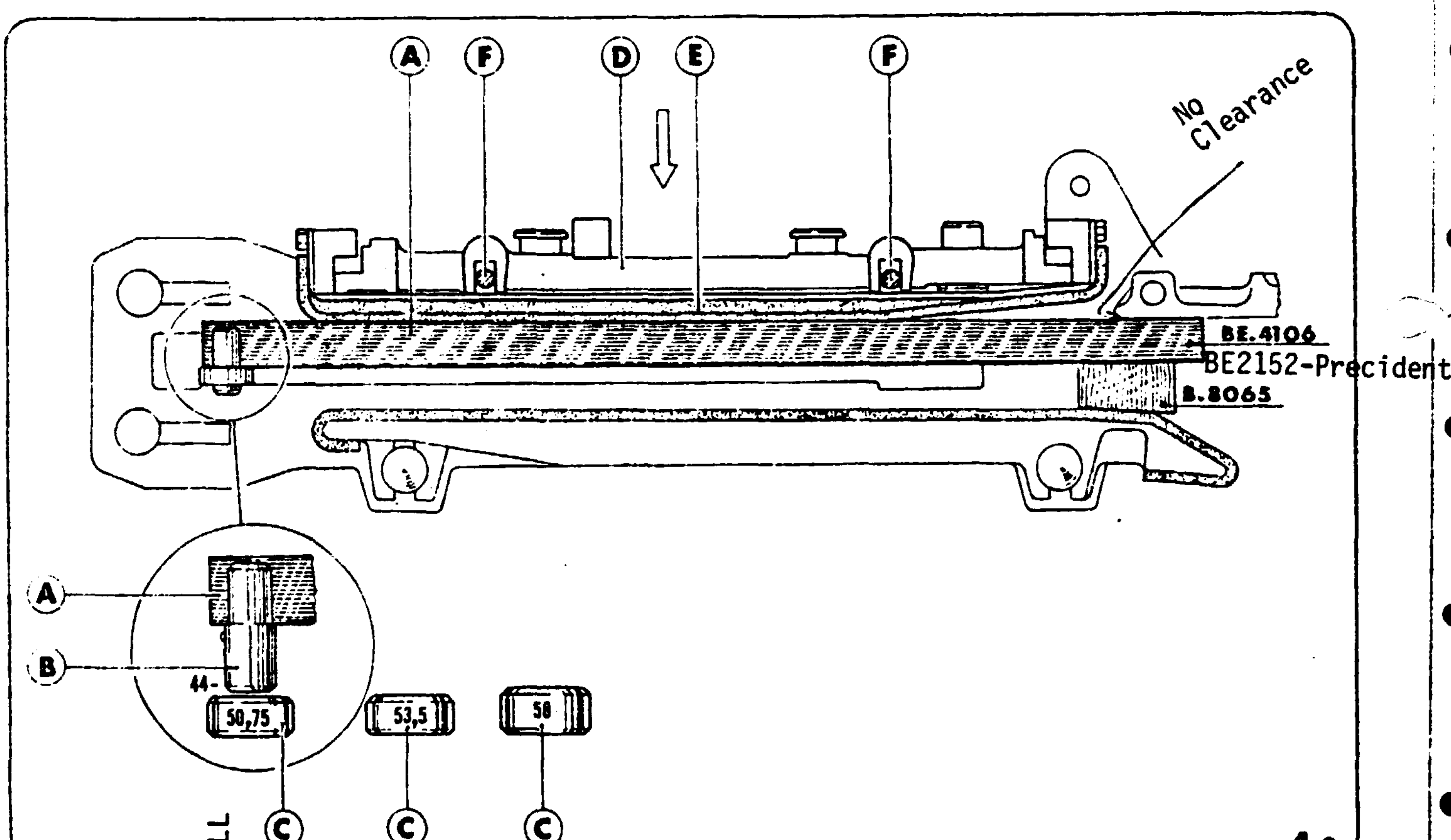


4.1

a.) Position of the floating swell F.S. & B.S. (Fig. 4.2.)

The gauge consists of :

- a straight ruler "A" with a fitted piece "B"
- a ring "C" 50,75 slipped over the piece "B".



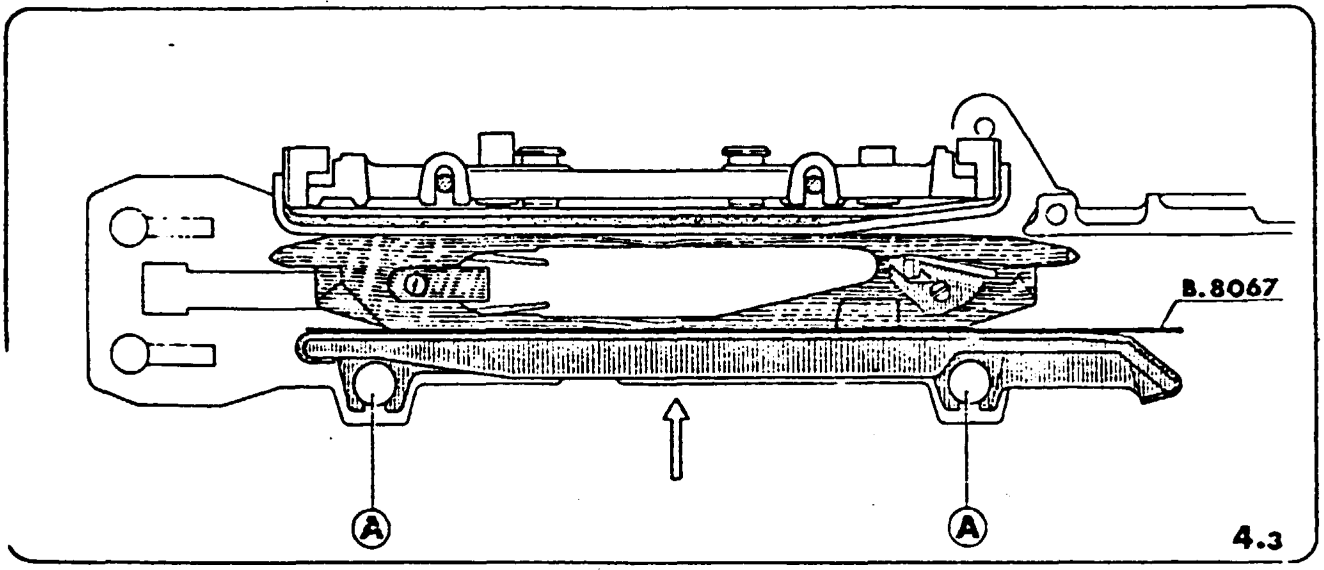
4.2

a) Place the straight ruler "A" with corresponding ring "C" in the box against the bottom of the box. Lock the ruler against the box-back by means of the intermediate piece B.8065.

b) Press the floating swell guide "D" against this floating swell "E" which is thus pressed against the ruler along its entire length. Retighten the bolts "F".

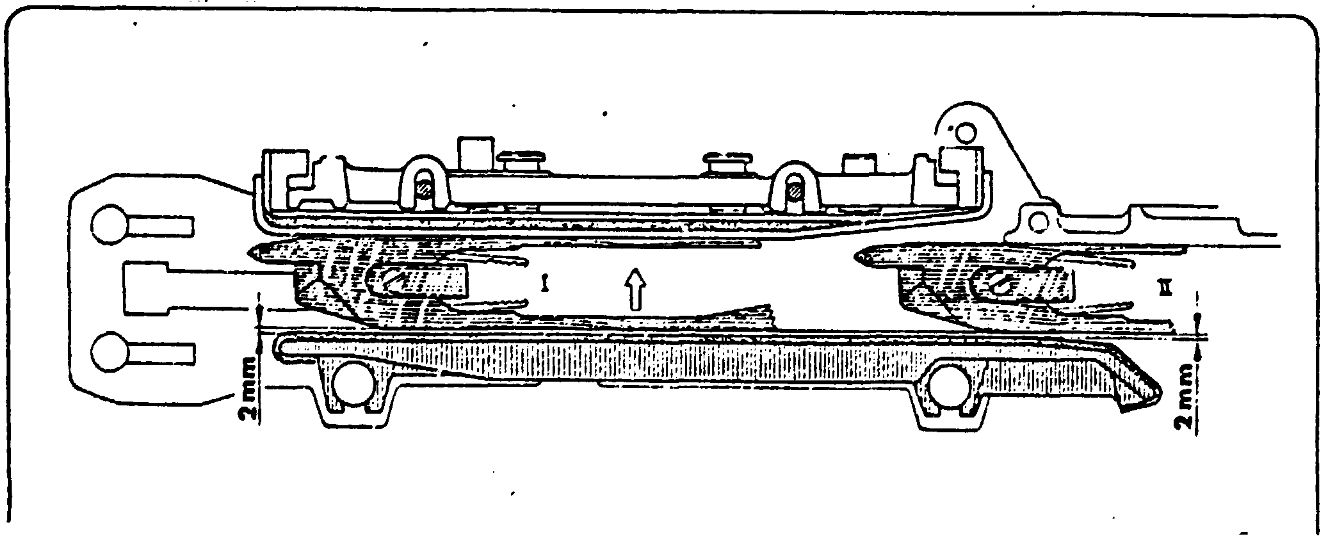
Note : it is possible to fit springs "A" (see fig. 4.1) either weaker or stronger to have an exact braking of the shuttle. In which case the springs have a different thickness of wire which is determined by a colour code.

b.) Position of the box front (Fig. 4.3)

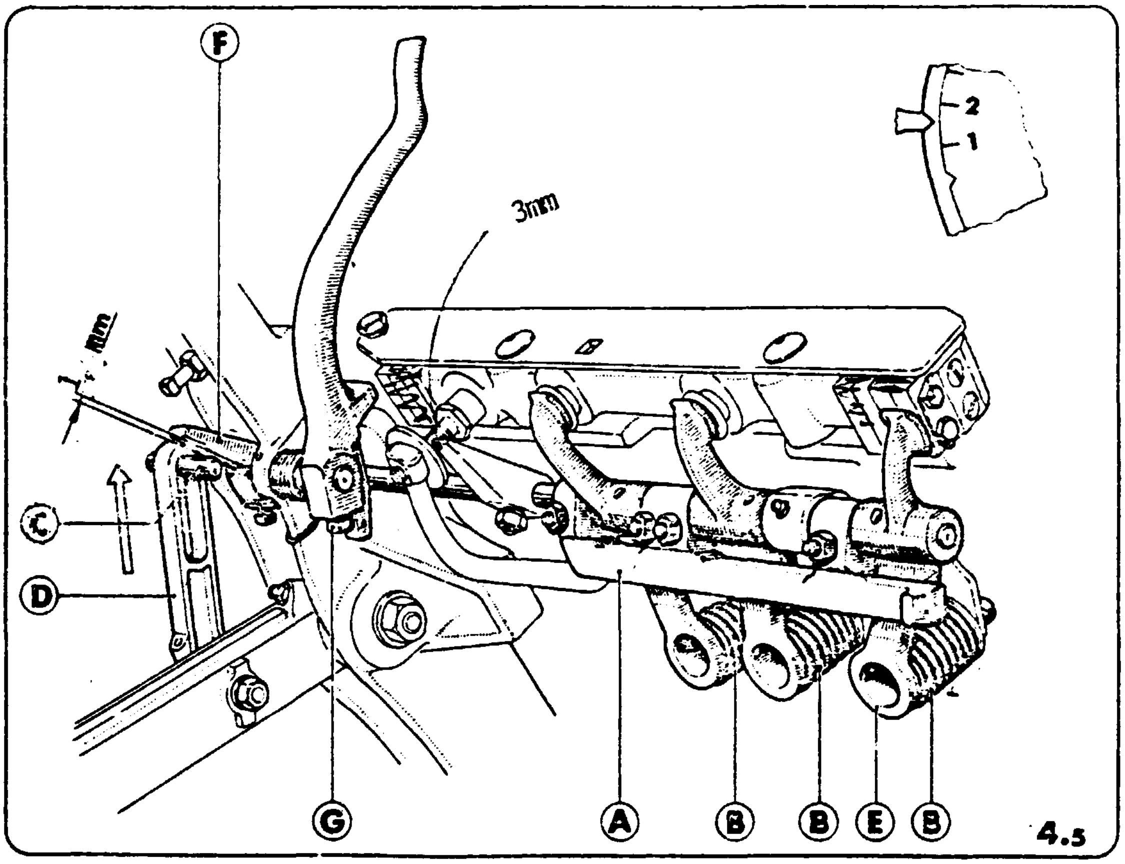


4.3

1. Place the shuttle and the gauge B. 8067 (2 mm thick) in the box.
2. Press the front box as far as possible in the direction and on the spot indicated by the arrow.
   The shuttle is pressing against the floating swell, the latter contacts the cast iron floating swell guide.
3. Tighten up the bolts "A" (2)
4. Check if the box front is parallel with the floating swell and the box-back (Fig. 4.4)
   - Put shuttle in position 1. Push shuttle hard against the floating swell, the latter being in contact with ist cast iron floating swell guide (2 mm clearance).
   - Push shuttle in position 2, push shuttle against the box back. Check 2 mm clearance.



c.) Releasing the floating swell (Fig. 4.5)



4.5

1. Lay position : 1,5. No shuttle in the box.
2. Place the driver "A" freely on its rod.
3. Impart a slight tension on the springs "B", the tension must be adjusted when the loom is started.
4. Pull the rod "C" right to the top of the plastic link "D". Pull the link as far as possible and rotate the driver "A" just against the fingers "E" and lock them.
   Then adjust for a 1 mm clearance between the lever "F" and the rod by means of the screw "G".

Settings for the shuttle box on the B(attery) S(ide) as for the box on the F(eeler) S(ide).

5. Loom problems created by :

A. Square reed and aligned boxes

1. Wear shuttle
2. Damage reed
3. Damage leather
4. Personal injury
5. Flags mechanical :
   - 5.1 break on change
   - 5.2 knock out ends
   - 5.3 break out ends
   - 5.4 knock out weft
   - 5.5. empty pirns
   - 5.6 false change
6. Cloth defects flags :
   - 6.1 lash in
   - 6.2 broken picks
   - 6.3 break weft
   - 6.4 kinky weft
   - 6.5 kinky weft at fork
   - 6.6 overshots
   - 6.7 bang off

B. Sley

1. Improper transfer (not ringing up properly)
2. Break on change
3. Broken picks
4. Lash in
5. Empty pirns
6. Thin places
7. False change
8. Bend crank arms (wear crank arms)
9. Break swords
10. Break sley and plate
11. Break pirns
12. Trip motor
13. Cause personal injury

3 B. Protector Motion or dagger motion (bang off)

1. Function

When the shuttle arrives too late in one of the boxes, or does not arrive at all, the daggers on the protection rod push the frogs forward, which causes the loom to stop in such a position that neither the warp ends will be broken nor any parts damaged. After a free travel of 8 mm B.S. the frog presses on the damping spring (See no. 4 Adjustments fig. 5.1 and 5.2).
In the course of this free travel, the B.S. frog triggers the quick release mechanism, thus freeing the driving flywheel before the large damping springs receive the moving parts.
The pivoting swell is released during picking which allows for a better start of the shuttle.

2. Parts

2.1 Frog bracket
2.2 Frog
2.3 Dagger
2.4 Protection rod
2.5 Frog spring
2.6 Front shipper handle
2.7 Frog plate.

3. Assembling the Protector motion :

a.) Assemble live frog bracket and live frog.

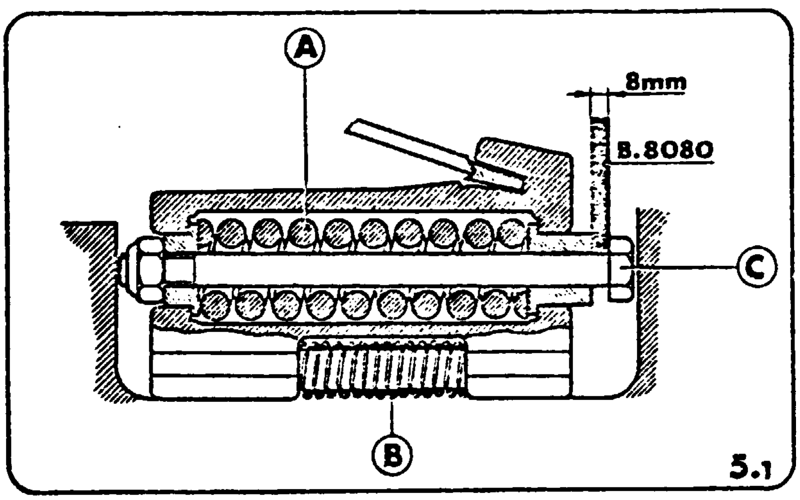
b.) Replace on loom. Ensure that small frog spring is in position before inside picker stick bumper bracket is replaced on the 2 bolts.
Tighten the 2 nuts.

c.) Replace dagger through sley guide, shuttle release lever and protector rod connection. Reset later.
Replace front shipper handle and attachments.

d.) Replace B.S. as above and replace front shipper handle connection.
Ensure that spring is in position.

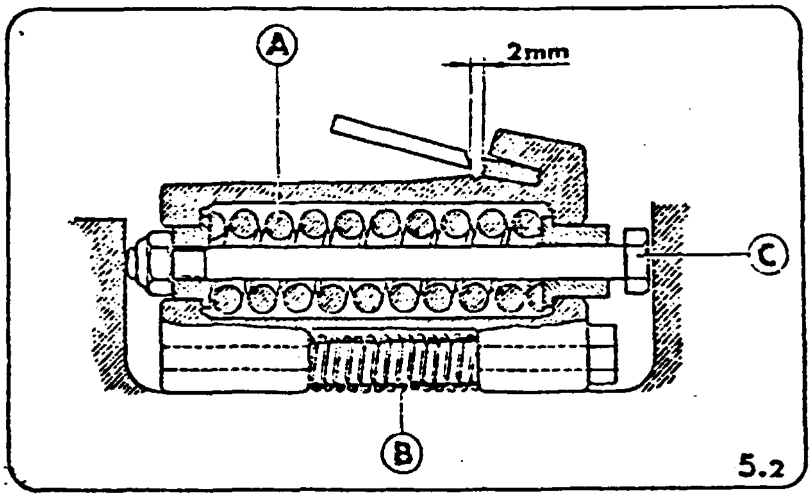
4. Adjustments :

a.) Position of B.S. frog (Fig. 5.1)



Turn the nut of the central bolt "C" until there is an 8 mm clearance in front of the frog.
Check with gauge B. 8080.

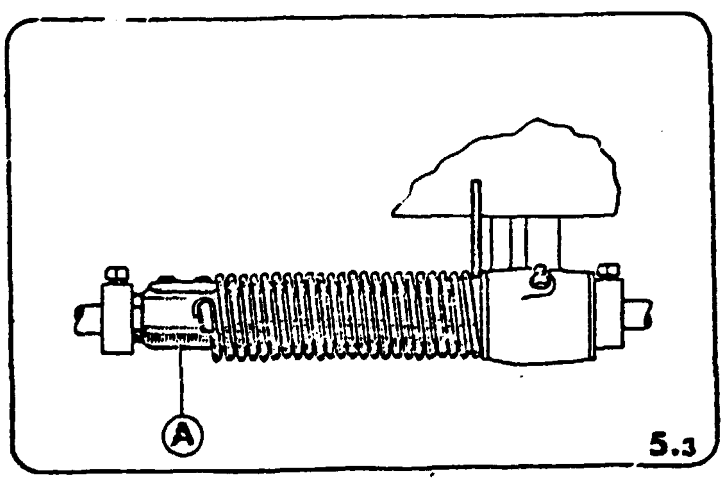
b.) Position of F.S. frog (Fig. 5.2)



5.2

Sley position : the B.S. dagger touches its frog plate without moving the frog (Fig. 5.2). Turn the nut of the F.S. central bolt "C" until there is a 2 mm clearance between the F.S. dagger and its frog plate.

c.) Protector rod spring (Fig. 5.3)

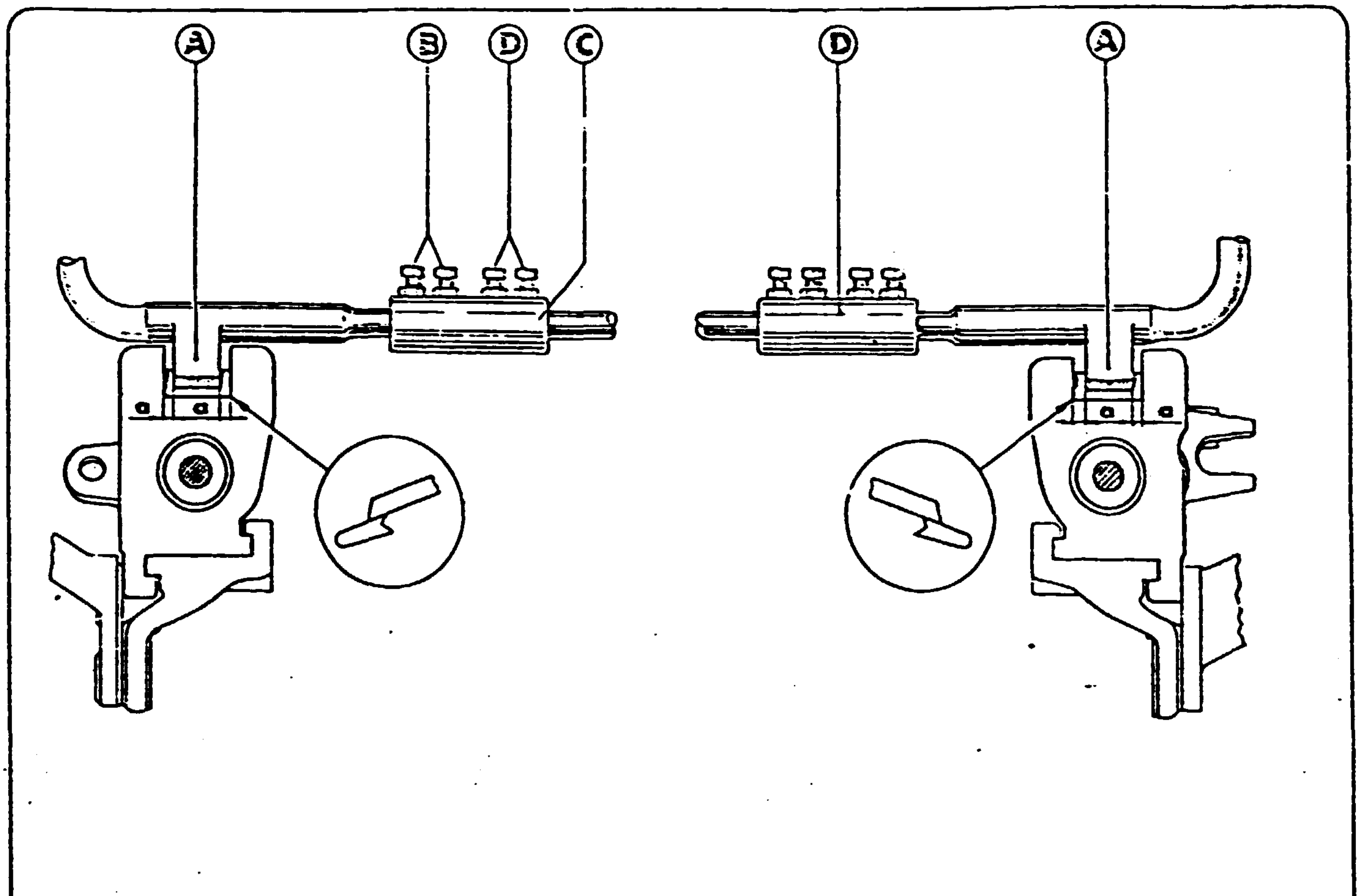


5.3

c.1 Adjust the spring tension by rotating the hub "A". The higher the loom speed the tighter the tension.

c.2 Check the tension afte having adjusted the da ger. In the following way : as the loom rotates without a shutt lift the daggers (for instance by means of a rag pushing away the pivoting binder). Release the daggers (by withdrawing the rag). There must be immediate "banging-off" of the loom.

d.) Postion of the daggers (Fig. 5.4)



5.4

This adjustment is carried out with no shuttle in the box.

a) Sley position : the daggers "A" must rest ± 5 mm. on the frog plates.

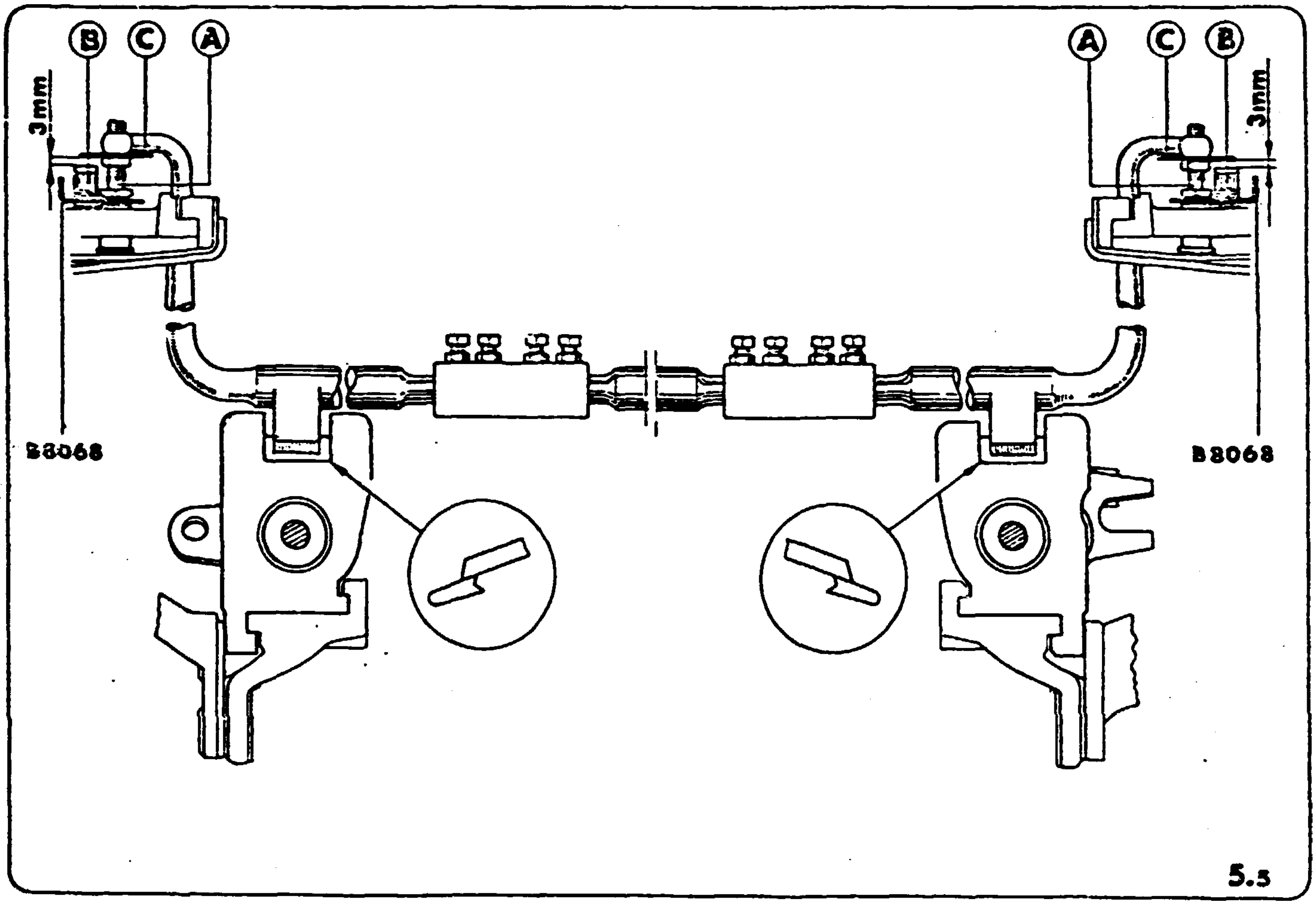
b) Slacken both screws "B" on sleeve "C". Both daggers should rest on their plates. Centre the F.S. dagger so that "a" = "a" and screw up the set screws "B". Take care that, when screwing up, the daggers remain in their place; the frog plates must rest well on the frog and there must be no dirt underneath them.

c) Centre if necessary the B.S. dagger : "a" = "a". Check that in the course of tightening the daggers remain in their position.

Note :

- The set screws on sleeve "D" (B.S.) must be turned towards the rear as they must not knock against anything when the sley is in the F.D.C.
- The side play of the dagger-bar "E" must be very small or nil, although there should however be no tightness.

e.) Lifting of the daggers (Fig. 5.5)



5.5

a) Sley position : always the same : the daggers must rest ± 5 mm on the frog plates. With no shuttle in the box, the daggers touch their frog plate.

b) Place the gauge B.8068 (thickness 1.5 mm) as shown on the figure and adjust the B.S. and F.S. screw "A" just against the nylon finger in the floating swell without daggers. Lock with locknut.

c) Give a distance of 3 mm between the pusher "B" and the plate "C". Fasten the screw in the pusher "B" very well.

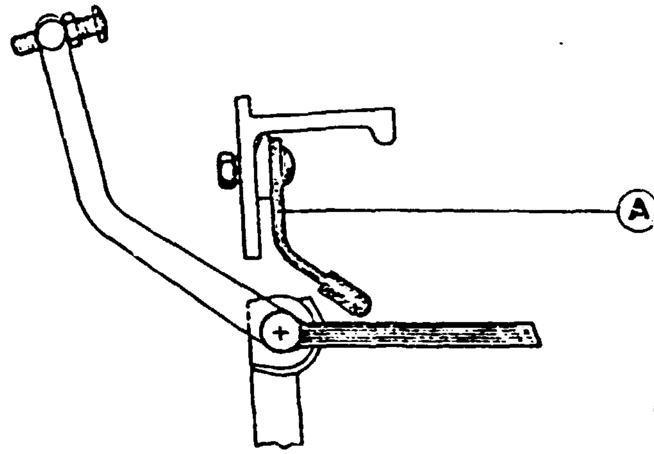
Check :

The shuttle being in the box, the daggers must pass above the frog-plates. With no shuttle in the box, both daggers must catch in the plates.

f.) Position of the dagger limitator (Fig. 5.6)

f.1 Place the sley in the position for which there is the maximum lifting of the daggers by the release mechanism.

f.2 Adjust the height of the limitator "A" so as to obtain 1 mm clearance between the dagger and the limitator.

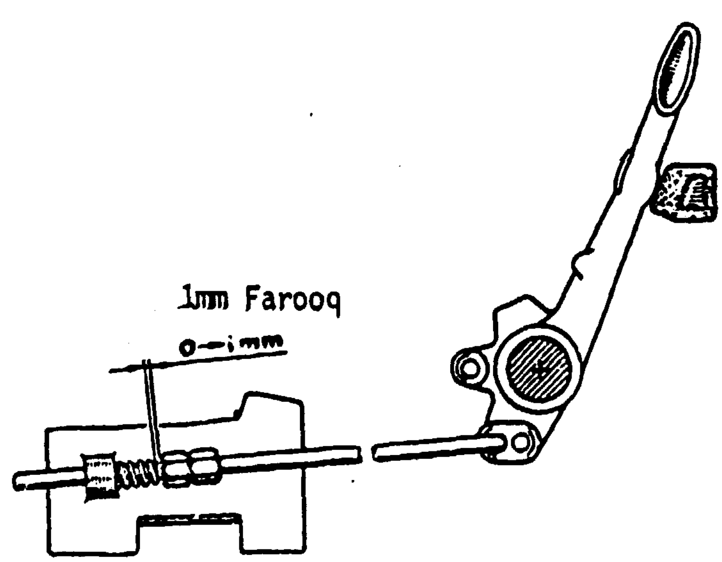


5.6

g.) Adjusting the small spring on the B.S. and F.S. handle connection rods (Fig. 5.7)

g.1 Stop the motor and engage the loom.

g.2 Adjust both nuts on handle connection rod so that the spring has a play of between 0 and 1 mm (the spring must not be compressed).



5. Loom problems created by Protector motion.

A. FROG

1. Spring weak or broken :

   1.1 Break out
   1.2 Break sword
   1.3 Break frog
   1.4 Break or bend sley
   1.5 Smashes

2. Frog steel worn and/or out
   same as 1.1 - 1.2 - 1.3 - 1.4

3. Frog broken
   same as 1.1 - 1.2 - 1.3 - 1.4

4. Only one frog stopping loom
   same as 1.1 - 1.2 - 1.3 - 1.4

B. PROTECTION

1. No protection : break out
2. Protection one end only :
   2.1 break out
   2.2 break sword
   2.3 break or bend sley
   2.4 Break frog
   2.5 Smashes

Group 4: A. Shuttles
B. Picking motion

4. A. Shuttle

1. Function:

To carry the weft pirn and insert the weft in the cloth

2. Parts :

2.4 Tip
2.2 Shuttle eye
2.3 Shuttle jaw
2.4 Nylon brake rings

3. Checking:

a.) pirn position in the shuttle jaw
b.) shuttle eye for cleanness
c.) wavyness
d.) cracks
e.) tension by nylon rings
f.) smoothness of tip
g.) 1mm (exact) clearance between pirn in the shuttle and inclination

4. Loom problems created by shuttle

a. pirn alignment.

1. Break weft
2. Break on change
3. Cut warp ends
4. Knock out weft
5. Kinky weft
6. Bad change

b. eye loose

1. Cut warp ends
2. Break weft
3. Broken picks

c. Nicks on surface of shuttle

1. Cut warp ends
2. Weft breaks

d. Nick near eye (groove)

1. Broken picks
2. Thin places

e. Loose screw

1. Break weft
2. Cut warp ends
3. Damage shuttle
4. Tear leather
5. Bad change
6. Damaged reed

f. Loose nylon (tension)

1. Kinky weft
2. Break weft
3. Loom stoppage
4. Improper working of shuttle eye and temple cutter
5. Lashing-in

4.B. Picking Motion

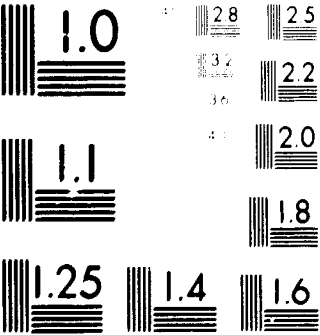
1. Function:

To strike the shuttle from the F.S. to the B.S. and from the B.S. to the F.S. - See table in Picanol Manual.
The picking strength is mainly determined by the shape of the picking cam.
For a given cam, it is possible to vary the picking strength by altering the height of the power strap:
when raising the strap the strength is reduced, when lowering it the strength is increased. The picking strength depends on a number of various factors, in particular:
- the cloth to be woven
- the start of the pick
- the loom speed
- the dimensions and weight of the shuttles.

It is therefore very difficult to prescribe the exact picking strength.
As a general rule, from the mechanical point of vieuw as well as from the weaving technique, picking should be as soft as possible.
The manner how to achieve a correct picking strength at the loom involved, will be described in part 4.C1, Lug straps...

2. Parts:

2.1 Picker
2.2 Picking stick
2.3 Lug straps (Long and short)
2.4 Picking cam
2.5 Picking cam hub
2.6 Picking shaft
2.7 Rocker shaft
2.8 Rocker box housing
2.9 Sley sword



MICROCOPY RESOLUTION TEST CHART

2.10 Picking stick bumper (Upper and lower)
2.11 Picking bowl
2.12 Paralle link
2.13 Picker setting shaft
2.14 Protection plugs
2.15 Picking motion crank arm
2.16 Bumpers
2.17 Parallel link pin

2.18 Picking stick return spring
2.19 Power strap

3. <u>Assembling the picking motion (F.S. and B.S.)</u>

a.) Replace picking cam on picking cam hub.
Hand tighten nuts.

b.) Assemble pick shaft and fix to loom (6 bolts).
Titghten bolts, ensuring that picking shaft is free and not fouling.

c.) Replace rocker shaft in rocker box housing and sley sword.
Replace locking key in shaft. Tighten screws and nuts.

d.) Replace lower picking stick bumper with protective leather Attached and spacers. Tighten screws and nuts.

e.) Replace parallel link on rocker shaft and insert picker setting shaft. Ensure that protection plugs are in position. Tighten screws and nuts.

f.) Position picking motion crank arm into picking stick stop and rocker arm. Insert parallel link pin in position, ensuring that flat side of the pin faces locknuts.

g.) Assemble parallel return spring and position on bolt on rocker arm. Replace picking stick return spring and strap. Give a moderate tension.

i.) Replace picking stick and power strap (Power strap level with picking stick washer).

j.) Replace short lug strap and lug strap connection with bolt, nut and special washers.

k.) Replace picker and insert screw. Ensure that the picker is not too low.

4. Adjustments.

a. Adjusting the picking stick and picker for height.
(Fig. 6.2)

As this adjustment must always be carried out when fitting a new picker or picking stick, we shall explain how to fit them.

a.1. Slightly tighten the picking stick in its holder by means of bolt "A".

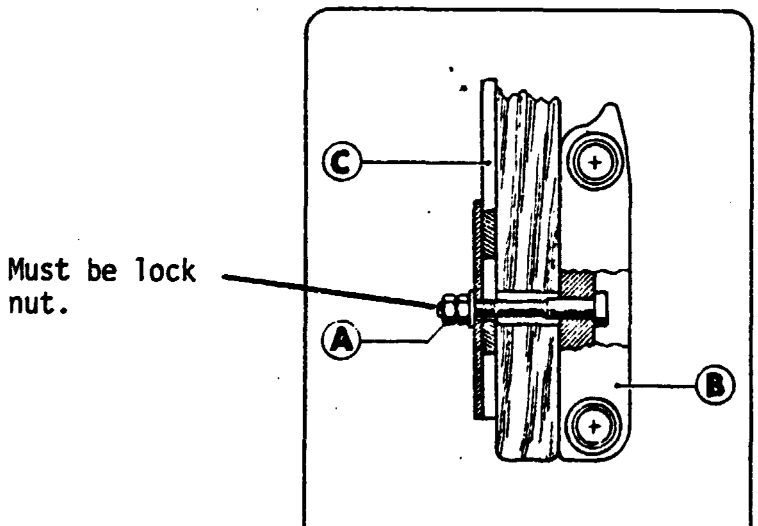
a.2. Bring up the bottom of the picking stick level with the bottom of its holder "B". Place the power strap "C" as high as possible. Tighten well bolt "A". In this position the picking stick may be raised or lowered by 5 mm. (see fig. 6.2)

a.3. Bring the picking stick towards the inside of the loom. When the picking stick is at the end of its stroke, the picker should coincide with the shuttle.

For man-made fibres, the picker may be slightly lower.

a.4. Fix the picker on the picking stick with a screw (Drill a hole first to insert this screw.)

ATTENTION: The pickers are different on left and right side.



6.2

Remark:

When adjusting only the height of the picker, instead of fitting a new picking stick or picker, slacken the bolt "A" and adjust the height of the picking stick.

Note:

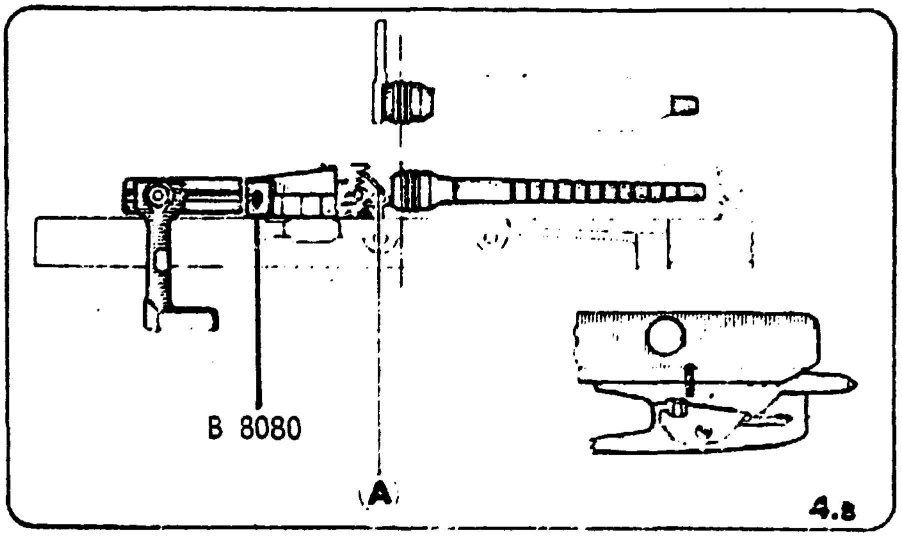
Place the picking stick as described above and attached the picker on it only ensuring that the picker is not bent over too much. Furthermore the picker is guided by the boards of the boxes.

b. Side position of the picker.

The picking stick must be placed in the middle of the groove of the box bottom plate.

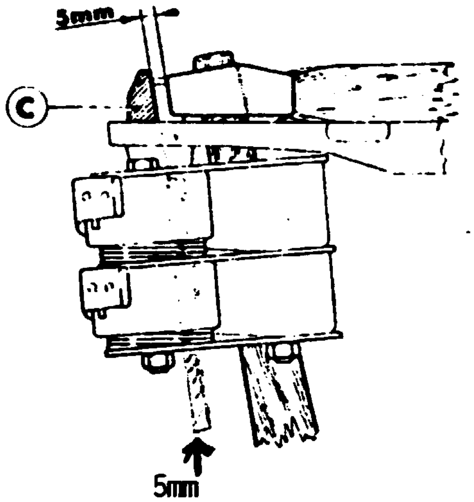
c. Final position of the shuttle B.S. (Fig. 4.8)

Introduce a shuttle with pirn (as near as possible to the inclination "A") into the box. Move the shuttle from 1 pirn ring distance to the right in relation to the pirn in the magazine. In this position, draw a line on the shuttle and on the top box plate.



4.8

d. Final stationary position of the shuttle F.S. (Fig. 4.10)



(Farooq) gauge

4.10

Move the picker in order to obtain a 5 mm. distance between the pickers and the stop "C".

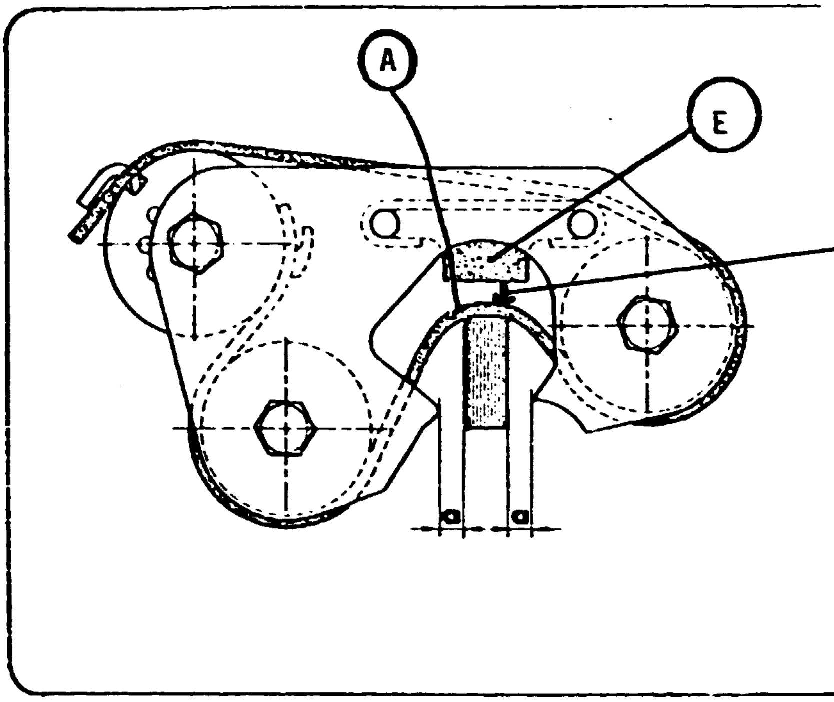
Farooq = between cheack leather and rubber shock absorber.

e. Position of the box end check F.S. and B.S. (Fig. 4.10)

e.1. Box shuttle correctly i.e. the mark on the shuttle and the mark on the top box plate in line with each other.

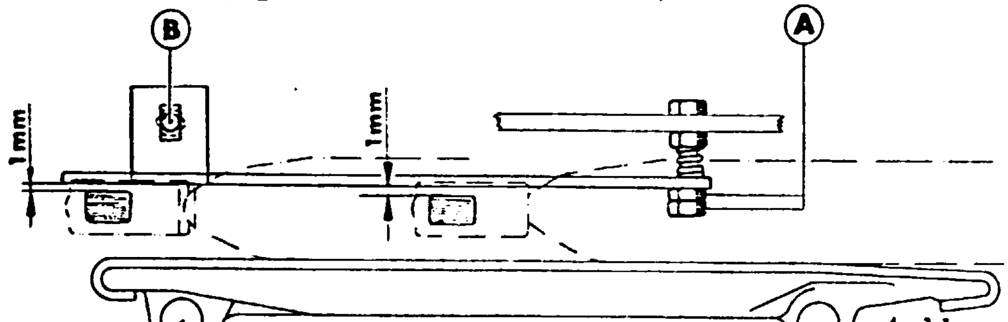
e.2. With the shuttle in this position move the picker against the shuttle. Adjust the box end check in such a way as to obtain a 5 mm. clearance between the check leather (A) and the rubber shock abscrber (E).

e.4. Tighten up the box end check keeping in mind to correctly center its position in relation with the picker stick: both distances "a" should be the same.

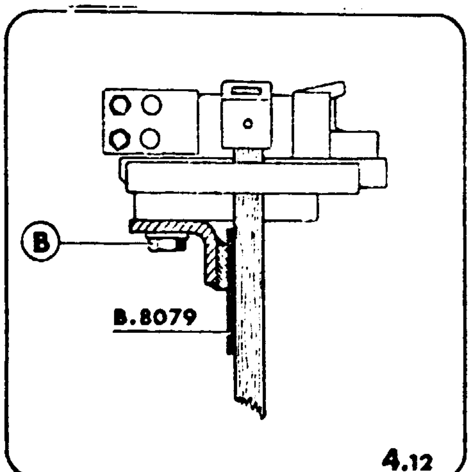


f. Position of the picker stick guides B.S. and F.S.

(Fig. 4.11- 4.12 - 4.13 - 4.14).



4.11



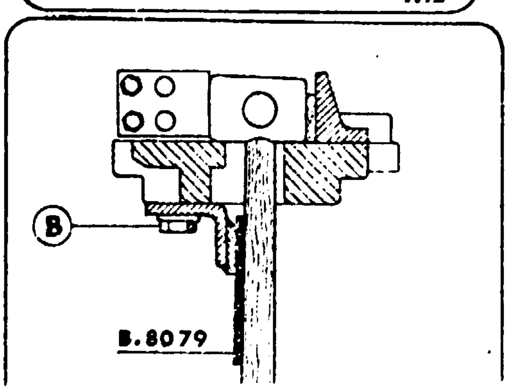
4.12

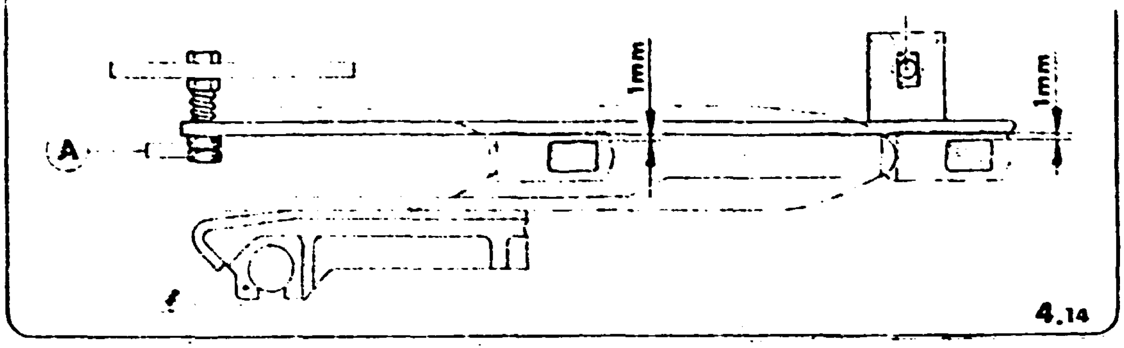
f.1. Make one pick with the shuttle fully in the picker

f. 2.By means of nuts "A" and bolts "B" adjust the picker stick guides on such a way as to obtain 1 mm clearance with the picker stick over the full stroke. Check this with gauge B.8079.

f.3. The back picker stick guide at the B.S. should not be in the way for ejected pirns after transfer.

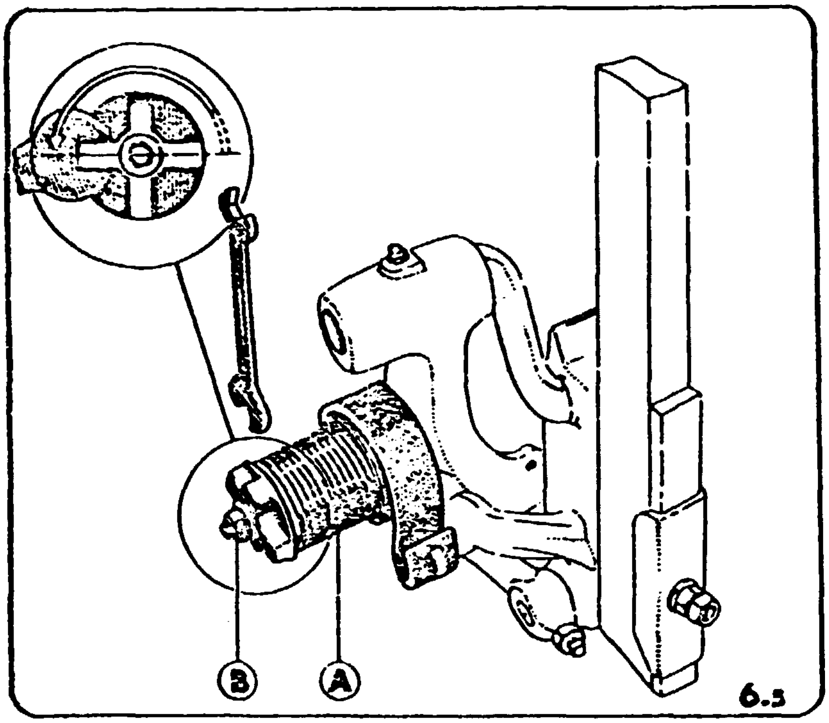
If so, get more clearance.





4.14

g . Tension of picking stick return spring (Fig. 6.5)



6.5

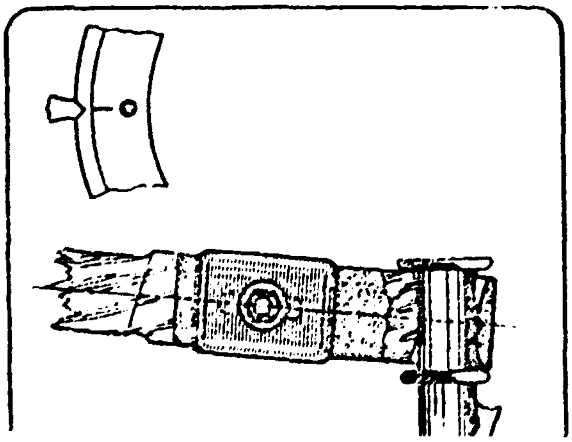
g.1. When mounting the spring bracket made of nylon take care that the grease nipple remains accessible. (The nylon spring bracket may be mounted in 2 different positions by rotating half a turn.

g.2. Give spring "A" a maximum tension of no more than 180° (half a turn) in relation to its free position, and tighten the spring bracket by means of nut "B".

The rib "D" in the spring bracket "E" may be used as a point of reference. An excessive tension reduces the effectiveness of the box end check. Too weak a tension : the box end check might have a tendency to push the shuttle forward. For very high speeds : the picking stick must be at rest before the shuttle arrives.

Generally speaking, the tension can be such that the picking stick no longer moves when pressed right home into the box end check.

h. Adjusting the short lug strap (Fig. 6.6.)

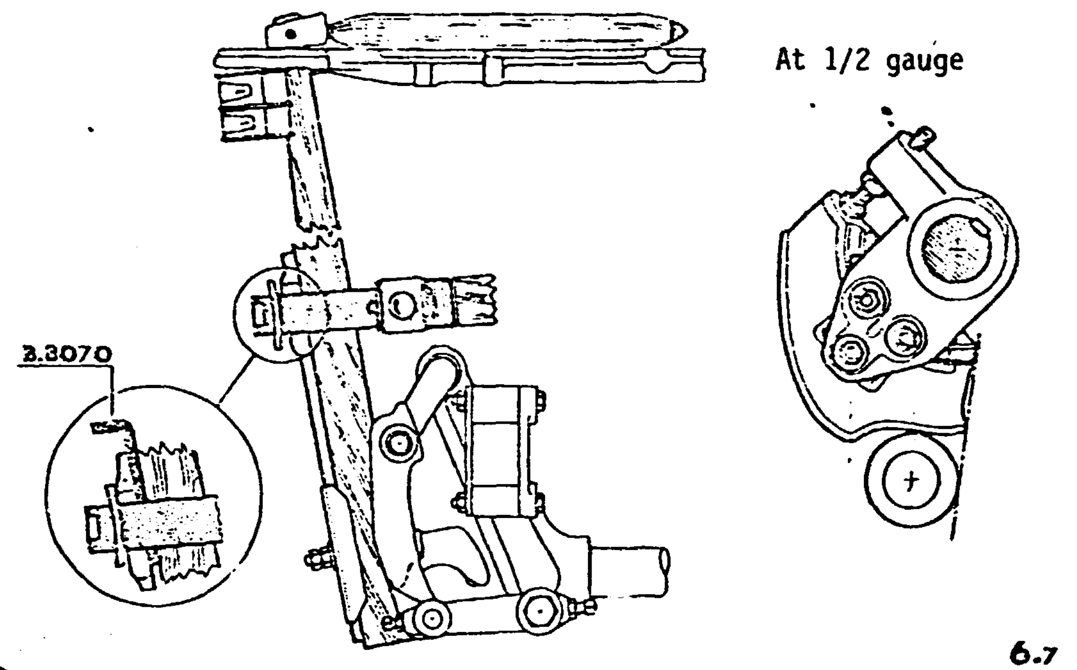


h.1. Sley position : B.D.C.

h.2. Adjust for minimum clearance on the picking shaft by moving the short lug strap ; be careful to place this strap in line with the wooden lug strap connection.

h.3. Rotate the sley to its F.D.C. and take care that the strap is free.

i . Adjusting the long lug strap (Fig. 6.7)



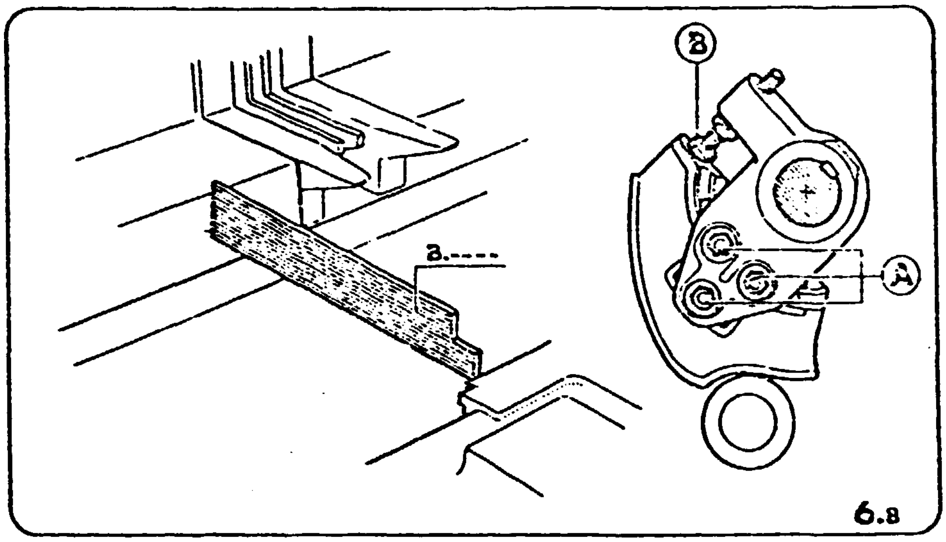
6.7

i .1. Place the sley with the picking bowl on the small radius of the cam ; the outer edge of the cam and of the bowl are approximately in the same line. If the pick starting point will be adjusted by means of a gauge, this gauge can also be used to adjust the length of the long lug strap (see : j . Adjusting the pick starting point).

i .2. Place the shuttle in its stop position in the box. Push the picker towards the tip of the shuttle. Adjust first the long lug strap against the picking stick by placing between them the 6 mm thick gauge B. 8070. Take care to place the strap in line with the axis of the wooden lug strap connection.

Remark : When it is necessary to alter the height of the power strap, or to move the box end check, check this 6 mm clearance. The action of the strap becomes stronger the lower the strap is fitted.

j. Adjusting the pick starting point (Fig. 6.8)



6.8

j.1. Place the shuttle in its stop position.

j.2. Revolve the sley after the F.D.C. until the long side of the gauge B.8074 (140) 8073 (135) passes between the sley and the groove of the machined face of the breast beam. Put on brake.

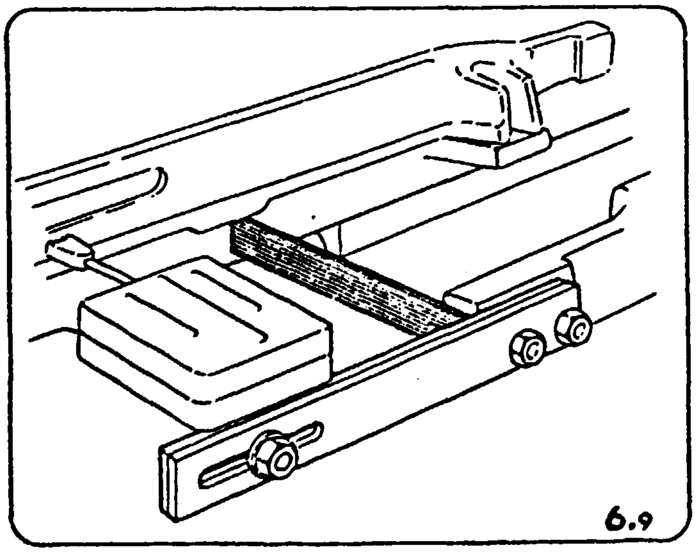
j.3. Slacken the three nuts "A". Revolve the picking cam until the picking stick shows a tendency to come forward. Fix one of the nuts "A".

j.4. Check again the start of the pick (by turning the sley) and using the gauge, ensure that the point at which the pick starts is correct : if so, fix the other two nuts.

j.5. Turn the setting screw "B" against the picking cam and lock with a lock nut.

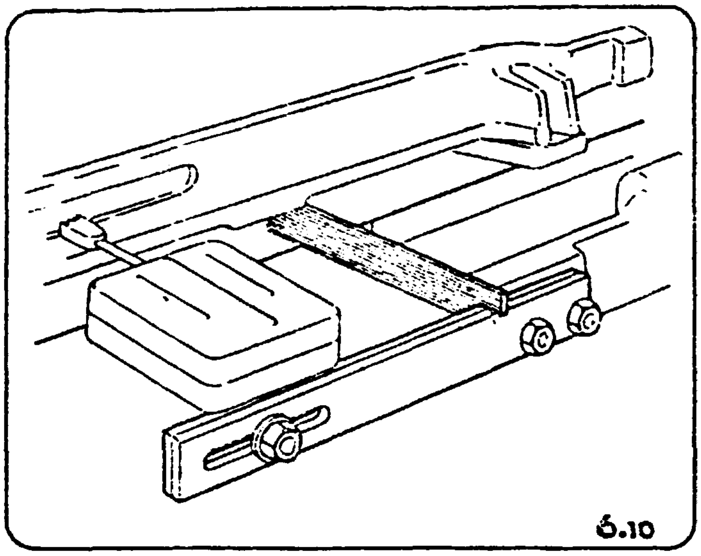
Note : The gauges listed below allow the following adjustments to be made :

- Start of picking.



6.9

Place the gauge as shown on fig. 6.8 against the breast beam or against the feeler bracket (Fig. 6.9).


6.10

- Length of the long lug strap.

If a gauge is used to adjust the start of the picking, place this gauge as shown on fig. 6.10 to adjust the strap.

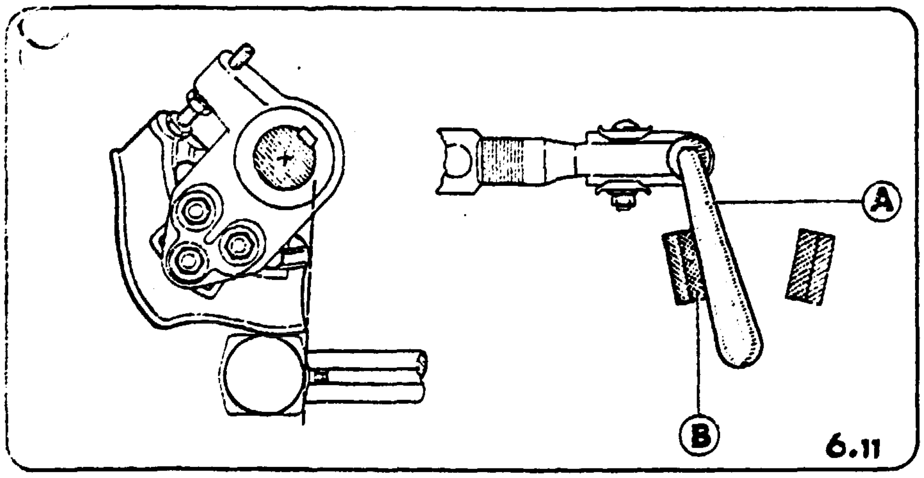
The following are generally used as the start of the picking stroke :

For CM and CL looms : gauge B. 8075 (145 mm).
gauge B. 8077 (155 mm) for looms fitted with a dobby, Jacquard or double centre weft fork.

Other starting points may be considered depending on :

- the quality to be woven.
- the crossing of the heald frames.
- the warp density etc...

k. Thickness of B.S. and F.S. picking shaft bumper bracket rubbers (Fig. 6.11 and 6.12).



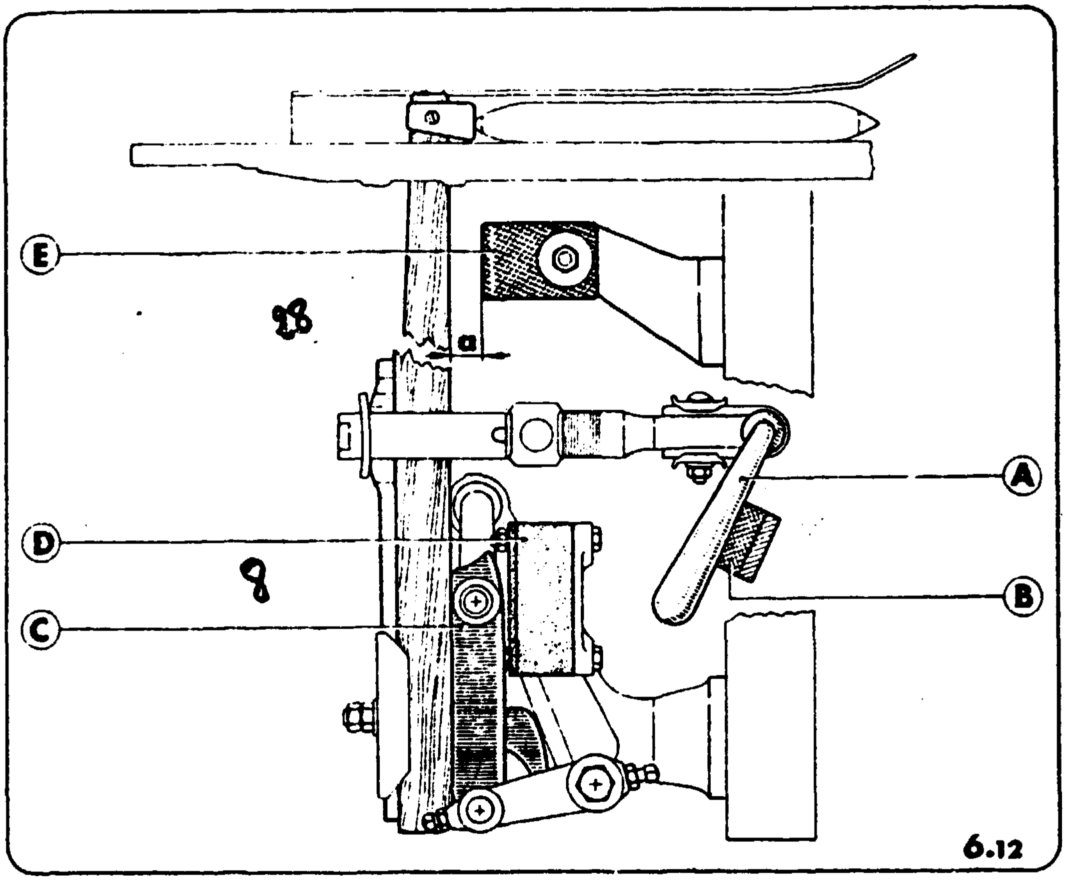
6.11

k.1. Thickness of rest rubber (Fig. 6.11)

Turn loom by hand until the point at which the cam nose touches the picking bowl. The bowl must touch the picking cam without rotating the picking shaft "A" (or very slightly) ; otherwise adjust the thickness of rubber "B".

k.2. End of pick rubber (Fig. 6.12)

Go on turning the loom by hand until the point at which the picker is at the end of its stroke. Then the picking shaft "A" may slightly compress the rubber "B" (max. 3 mm) to allow the bowl to follow better the contour of the picking cam. Keep a slight clearance between the picking stick and the holder "C" and the rubber "D". There must be a clearance "a" between picking stick and buffer "E".



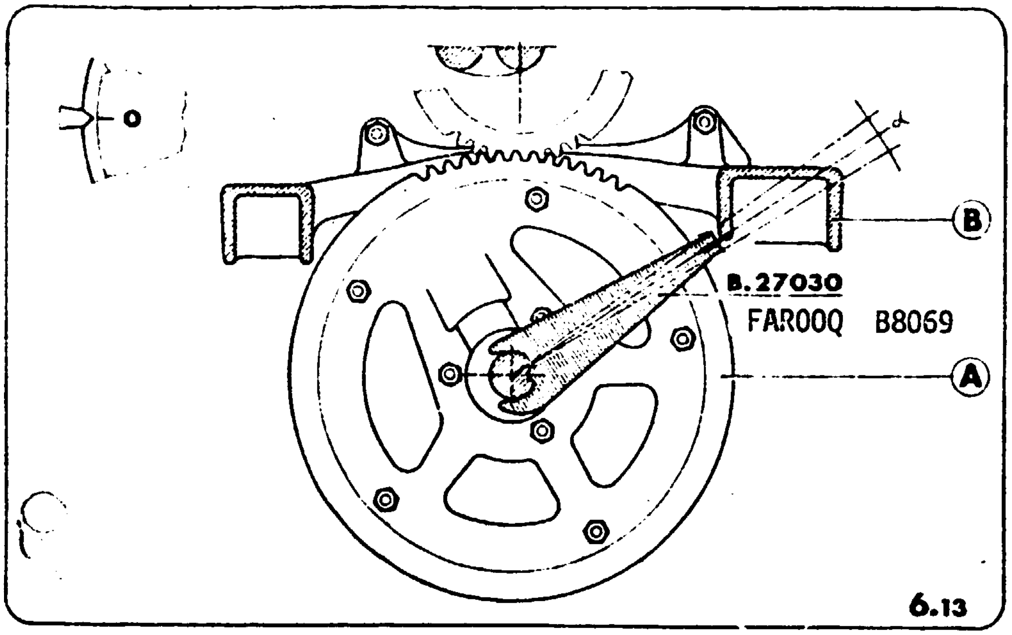
6.12

Remark :

Incorrect adjustment of the position of the box end check or of the clearance of the long lug strap will affect the clearance between the picking stick or its holder with the buffers.

Clearance -a- and between cC + D are obtained by proper adjust. of lug strap, pickcam pos. and bumber rubbers.

1. Position of the bottom shaft in relation to the crankshaft (Fig. 6.13)



6.13

if for any reason the crown gear "A" has been removed it can be replaced by using gauge B.27030.

1.1. Sley position : F.D.C. Brake closed.

1.2. Place the crown gear on the picking shaft, just next to the hub on which the crown gear will be fixed.

1.3. Position the picking shaft by means of gauge B.27030 The keyway corresponds to the recess on the gauge. Turn the gauge until its line is opposite the corner of the bracket "B".

1.4. Fit the crown gear and tighten the bolts.

Remarks :

- Check position with gauge.
  The angle indicates a tolerance for the position of the gauge relative to bracket "B".

- To keep the wear of the teeth even you can loosen the three nuts and turn the gear wheel 1/3 of a turn. The crown gear can also be turned by 1/5 of a turn by loosening the five nuts. (This means that the wear on the teeth caused by the pick can be moved to 3 x 5 = 15 different places).

5. Loom problems created by Picking motion

Picking early or late :

1. Overshots.
2. Kinky weft.
3. Throw shuttle.
4. Personal injury.
5. Knock out ends.
6. Break weft.
7. Knock out pirns.
8. Bang-off.
9. Empty pirns.
10. False change.
11. Damage shuttle.
12. Knock off on change.
13. Damage leathers.

Loom problems created by Straps :

Improper shuttle boxing, causing :

1. Lash in
2. Broken picks.
3. Kinky weft.
4. Break on change.
5. Break weft.
6. False change.
7. Knock out weft.
8. Laying off.
9. Bang off
10. Empty pirns.

Group 5 : A. Weft side fork

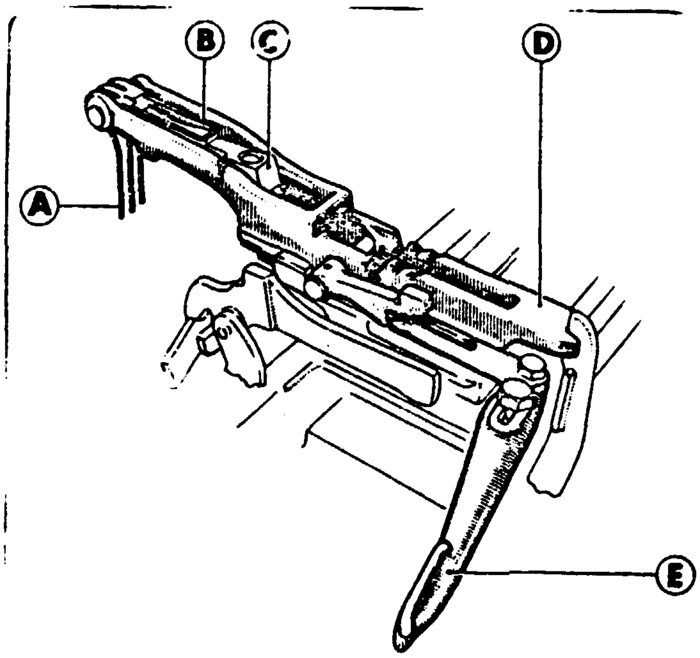
B. Mechanical feeler and transfer

C. Change control

5. A. Weft side fork.

1. Function :

The aim of the side fork is to stop the sley in the event of the weft breaking. Fig. 22.1 shows how it operates.



22.1

The fork "A" turns around its axis under the small pressure of the weft against the grid. The eye "B" of the fork is then freed from the hook "C" which moves to and from, controlled by a cam on the bottom shaft.

If the weft is broken, or if there is no weft, the fork enters into the grid. As the eye of the fork is therefore not raised it will be caught by the hook. This hook then pulls the slide "D" towards the weaver and the slide in its return disengages the loom by means of the lever "E".

The loom stops with the shuttle at the b.s.

2. Parts :

2.1. Filling motion strip stop

2.2. Filling motion stand

2.3. Filling fork slide spring

2.4. Filling fork slide

2.5. Filling fork slide pawl and pin

3. Assembling the weft side fork.

3.1. Replace filling strip stop with screw into filling motion stand. Tighten screw into filling fork slide spring.

3.2. Connect spring to filling fork slide and place into position on filling motion stand.

3.3. Place filling fork slide pawl pin into filling fork slide pawl. Insert pawl and pin into filling fork slide. Ensure that pin is behind filling motion strip stop.

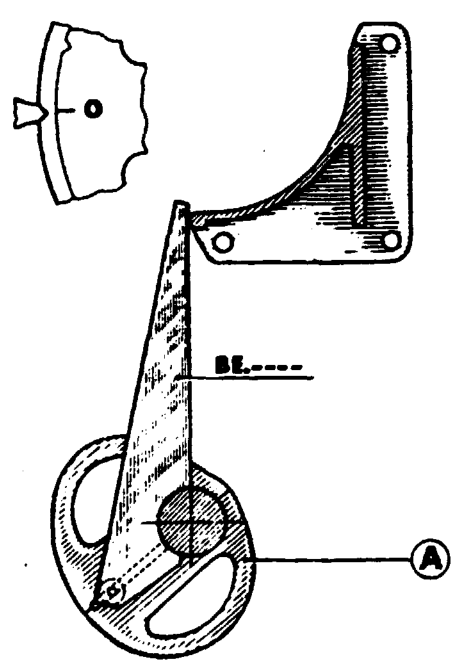
3.4. Replace split pin into filling fork slide pawl pin.

3.5. Ensure free movements of parts.

3.6. Position weft fork assembly into loom frame. Hand tighten nut.

4. Adjustments.

4.1. Position of the control cam (Fig. 22.3.)

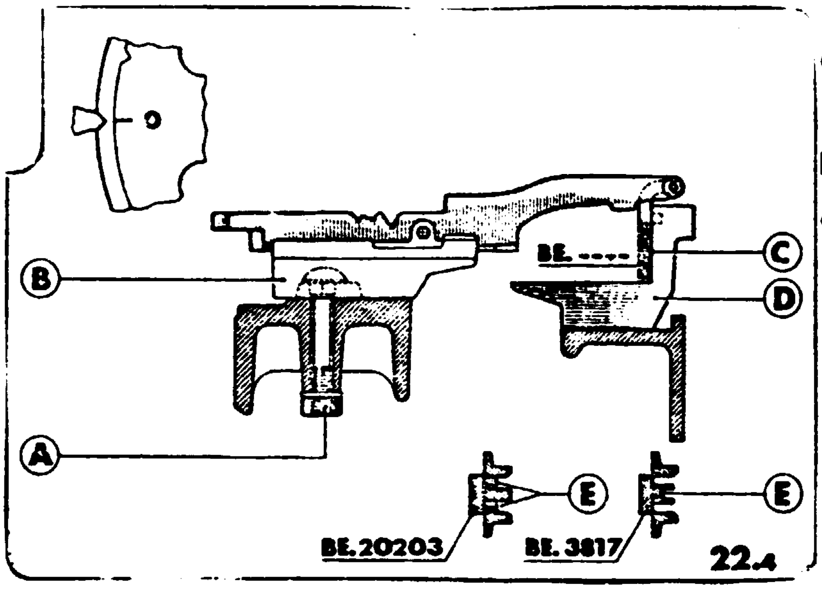


22.3

a) Sley position F.D.C. Shuttle in F.S.

b) Adjust the position of the cam "A" by means of the gauge BE.3134. The gauge, placed against the bottom shaft, is placed with its locating lug in the cam groove and must touch the cross part.

4.2. Depth and side position of the fork (Fig. 22.4.)

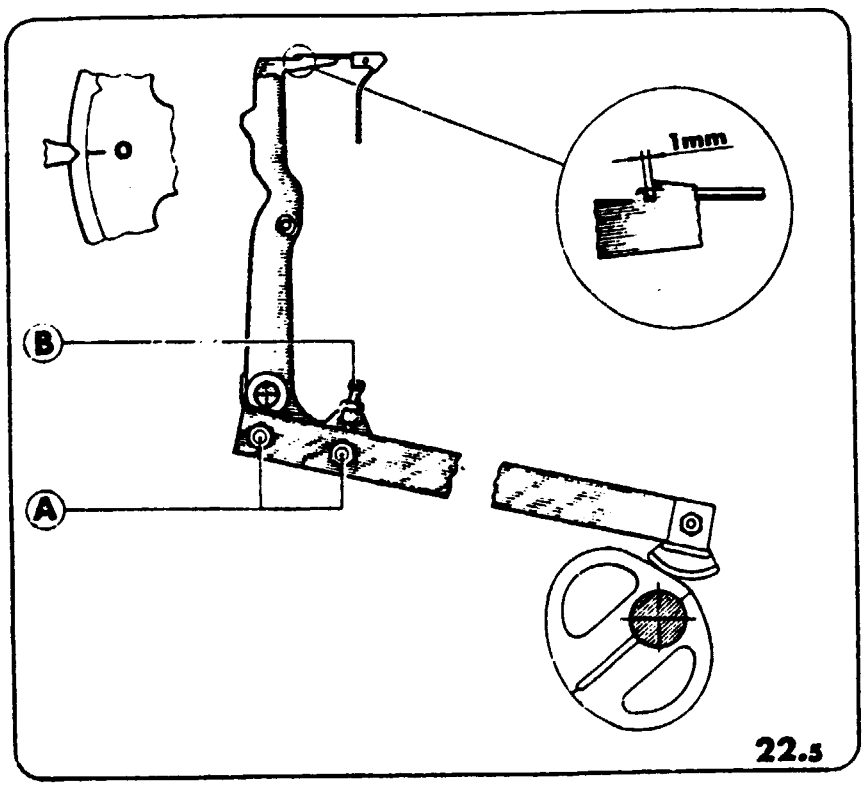


a) Remove the fork and place the gauge BE.3817 on the fork pin.
b) Sley position: F.D.C.
c) Slightly tighten the nut "A". Move the slide stand "B" until the face "C" of the gauge is fully in contact with the grid "D".

The pin "E" must be in the middle opening of the grid.

d) With the slide in this position tighten the nut "A". Remove the gauge.

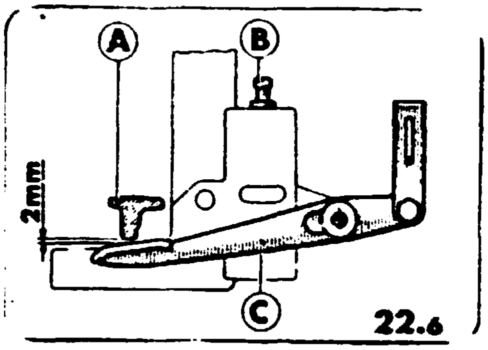
4.3. Clearance between the fork and the hook (Fig. 22.5.)



a) Sley position: F.D.C. Shuttle in F.S.
b) Slightly tighten the bolts "A"
c) Adjust for a clearance of 1 mm. between the fork eye and the hook, using the screw "B"
d) Tighten the nuts "A" and the lock nut on the screw "B".

Set with fork at the top of the hook.

4.4. Position of the pusher (Fig. 22.6.)



22.6

a) The fork is not hooked.
b) The starting handle is in the "engaged" position.
c) Adjust for a clearance of 2 mm. between the starting handle and the pusher "C" using the screw "B"
d) Lock the screw "B" by means of the locknut.

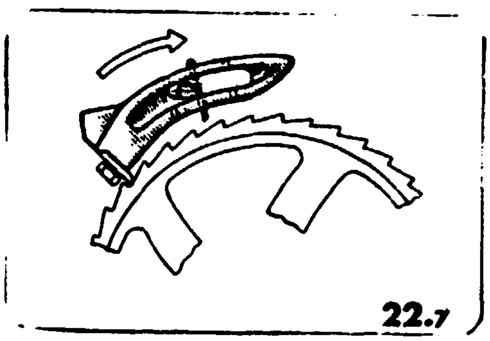
IT IS MOST IMPORTANT THAT AFTER MAKING ANY ADJUSTMENTS TO WEFT FORK SLIDE TO RE-CHECK TRANSFER MOTION SETTINGS.

....

REMARK: The grid must be clean
Any fluff stuck on it could lift the fork even if the weft is broken.

....

4.5. Position of the slack pawl. (Fig. 22.7.)

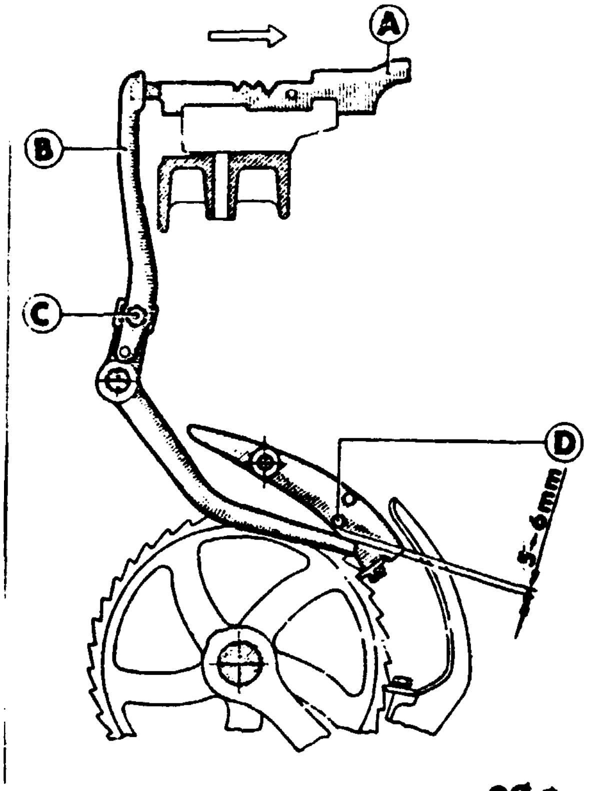


22.7

'ush this pawl as far as it will go towards ıe inside of the loom and place the Split pin behind the stud. The Split pin will therefore be in the middle of the hole. When proceeding this way, the regulator will not work for 2 picks when the weft breaks.

If the cloth require s the regulator to be lossened for one more pick, it is possible to place the split pin in the third hole.
In any case this pin must always be behind the stud.

4.6. Position of the pick return lever (Fig. 22.8.)

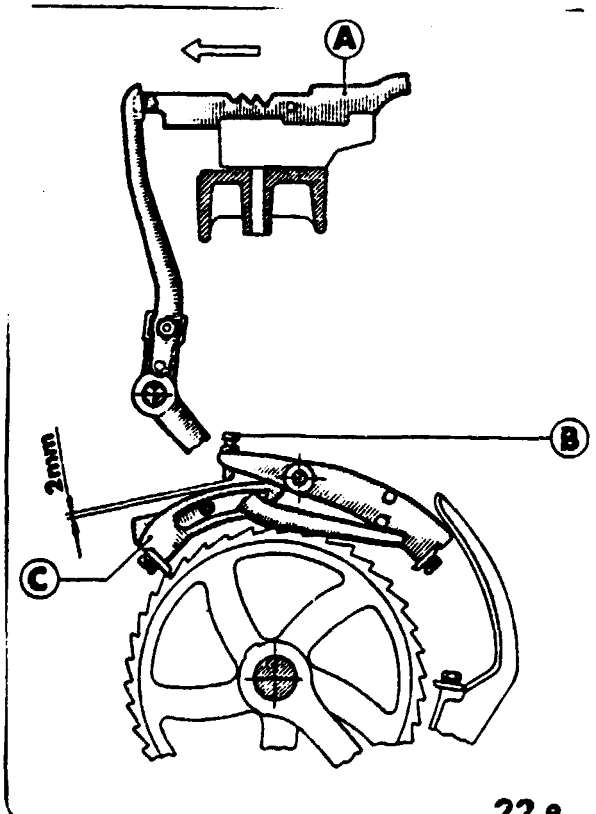


22.8

a) The fork is free, the slide "A" is therefore in its position, "fully away from the weaver". The lever "B" rests against the slide. The holdback pawl is at the base of a tooth.

b) Slightly tighten the bolt "C" and adjust for a clearance of between 5 and 6 mm. between the lever and the stop "D" of the hold back pawl.

4.7. Clearance between the screw and the pick return lever. (Fig. 22.9.)



22.9

a) The fork is held by the hook which has therefore brought the slide "A" to the end of its stroke towards the weaver.

b) Adjust for a clearance of approx. 2 mm. between the screw "B" and the pawl "C".

REMARK: The grid must be clean. Any fluff stuck on it could lift the fork even when the weft is broker

5. Loom problems created by side fork.

5.1. Thin places.

5.2. Broken picks.

5.3. Missing picks.

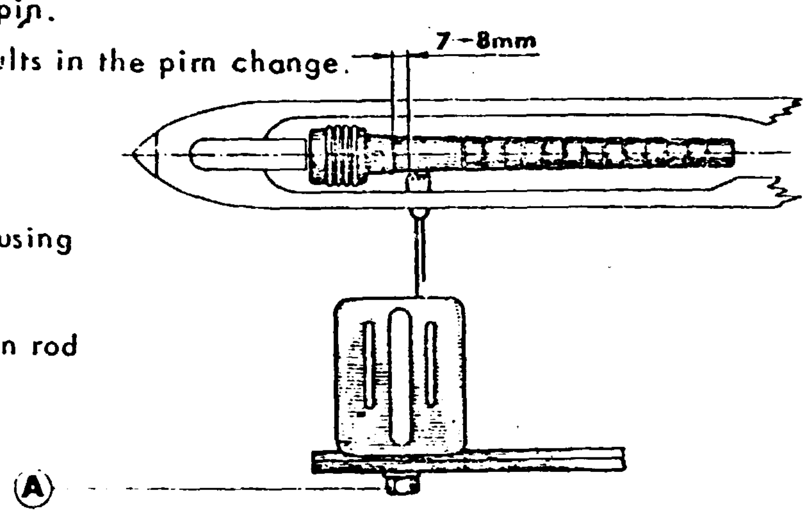
5.4. Knock-off on change.

1. Function.

The feeler has a sliding motion as the loom begins to use the reserve on the pirn.
This motion results in the pirn change.

2. Parts.

2.1. Feeler housing
2.2. Feeler
2.3. Connection rod
2.4. Latch.



3. Adjustments.

24.

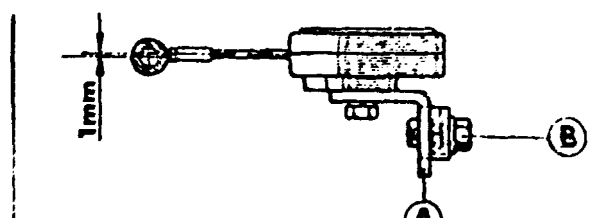
Place a pirn, which only has its reserve of weft, in the shuttle and push the shuttle right into the box. The shuttle must be in its stop position. The shuttle tip is in the picker.

3.1. Side position (Fig. 24.1.)

a) Rotate the sley until the feeler is going to touch the pirn.
b) Slacken the nut "A" and move the unit horizontally until the distance between the feeler and the reserve is 7 to 8 mm. The distance should be more than 8 mm. for thick wefts.
c) Slightly tighten the screw "A". The box should remain horizontal.

3.2. Height (Fig. 24.2.)

a) Move "A" vertically so that the feeler axis is 1 mm. higher than the pirn axis.
b) Tighten the screw "B".



24.2

3.3. Depth (Fig. 24.3.)

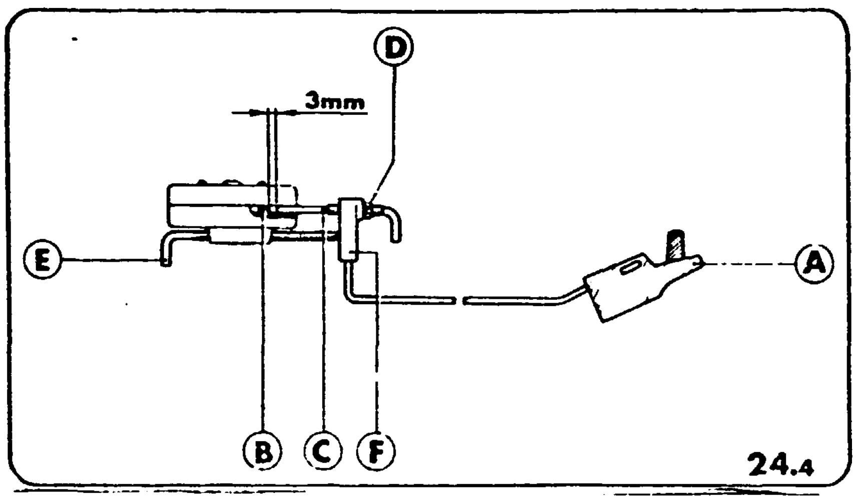
a) Sley position: F.D.C.
b) Loosen the screw "A" and move the box until there is a clearanc of 1 to 2 mm. between the pirn and the tip of the feeler in the "away" position. The feeler must not go back into the box: it only revolves around "B".
c) Check that the box is truly at right angles to the pirn axis and tighten the screw "A".

?.4. Position of the driving rod. (Fig. 24.4.)

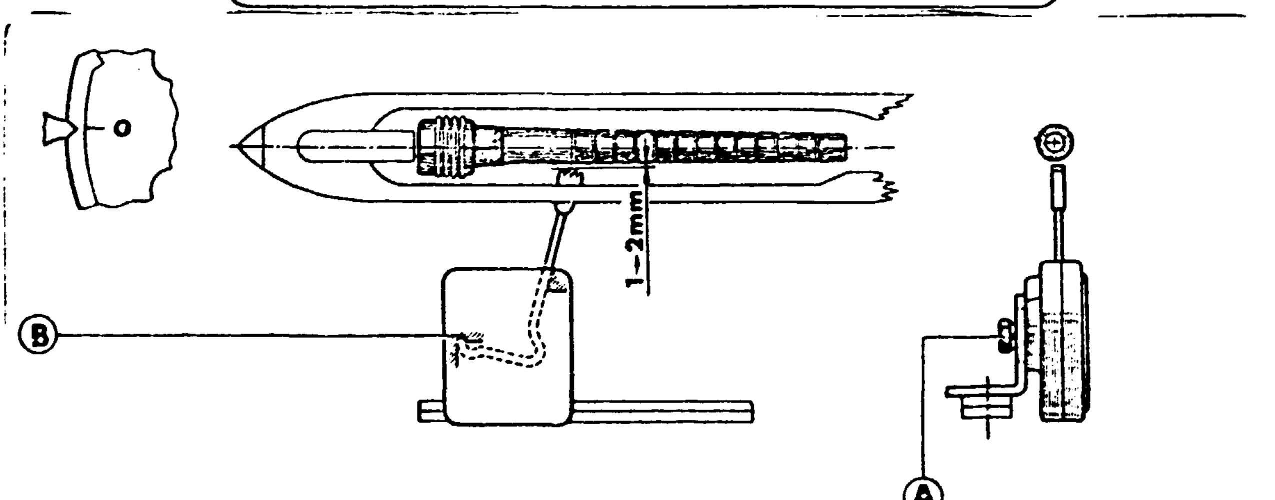
a) The feeler is in the rest position. The latch "A" is against its stop.

b) Adjust for a 3 mm. clearance between the feeler "B" and the small hook "C".
Tighten the nut "D".

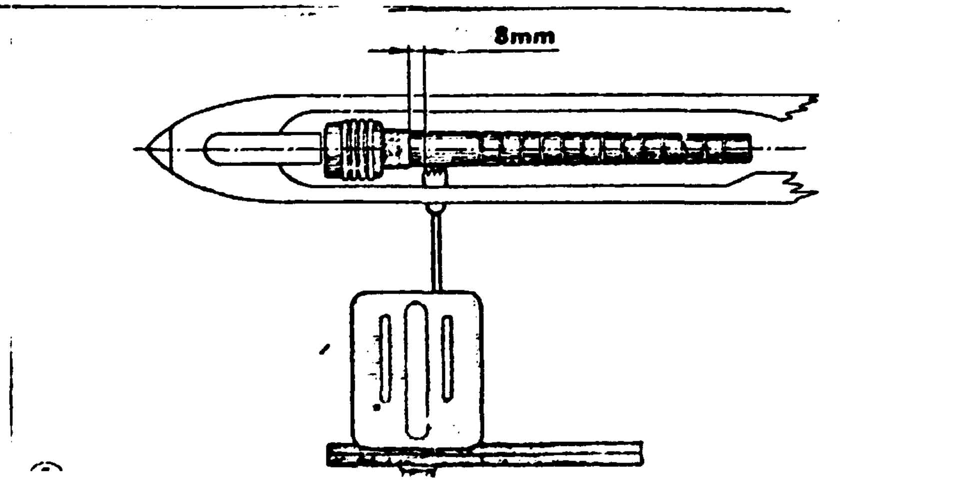
c) Turn the hook "E" so that it merely touches the nylon piece "F"
The driving rod must still have a minimum clearance when the sley is in the F.D.C. position, the feeier working.



24.4

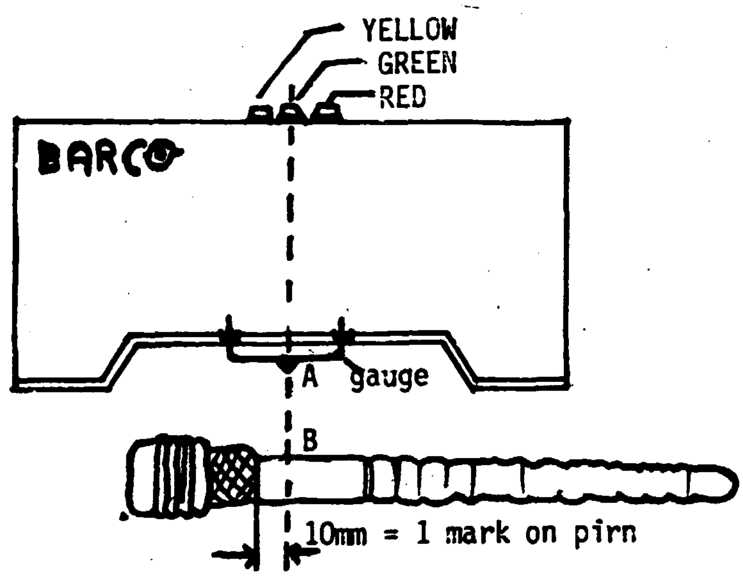


24.3



BARCO - I K 109

Photo-electronic weft feeler
Used at M.Farooq - Picanol 103" - CL



ADJUSTMENTS

For adjustment, the light indicators on the detection head are used. This adjustment can only be done when unit is connected. The provisory adjustment of the detection head is as follows :

- shuttle on line
- the detection head is adjusted laterally until point A (axis of the detection head) is perpendicularly under point B (10mm over the reserve)
- in the hight, the detection head is adjusted 10 mm above the box plate.

NOTE

- the ideal height is obtained by adjustment by means of the light indicator when diffusion takes place.
- the lateral position can eventually be adjusted, when the pirns have been changed with more weft yarn on, than required for reserve.

Group 5C. : Change control.

1. Function:

Replace an empty pirn by a full one when needed.

2. Parts :

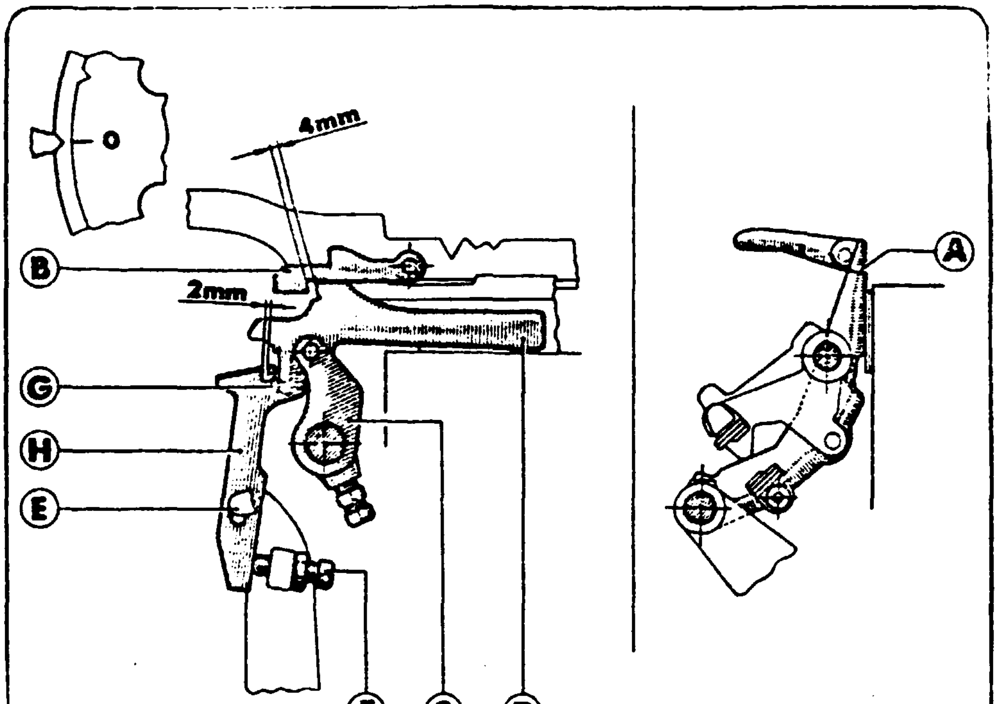
2.1. Filling feeler slide
2.2. Filling feeler slide hub (intermediate lever)
2.3. Lifting lever connection rod
2.4. Filling cam hub
2.5. Filling forkslide pawl stop
2.6. Knife
2.7. Latch
2.8. Transfer stud
2.9. Cutter release lever spring
2.10. Hammer
2.11. Transfer reverse link
2.12. Stop collar
2.13. Feel side lever
2.14. Clearer tube bracket
2.15. Filling knife carrier link
2.16. Hopper stand
2.17. Bobbin guide
2.18. Temple cutter release lever
2.19. Temple cutter release lever guide
2.20. Bobbin support.

3. Assembling the Transfer.

3.1. Replace filling feeler slide in filling feeler slide hub (intermediate lever)
3.2. Replace straddle bug in position with grooved washer on the filling cam hub.
3.3. Replace filling fork slide pawl stop.

4. Adjustments at the transfer.

4.1. Position of the filling feeler slide hub (Fig.27.3.) (intermediate lever).



27.3

a) Sley position: F(ront) D(ead) C(enter)
Shuttle at feeler side.
The arm "A" of the controller is in the rest position against the frame of the loom.

b) Place the hook "B" of the side fork in the position as shown on the figure.

c) Fasten the intermediate lever "C" to obtain a clearance of 4 mm. between the hook "B" and "D".

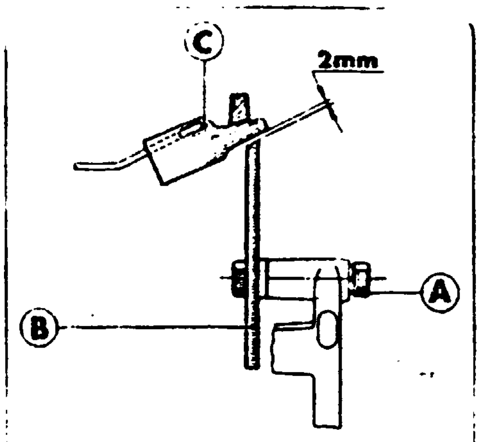
d) Slightly tighten the bolt "E" and adjust for a clearance of 2 mm. between the latch "G" and the "knife" "H" by means of the adjusting screw "F".

4.2. Height of the " knife " (Fig. 27.4.)

a) Sley position: immediately after F.D.C., shuttle on F.S.

b) Loosen the nut "A" and adjust for a clearance of 2 mm. between the "knife" "B" and the latch "C".

The latch touches its upper stop.



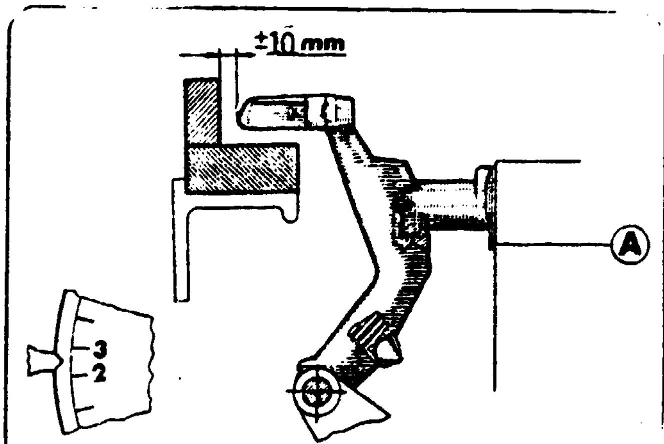
27.4

4.3. Shuttle feeler (Fig. 27.5.)

Begin a change and stop the sley at 2,5 shuttle B.S.

The plastic controller (feeler) must be ± 10 mm. from the box back when the dog has just touched its pointed stop on the sley.

Adjust this position by means of shims "A".



27.5

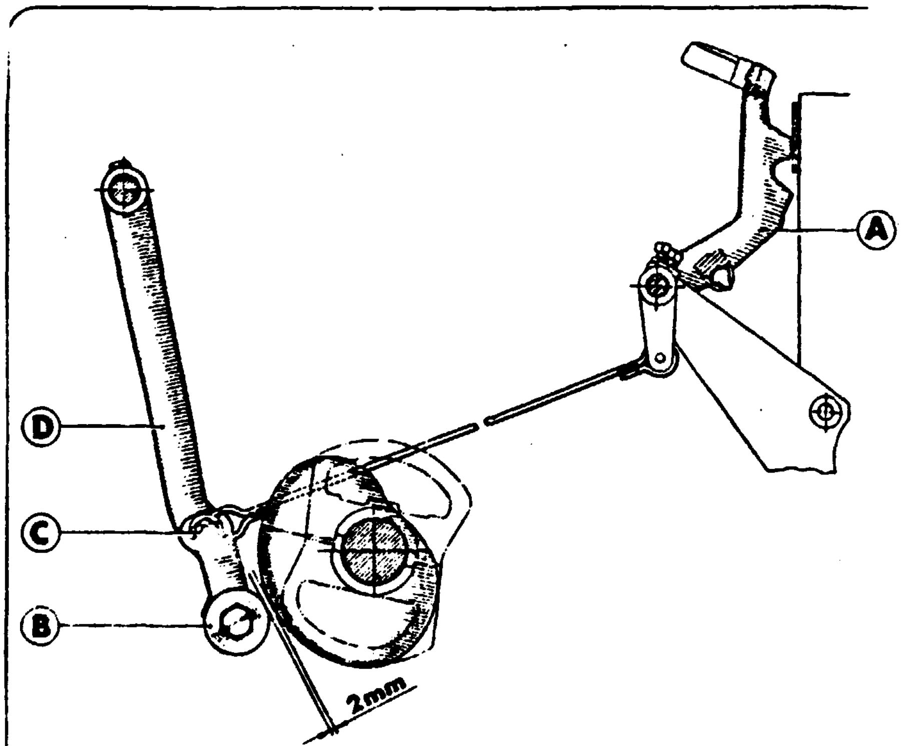
4.4. Clearance between controller roller and cam (Fig. 27.6.)

a) The controller arm "A" is in its rest position against the frame of the loom.

b) Turn the loom so that the roller "B" is opposite the large radius of the cam.

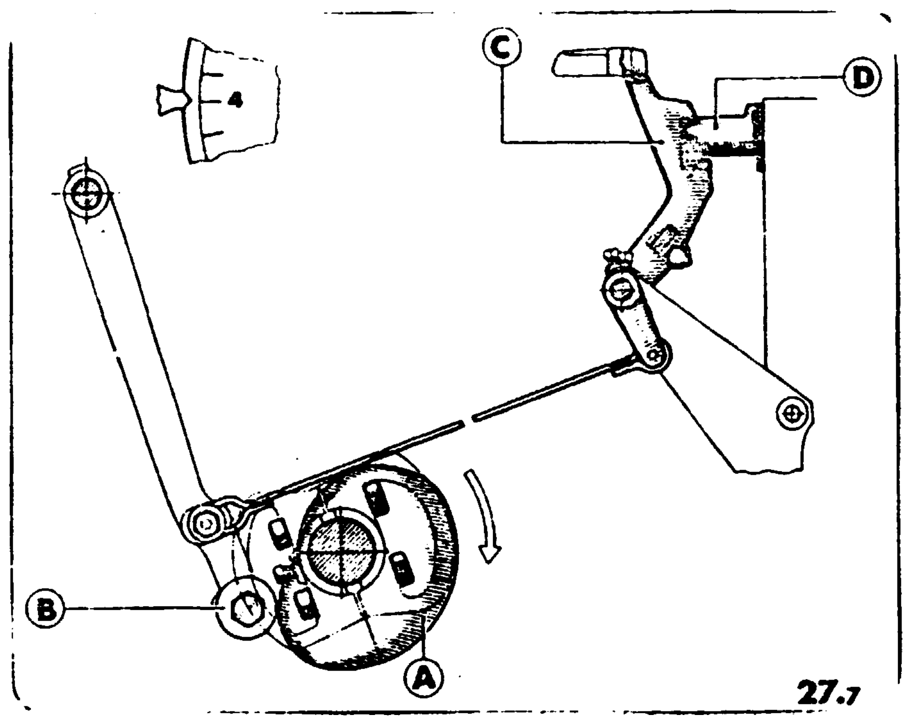
REMARK: It is also possible to rotate the cam on the bottom shaft if the cam position is still to be adjusted.

c) Give 2 mm. clearance between the roller and the cam by moving the screw "C" along the slide of the lever "D".



27.6

4.5. <u>Position of controller cam (Fig. 27.7)</u>



27.7

a) Begin a change.

b) Sley position: 4 - Shuttle on B.S.

c) Rotate the cam "A" as shown by the arrow until the roller "B" touches the cam.

The arm "C of the controller is against its stop "D" and must not leave it. Fix the cam temporarily.

Check: Starting with the sley at 4, slightly turn the loom by hand a bit towards the rear and then slowly towards the front.

Watch the movement of the dog: it must stop rising when the loom arrives at 4. In this case, you can fix the cam on the bottom shaft.

REMARK:

As this cam is integral with the temple cutter cam, the latter is automatically adjusted.

5. Loom problems created by Transfer and Hammer.

a) High.

5.1. Hang bobbin

5.2. Break weft on change

5.3. Damage shuttle

5.4. Damage hammer

b) Low.

5.11. Break on change

5.12. Knock pirn through shuttle

5.13. Damage shuttle

5.14. Damage hammer

5.15. Damage box plate.

Group: 6 A. Battery

B. Pirn change

6.A. Battery (magazine)

1. Function:

Holds the pirns (bobbins) for the change.

2. Parts :

2.1. Pirn but holder (bobbin disc) with ratchet wheel
2.2. Pirn trip holder (small end disc)
2.3. Thread guide
2.4. Thread holder
2.5. Small end disc bobbin holder
2.6. Bobbin weft holder ring
2.7. Hopper stand
2.8. Bobbin support (guide) with eccentric bush.

3. Adjustments :

3.1. Placing a new change holder (Fig. 28.1. and 28.2.)

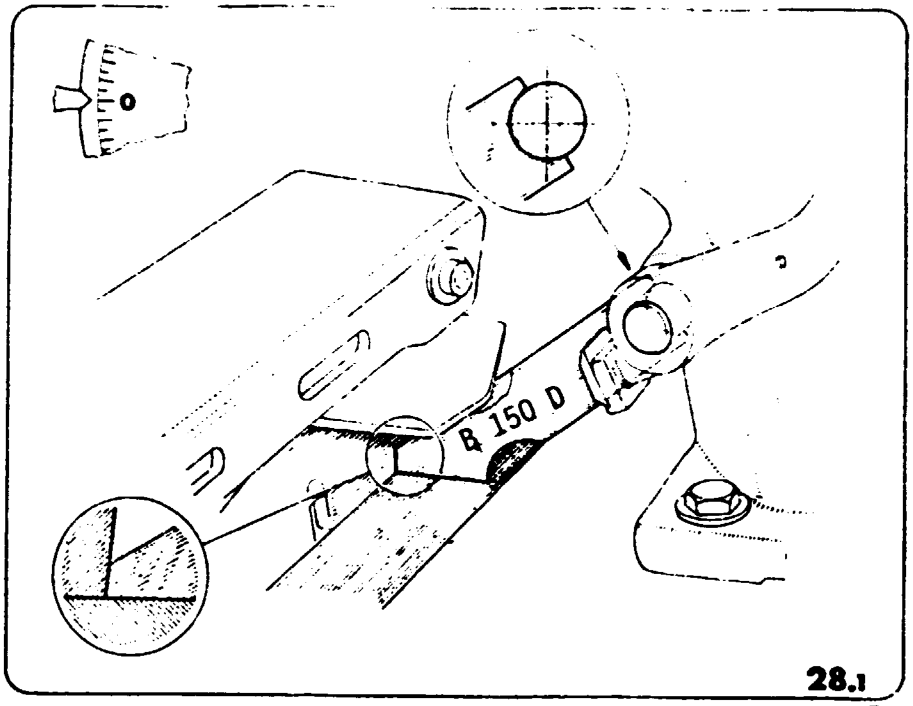
a) Sley poistion: F.D.C.

b) Place one of the following gauges as shown on figure 28.1. and 28.2.

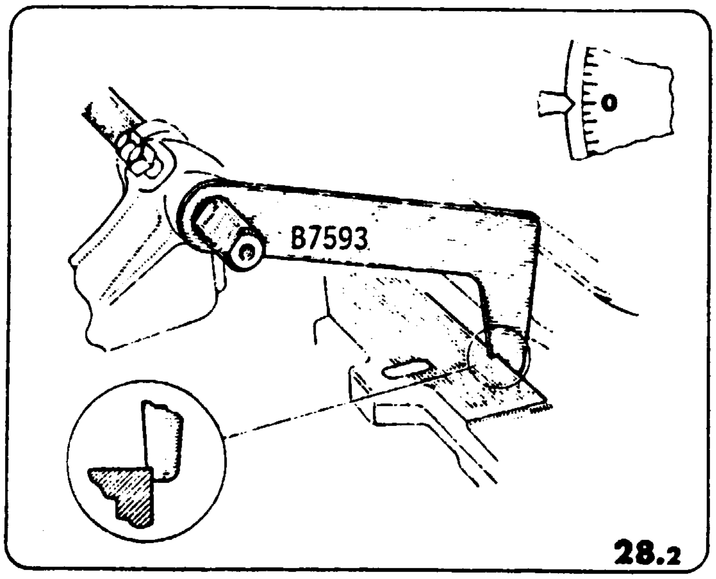
Number of gauges for battery or Unifil :
Width of the shuttle in mm. 50,75: gauges 42274 and 42277.

c) Move the bracket along the frame until both gauges are in the correct position (according to fig. 28.1 and 28.2)

REMARK: On the new looms the brackets are in the correct position held by two pins. This position may not be altered.



28.1



28.2

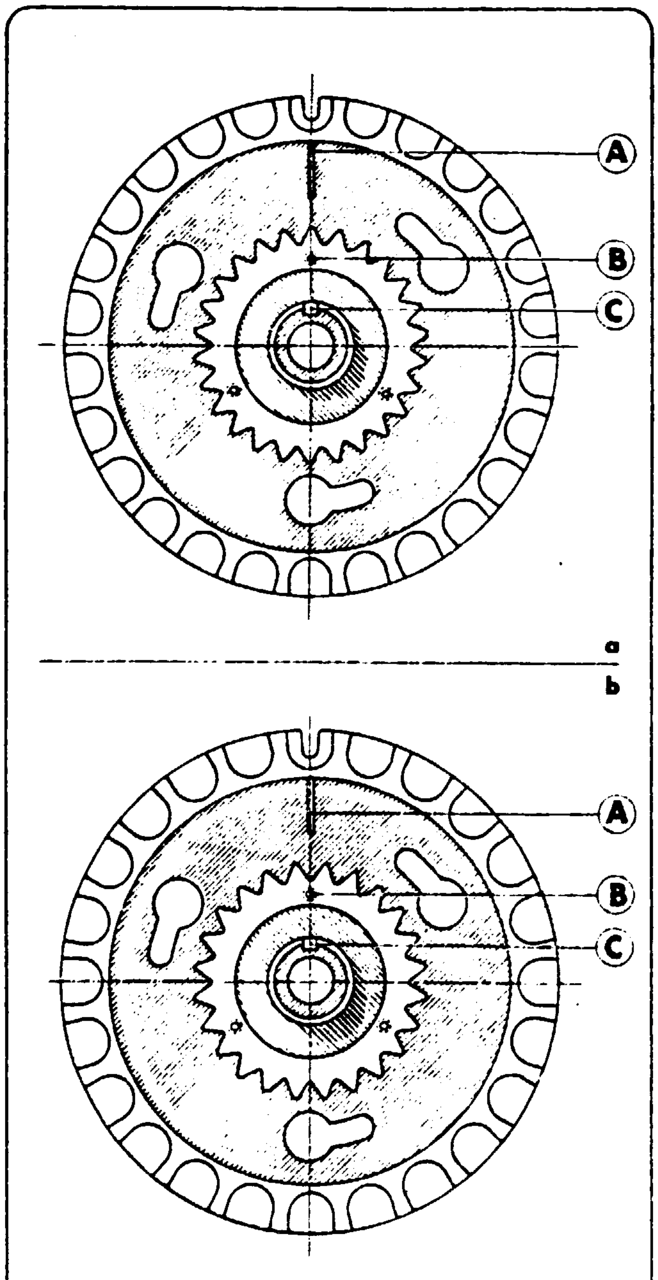
3.2. Position of the pirn-butt holder disc (Fig. 28.3)

a) Slacken the 3 mounting screws through the change holder hole.

b) Align:

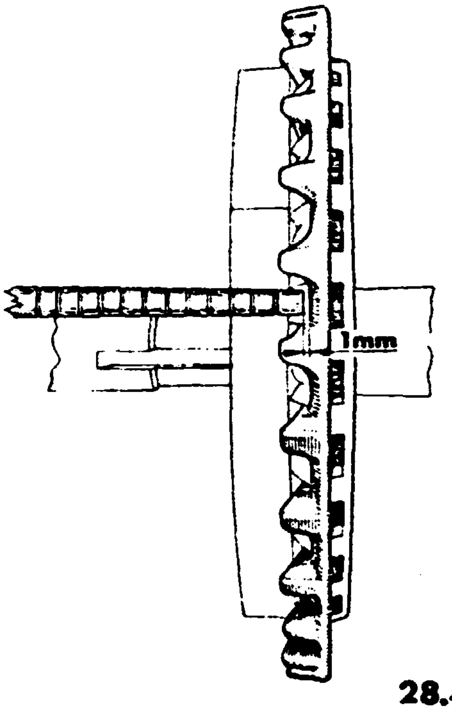
- the mark "A" on the pirn-butt holder.
- the screw "B" which is in the middle of a tooth (for a ratchet wheel with one single screw in the middle of a tooth).(Fig.28.3.a.)
  or: one of the 3 screws "B" (for a ratchet wheel with 3 screws, all of which are at the V between two teeth).(Fig.28.3.b.)
- the keyway "C".

c) Check that the pirns are parallel with the axis of the magazine.



28.3

Adjust for a 1 mm. clearance between the tip of the pirn and the metal part of the tip-holder disc. Check on this clearance at several points on the circumference.



28.4

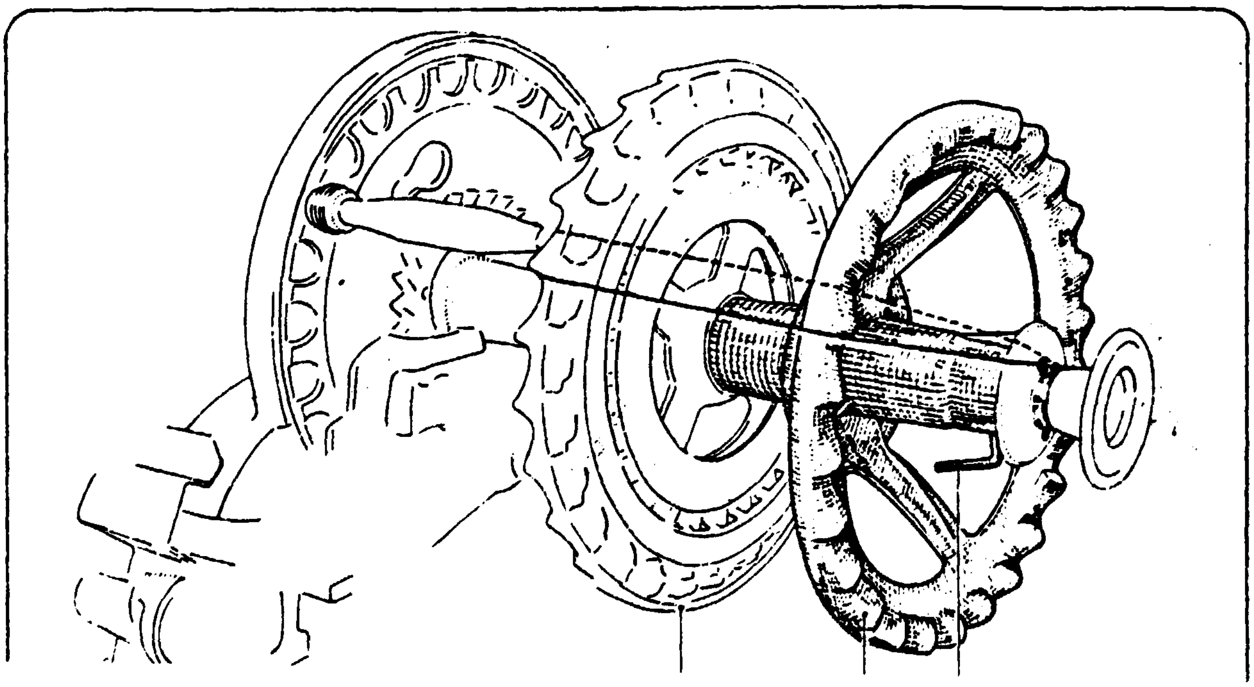
3.4. Position of thread guide disc and direction of threads ends (Fig.28.5)

a) Tighten the thread guide disc "A" against the pirn holder disc "B".

b) Place the threads:

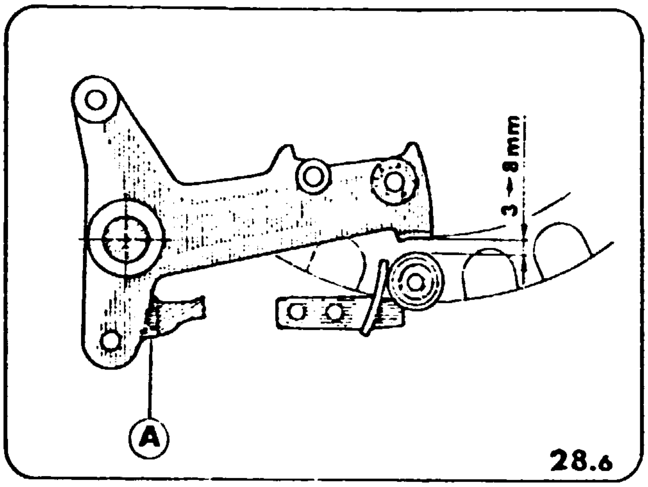
- as shown on the figure by the dotted line: for looms with central weft fork.
- as shown on the figure by the thick line: for looms with side weft fork.

c) The hook "C" of the thread holder must be turned inwards.



3.5. Hammer rest position (Fig. 28.6)

When fitting a new hammer, check that there is a clearance of between 3 and 8 mm. between the pirn rings and the hammer in its rest position.
Limit the hammer stop "A" if necessary.

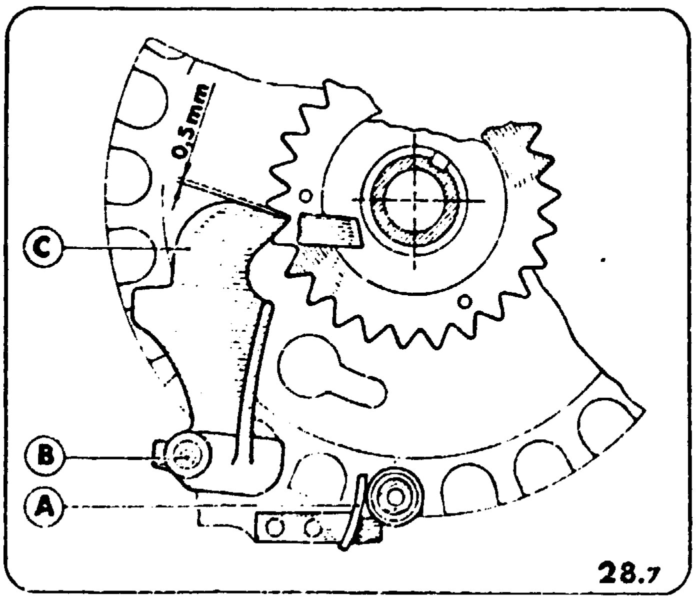


28.6

3.6. Position of the stop pawl (Fig. 28.7)

a) Place a pirn in the magazine and press it against its fixed guide "A".

b) Adjust eccentric pin "B" for a maximum clearance of 0,5 mm. between the top of the stop àawl "C" and the tooth immediately above.



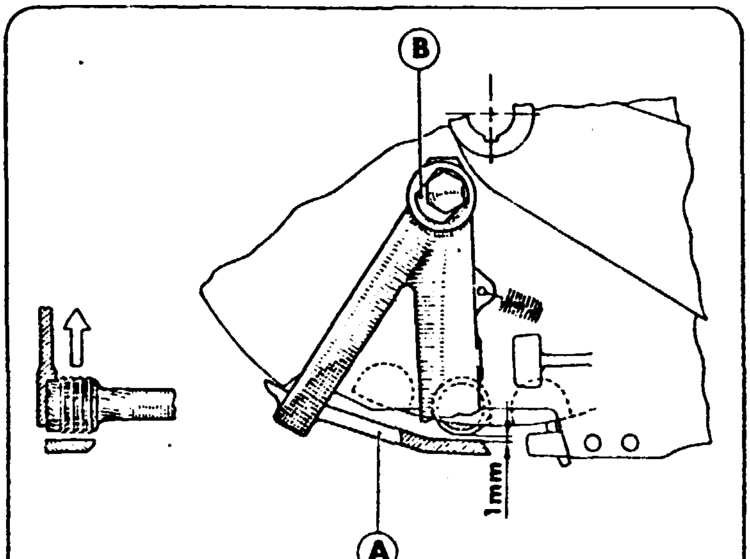
28.7

3.7. Clearance between the pirn and mobile guide (Fig. 28.8)

a) Place a pirn right at the top in the recess of the pirn holder disc.

b) Bring the pirn above the mobile guide "A" as shown on the figure.

c) Adjust eccentric bush "B" until there is a clearance of 1 mm. between the pirn rings and the mobile guide.

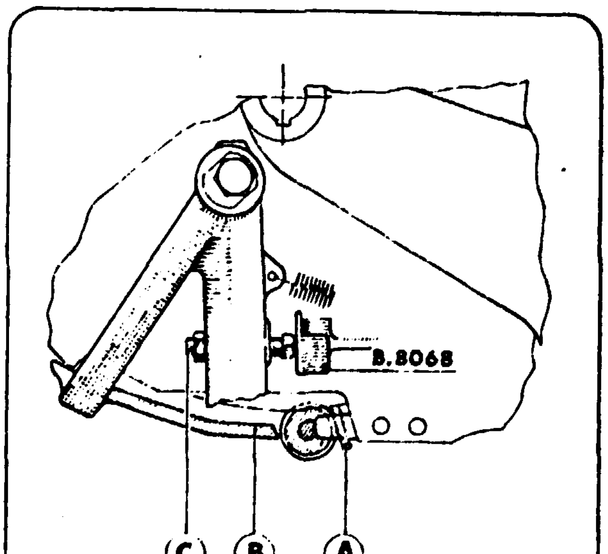


28.8

3.8. Angle of mobile guide (Fig. 28.9)

a) Place a pirn so that the full diameter of the rings is between the fixed guide "A" and the mobile guide "B".

b) Adjust for a 1,5 mm. clearance between the adjusting screw "C" and the stop, by means of the adjusting screw "C".
Check on this clearance by means of the gauge B.8068 as shown on the figure.



28.9

4. Loom problems created by the battery :

4.1 Break weft on change

4.2 Break pirns

4.3 Break shuttle

4.4 Smash

4.5 False change

4.6 Damage pirn tips.

6.B. Pirn change

1. Function :

To change an empty pirn in the shuttle with a full bobbin from the battery.

2. Parts :

2.1 Hammer
2.2 Hold back pawl
2.3 Feed pawl
2.4 Transferrer reserve link
2.5 Eccentric bush
2.6 Latch finger or Dog
2.7 Controller arm with shuttle feeler
2.8 Temple cutter release lever guide
2.9 Temple cutter release lever
2.10 Transfer stud
2.11 Bobbin disc stud
2.12 Transferrer spring

3. Assembling the hammer (B.S.) :

3.1. Replace latch depresser on shuttle feeler
3.2. Replace transmission lever in front position and insert transfer stud making sure that temple cutter release lever spring is in position, also that parallel key is inserted in keyway.
3.3. Replace hammer assembly onto transfer stud, check position of the transfer stud and tighten.
3.4. Slide hammer assembly into position ensuring that latch stud is in position in latch depresser.
3.5. Connect transfer reverse link to hammer with link pin and secure with split pin.
3.6. Replace stop collar on transfer stud.
3.7. Slide feeler side lever onto transfer stud at the same time replacing clearer tube bracket.

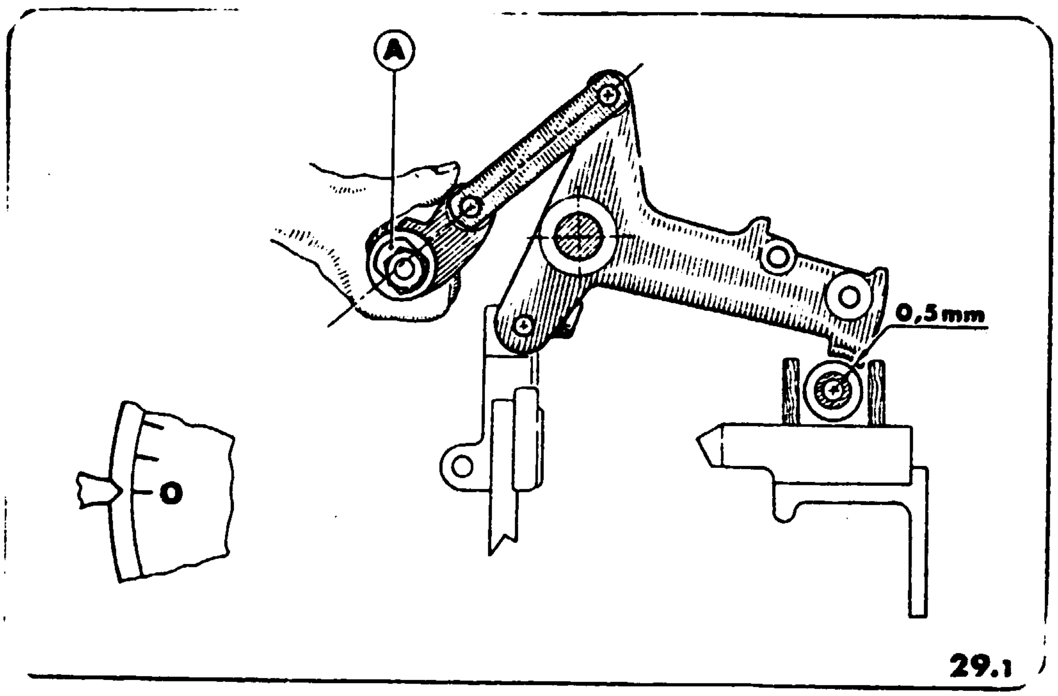
3.8. Connect feeler side lever to filling "knife" carrier link making sure that bushes are in position.

3.9. Replace shuttle eye cutter assembly on transfer stud.

3.10. Replace transmission lever cap on hopper stand.

4. Adjustments :

4.1. Adjusting the eccentric bush (Fig. 29.1)



29.1

a) The sley is still in the same position.

b) Press by hand so that the three centres of rotation of the hammer return device are on the same axis. There should be a clearance of 0,5 mm. between hammer and the pirn rings in this lowest position (Notice that the shuttle is at rest on the box plate)
Adjust by means of eccentric bush "A".

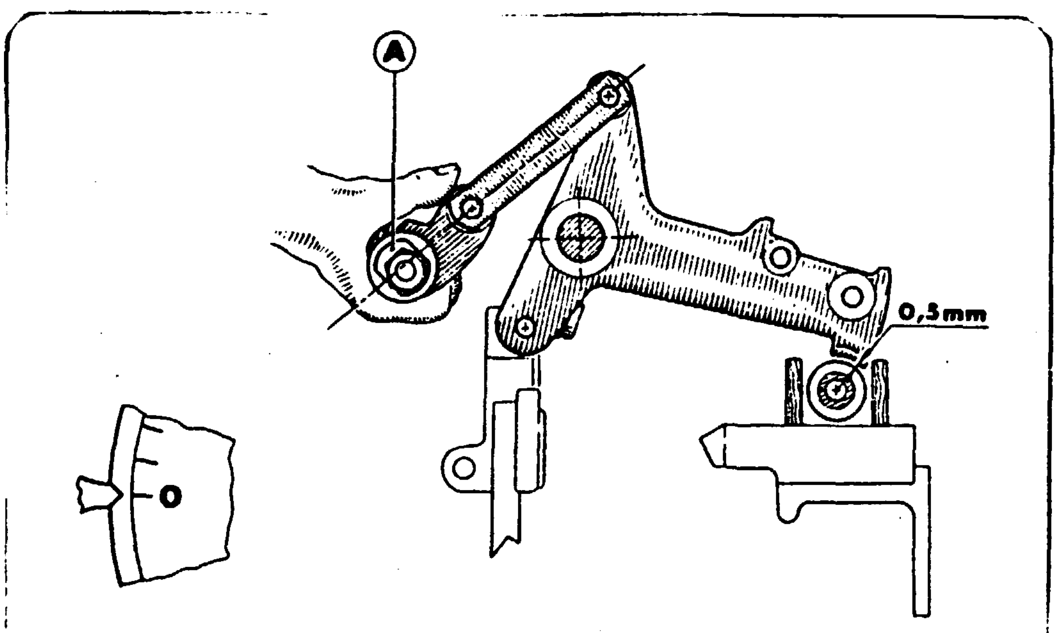
3.8. Connect feeler side lever to filling "knife" carrier link making sure that bushes are in position.

3.9. Replace shuttle eye cutter assembly on transfer stud.

3.10. Replace transmission lever cap on hopper stand.

4. Adjustments :

4.1. Adjusting the eccentric bush (Fig. 29.1)



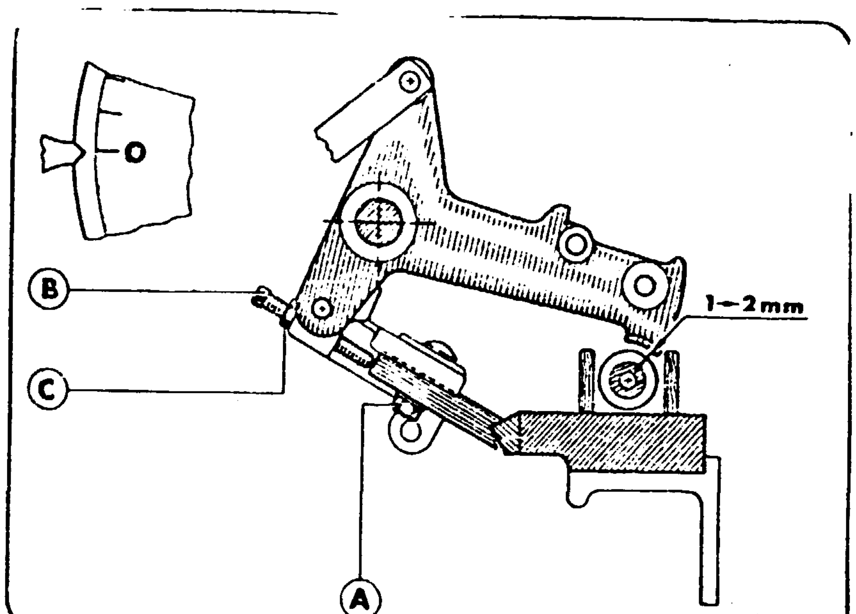
29.1

a) The sley is F.D.C. and shuttle in B.S. box. No change.

b) Press by hand so that the three centres of rotation of the hammer return device are on the same axis. There should be a clearance of 0,5 mm. between hammer and the pirn rings in this lowest position (Notice that the shuttle is at rest on the box plate).
Adjust by means of eccentric bush "A".

4.2. Length of dog (Fig. 29.2.)

a) Sley position: always with a change motion, turn the sley until it is at F.D.C. Take care that the hammer return mechanism is not distored during this operation because of the eccentric bush which is not yet adjusted ' "A" on fig. 29.3).
The lever ("E" on fig. 29.4.) must not touch its limitator.
The shuttle is in the B.S. box and rests on the bottom of the box.



29.2

b) Slightly tighten the nut "A". By means of the screw "B" adjust for a clearance of 1 to 2 mm. between the pirn rings and the hammer:
- for speeds of up to 200 r.p.m.: 1 to 2 mm.
- for speeds above 200 r.p.m.: 2 mm.

c) Tighten the nut "A" and check the position of the hammer. If it is correct, tighten the lock nut "C".

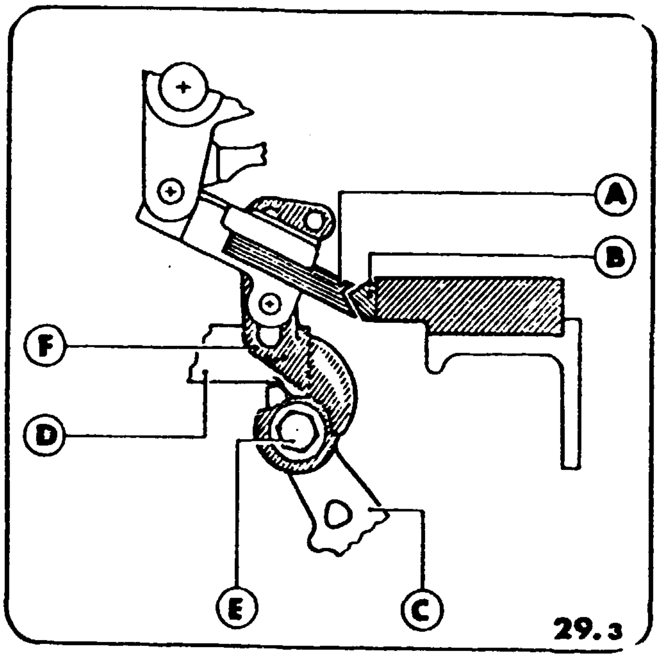
REMARK: It will be necessary to carry out again adjustment a. if the dog has had to be lengthened or shortened appreciably during the adjustment.

4.3. Adjustments of the hammer (B.S.): height of the dog (Fig. 29.3)

a) Begin a change movement.

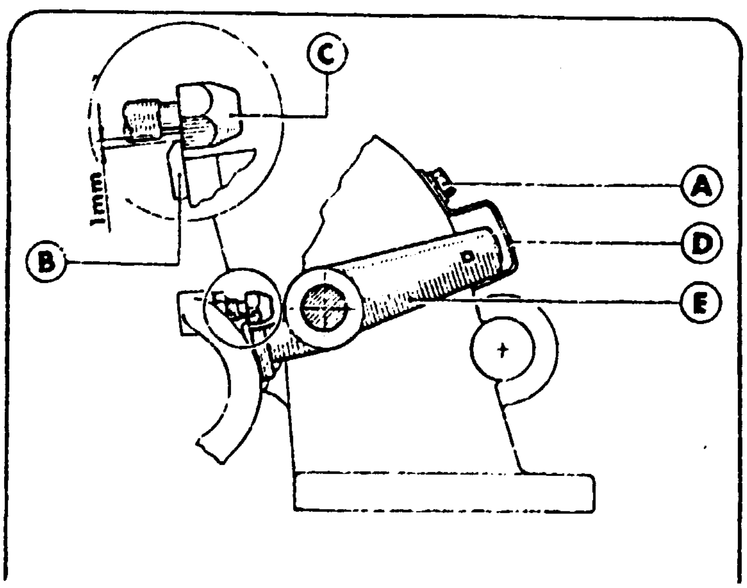
b) Turn the loom until the dog "A" is approximately 1 mm. from the pointed stop "B". The controller arm "C" is against its stop "D".

c) Slacken the screw "E" and adjust position of the driving piece of the dog "F" until the height of the dog corresponds with the pointed stop on the sley.



29.3

4.4. Transmission lever stop (Fig. 29.4.)



a) The hammer is in its rest position (therefore at the top).

b) Slacken both screws "A"

c) Adjust for a 1 mm. clearance between the plate "B" and the shank of the adjusting screw "C" by moving the plate "D". Check that the limitator is parallel to the transmission lever "E".

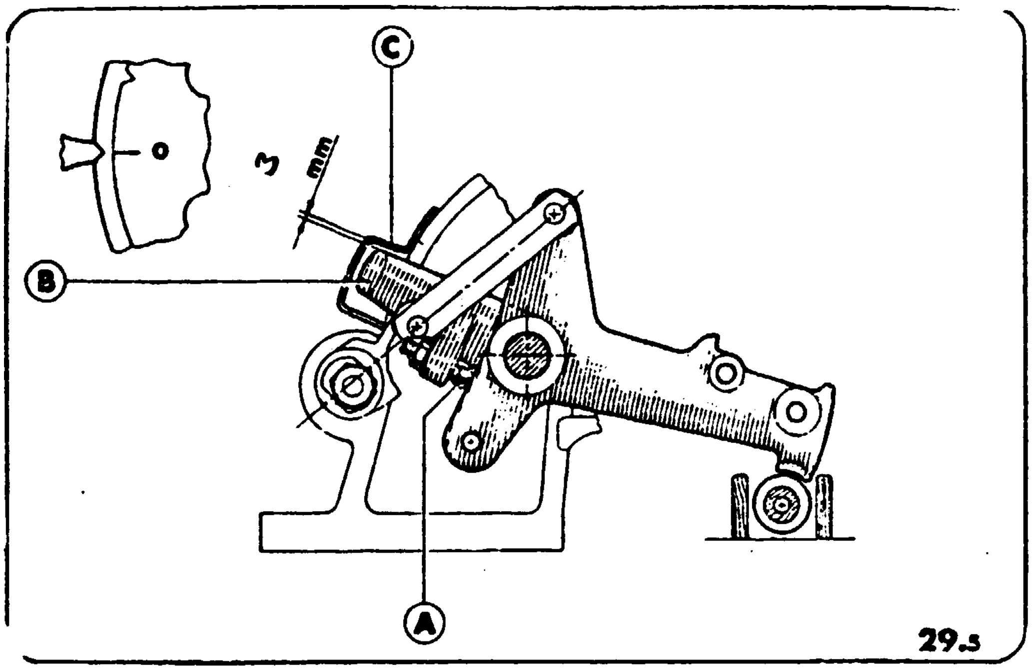
d) Lock both screws "A".

4.5. Stroke of transmission lever (Fig. 29.5.)

a) sley position: F.D.C. Hammer in lowest position & correctly adjusted

b) By means of the adjusting screw "A" adjust for 3 mm. clearance between the transmission lever "B" and the plate "C".

c) Lock the adjusting screw by means of the lock nut.



29.5

5. Looms problems created by pirn change.

5.1. Lash in
5.2. Break weft
5.3. Break on change
5.4. False change
5.5. Hang bobbin
5.6. Run out
5.7. Breakshuttle
5.8. Break pirns
5.9. Break shuttle bottom plate
5.10. Break hammer or bend hammer spindle
5.11. Knock-off on change
5.12. Smash
5.13. Personal injury
5.14. Broken pick

7. A. Shuttle eye cutter.

1. Function :

To cut the yarn of the ejected pirn at pirn-change.
The yarn is held before it is cut. Once closed, the cutters return to the back still holding the yarn which will then be cut by the temple cutter.

2. Parts :

2.1. Cutterblades with spring
2.2. Thread gripper pusher plate
2.3. Shuttle slot
2.4. Dog
2.5. Cutter driver
2.6. Drive lever and stud
2.7. Locating pin
2.8. Axle for driving bridge
2.9. Brass bushing
2.10. Filling knife support and safety device
2.11. Filling knife carrier
2.12. Pawl holder and pawl
2.13. Stop with slide and movable blade

3. Assembling :

The cutter-unit is placed on slide ensuring that blades are positioned correctly.

4. Adjustment :

To ensure the best operation of the shuttle-eye cutter the fixed blade is slightly bent inwards. Remember this when sharpening the cutters to improve their cutting action.
The thread gripper must be polished and smooth.
The operation of the cutters must be perfect.
Great care must therefore be taken when adjusting them.

4. Adjustments.

4.1. Side position of the shuttle-eye cutters (Fig. 30.2)

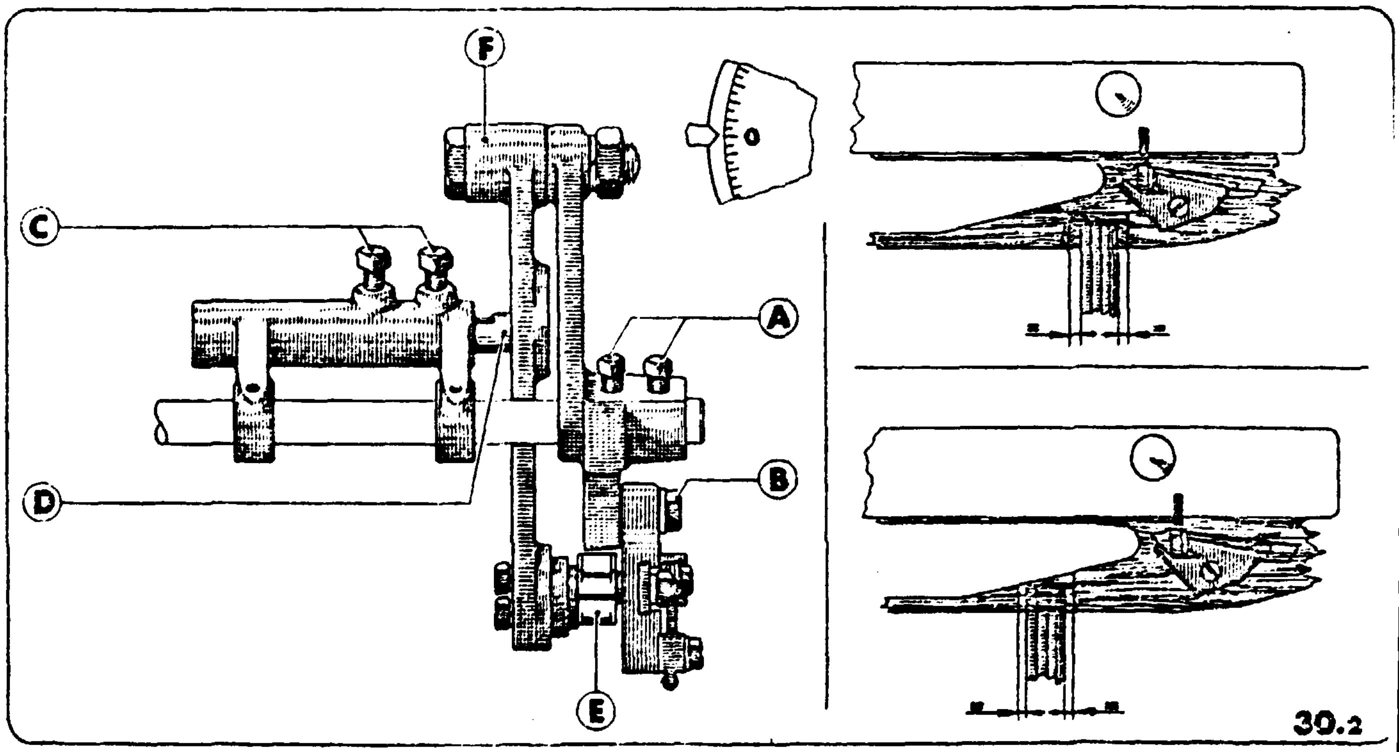
a) Having started a change movement, turn the sley at F.D.C. The shuttle us on the B.S. and in its stop position: the marks on the shuttle upper guide and on the shuttle itself must coincide.

b) Slacken the screws "A" and place the cutters exactly in the middle of the slot in the shuttle.

c) Fasten all by means of the screws "A".

d) Adjust provisionally the height of the points of the cutters by means of the nuts "B", so that the open blades are in contact with nothing.

e) Loosen the two pressure screws "C" (see fig. 30.2) and set the rod "D" against the wall in the blind hole of the lever "F".



30.2

REMARK:

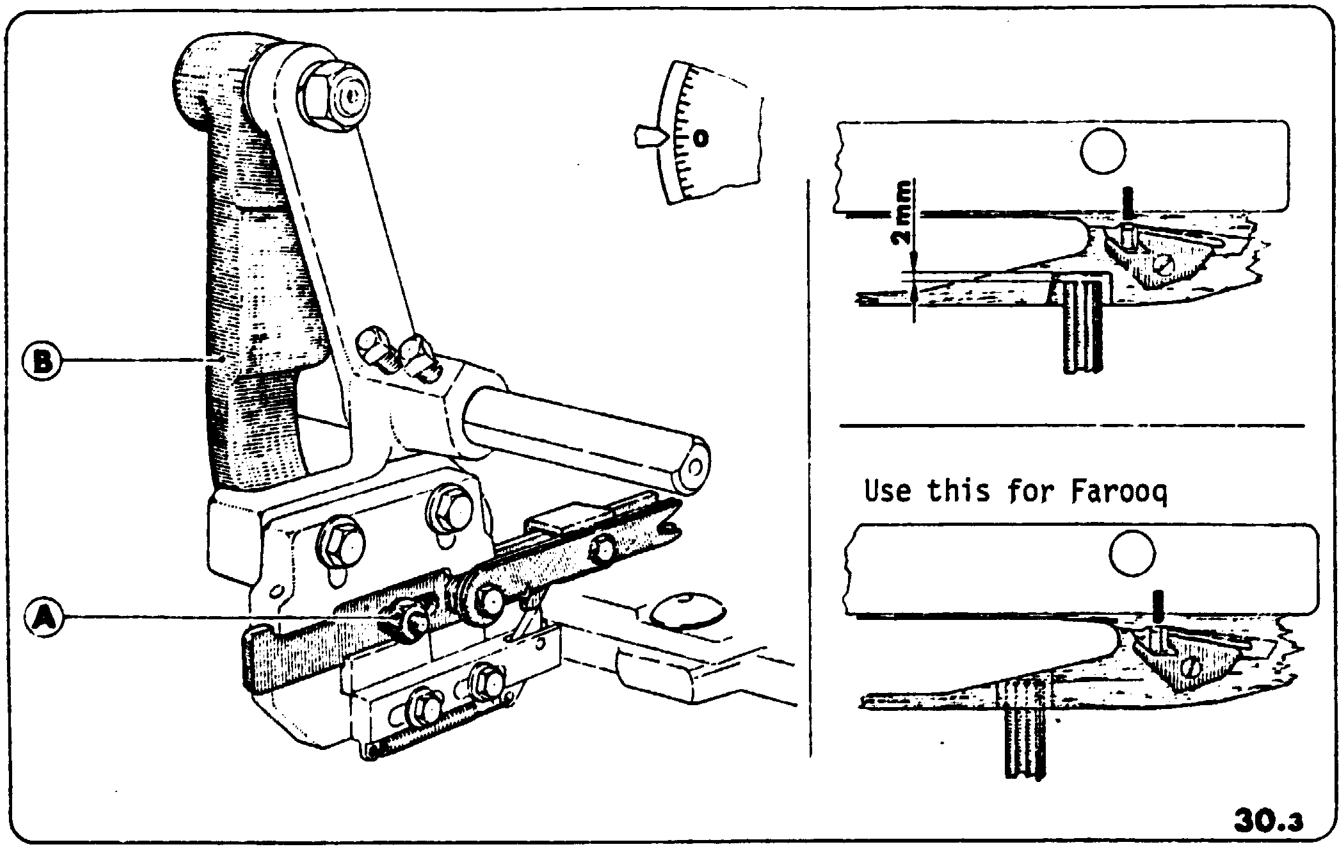
If the shuttle goes too deep into the box B.S., the safety mechanism "E" is activated as soon as the cutter points press against the wall of the shuttle. (See fig. 30.2)

4.2. Depth of the scissors (Fig. 30.3)

- Position of the sley: F.D.C. with a change movement.
  The box bumper of the sley should be in the "V" of the latch finger.
- Loosen the screws "A".
- Press on the lever "B" to advance the scissors slide to obtain:
  - for shuttles with high discharge 2 mm. clearance between the tips of the scissors and the slide of the slot.
  - for shuttles with centre discharge: the points come right up to the shuttle inside wall.

NOTE:

- During this adjustment also push the slide towards the loom to increase the play between the lever "B" and the slide.
- Tighten the screws "A".



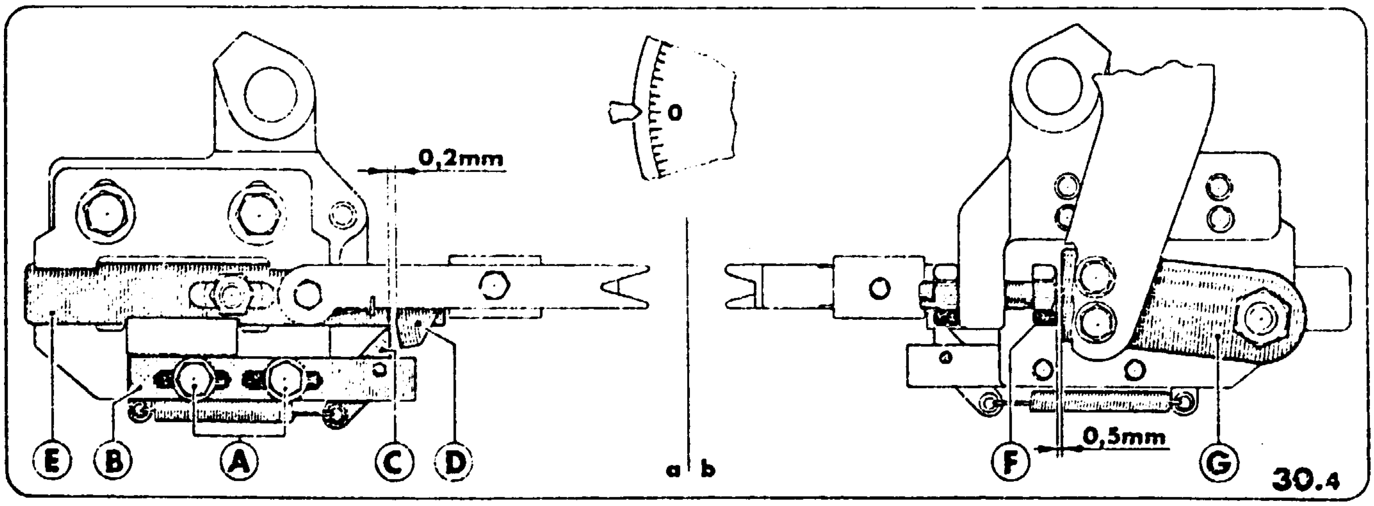
30.3

4.3. Moment to close the scissors (Fig. 30.4 a. and b.)

- Sley position: same position a previously (F.D.C.) with a change movement.
- Loosen the screws "A".
- Move the part "B" to give a play of 0,2 mm. between the cam "C" and the latch "D".

ATTENTION :

- It is necessary to remove all the play of the control rod during this adjustment by pushing the slide "E" forwards (away from the weaver). The scissors must close at the end of their movement when the sley is at F.D.C.
- At the other side of the scissors is an adjustment screw "F". (See fig. 30.4.b.)
- Put the sley in F.D.C. Press the hammer to the lowest point (as shown in fig. 29.1. on page 29.1.) In this position adjust a clearance of 0,5 mm. between screw "F" and the plate "G".



30.4

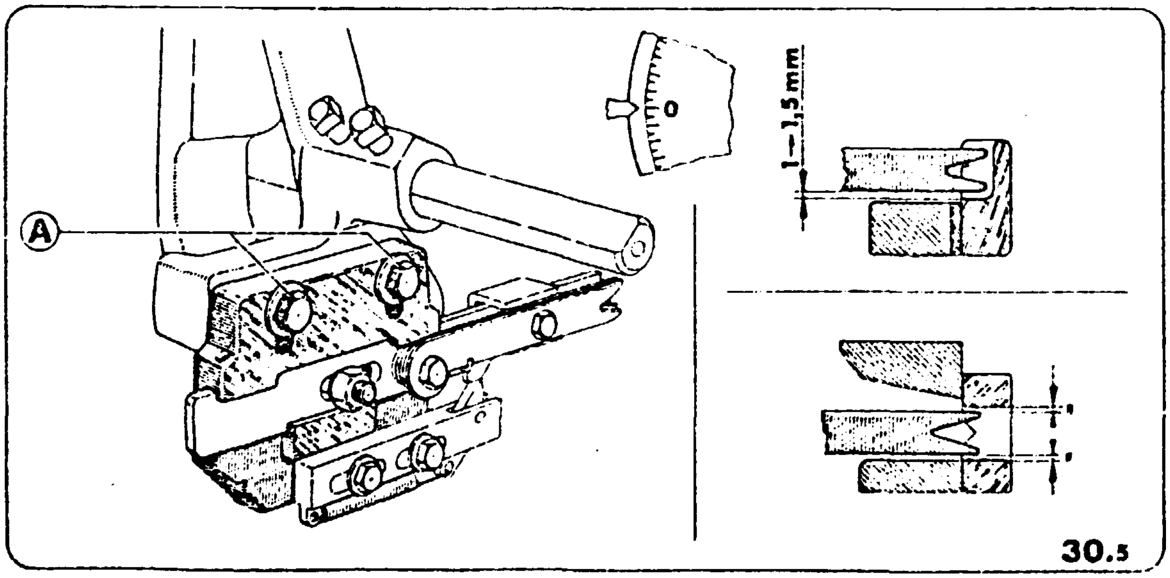
Pusher plate see Picanol Manual for Farooq

4.4. Height of the scissors (Fig. 30.5.)

- Sley position: F.D.C. with a change movement.
- Loosen the screws "A".
- Adjust the height to obtain:
  - for shuttles with high discharge: a clearance of 1 to 1,5 mm. between the fixed part of the scissors and the lower part of the slot in the shuttle.
  - for shuttles with centre discharge: the clearance between the cutters and the opening in the shuttle must be equalised. The cutters must not touch the box front.

NOTE:

The shuttle must be correct in the box .



30.5

5. Loom problems created by Shuttle-eye cutters.

5.1. Lash in
5.2. Break weft
5.3. Break on change
5.4. Run out
5.5. Knock-off on change
5.6. Buzz shuttle
5.7. Broken pick

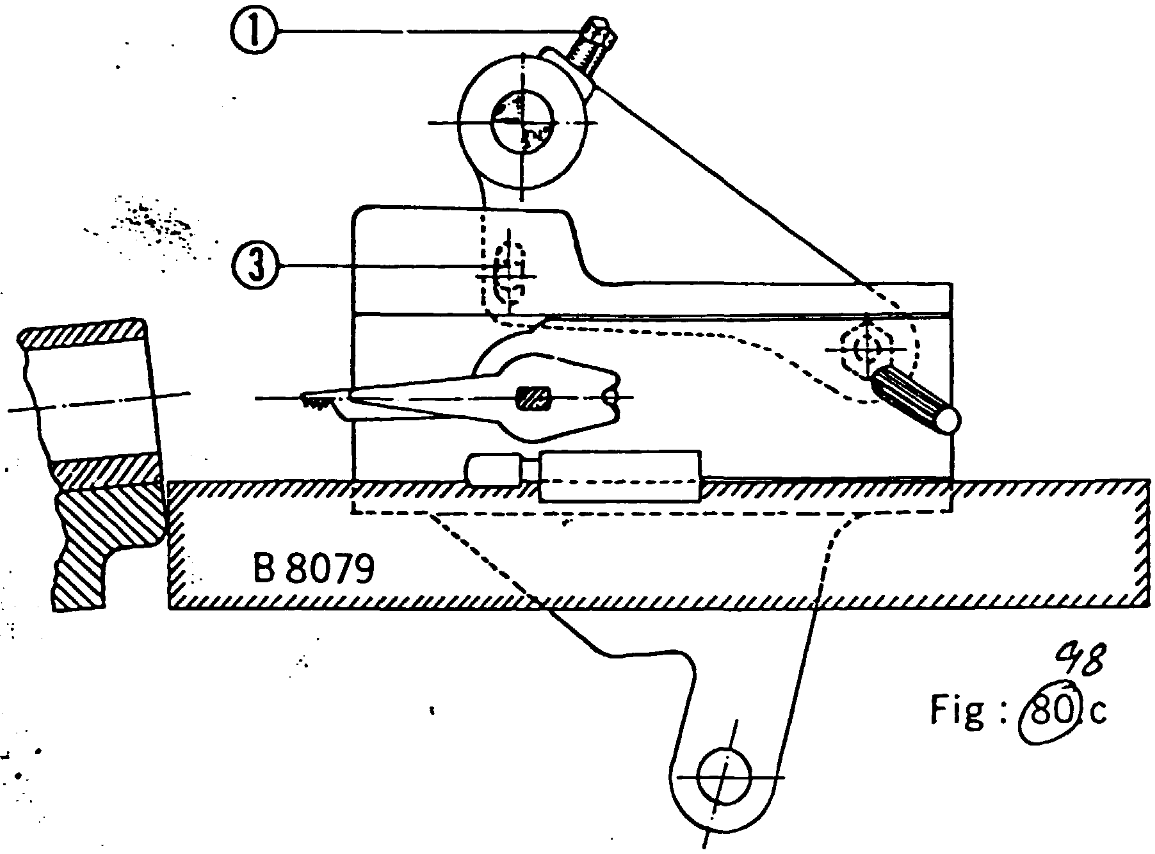


Fig : 80 c
98

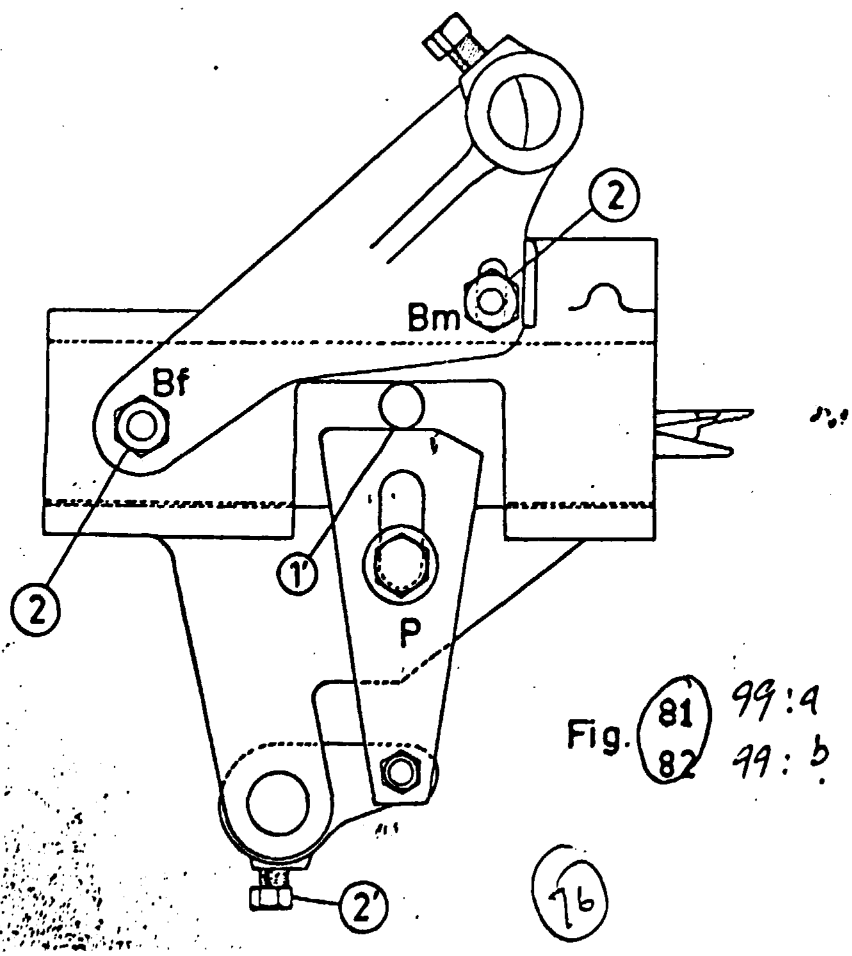


Fig. 81 99:a
82 99:b

76

Cutter slide (Fig 80C.)

1. Connect the cutter-slide provisionally with the holder by putting the bolt in the center of the groove.

2. Put the sley on back dead center.

3. Line up the cutter-slide with the upper surface of the boxplate by using gauge B.8079. Now tighten both screws.

81. Height of the cutter.

1. Put the loom on a transfer and bring the sley forward to 3 cm from front dead center, the shuttle being on the battery side.

2. Fig 82.
   Loosen the bolt "Bm" while the bolt "Bf" remains lightly tightened. With the cutter in open position adjust the height so that there is 1 mm play between the lower blade and the bottom of the opening in the shuttle.
   Now tighten firmly the bolts "Bm" and "Bf".

82. Moment of opening of the cutter.

1. With the loom on a transfer and the shuttle on the battery side, turn the loom until the pin of the cutter is in a vertical line with the center of the groove in the push bottom "P". (1')

2. Loosen both screws (2') and push the push-button upwards against the pin. Tighten both screws. One should avoid forcing the push button because the cutter will not slide freely in its carrier.

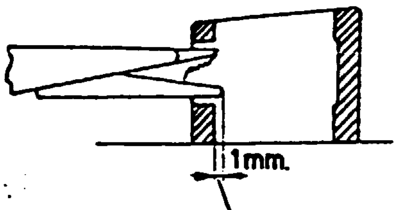


Fig 82a 99:c

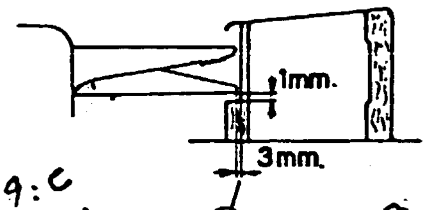
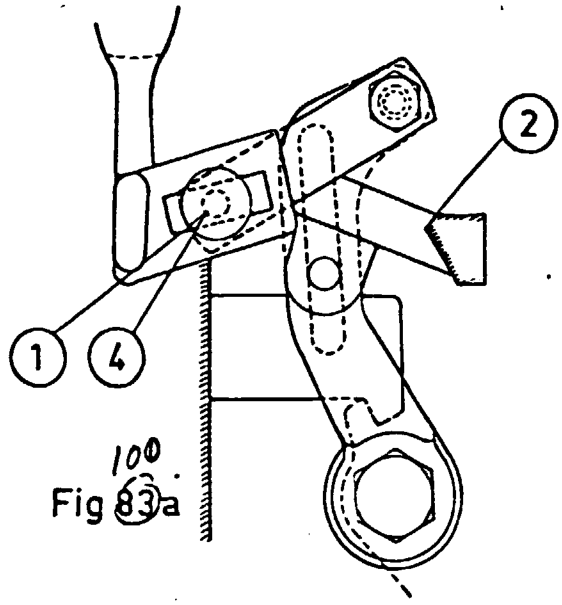
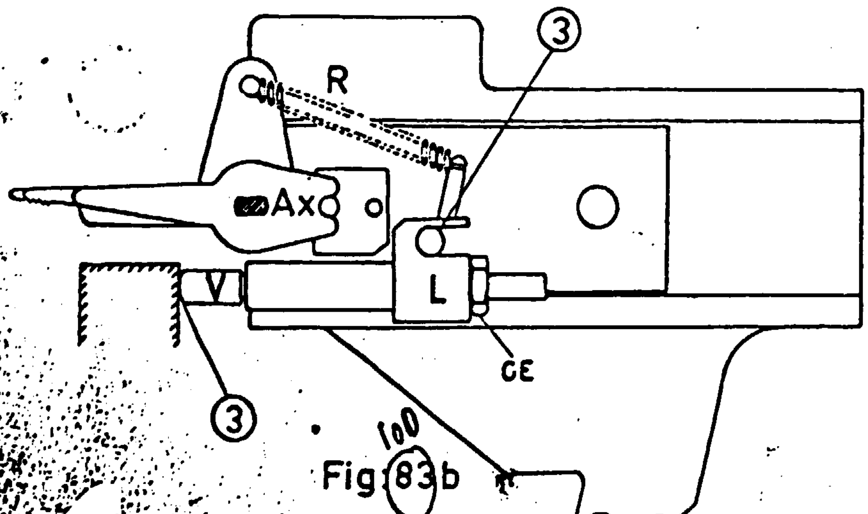


Fig 82b 99:d



100
Fig 83a



100
Fig 83b

83. Opening and depth of the cutters.

1. Fig. 83 a

   Loosen the round-head bolt which connects the cutter sliding lever to the control arm.

2. Put the sley with a pirn change taking place, shuttle in battery-side box, the stop just against the dog.

3. With the scissors closed, adjust the point of the cutter to pass 1 mm. from the inside wall of the shuttle for center discharge shuttles,
   - 3 mm. before it touches the wall of the shuttle for top discharge shuttles (hight thread)

   At this moment set the round headed bolt which relies the shuttle feeler with the lever.

4. The loom always in the same position:
   push the feeler knife stud until the feeler knife stays open; only then, adjust the stop until it just touches the box front.

   Remark : If you turn the loom in slow motion the cutter will not close but when the loom is running normal the cutter will work perfectly.

CHECKING

1. In the rest position, it is necessary that the scissors slide does not go beyond its guide.
   If it does, check the placing of the cutter guide support.

2. When pushing with one's finger on the screw V, the side pressure of the scissors should not impede the smooth opening of the scissors. If this is not the case, it is necessary to slightly loosen the scissor stud or to ascertain that the spring is not damaged.

3. By hand, make a pirn change - the scissor opening latch must open the scissors sufficiently to allow the guide L of the screw V to engage itself to hold the cutters open. If not, recheck the setting of the cutter opening latch.

Group 8 : A. The back rest
B. The let-off motion.

A. The back rest.

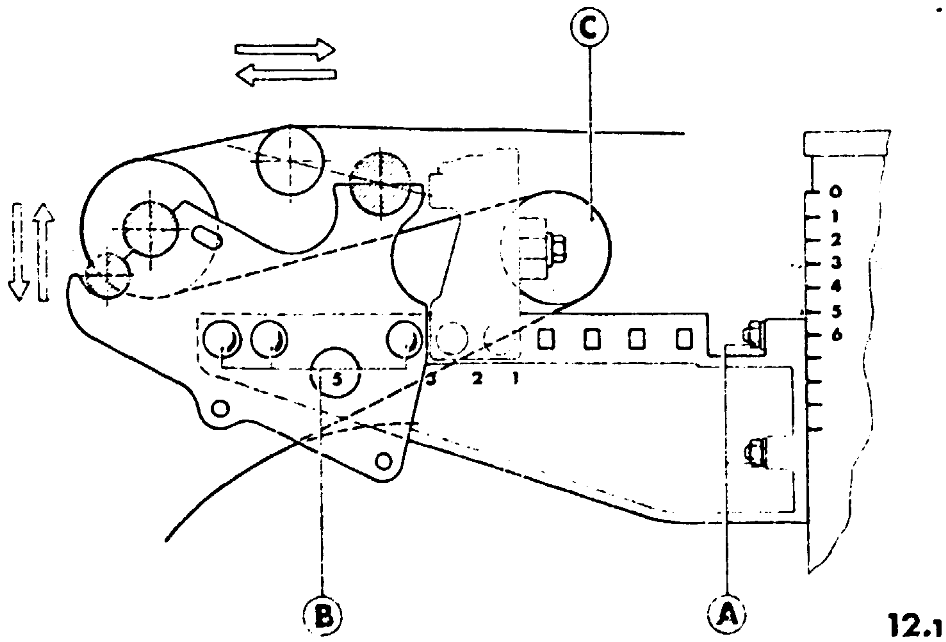
1. Function:

To adjust the tension of the upper and lower ends.

2. Parts:

2.1. Whip roll
2.2. Brackets
2.3. Vibrator
2.4. Vibrator lever
2.5. Vibrator lever cam

3. and 4. Assembly and adjustment:



12.1

4. Position of the back rest (Fig. 12.1)

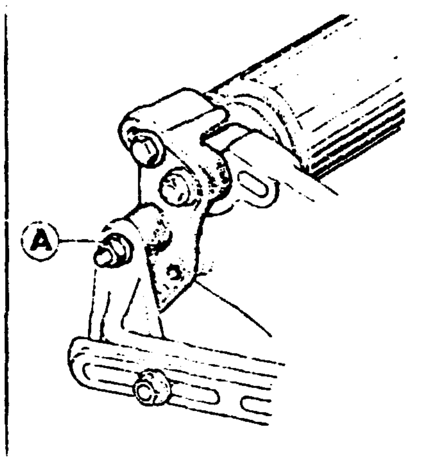
a) Height:

Adjust the height by loosening the nuts "A" and raising or lowering the brackets. The higher, the back rest, the tighter the lower warp and the slacker the upper warp.
The height depends on several factors as type of cloth warp breakages, cover, etc.

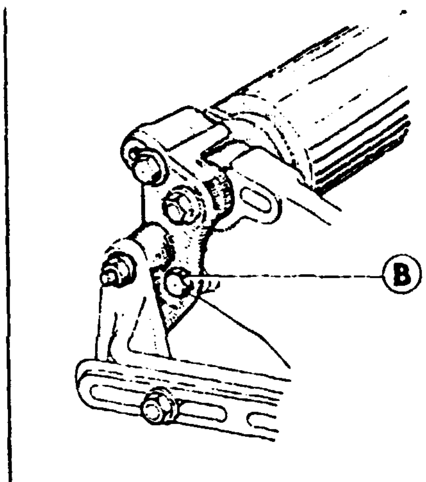
The high position is generally selected for plan 1/1 weaves and heavier fabrics. The lower positions are for synthetics.

b) Depth:

Adjust the depth by loosening the nuts "B" and moving the F.S. and B.S. brackets to the front or the rear. For delicate yarns the back rest is placed as far back as possible from the harnesses in order to have a smaller warp opening angle and to spread the yarn elongation more satisfactorily.
For stronger yarns the back rest is placed as near as possible to the harnesses for a better opening and to facilitate the work of the weaver.



12.2



12.3

4.2. Fixing the Whip roll (Fig. 12.2. - 3.)

a) Rotating with or without vibrator (Fig. 12.2. and 12.3.)

b) Fixed, with vibrator (Fig. 12.2.)

Lock the whip roll by means of the outside screw. The whip roll unit can still rotate round its rotation point "A".

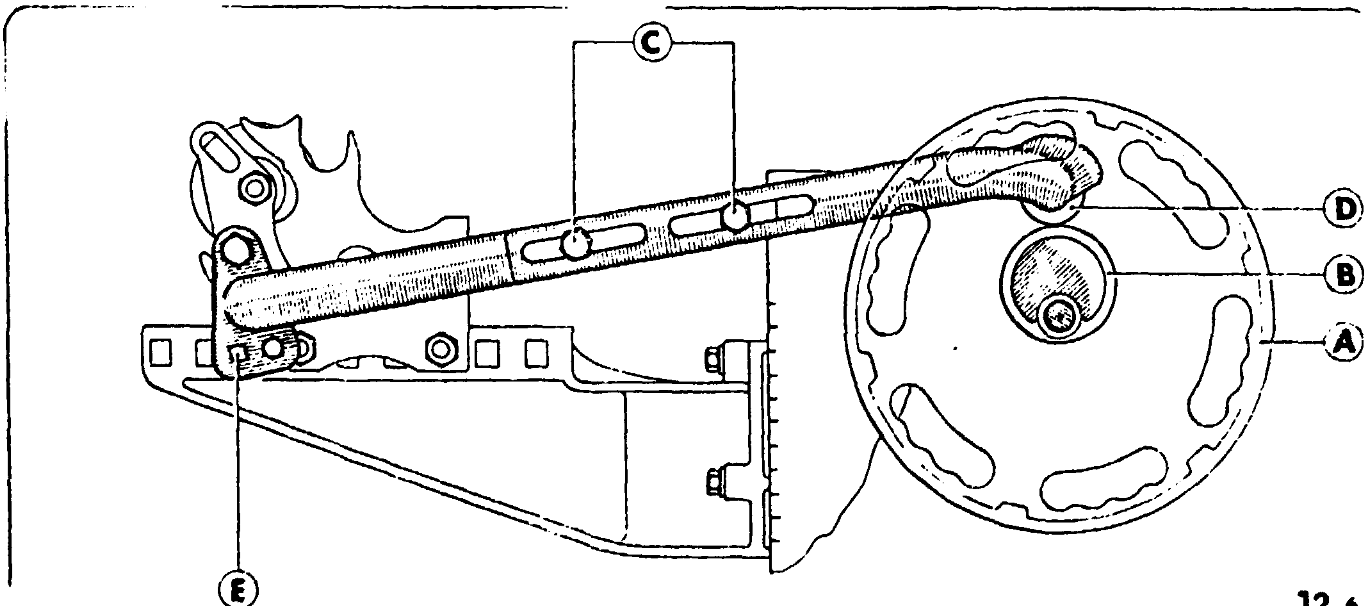
c) Fixed without vibrator (Fig. 12,3.)

Fix the whip roll to its lever by means of the outside screw and lock this lever by tightening up the screw "B".

4.3. Adjusting the vibrator lever (Fig.12.6.)

a) Sley position: shed closed.

b) Remove the handwheel "A" and place the maximum radius of cam "B" at the top. (Fig. 12.6.)



12.6

c) Adjust the arm length by means of the bolts "C" so that the roller "D" arrives on the greater radius of the cam "B" (Fig. 12.6.)

d) Replace the handwheel and tighten it.

REMARKS:

- Use the second hole "E" (fig. 12.6.) in the vibrator arm for the lower positions of the back rest.
- The vibrator is used as a rule only for plain weaves and its purpose is to make more uniform tension of the threads, between open and closed shed For the other weaves, shorten the vibrator in order to put it out of action.

5. Loom problems created by Back rest.

A. Whip roll.

5.1. Binding:

5.1.1. Weavy cloth

5.1.2. Strain warp yarn.

5.2. Too high:

5.2.1. Overshots

5.2.2. Skips

5.2.3. Throw shuttle

5.2.4. Damage shuttle

5.2.5. Damage leather

5.2.6. Kinky weft

5.3. Too low :

5.3.1. Warp breaks

B. Vibrator cam timing.

5.4.1. Break ends

5.4.2. Wavy cloth

5.4.3. Irregular weave

5.4.4. Strain warp yarn

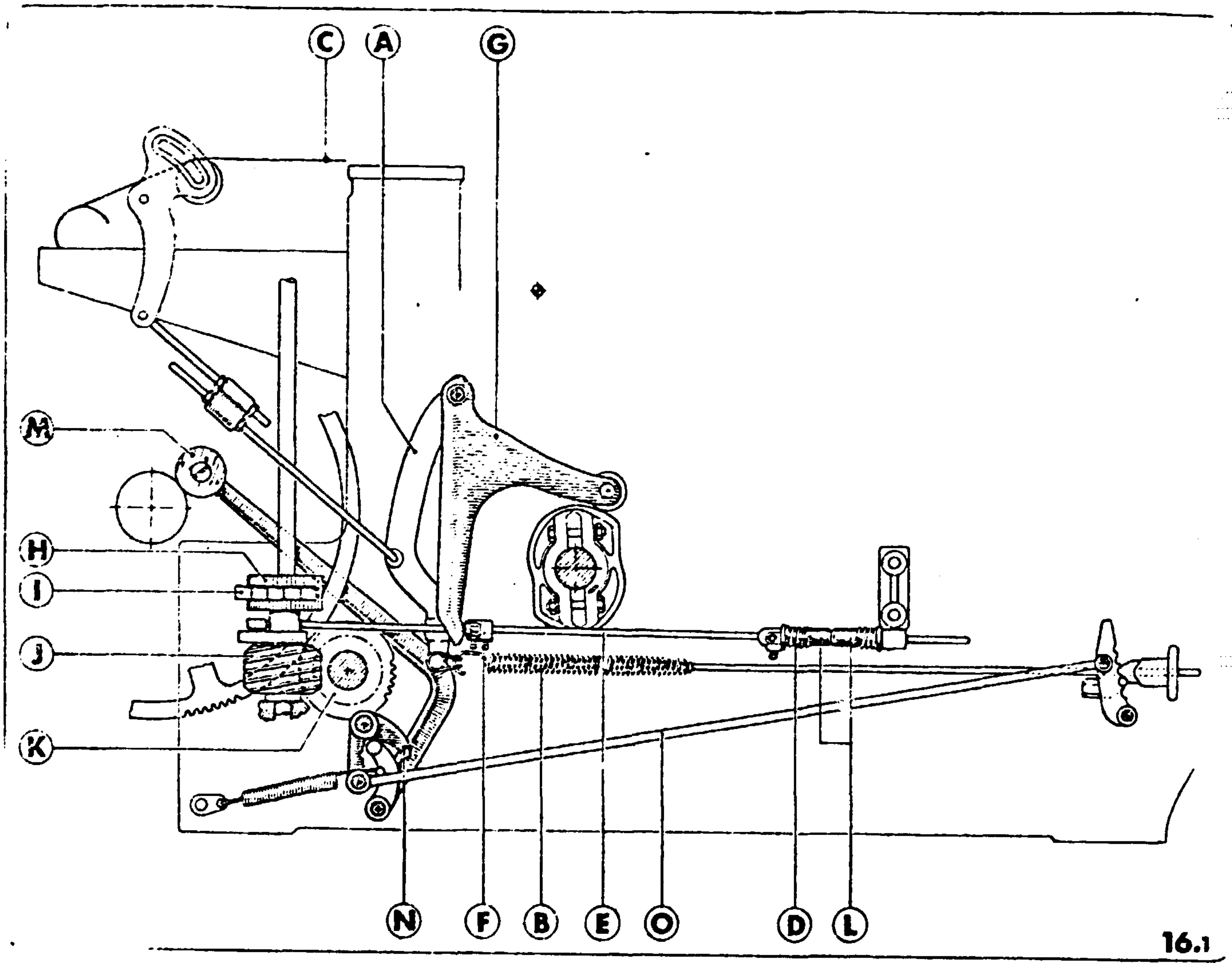
8. B. LET OFF MOTION (for cotton).

1. Function:

To regulate the rolling-off of the warp beam in such a way, that the tension of the warp remains constant, indepently of the diameter of the warp on the beam.

Fig. 16.1. shows the basic principle of the mechanism.

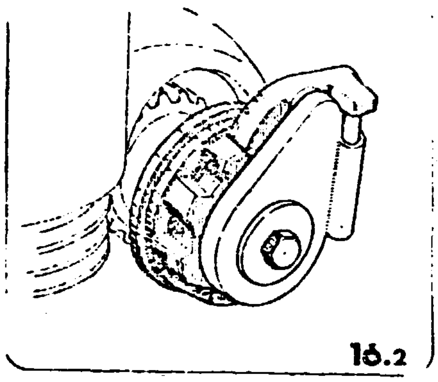
A vertical lever "A" is balanced, on the one hand by the spring "B" and on the other hand by the tension of the warp "C.



16.1

The spring "D" always presses the rod "E" and its stop "F" towards the lever "A". The driving lever "G" brings the rod "E" to the right at each pick, therefore a number of teeth on the ratchet wheel "H" are caught by the pawls "I". A worm "J", mounted on the same shaft as the ratchet wheel drives the beam through the wormwheel "K". The pawls are staggered by a quarter of a tooth in order to increase accuracy.

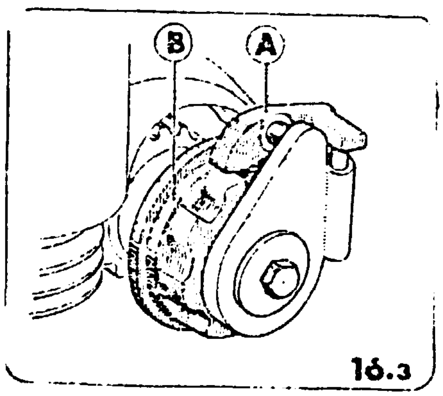
When the warp tension increases, the lever "A" is pushed to the left, thus bringin also to the left the rod "E" by means of the spring "D". When the rod "E" is pulled to the right by the driving lever "G" more warp is then let off.
A beam feeler "M" regulates the position of lever "A" in relation to the beam diameter, by means of the special cam "N" and rod "O".


16.2

The let-off motion is not controlled directly but through a safety device: fig. 16.2, 16.3. If for any reason the beam cannot rotate, the pawl "A" is raised.

This system also allows:

- to wind on manually the beam to an appreciable extent without altering the loom (for instance when a new beam has been fitted).



16.3

- Unwinding of the warp threads to an appreciable extent (fig. 16.3.)
  In this case, slip the pawl "A" on the solid edge "B".
  Do not forget to put this pawl back and give the warp its normal tension by means of the smdll handwheel before starting up the loom again.

2. Parts:

   2.1. Circlip
   2.2. Let-off worm shaft
   2.3. Ratchet wheel
   2.4. Upper let-off worm shaft bracket
   2.5. Hand wheel
   2.6. Pallet lever assembly
   2.7. Let-off worm
   2.8. Let-off bracket
   2.9. Pallet spring
   2.10. Pallet spring rest
   2.11. Pallet lever connecting rod

2.12. Pallet lever

2.13. Let-off worm wheel

2.14. Tension control rod

3. Assembling :

3.1. Replace circlip on let-off worm shaft in groove

3.2. Replace ratchet wheel from top of shaft
Tighten temporarily half-way on shaft.

3.3. Replace upper let-off worm shaft bracket.

3.4. Insert key in key-way on shaft and replace handwheel tighten with set screws.

3.5. Replace pallet lever assembly from bottom.

3.6. Replace let-off worm ensuring that key is in position.

3.7. Fix let-off bracket to loom (3 bolts)

3.8. Replace let-off worm shaft in position on let-off bracket.

3.9. Fasten upper let-off worm shaft bracket to loom (3 screws).

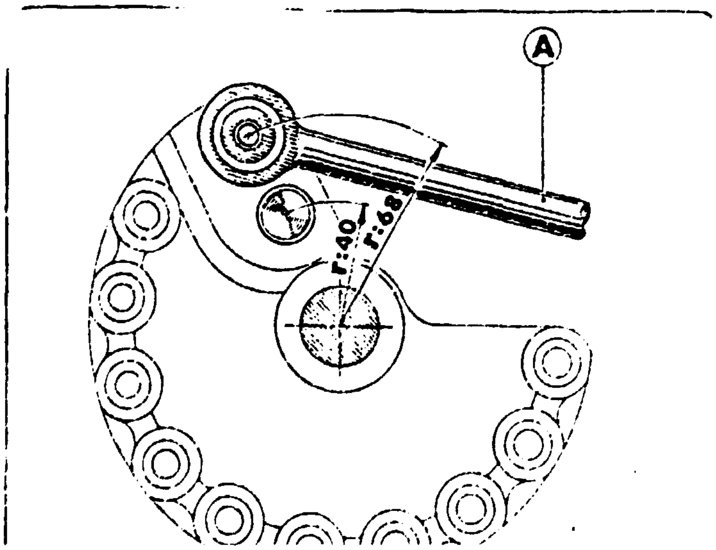
3.10. Place pallet springs in position on pallet spring rest.

3.11. Put pallet lever connecting rod in position on pallet lever, holding pallets away from wormwheel.
Place ratchet wheel in position, ensuring that the key is in the key-way.

3.12. Assemble let-off worm wheel and wormwheel bush, ensuring that let-off worm wheel ratchet spring and pin are in position.
Place on shaft and tighten the screws securely.

4. Adjustments:

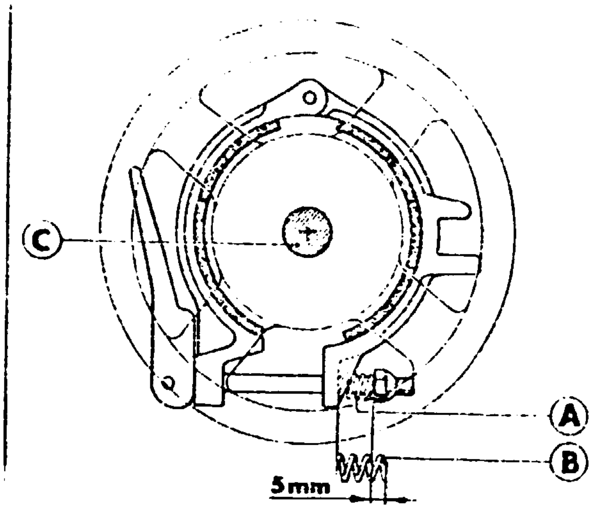
4.1. Choice of the pivot for the horizontal rod A (Fig. 16.5.)



a) Pivot at a distance r = 68 mm. (with a bowed rod "A")for the same or higher picks than those mentioned in table below "A".

b) Pivot at a distance r = 40 mm. (with a straight rod "A") for the same or higher picks than those mentioned below "B".

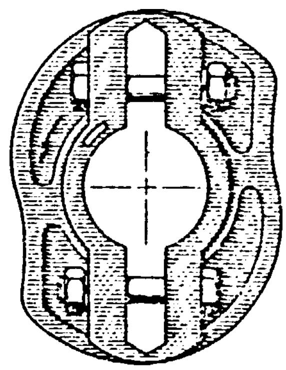
4.2. Braking of the let-off motion ratchet wheel (Fig. 16.4.)



16.4

Give to spring "A" a minimum tension of 5 mm. relative to its free length "B". The tension given to the spring must be sufficient to prevent the spindle "C" from rotating too far (under the effect of its own moving weight).
If on the other hand the small brake is too tight, this results in an unnecessary load of the loom.

4.3. The cam: choice (Fig. 16.6.)



BE.21657

b

16.6

WITH BE.21657 CAM - MINIMUM PICKS PER CM.

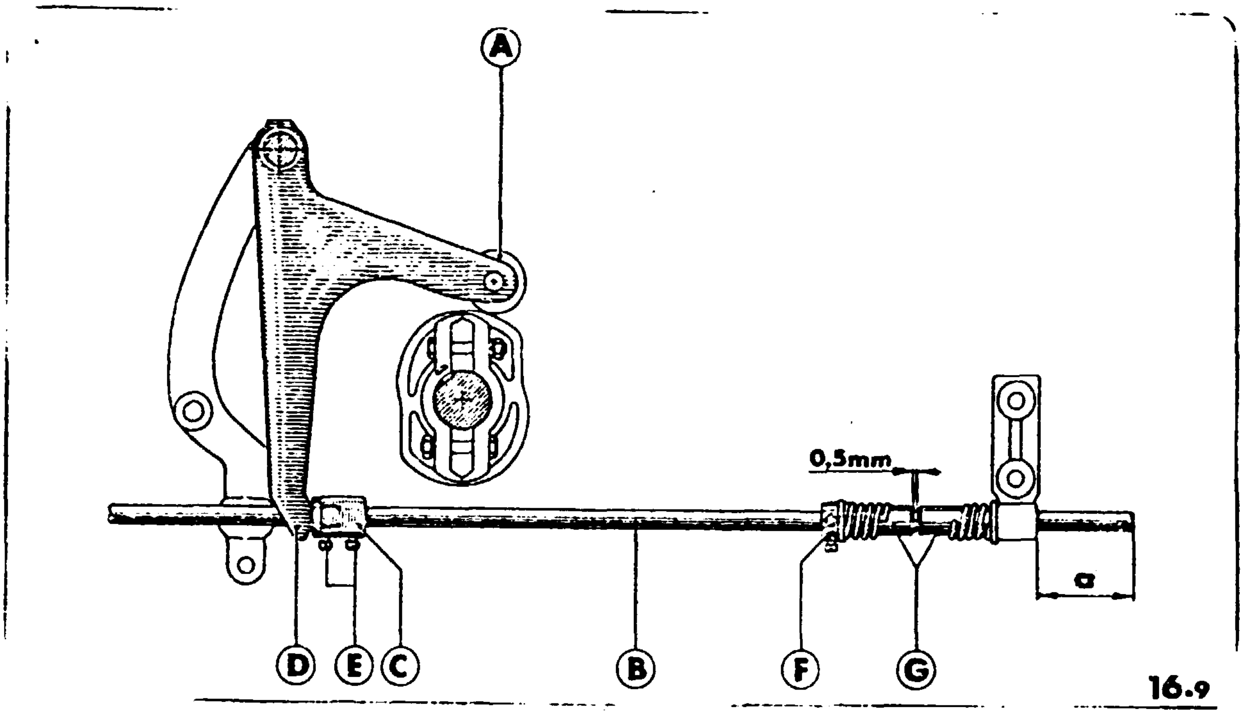
A. Bowed rod

Flange Ø 710	Positions: A, G, Jh, Jc, K	17,5 p/cm.
Flange Ø 810	Positions: B, C, D, E, F, H, I, Ja	16,5 p/cm.

B. Straight rod

Flange Ø 710	9,8 p/cm.
Flange Ø 810	9,0 p/cm.

4.4. Position of the stops on the horizontal rod (Fig. 16.9.)



16.9

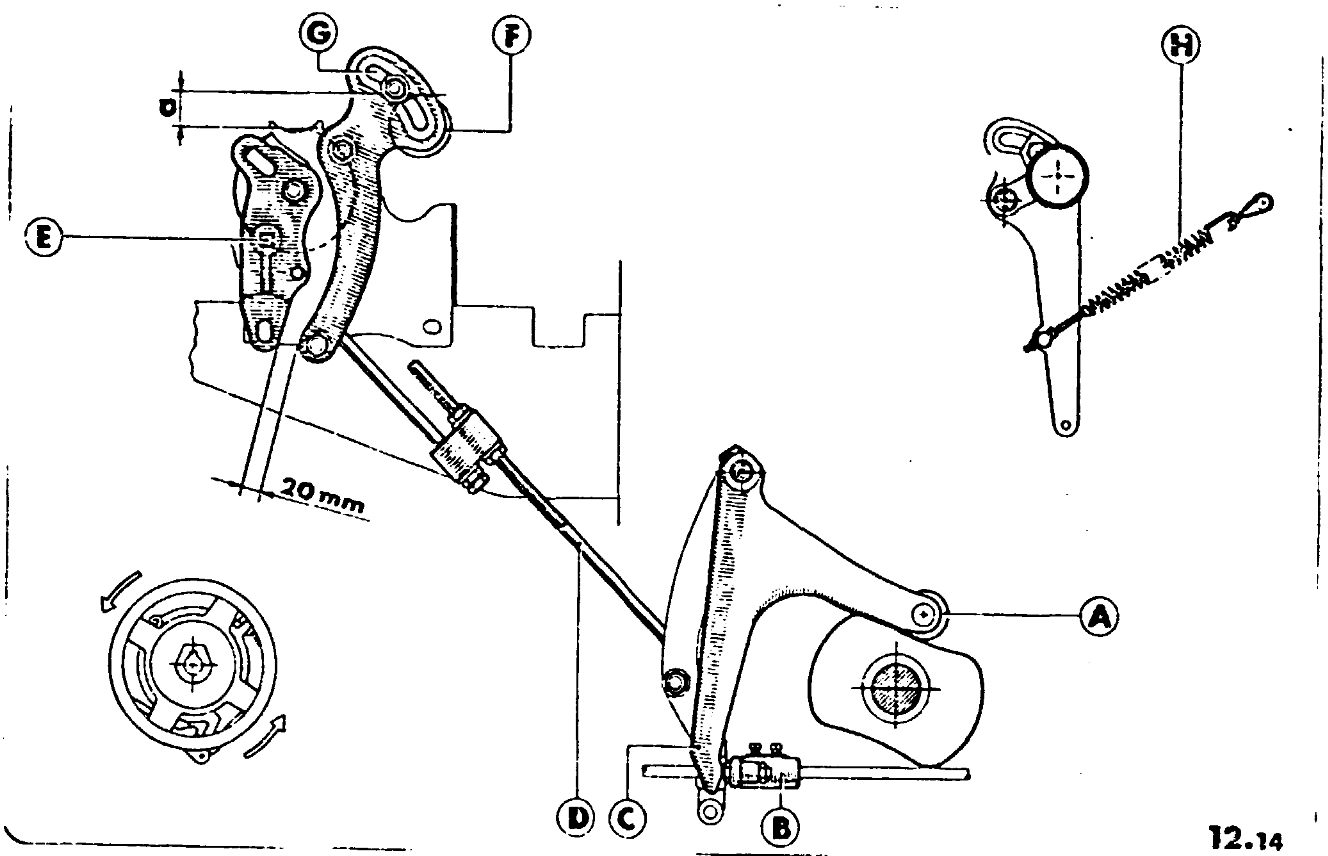
a) Sley position: The roller "A" is on the cam greater radius.

b) Bring the horizontal rod "B" at a distance "a" from its guide:
- with bowed rod: "a" = 48 mm.
- with straigth rod: "a" = 58 mm.

c) The horizontal rod being in this position:
slide the stop "C" along the rod against the lever "D" and fasten it by means of the set screws "E".

d) A clearance of 0,5 mm. move the stop "F" until the two stops "G" and fix it.

4.5. Back rest connecting rod and height of tension roller. (Fig. 12.14)



12.14

a) Sley position: the roller is on the cam small radius.

b) turn the small handwheel anticlockwise until the stop ("B" on fig. 12.14) rest against the lever ("C" on fig. 12.14).
Lock this small handwheel by means of its small brake.

c) Adjust the length of the connecting rod " D" by means of nuts until there is a clearance of 20 mm. as indicated on the figure. The stud "E" must rest on its bearing.

d) Adjust the heigth of tension roller "F" by moving along the slide "G". Slacken the warp is necessary.

This height depends on the width of the loom and on the tension of the warp required for the fabric:

- for wide looms or high tension, reduce the height "a"
- for narrow looms or low tension, increase the heigth "a".

Back-rest with spring B.S. - Tension of this spring.

a. tighten the warp until a normal tension is obtained.

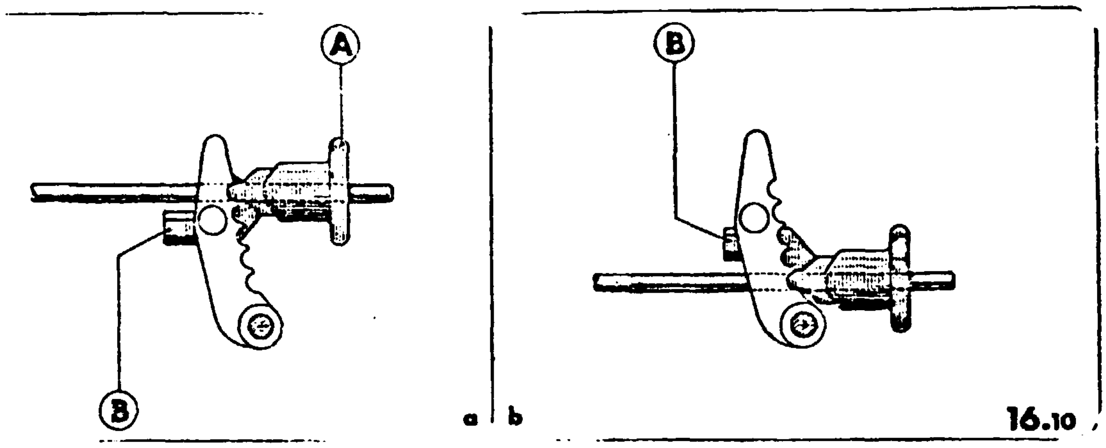
b. Tension spring "H" depending on the warp tension and on the wide of the loom.

4.6. Position of the spring tension control rod (Fig. 16.10)

Place the knob "A" in the position corresponding to the pick for the fabric. The required fabric tension is adjusted by turning the knob during the weaving operation.

- For the higher positions of the knob: guide "B" below (16.10.a)
- For the lower positions of the knob: guide "B" above (16.10 b)

Picks	cm
15	
30-15	
50-30	
80-50	
120-80	



16.10

FAROOQ PRODUCT MIX-PLAIN

60x60 20/20 → 60/2.54 = 24 picks/cm

112x72 40/40
(150) → 72/2.54 = 28 picks/cm

5. Loom problems created by Let off.

Too tight or too loose:

5.1. Break ends
5.2. Skips
5.3. Wavy cloth
5.4. Irregular weave
5.5. Bang off
5.6. Overshots
5.7. Damage shuttle
5.8. Damage leather
5.9. Shuttle boxing incorrectly
5.10. Burst cloth
5.11. Smash

Group 9 : A. Drop wire stand

B. Warp stop motion and timing.

C. Electro-mechanical warp stop motion.

9. A. DROP WIRE STAND.

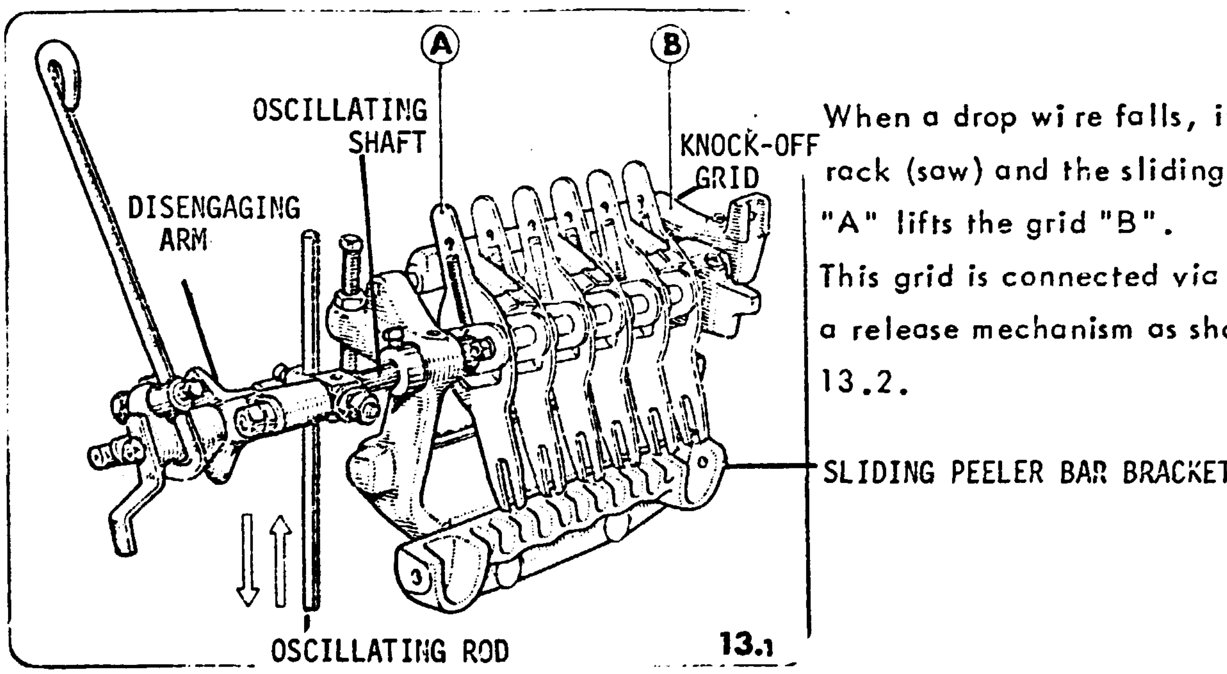
1. Function:

Support the saws and pins (drop wires)

2. Parts:)
3. Assembling:) SEE 9.B. Warp stop motion.
4. Adjustments:)

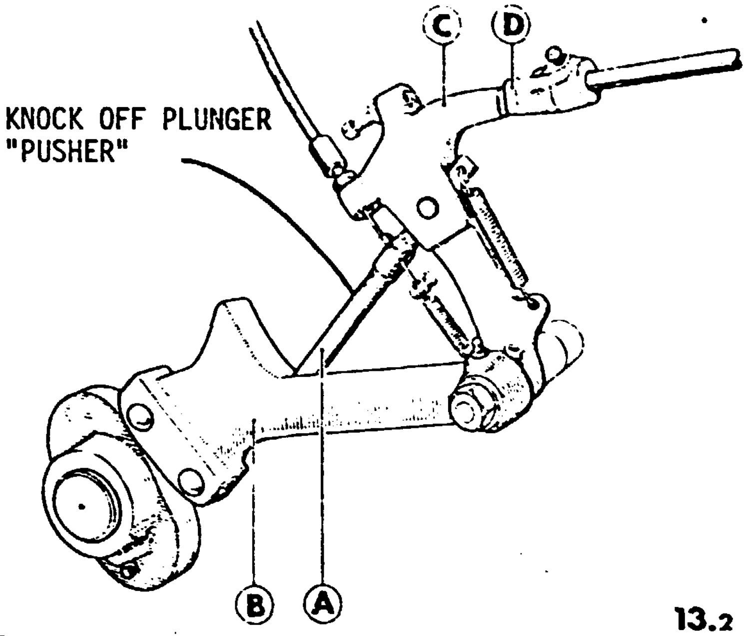
9. B. WARP STOP MOTION.

1. Function: see fig. 13.1.



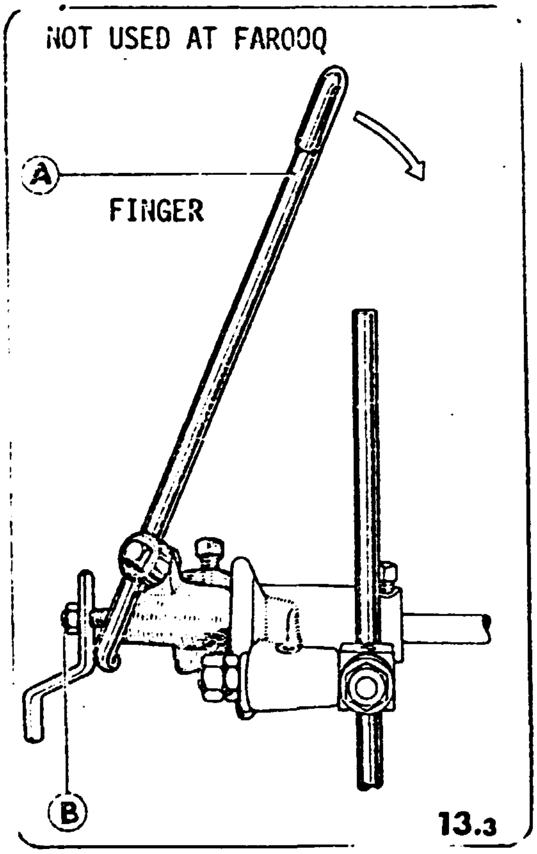
13.1

When a drop wire falls, it jams the rack (saw) and the sliding bar finger "A" lifts the grid "B". This grid is connected via a cable to a release mechanism as shown on fig. 13.2.



13.2

Here the pusher "A" is pulled upword, and then pushed to the front by the vibrating lever "B". In this way the lever "C" pushes the catch "D" on the operating rod, which disengages the loom. Another mechanism is used to start the loom again.



13.3

When a rack (saw) is jammed by a fallen wire (pin) the finger "A" (on fig. 13.1.) lifts. This finger "A" is therefore no longer in line with the adjacent ones: the operator will therefore look for the broken thread on the rach of finger "A".

If all this fingers are in line, then use the mechanism shown on fing. 13.3. The lock "B" is released by the rod "A". Move then the racks to and fro which will show the place of the fallen drop wire. The racks may remain in their released position when the rod "A" is pulled as shown by the arrow. Place the rod in this released position when wishing to weave without the warp stop motion coming into operation, for instance at the beginning of a warp with missing or broken ends. In other cases take care that the racks are again engaged before starting the loom again.

With the existing control cam (13.5) the loom will stop every 4 picks.

2. Parts :

2.1. Feeler bar

2.2. Finger assembly

2.3. Finger slots

2.4. Sliding feeler bar stud

2.5. Oscillator shaft

2.6. Sliding feeler bar bracket

2.7. Oscillator arm

2.8. Feeler bar release finger

2.9. Out of action rod

2.10. Feeler bar finger guide

2.11. Knock-off lever assembly

2.12. Knock-off oscillator arm.

3. Assembling :

3.1. Place feeler bar finger assembly in position making sure that finger slots are in position on sliding feeler bar stud and insert oscillator shaft ensuring that spacers are in position. Slide oscillator shaft in level with back of sliding feeler bar bracket and place collar on end of shaft.
Place 2 collars on inside. Tighten in correct position.

3.2. Place oscillator arm on oscillator shaft and place disengaging arm in position, tighten with screws.

3.3. Replace out feeler bar release finger on shaft through loom frame. Tighten nut.

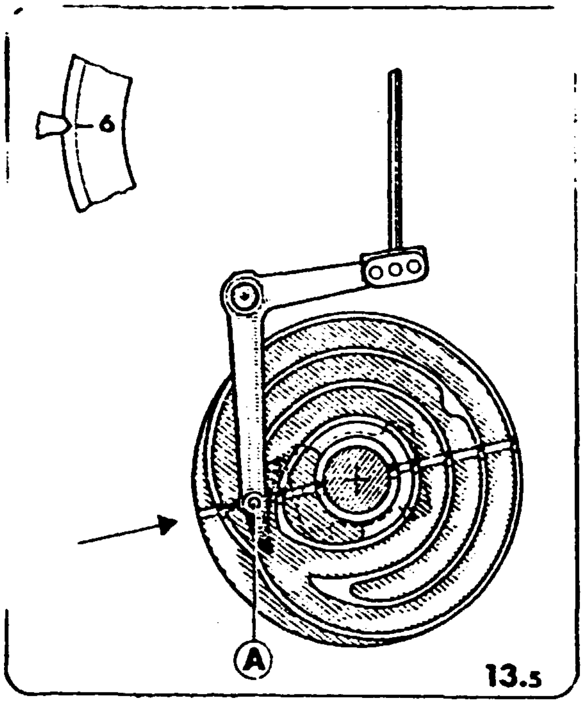
3.4. Connect out of action rod to feeler bar release finger and stop ring, secure with two bolts.

3.5. Replace locking arm hub.

3.6. Connect spring from feeler bar release finger to the feeler bar finger guide.

3.7. Replace knock-off lever assembly

3.8. Replace knock-off oscillator arm on shaft and tighten nut.



4 PICKS - NARROW LOOMS

4.1. Position of the rack control cam. (Fig. 13.5)

To and fro movement at every 4 picks.

- sley position : 6-shuttle B.S.
- the cam division must pass through the axis of the pin "A".

Take care: the division is that shown by the arrow, not on the opposite side.

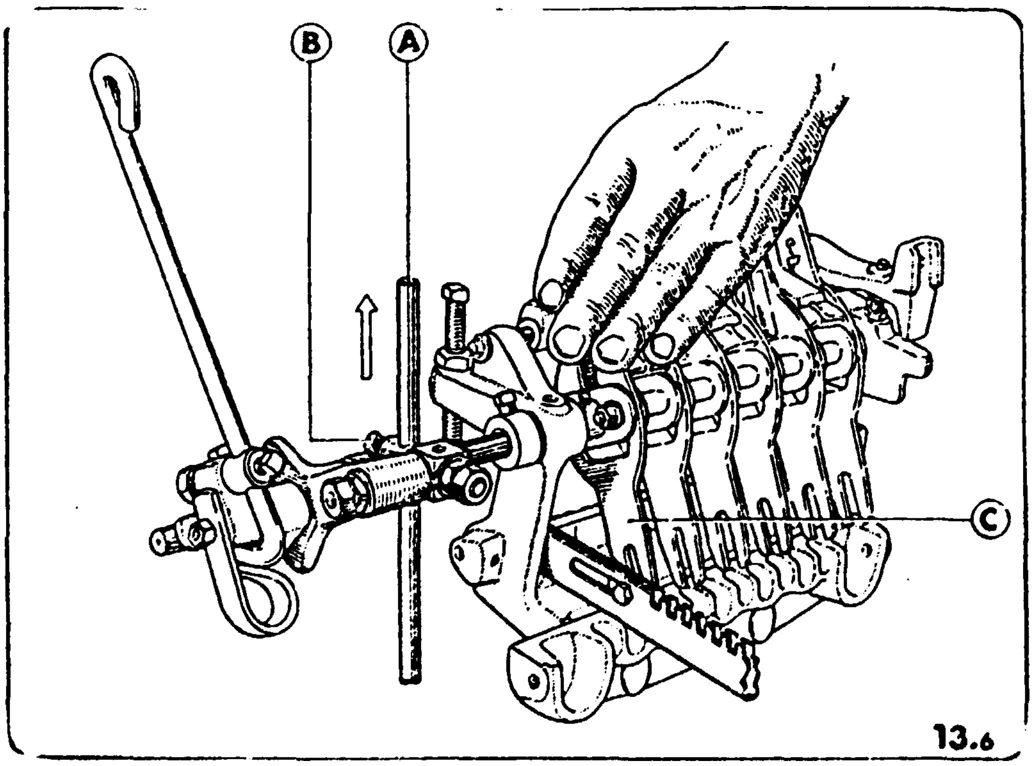
REMARK: These positions are not fixed but may be considered as a starting point. They may be modfied if required.

13.4 WIDE LOOMS CL - 2 PICKS-SET 0.BDC-B.S.

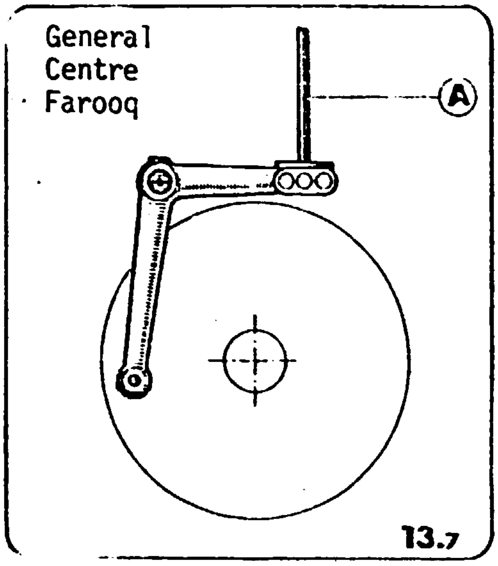
4.2. Rack travel (Fig. 13.6.)

- Sley position: the rack control rod "A" is in its highest position.
- Slacken the screw "B".
- Push the lower part of the fingers "C" towards the inside of the loom right to the end of the rack guide slot.

- Tighten the screw "B".



4.3. Rack maximum travel (Fig. 13.7.)

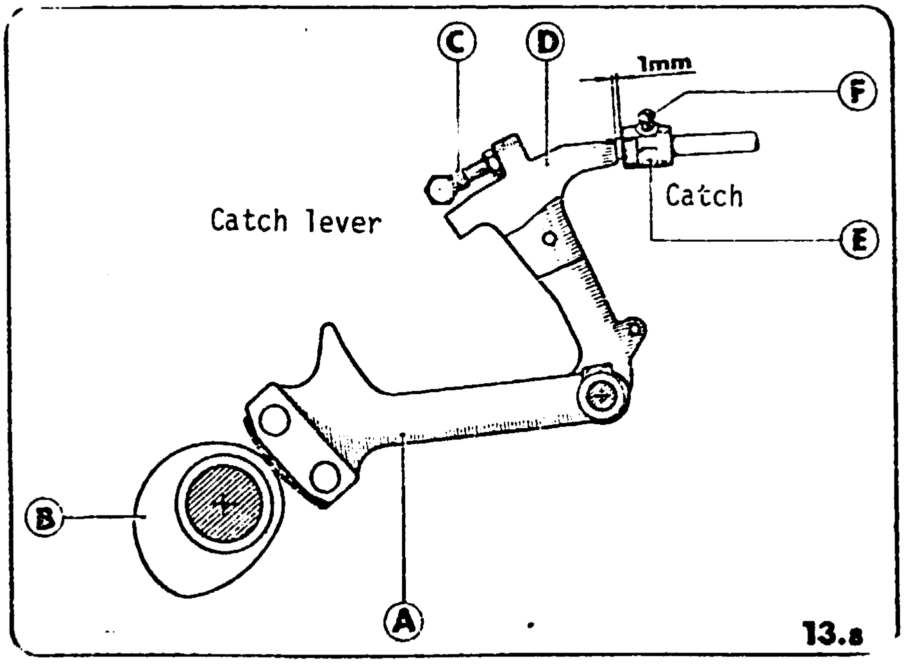


13.7

Watch the complete oscillation of the racks and adjust the movement by placing the control rod "A" in the appropriate hole.

The appropiate hole is that giving a length of travel along the entire length of the slot

4.4. Position of the catch lever (Fig.13.8)

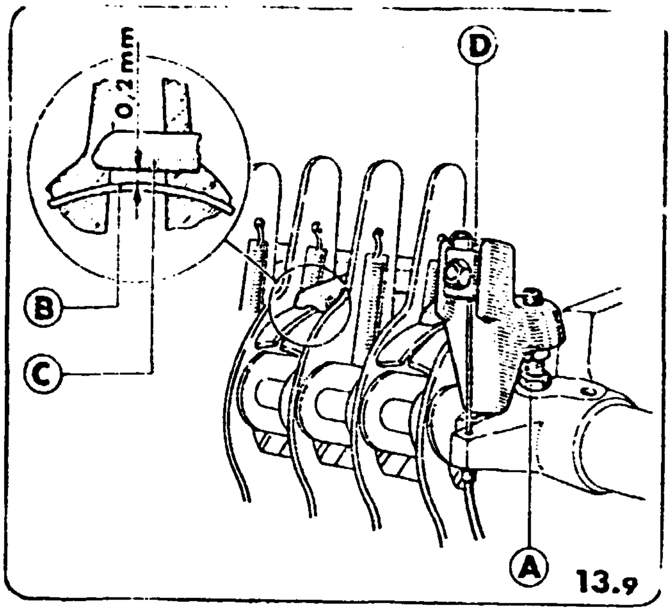


13.8

a) Sley position: the oscillating lever "A" must rest on the minimum radius of the cam "B". Starting handle towards the weaver.

b) Adjust screw "C" until there is a clearance of 1mm between the catch lever "D and the catch itself "E".

REMARK: - The screws "F" must be really tight.
- The catch "E" must drop properly.

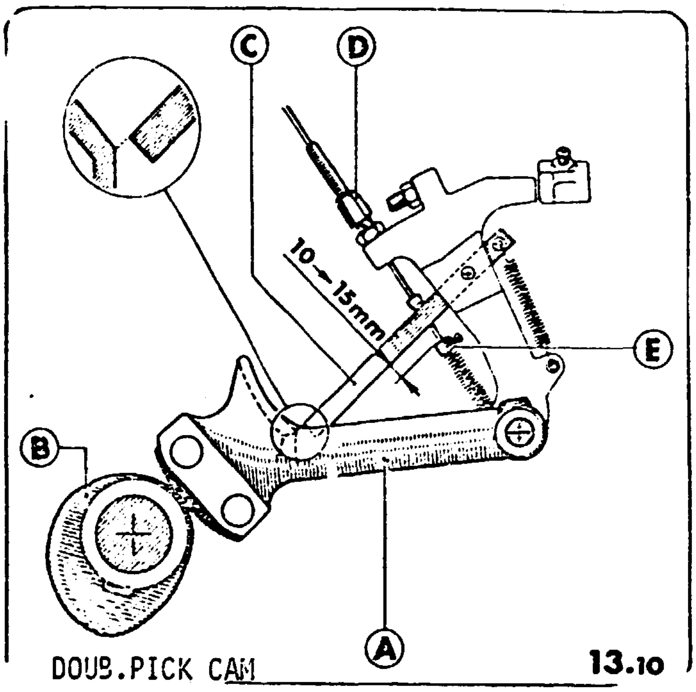


13.9

4.5. Position of the disengaging grid (Fig. 13.9)

Adjust for a clearance of 0,2 mm. (thickness of a drop wire) by means of the adjusting screw "A" between the fingers "B" and the grid "C".

CC-CM



DOUB.PICK CAM 13.10

4.6. Length of the cable (Fig.13.10)

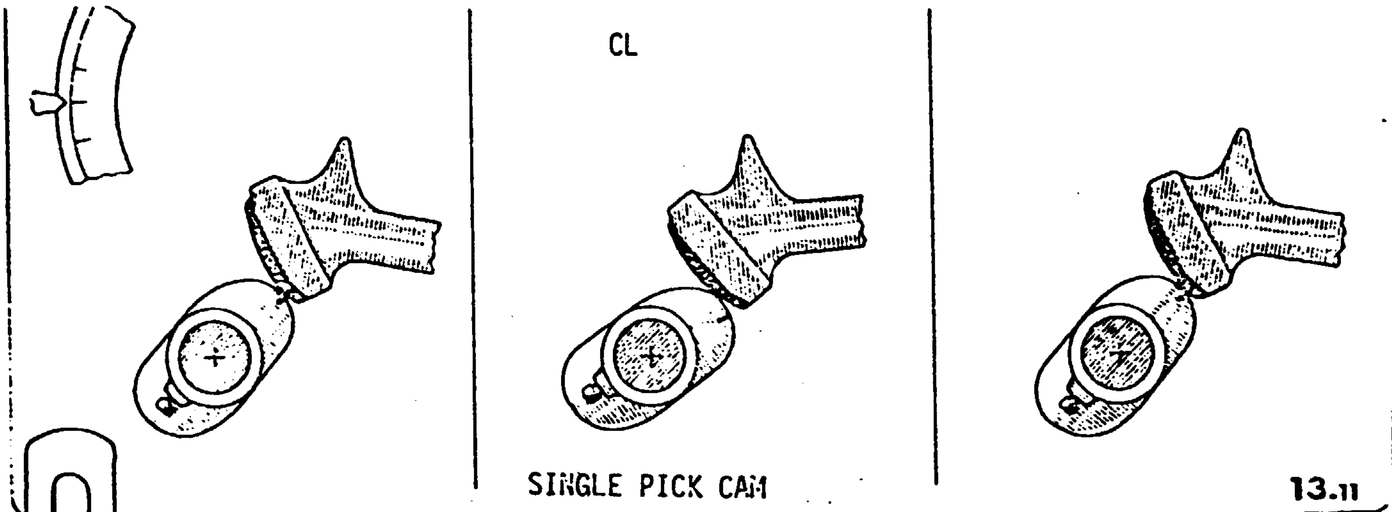
a) Sley position: the oscillating lever "A" must rest on the minimum radius of the cam "B".

b) Adjust the length of the cable by moving it along its housing "D" (on fig. 13.9) until the upper face of the pusher "C" is in line with the lower part of the heel of the oscillating lever "A".

c) Make the final adjustments by means of screw "D".

It should be noted that there must be a clearance of 10 to 15 mm. between the pusher lower part and the fastening of the cable "E".

4.7. Position of the sley after a stoppage caused by the warp stop motion (Fig. 13.11)

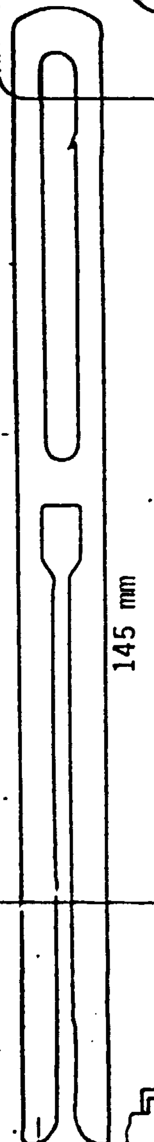


13.11

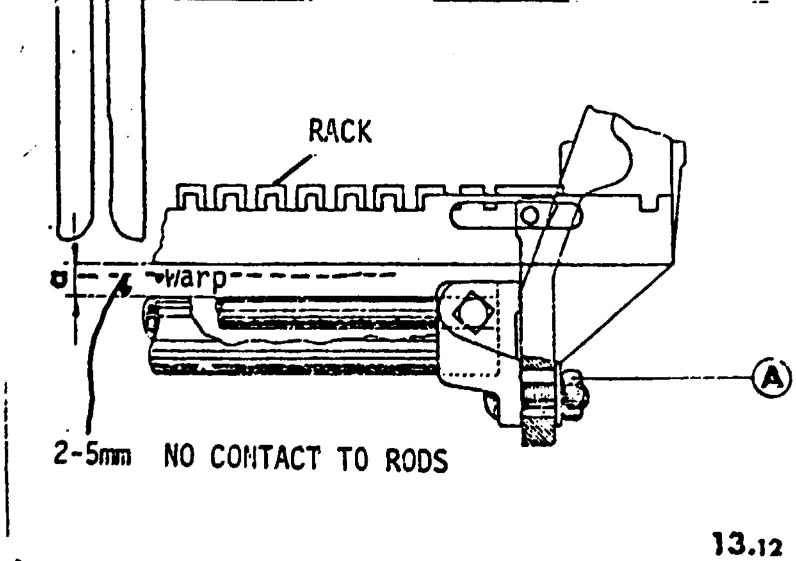
a) Cause the loom to stop by means of the warp stop motion and draw a chalk line on the cam and the shoe of the oscillating lever.

b) Place the sley in the required position. The sley is generally stopped the shed being closed.

c) Rotate the cam so that the chalk marks coincide again. Tighten the set screw on the shaft and check that the loom stops in the required position.



REMARK: With a warp stop motion operating every 2 picks the shuttle is in the F.S. when the loom stops.
If the shuttle is required to stop in the B.S. then move the rack control cam by 180° (see adjustment a. Position of the control cam)



13.12

4.8. Distance between the seperation bars for the drop wires and the racks. (Fig. 13.12)

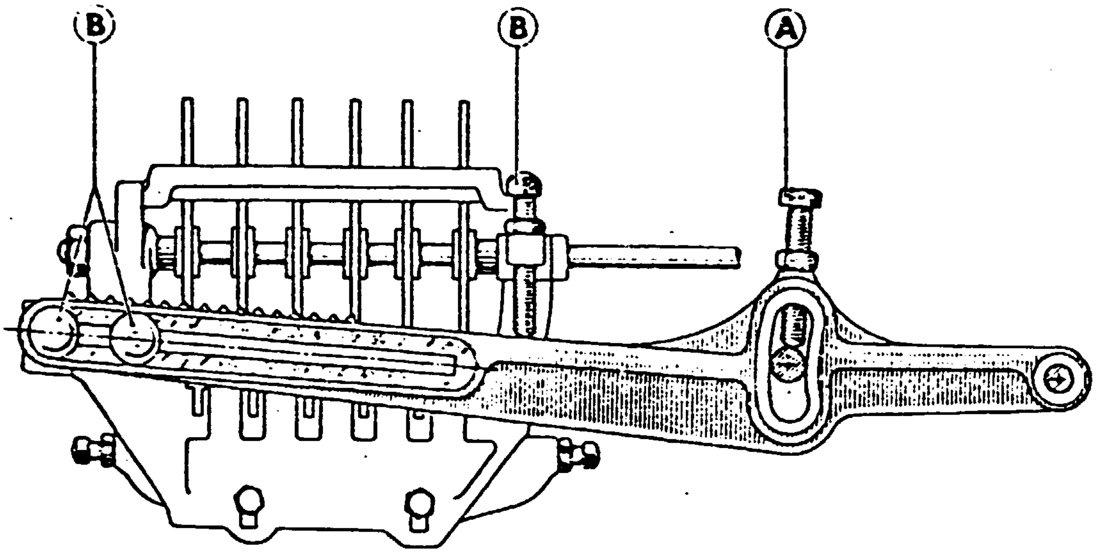
Loom pos. open shed

The height "a" is adjusted by means of the bolts "A" and deper on various factors, in particulcr the length of the drop wires used

"a" 2-3 cm

DROPWIRES MUST BE STRAIGHT

4.9. Height depth and angle of the warp stop motion (Fig. 13.13)



13.13

That position of the warp stop motion depends on the type of fabric to be woven and on the height of the back rest.

"A" : adjusting the height

"B" : adjusting the depth and the angle.

5. Loom problems created by warp stop motion.

5.1. Loom not stopped in proper position.
5.2. Missing ends
5.3. Smash
5.4. Broken shuttle
5.5. Skips
5.6. Ends breaking
5.7. Unequal shed.

MECHANICAL WARP STOP MOTION.

. Adjustment of the pawl lever.

a) Position of the sley : the oscillating lever rests on the smallest radius of the cam.
Fig 8.1a For warp stop motion stopping each pick.
Fig 8.1b For warp stop motion stopping every two picks.

b) Loom engaged, motor stopped.

c) Adjust the set screw "L_1" to have a play of 1 mm between the stop of the pawl lever "N" and the release latch "M". Screw "L_2" well tightened, the release latch "M" must still be free.

Stopping position of the sley on warp-stop. (Fig 8.2)

Remark : Before the setting of the following points make sure the brake works formally.
When the weft breaks the loom must be stopped :
- with the sley full backwards in case of side weft fork.
- with the sley before F.D.C. with center weft fork.

a) Produce a loom stop through the warpstop motion an mark with a piece of chalk both, the cam and the lever (Fig 8.2a)

b) Turn the sley in the position the loom stop is wanted (Fig 8.2b).
Normally the loom must be stopped with the heald shafts levelling and in case of warp stop motion stopping every two picks, with the shuttle at b.s.

c) Turn the cam till both marks correspond again and tighten the cam on the bottom shaft.

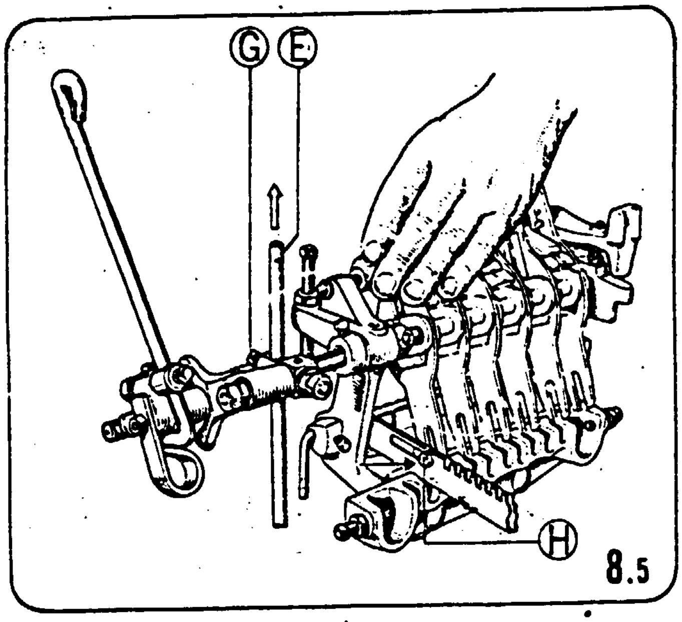
. Position of the cam controlling each warp stop motion bar.

Fig 8.3 Excentric for warp stop motion stopping each pick.
Fig 8.4 Excentric for warp stop motion stopping every 2 picks.
The excentric should be set in such a way so that when the warp stop motion works the finger "Q" (Fig 8.7) rises to its highest position by the cable as the oscillating lever "K" just begins to rise.

a) Turn the loom by hand till the oscillating lever "K" just begins to rise.

b) *Turn the excentric (Fig 8.3 and 8.4) in the direction of the bottom shaft until the oscillating rod "E" just arrives in its highest or lowest position. Tighten the excentric in this position.*

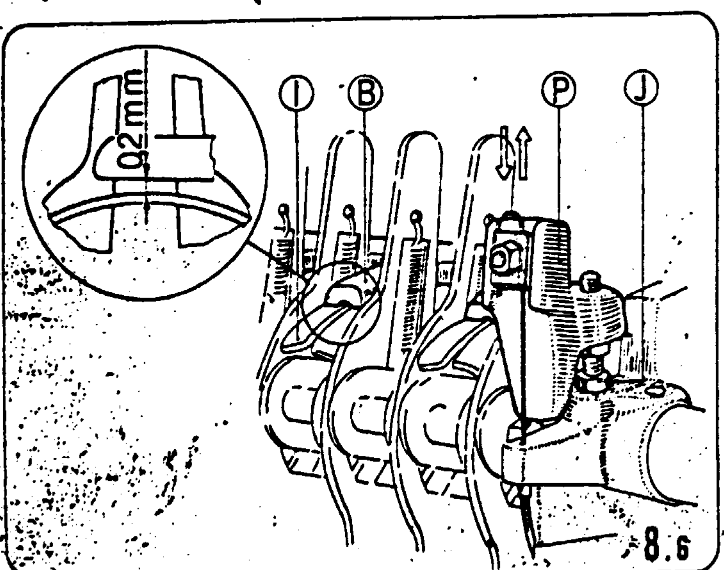
B



8.5

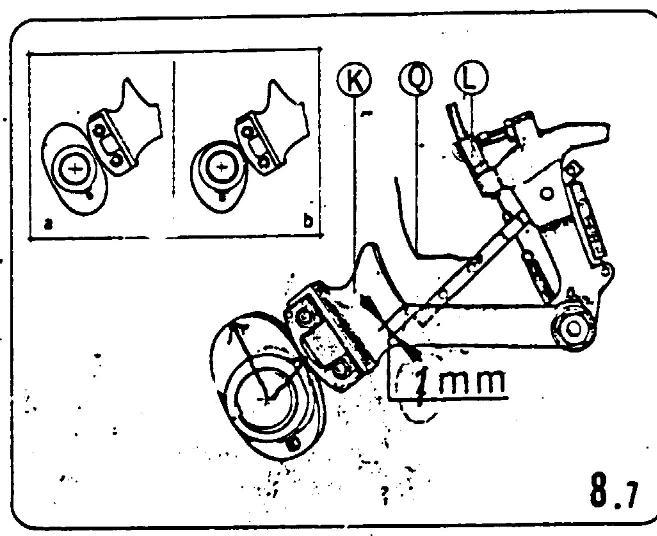
fig 42.

fig 43

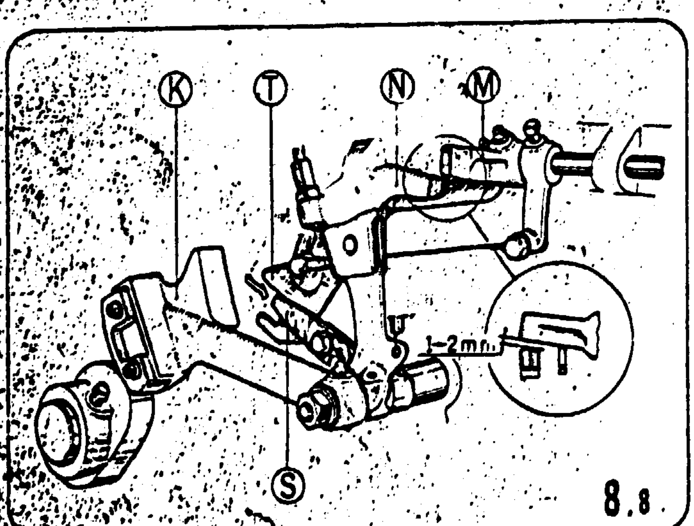


8.6

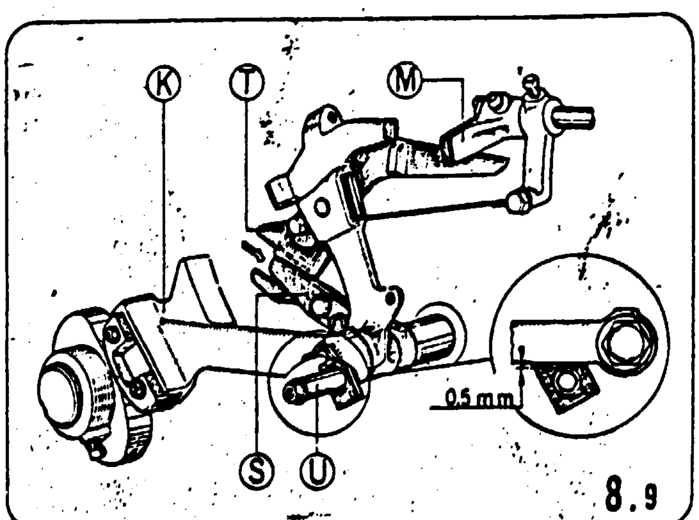
fig 44.



8.7



8.8



8.9

fig 46

Maximum stroke of slider bars. (Fig 8.5)

a) Turn the loom by hand until the oscillating rod "E" is in its highest position.
b) Unscrew the screw "G" fixing this rod on the oscillating arm.
c) Push by hand, the slider bars towards the centre of the loom in such a way that the sliding bar stud "H" comes to the end of the slider bar holder.
d) Secure the fixing screw "G" on the oscillating rod.
e) Watch the complete movement of the slider bars and see if it is necessary to increase or diminish this movement by displacing the rod "E" in another hole of the lever "D". (Fig 8.3 and 8.4)

Setting of the Bowden Wire Grid. (Fig 8.6)

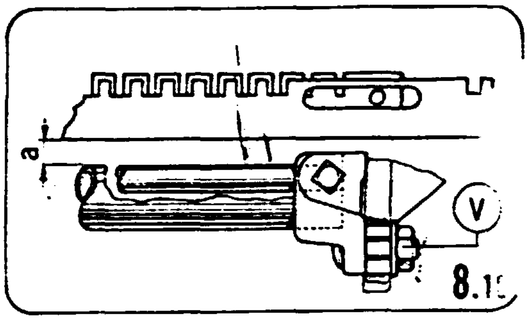
Tighten or loosen the screw "J" to have a play of 0,2 mm between the escape lever "I" and the release grid "b".

Adjustment of the Cable Length. (Fig 8.6 and 8.7)

a) Loom clutched, motor stopped, turn the loom by hand until the oscillating lever "K" rests on the minimum radius of the cam.
b) Adjust the suspension screw of the cable so that while the oscillating lever "K" rises, there is 2 mm play with the finger "Q" at the bottom of the cable.
c) Use the screw "L_3" at the bottom of the cable to make the fine adjustment.

Lever putting out of action the stop motion on first pick.

a) Produce a loom stop through the warp stop motion.
b) With the hook "S" in the upper hole of the pawl "T" (Fig 8.8), adjust the length of the hook "S" so that there is a play of 1 to 2 mm between the pieces "M" and "N". The stop of the pawl lever "N" must go freely under the release latch "M" when the clutch is engaged.
c) Turn the loom until the oscillating lever "K" rests on the smallest radius of the cam.
d) With the hook "S" in the lower hole of the pawl "T", adjust the finger "U" against the oscillating lever "K" with a play of 0,5 mm.
Check if the release latch "M" falls down after the first pick.



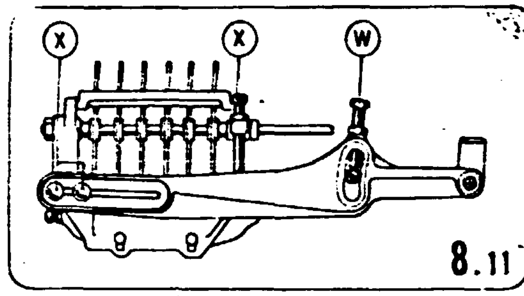
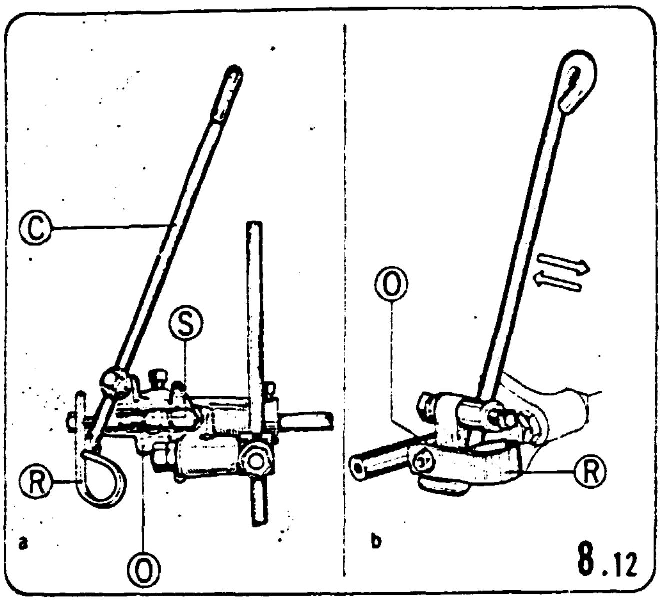


fig: 47



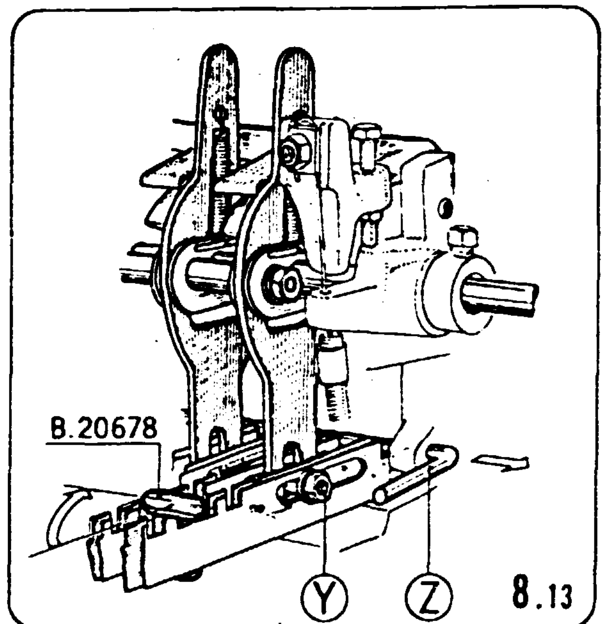


fig: 48a

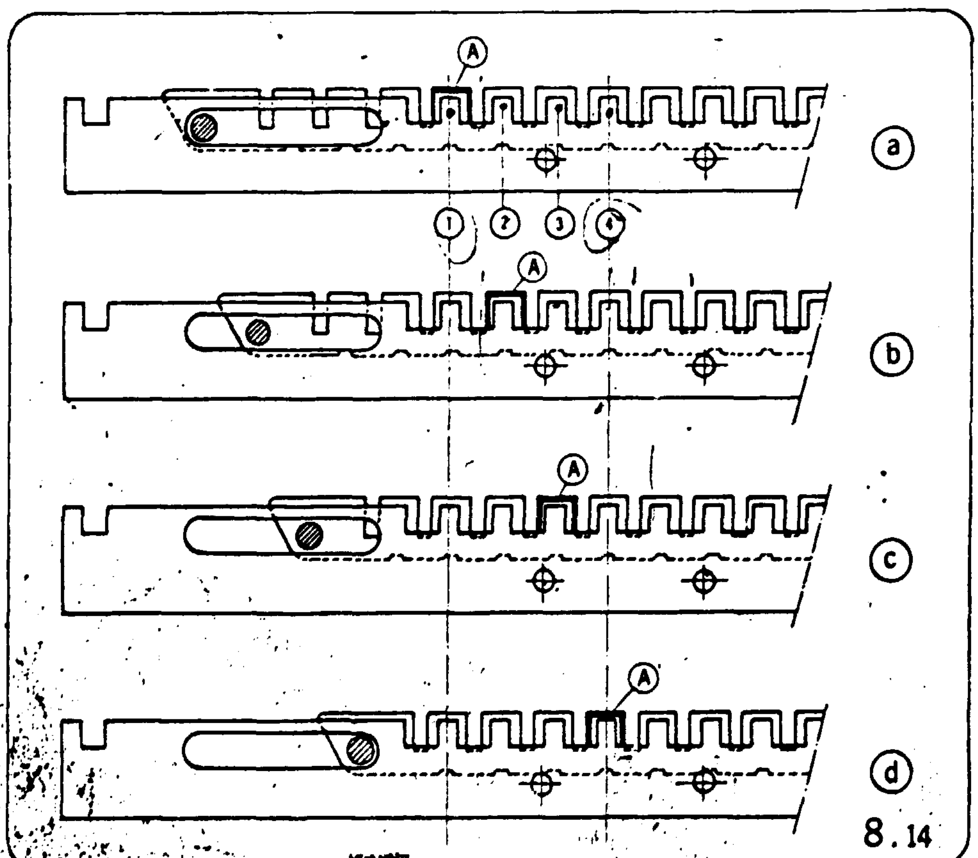


fig: 48.b

Distance between the slide racks and posit[illegible] [illegible]ars.

Distance "a" is adjustable with the bolt "V[illegible] [illegible]epends on different factors, particularly on the length of the drop wires.

Height, depth and angle of the warp stop motion.

The position of the warp stop motion depends on the cloth we have to weave.

Disconnecting of the warp stop motion bars. (Fig 8.12)

The locking device "R" in the position as shown in fig 8.12b (warp stop motion bars out of action).
In this position the locking device pin "S" must be fully in the piece "O".
If this is not the case one should displace the piece "R" on the pin "S".

Adjustment of the slider bars on mechanical warp stop motion. (Fig 8.13)

On filament looms, two slider bars are moved by one lever. To fix the bolts "Y" you have to do the following:

a) Remove the rod "Z".
b) Place the gauge B.20678 between the two slider bars which have to be attached at the same rod. Turn by 90° (a quarter turn).
c) Fix the bolts "Y".
d) Replace the rod "Z".

CHECKING if the warp stop motion works perfectly (Fig 8.14)

- During the complete movement of the warp stop motion bar, the tooth "A" comes in front of 4 different teeth of the fixed warp stop motion bars. (1, 2, 3, 4)
  A drop wire can fall between the bars in one of these four positions. (Fig 1, b, c, d)
  - Put a drop wire when the tooth "A" is just facing the tooth "2" (Fig b) and check that the loom stops at once.
  - Do the same when the tooth "A" is facing the tooth "3" (Fig c).

  These are the two extreme cases, the cable pulls less and later.
  If the loom stops at once in the above mentioned cases it will surely stop in the cases of fig a and d.
  If the loom do not stop at once in one of above mentioned cases one should check the settings again.

Group: 10 A. Tappets and treadles.

B. Harness setting and timing.

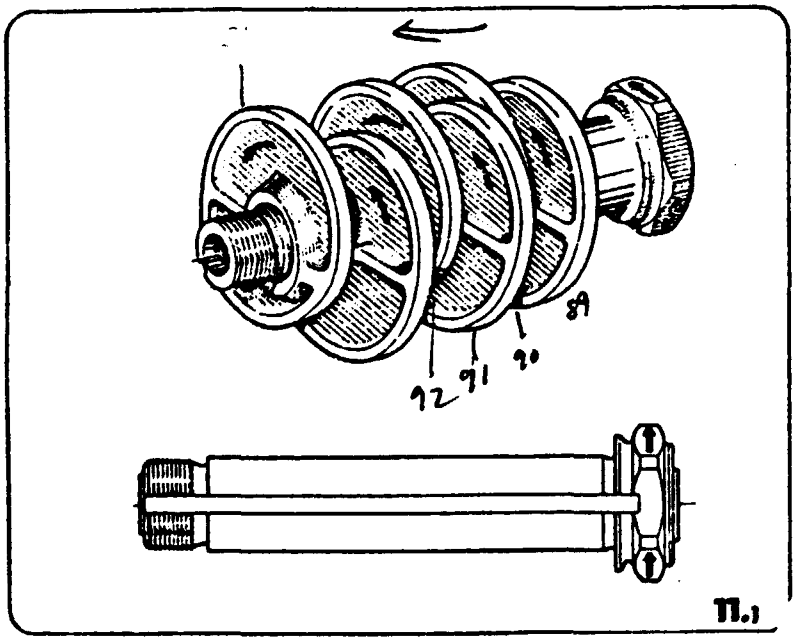
C. Selvedge motion. - Not Farooq

10. A. Tappets and treadles.

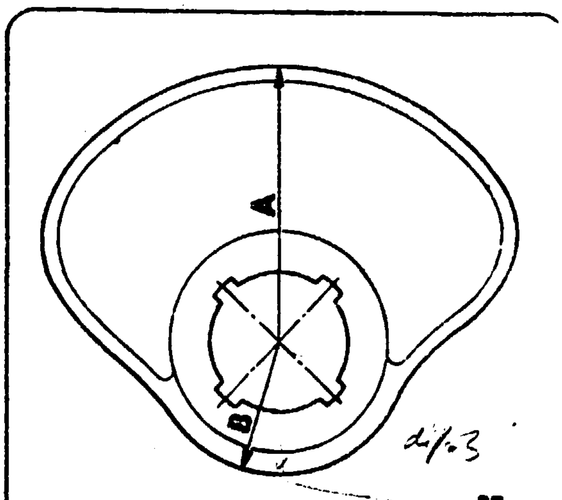
1. Function :

Commanding the up and down movements of the harnesses according to the type of weave in which the cloth is woven. When rotating, the tappet (see fig. 11.2) pushes down the treadle, which is connected with the harness and the last one is pulled down too, thereby forming the shed according to the weave. This movement is controlled by the big radius "A" of the tappet.

When coming to the small radius "B" the treadle can move upwards and consequently the harness too, the harness is pulled up by means of springs attached to the top of the harness.



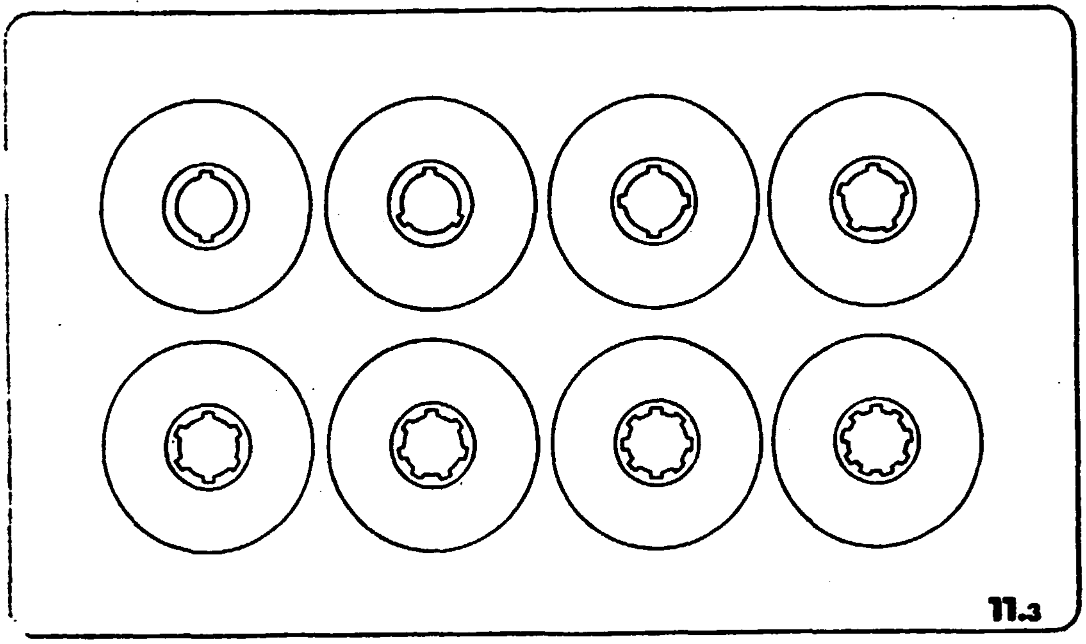
11.1



11.2

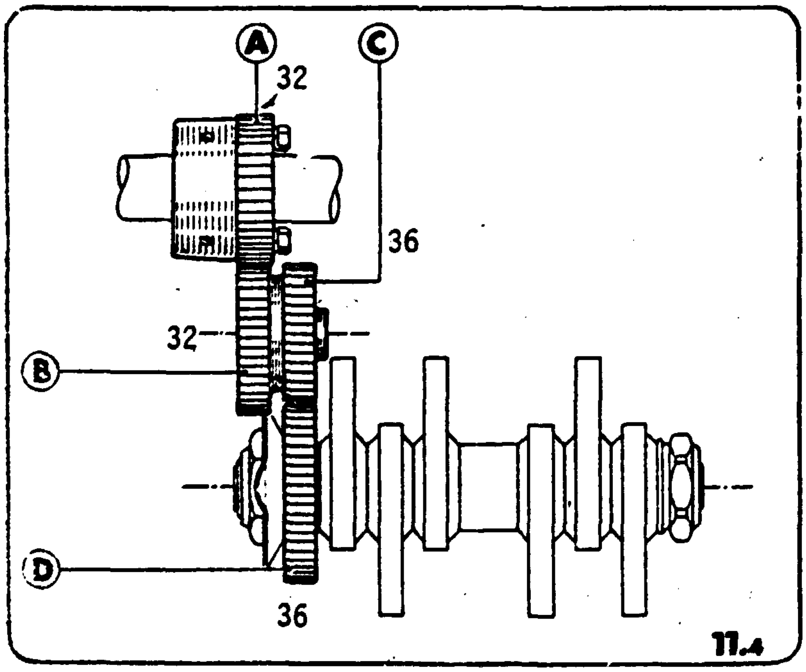
Fig. 11.1 : on the tappet shaft, arrows indicate the direction of rotation of the block in the loom. This direction is always the same as the one of the bottom shaft. When assembling the tappets, make sure that each of them has the correct direction i.e. the arrow corresponding to the arrows on the tappet shaft.

The various tappets (fig. 11.2) of one block have different dimensions. The big radius "A" of each tappet is the same. Due to the fact that the big radius corresponds to the lower position of the harness, the different lower positions for each harness is determined by the length of the jack eyes. The small radius "B" determines the upper position of the harness. The tappet having the smallest radius "B" results in the highest position and consequently is foreseen for the last harness. The tappet having the biggest radius "B" moves the first harness (see fig. 11.2).



11.3

Should the number of used tappets be insufficient to complete the block, distance pieces are provided corresponding to the missing tappets. The type of tappets to be used should have a number of keyways equal to the number of picks in the weave (Fig. 11.3).



11.4

Following list (page 117) indicate the transmission pinions accordingto the number of picks in the weaves (fig.11.4). The number of teeth of the pinions "A" and "B" is 32 and always constant. The pinions "B" and "C" are made of one single piece.

Number of picks for a specific weave	Transmission ratio between "C" and "D".	Number of teeth in the pinions. "C"	"D"
2 picks	1 : 1	36	36
3 picks	1 : 1	28	42
4 picks	1 : 2	24	48
5 picks	1 : 2,5	20	50
6 picks	1 : 3	18	54
7 picks	1 : 3,5	16	56
8 picks	1 : 4	14	56
9 picks	1 : 4,5	12	54

2. Parts :

2.1. Tappets
2.2. Tappet-shaft
2.3. Treadle lever
2.4. Treadle roll
2.5. Drift pin
2.6. Central cam bush.

3. Assembling :

3.1. Replace treadle levers for harness.
Replace, starting from the right (front of loom) in the order :
(1, 3, 5, 7) (2, 4, 6, 8) (1, 3, 5, 7) (2, 4, 6, 8)
(1, 3, 5, 7) (2, 4, 6, 8).
3.2. Replace treadle rolls in treadle levers.
3.3. Replace tappet assembly in cam shaft box.
3.4. Replace drift pin through tappet assembly.
Replace spacers and special washer.
Secure in position by tightening special nut.

NOTE: Ensure that bolts in cam shaft driving pinion are located in center of slots in pinion driving coupling.

4. Adjustments: See adjustments 10 C. Harness setting and timing.

10. B. Harness setting and timing.

1. Function:

Pulling up and down the groups of warp ends, according to the weave of the cloth.

2. Parts :

2.1. Harness cable

2.2. Jack eyes

2.3. Harness frame

2.4. Healds

2.5. Clock spring

2.6. Clock spring disc

2.7. Clock spring disc shaft

2.8. Indicator disc

2.9. Clock spring top front plate

3. Assembling F.S. and B.S. :

3.1. Replace clock spring disc on shaft.

3.2. Replace clock spring hub

3.3. Replace clock spring

Replace in same sequence for any additional shaft.

3.4. Replace spacer on outside of shaft

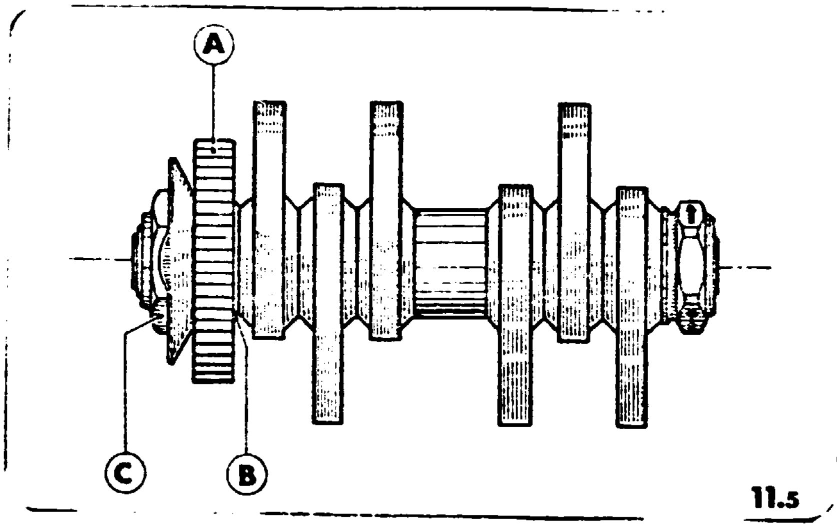
3.5. Replace indicator disc.

3.6. Replace clock spring top front plate

3.7. Tighten assembly (4 bolts).

4. Adjustments :

4.1 . Assembly of the tappet block (Fig. 11.5)



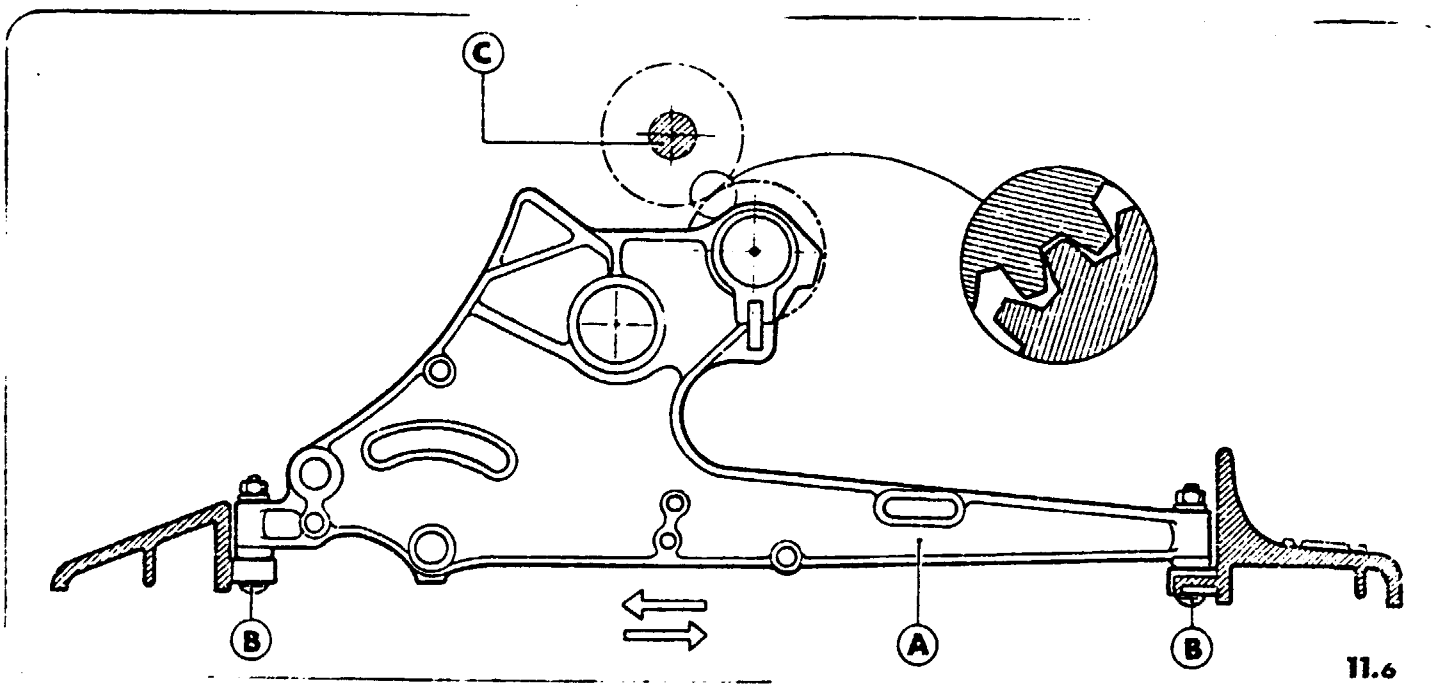
11.5

a) Pinion "A" has its collar "B" always directed towards the tappets.

Also the big nut "C" has its largest collar directed towards the cams.

b) Tighten up the big nut "C" properly under pressure and bend the security washer over the nut.

The tappet shaft pinion (A) should be so engaging as to lift Shaft 1 (front) at B.S. picking.



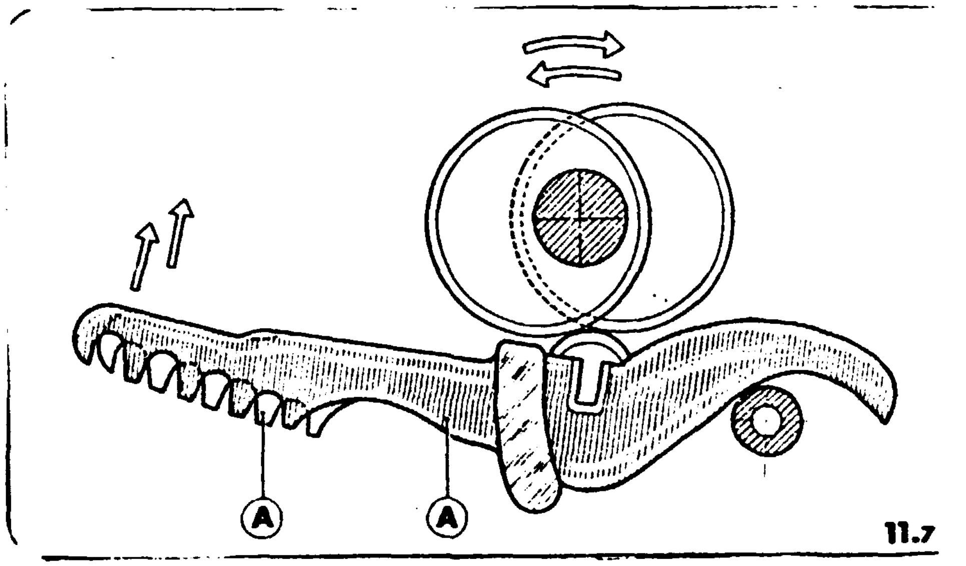
11.6

4.2. Clearance and position of the transmission gear (Fig. 11.6)

a) Tighten up the bolts "B" holding the tappet block support "A" in such a way as to obtain a normal clearance between the pinions on the bottom shaft and the intermediate pinion.

b) Make sure that the bottom shaft "C" and the shafts on the tappet-assembly are parallel.

4.3. Crossing of the harness (Fig. 11.7)



The crossing of the harnesses means the moment in which a downwards going harness is level with the upwards coming harness.

a) Single spring top motion. CM-CC

- Put the loom on the shedding number where the crossing of the harness is needed.
- Loosen the 3 bolts of the pinion on the bottom shaft.
- Push the treadles "A" of a falling shaft and a rising one against their corresponding tappets. Turn the block until both treadles are at the same height.

The fig. shows this position.

Should there be not sufficient distance in the slots to adjust the pinion correctly, then it will be necessary to loosen the intermediate pinion and to slide it. Turn the pinion on the bottom shaft approximately in the middel of the slots. Put the treadles level and put the intermediate pinion back. Tighten up the nuts properly.

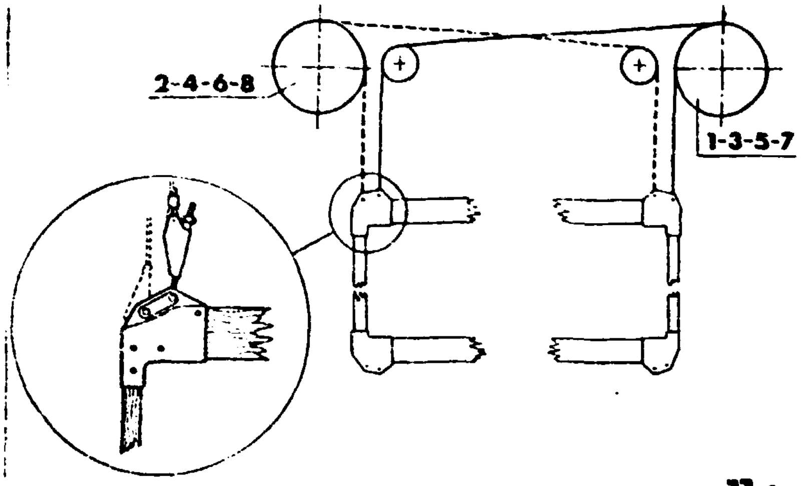
b) Double spring top motion. CL

Proceed in the same manner as with the single spring top motion. In this case, it will never be necessary to loosen the intermediate pinion, as the bottom shaft can be turned around 360°.
Care shouls be taken that the treadles of the same harness number are adjusted when there are two blocks.

REMARKS:

- If afterwards an earlier or a later crossing is desired, proceed as follows: Turn the loom in the desired position for crossing. Loosen the pinions and put the treadles of a falling and a rising harness at the same height. Tighten up the pinions securely. Care should be taken that the pinion of the bottom shaft and intermediate pinion face each other in the case of the double spring top motion.

- It is recommended not to cross the harness earlier than 5 cm. before F.D.C. on loom with 1 or 2 centerweft forks. This in order to prevent weft curls or loops.



11.8

4.4. Putting harness frames in loom.

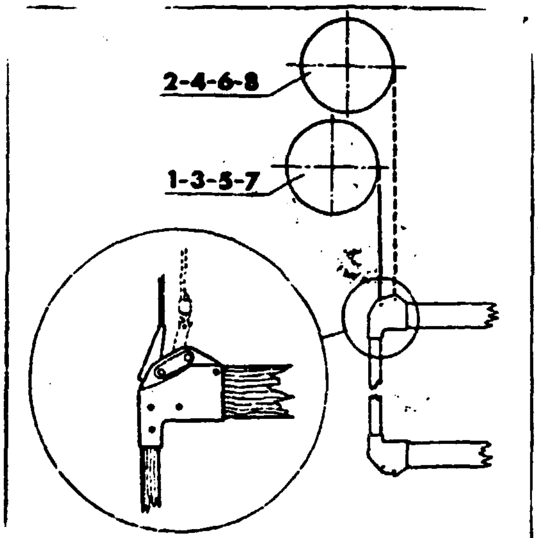
a) Top.

Single spring top motion (Fig.11.8)

Each harness is pulled back by means of one spring.

The position of the springs is as follows:

1. For the first harness (and all uneven harnesses):
   - right.
2. For the second harness (and all even harnesses):
   - left.



11.9

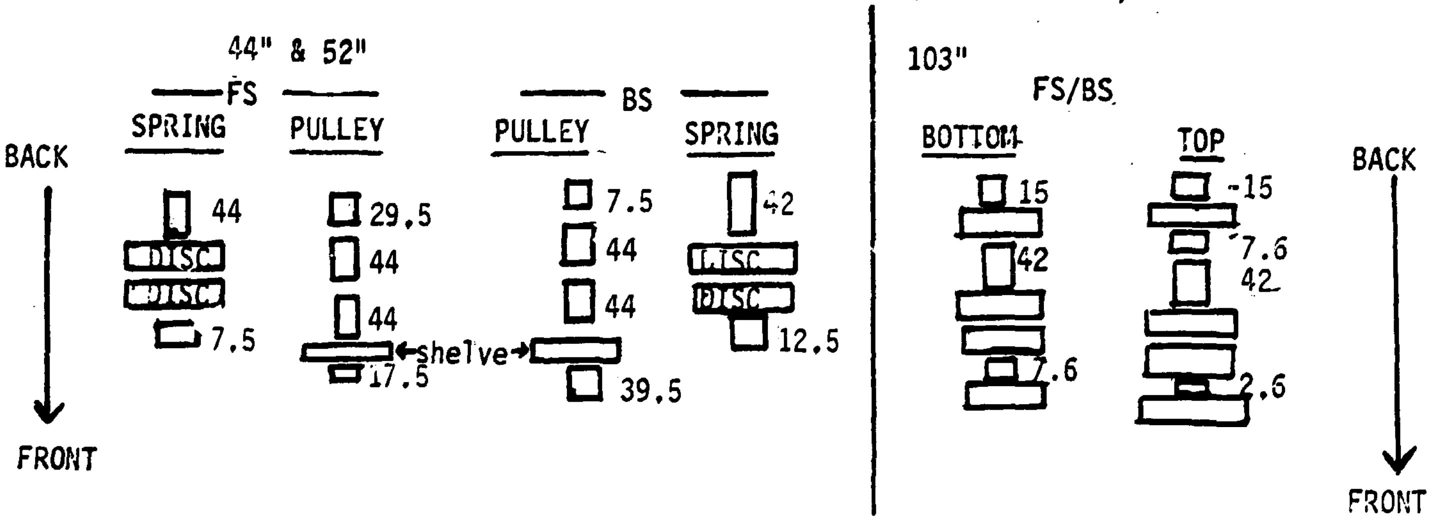
- Double spring top motion (Fig. 11.9)

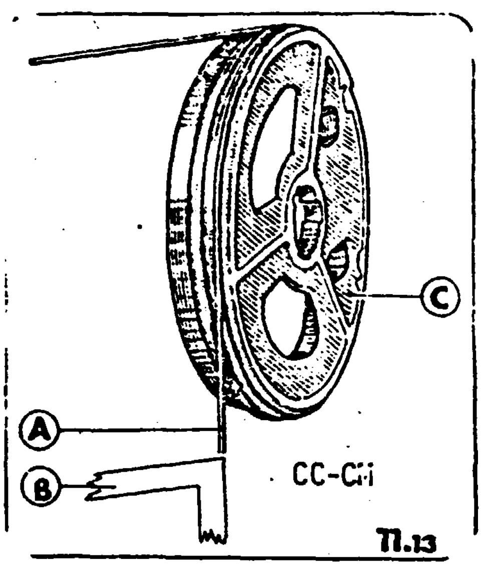
  Each harness is pulled back by means of two springs, one on each side of the loom.

  1. The first and all uneven harnesses are fixed to the lower set of springs.
  2. The second and all even harnesses are fixed to the upper set of springs.

ASSEMBLY OF CLOCK SPRING

(WITH SPACERS)





B 8944
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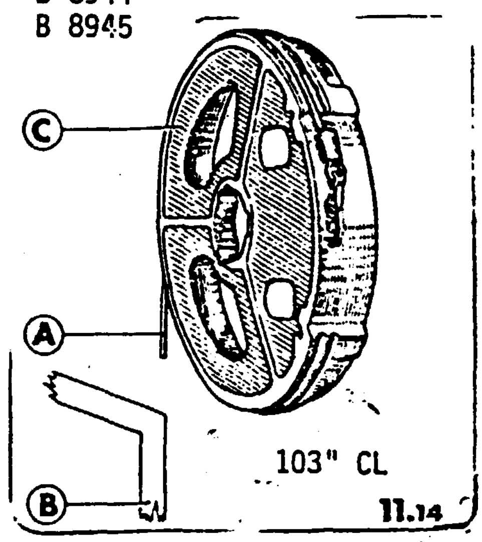
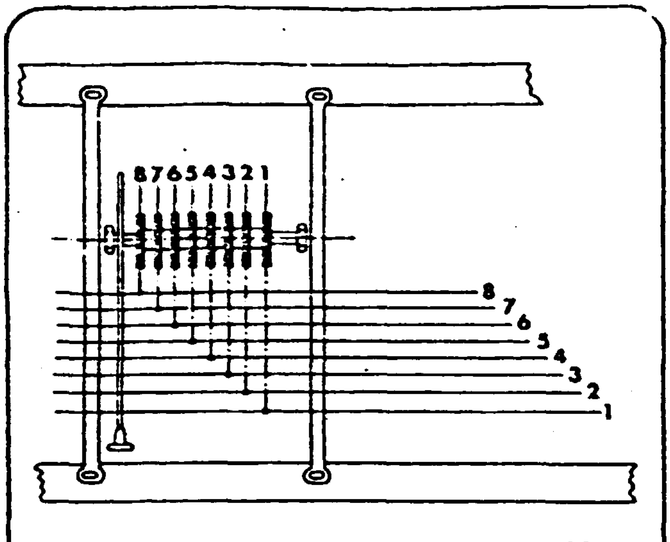


Cable "A" which fixes the clock spring, directly to the harness "B" (i.e. the cable which is not guided to the other side of the loom) should be put in the groove nearest to the clock spring housing surface "C". This surface is always located on the side of the clock spring housing where the hole is to fix the hook.

- Fig. 11.13 : single spring top motion. CC-CM
- Fig. 11.14 : double spring top motion. CL

ATTENTION.

- This side of the clock spring housing can be turned either to the front or to the back.
- Be careful to assemble correctly all individual parts when the return springs have been disassembled.
- The tension on the clock return springs is determined by the type of cloth being woven, the width of the loom and its speed.
- The tension should be the same on both sides.

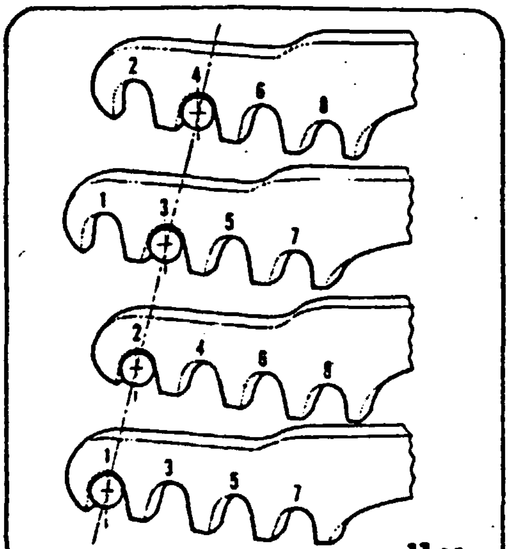


11.14

b) Bottom.

1. Single motion (Fig. 11.14)

The harness is fixed to the treadle by means of a pulling board and an adjustable jack eye. Each board has 2 numbers, for example 3 and 6. This means that this board is turned to the other side. The first harness is fixed to the first tappet i.e. the first from the battery side.

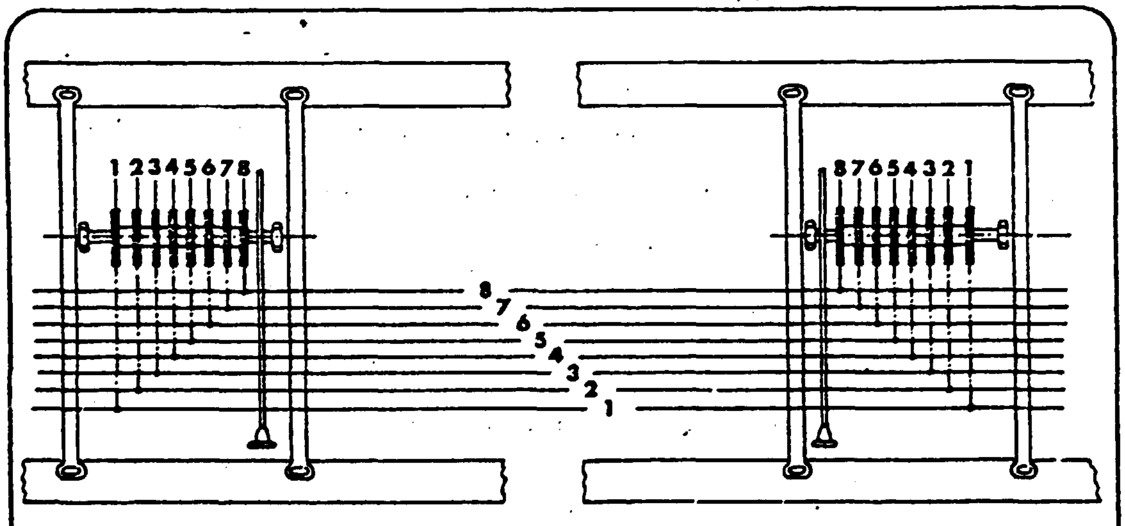


11.15

Remark:
The recesses in the treadles have numbers.
These numbers correspond with the corresponding harnesses (Fig. 11.15)

2. Double motion (Fig. 11.16)

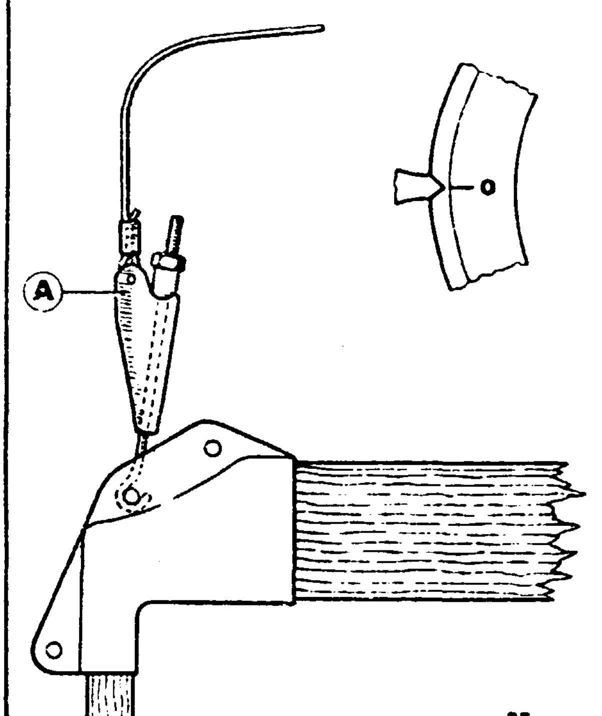
The harness is fixed by means of two harness rods and two adjustable jack eyes.
The first harness is fixed on the two first tappets, i.e. rhe outer tappets.



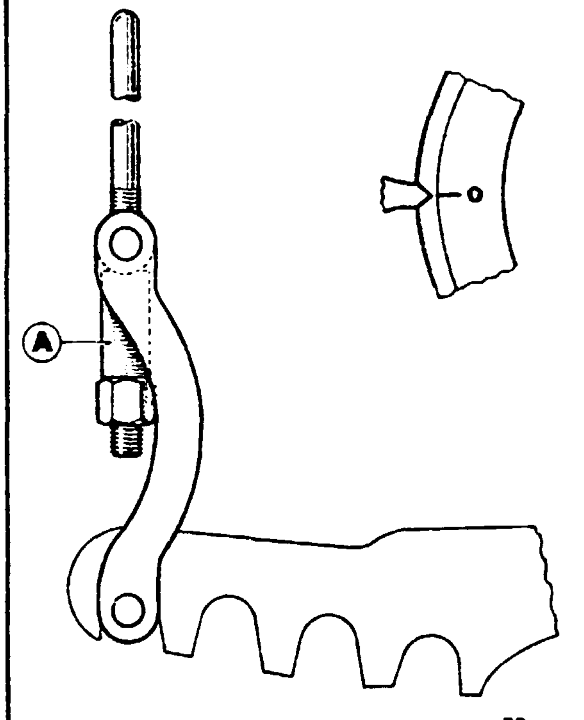
11.16

Also here the longest treadles belong to the 1st, 3rd......harness (uneven ones and the short treadles to 2nd, 4th, ... harness (even ones). (Fig. 11.15)

4.5. Adjustment of the bottom shed (Fig. 11.17 and 11.18)



11.17



11.18

a) Position of the sley: B.D.C. The shed is open.

b) The harnesses should be level at any time. This is adjusted by means of checking the bottom shed, which should have the same height over its full width in relation to the race-board.

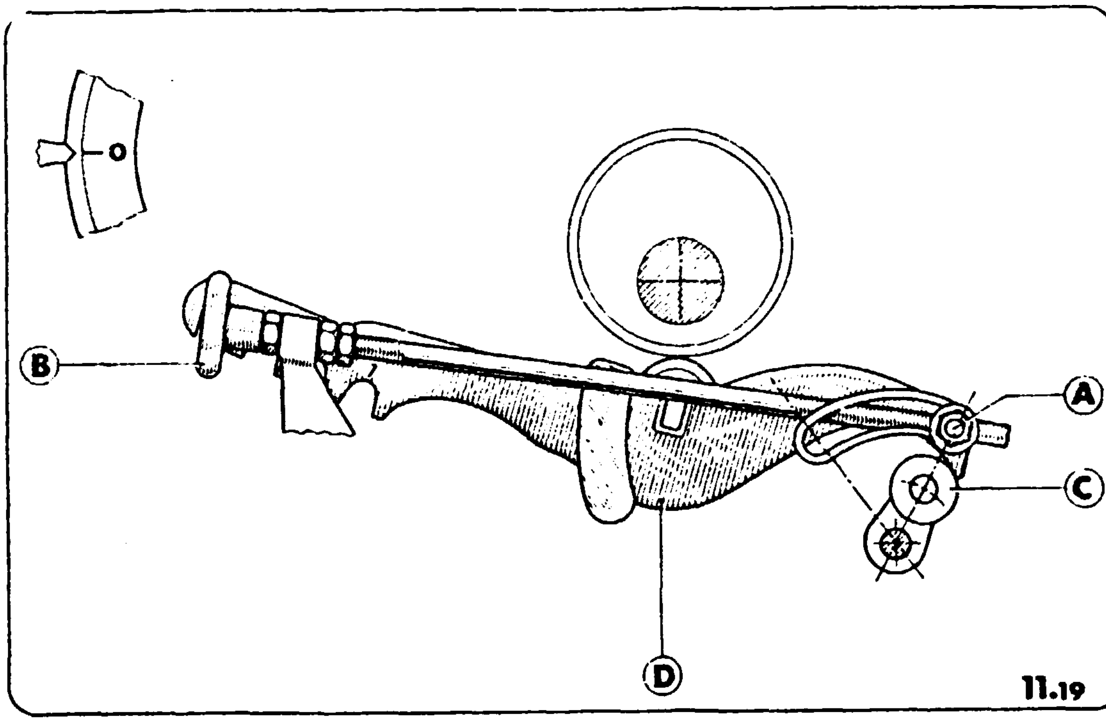
Adjust this as follows:

- on the single motion by means of cable hooks "A" (Fig. 11.17)
- on the double motion by means of the jack eyes belonging to one of the tappet blocks (fig. 11.18).

c) The height of each harness is adjusted with the jack eye "A" (fig. 11.18) in such a way that the bottom shed nearly touches the race-board (for single and double motion).

4.6. Size of the shed (Fig. 11.19 and 11.20)

a) Position of the slay : B.D.C. The bottom shed nearly touches the race-board.



11.19

b) Put a shuttle in the shed opening and loosen nut "A".

c) With handwheel "B" alter the oscillating point "C" of treadle "D" in such a way that the top shed is 5 mm. clear from the front wall of the shuttle.
Cotton-narrow 5 m. / Cotton wide 8-10 m.
Tighten up nut "A" properly.

Fig. 11.19 shows the position with minimum shed opening.

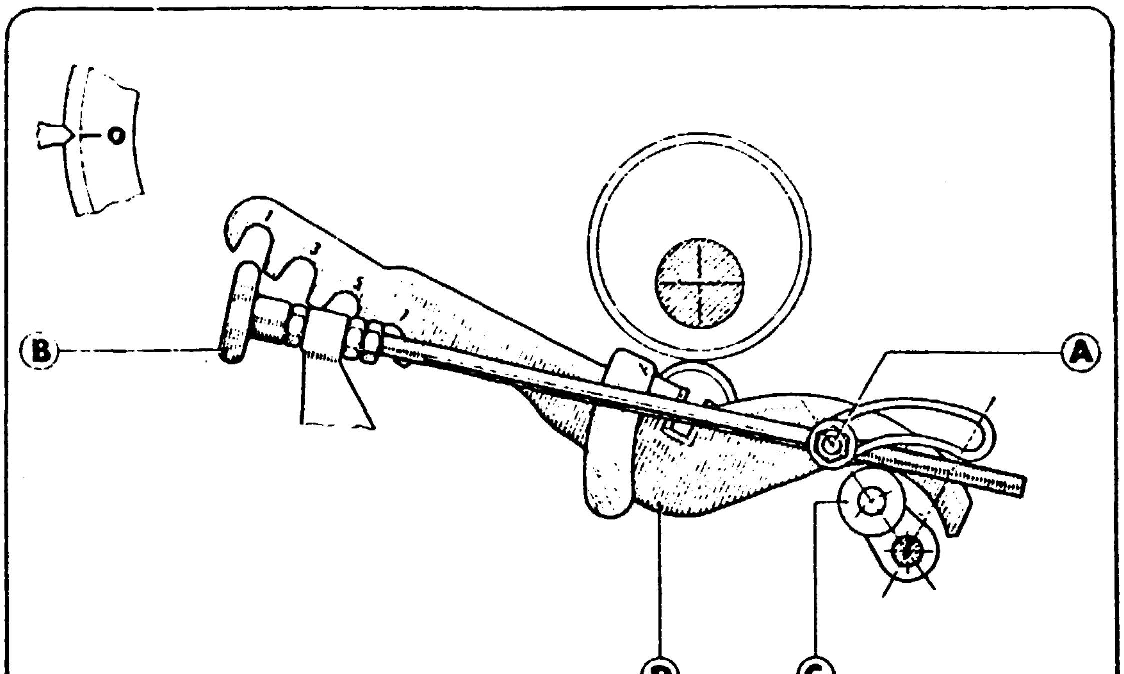
Fig. 11.20 shows the position with maximum shed opening.

On the double motion, the size of the shed should be adjusted on both sides.

REMARKS.

- Adjust the opening of the upper shed at less than 5 mm. from the front wall of the shuttle for silk, man-made fibres and heavy fabrics.

- Each position of the roll "C" between its minimum and maximum position corresponds to a shed opening varying between the min. and max. shed opening.



Π.20

- When altering the position of roll "C", the pivoting length of the treadle becomes bigger or smaller, which in turn gives a different lift to the top shed. The position of the bottom shed remains the same when making this adjustment and, consequently, remains with a minimum clearance from the race-board.

5. Loom problems created by Harness setting and timing.

A. Harness setting.

5.1. Overshots
5.2. Skips
5.3. Smash
5.4. Break weft
5.5. Kinky weft
5.6. False change
5.7. Bad change
5.8. Knock out pirn
5.9. Laying off
5.10. Bang-off
5.11. Hang obbin
5.12. Dammage of the race-bobbin.

B. Harness timing.

5.21. Overshots
5.22. Skips
5.23. Smash
5.24. Knock-out pirn
5.25. False change
5.26. Hang bobbin
5.27. Break weft
5.28. Throw shuttle out
5.29. Bang off
5.30. Dammage of the raceboard.

10. D. Selvedge motion (independent) not on Farooq Picanol

1. Function.

The independent selvedge motion consists of two devices placed on each side of the loom which make it possible to weave the selvedges without ground healds frames being required.

2. Parts.

2.1. Control cam
2.2. Selvedge cam follower
2.3. Selvedge treadle
2.4. Selvedge treadle shaft
2.5. Selvedge harness embraces
2.6. Selvedge roll

3. Assembling.

3.1. Place the selvedge cam on the bottom shaft with the cam follower and threadle
3.2. Place the straps with the harness embraces and springs and pass then over the selvedge roll.

4. Adjustments.

4.1. Suspension of the frames (fig. 33.4 and 33.5.)

a) Upper fastening.

- loom with single top spring motion (Fig. 33.4.)

1) By means of the two set screws "A" adjust the position of the second selvedge frame "B" (the frame which is farthest from the weaver) until it is ± 3 mm. from the first ground shaft.
The slide "C" must remain vertical.

2) Adjust the selvedge frame "D" (the frame nearest to the weaver) so that it barely touches the second frame.
For this adjustment use the roller "E".

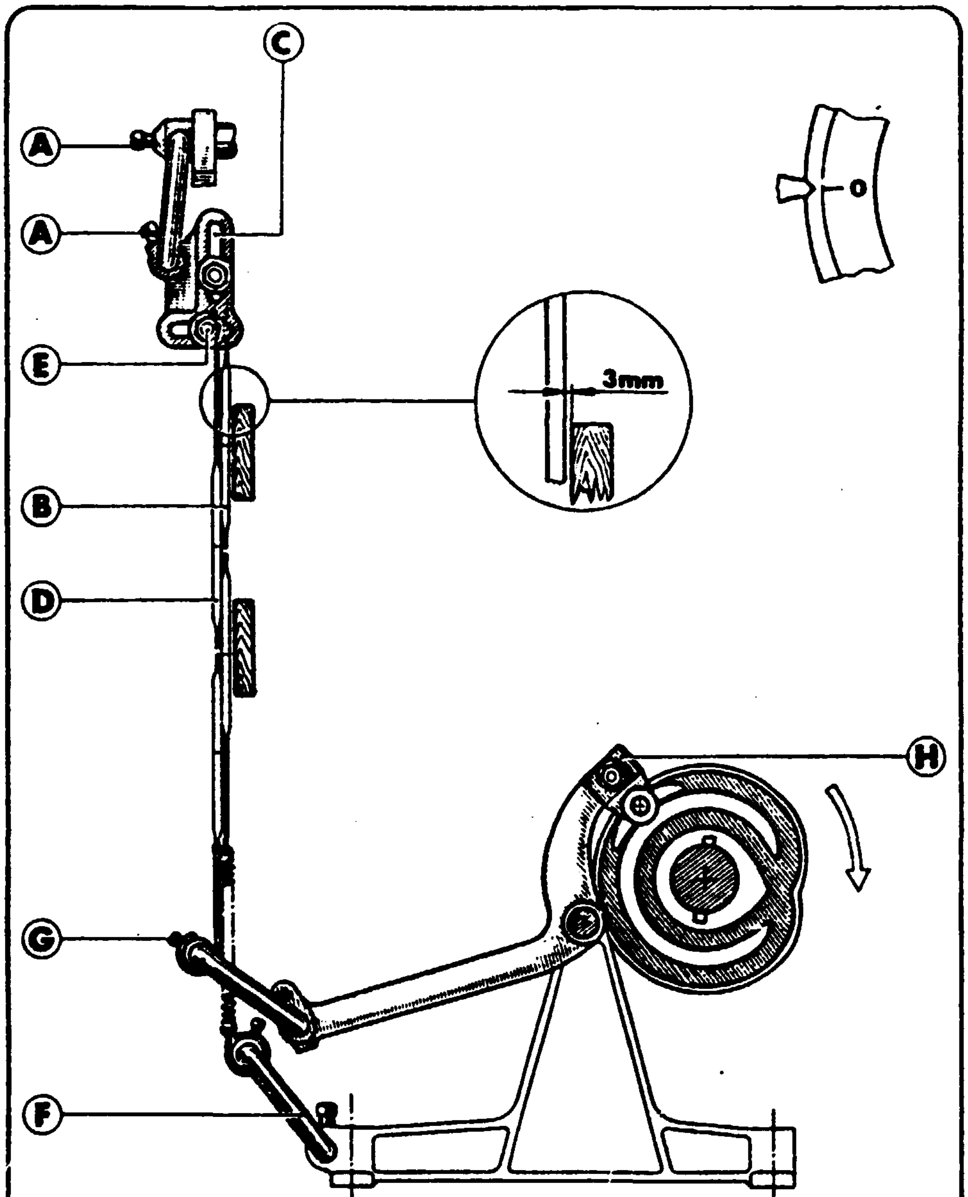
- loom with double top spring motion (Fig. 33.5)

1) Move the roller "A" so that the second selvedge frame "B" is ± 3 mm. from the first ground shaft.

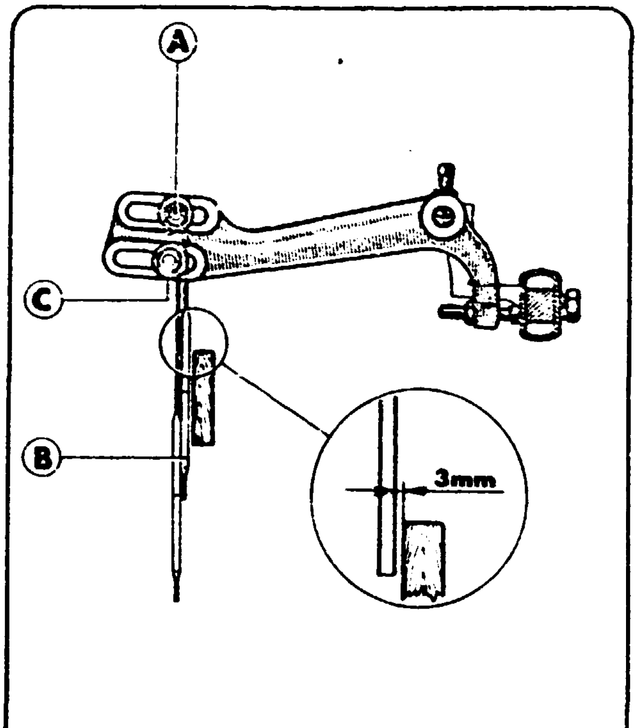
2) Move the roller "C" of the first selvedge frame so that the frame barely touches the second frame.

b) Lower fastening (Fig. 33.4)

Move the rod "F" until the second frame is vertical.



33.4



33.5

4.2. Position of the first frame lower shed and size of shed (Fig.33.4)

a) Sley position: B.D.C.
The first selvedge frame is in its lowest position (if necessary: turn the sley or the control cam on the bottom shaft if this cam must still be adjusted).

b) Adjust the strap length by means of the screw "G" so that the lower shed is just touching the race board.

c) Turn the loom (or the cam on the bottom shaft) to bring this first frame into its high position.

d) Adjust this high position (shed size) by moving the half moon carrier "H" along the lever. The selvedge upper shed may remain up to 5 mm. below the ground warp upper shed.

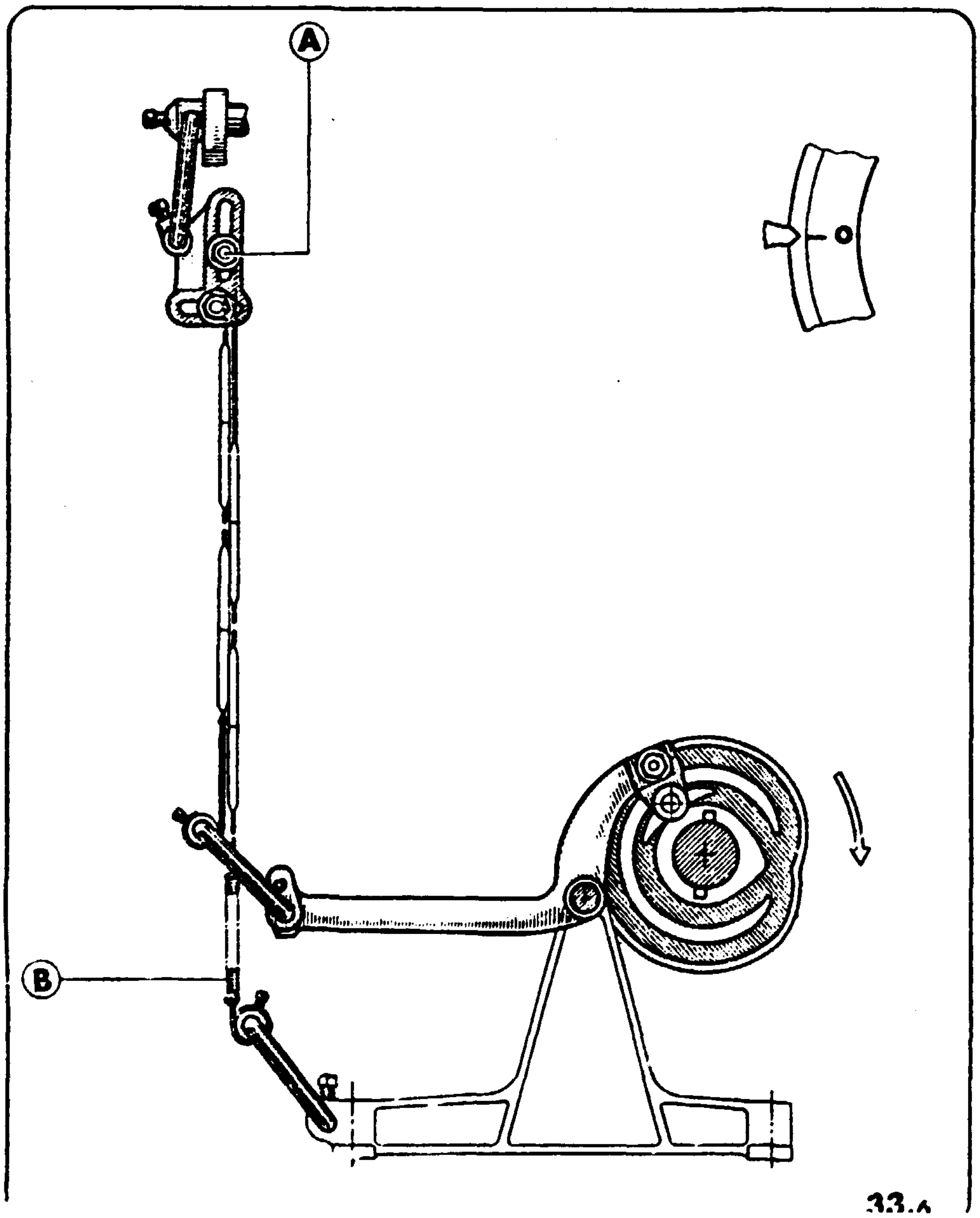
4.3. Position of the second frame lower shed (Fig.33.6 and 33.7)

Sley position: B.D.C. The second selvedge frame is low.

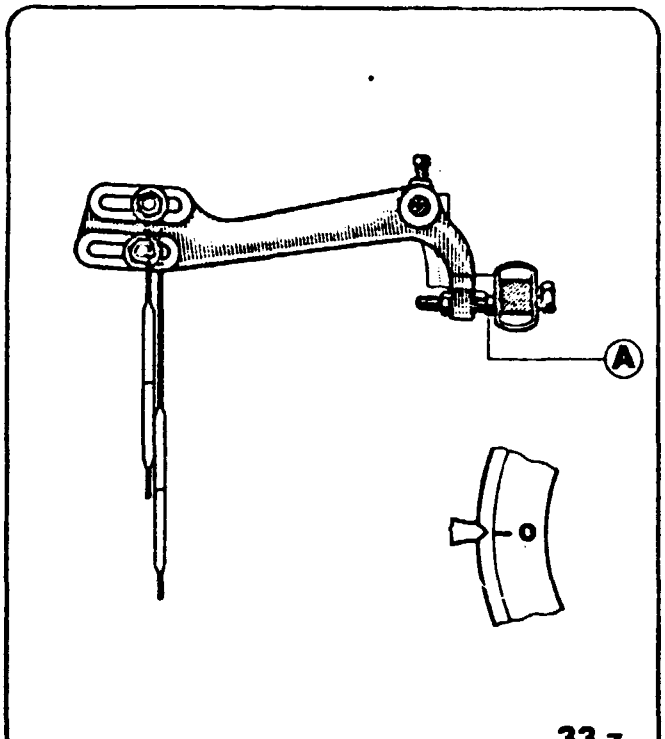
a) Looms with single top spring motion (Fig. 33.6)
Adjust the warp line to the race board by moving the roller "A" along its vertical slide.

b) Looms with double top spring motion (Fig. 33.7)
Adjust the shed so that it barely touches the race board by means of the screw "A".

In this position: Tension the return spring "B" (fig. 33.6) by approximately 30 mm. relative to its free length.



33.6



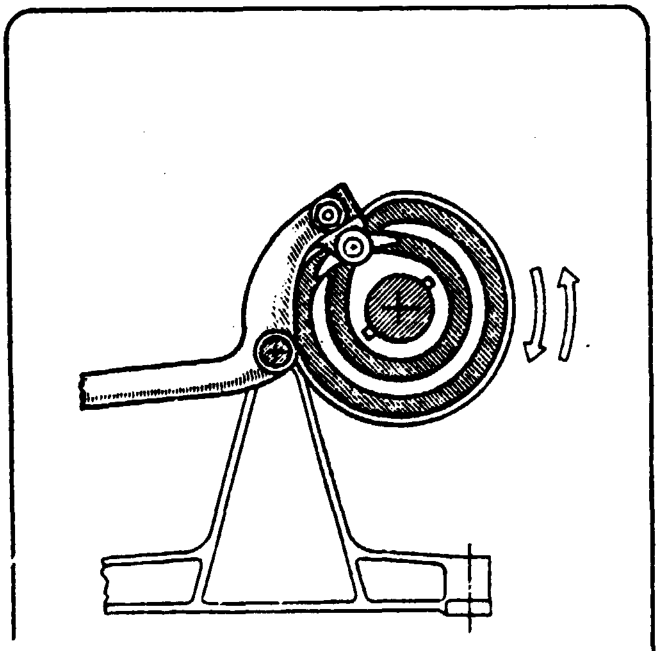
33.7

4.4. Position of the control cam (Fig. 33.8)

a) Sley position: the shed is closed for the ground cloth.
In case of a warp rib weave or basket weave, the shuttle must be on the side where the cam is adjusted. For a plain weave the shuttle may be on either side of the loom.

b) Fasten the cam on the bottom shaft so that the shed (of the selvedge) is closed.

REMARK: If the shuttle must be on the same side as the cam when the latter is being adjusted (rib or basket weaves), both cams will automaticaaly be staggered by half a turn relative to each other (see: A.General).



5. Loom problems created by the selvedge motion.

5.1. Broken selvedge ends
5.2. Loose selvedge
5.3. Bang off
5.4. Bad selvedge
5.5. Dammage of the raceboard
5.6. Overshots

Group 11. A. Temples
B. Cutter

A. Temples.

1. Function :

To hold the cloth for width and height by means of rings with needles.
The temples should be mounted as close to the cloth as possible, but without exaggeration so that the selvedge is still hold by the pins of the last rings.

2. Parts :

2.1. Temple
2.2. Temple holder
2.3. Spring box
2.4. Rings with needles
2.5. Ring bar

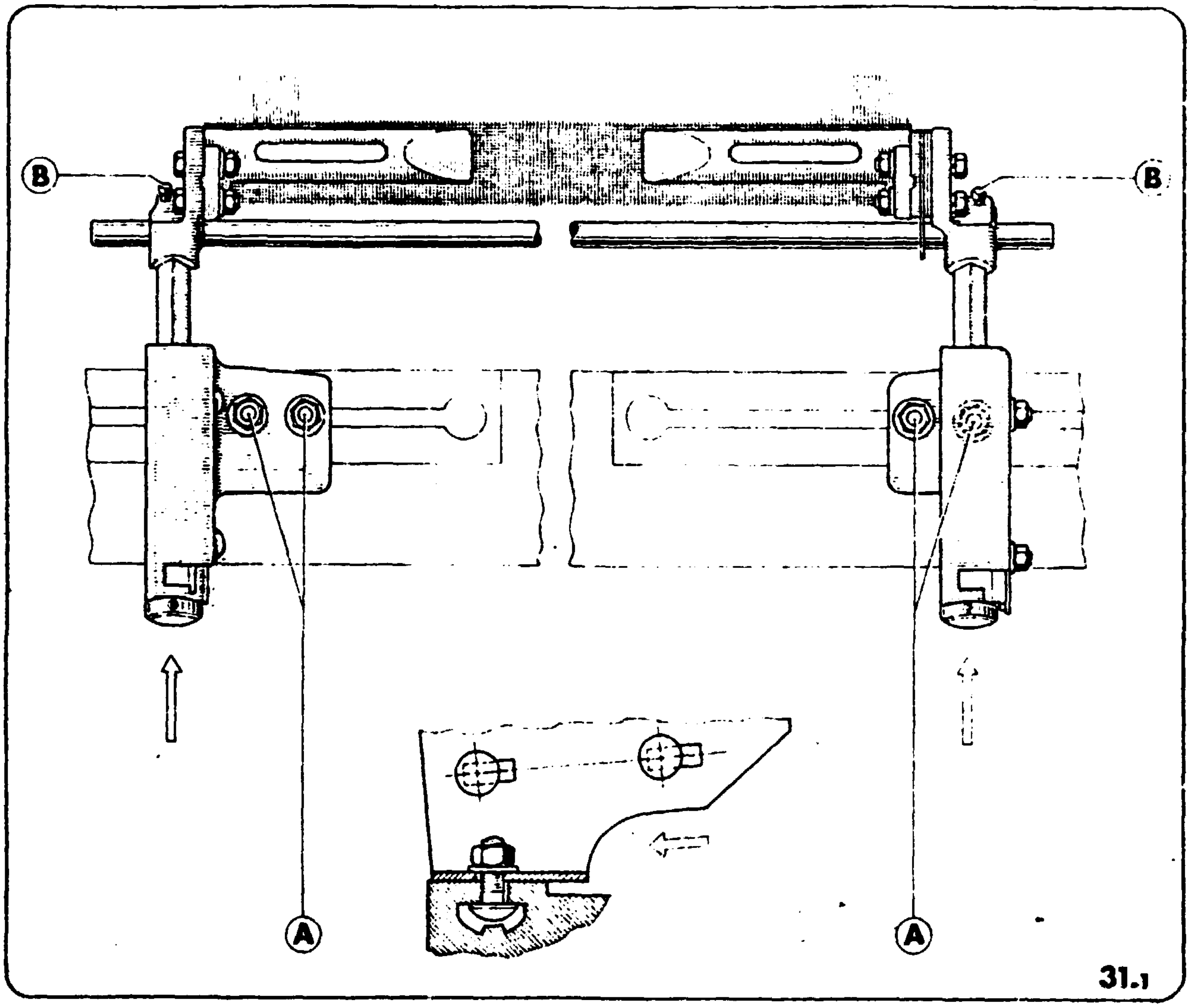
3. Assembling:

3.1. When assembling the spiked ring barrels and rings, we must pay attention to put them back with the same order as they have been dismantled.
Each barrel has at the top a groove and all of them must be in line.
Fix the barrels and rollers on the loom and replace the support before fix them with the nut.

3.2. Replace the ring temple cover.

4. Adjustments.

4.1. Side position of the temple on F.S. and B.S. (Fig. 31.1)



31.1

a) Slacken the nuts "A" and the set screw "B".

b) Place the temple with the normal gap and tighten screw "B"

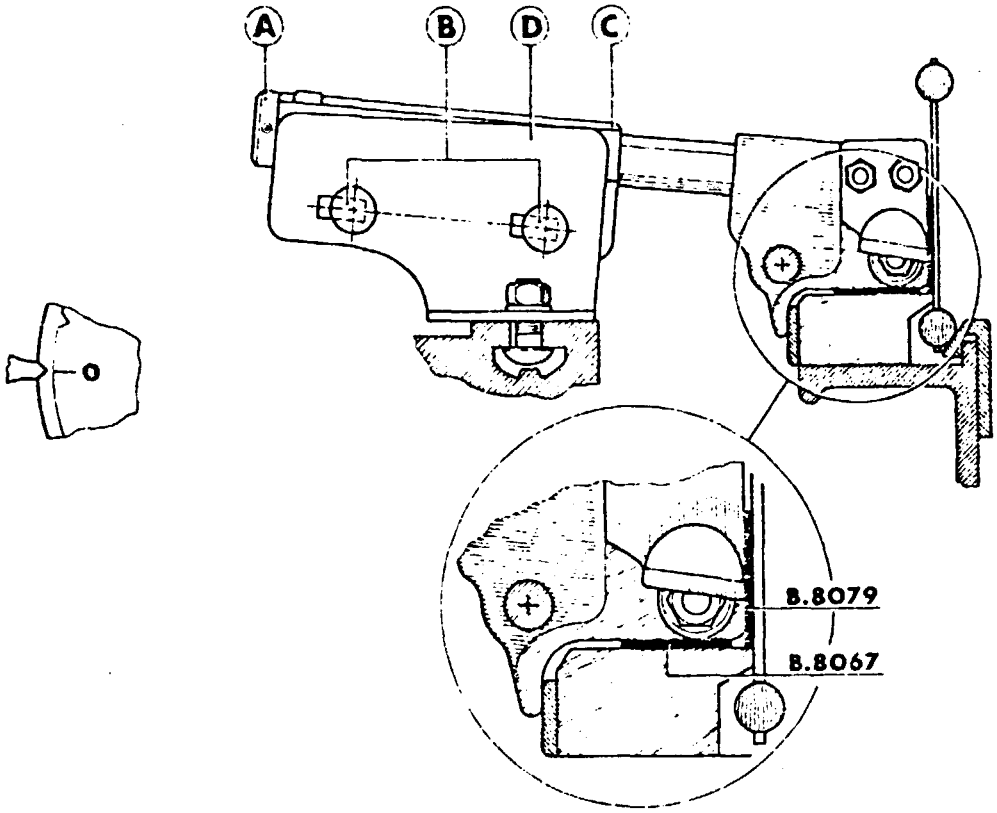
c) Press the whole temple unit towards the reed (in the direction of the reed) and tighten nuts "A".

When pushing, the play of the bolt in the slot and in the temple holder is eliminated, which makes it possible:

- to obtain always the same distance relative to the reed, when the temple must be moved for any reason.
- not affect the adjustments of the temple cutters.

When mounting the B.S. temple, check that the recess of the mobile cutter of the temple cutters is in fact on the control lever. This prevents damage to the reed by the temple cutters when turning

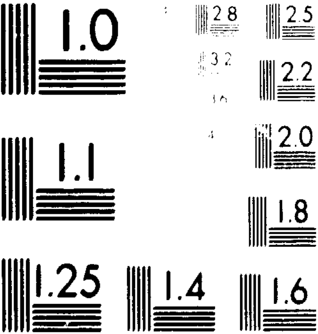
4.2. Position of the temples relative to the race board and reed (Fig. 31.2)



31.2

The ring "A" must be in contact with the spring box and the reed is not hold back.

a) Sley position: F.D.C.
b) Slacken both bolts "B" on the spring box
c) Place the gauge B.8067 (2 mm. thick) between the race board and the temple.
d) Place the gauge B.8079 -(1 mm. thick) between the reed and the temple.
e) Adjust the temples against the gauges. The upper plate "C" of the spring box must rest on the vertical side "D".
f) Tighten the bolts "B" and remove the gauges.



MICROCOPY RESOLUTION TEST CHART

5. Loom problems created by the temple.

1. Temple to sley.

a) Close:

1. damage reed
2. break ends
3. break selvedge
4. break weft

b) Far back:

1. break selvedge
2. narrow cloth
3. break weft

c) Too low:

1. damage race board
2. break out ends
3. damage spikes

d) Top high: (harness too high)

1. Overshots
2. throw shuttle
3. not boxing
4. wear shuttle

2. Selvedge in line.

a) Inside of line:

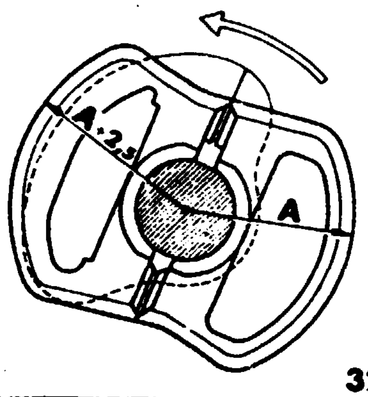
1. narrow cloth
2. knock out selvedge
3. break selvedge ends

b) Outside of line:

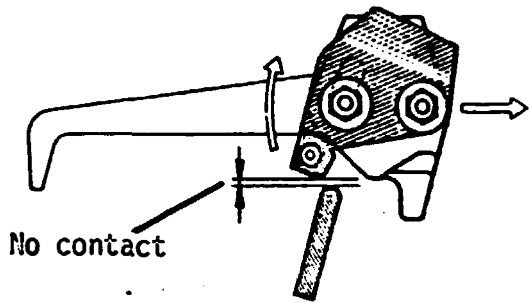
1. not holding properly
2. improper spread
3. knock-out selvedge
4. break ends

11. B. Cutter.

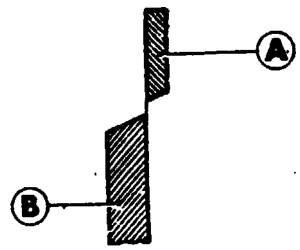
1. Function.



32.1



32.3



32.2

The cutters operate twice after each change, cutting the thread hold by the cloth and the shuttle-eye cutter. They are made free by the change hammer.

The two consecutive motions of the cutters are controlled by a cam (fig. 32.1) mounted on the bottom shaft.

This cam protrudes in two parts. The first part, of "A" radius, controls the first cutting cycle, whereas the second part, of radius "A" + 2,5 mm. controls the second cycle and holds back the mechanism, preventing it from operating. The cam is integral with the controller cam. It is therefore necessary to see it is in the correct position. The end of the mobile cutter is slightly bent to obtain the required cutting pressure. In order to improve the cut, it is possible to sharpen the blades "A" and "B" with a soft stone (Fig. 32.2).
The figure 32.3 shows how the safety device operates, allowing the mobile blade to withdraw if a shuttle is between the reed and the temple.

2. Parts.

2.1. Controller cam (on bottom shaft)
2.2. Mobile cutter
2.3. Cutter blades
2.4. Connecting rod
2.5. Control lever

3. Assembling:

3.1. Place plate on ring temple bracket

3.2. Place upper spacer on top of plate

3.3. Place cutter guide on top of spacer

3.4. Place lower spacer on bottom of plate

3.5. Place fixed cutter on assembly

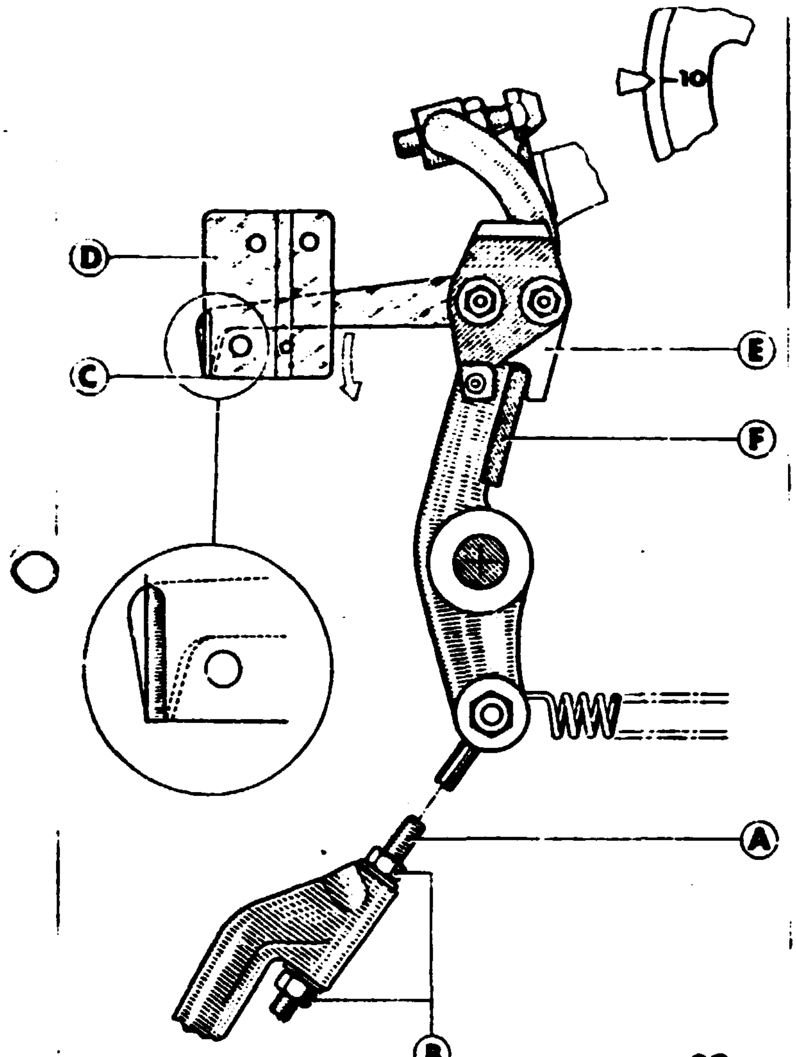
3.6. Tighten assembly with 3 bolts

3.7. Position temple spring cutter into assembly

3.8. Position ring temple bracket on cutter bracket stand. Tighten bolt.

4. Adjustments.

4.1. Position of the mobile cutter after the first cut.(Fig. 32.4)



32.4

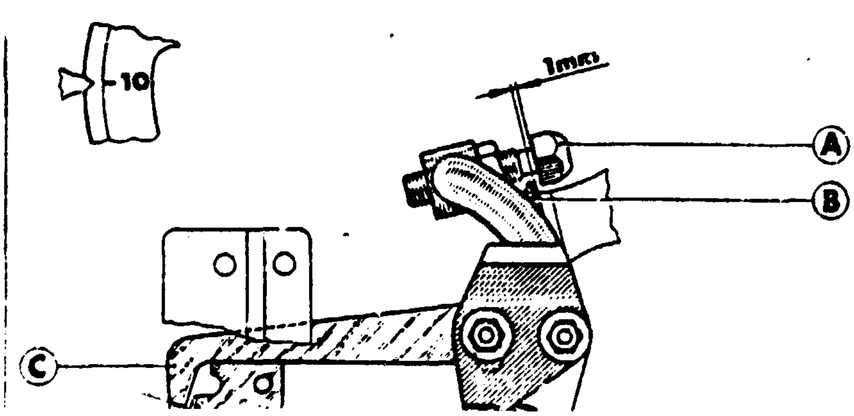
a) Turn the loom until the roller is on the cam small radius (Radius marked "A" on fig.32.1), it is possible to adopt for the sley position: 10, with the shuttle on F.S.

b) Adjust the length of the connecting rod " A" by means of the nuts "B" so that the lower end "C" of the mobile cutter is just level with the front face of the fixed part "D".
Check that the leg "E" rests against the control lever "F" and that the end "C" of the mobile cutter goes as far down as possible.

4.2. Clearance between the screw and retaining plate (Fig. 32.5)

a) Turn the loom until the roller is on the cam great radius (for instance sley position: 10, with shuttle on the B.S.).

b) Adjust the screw "A" until there is a clearance of 1 mm. between the head of the screw and plate "B".



REMARKS:

- When the roller is on the cam maximum radius, there must be a clearanc "a" between the mobile cutter "C" and "D" on fig. 32,5. Check on this clearance by pulling the mobile cutte towards the rear. The mobile cutter does not move between two consecutiv

5. <u>Loom problems created by the temple cutter.</u>

5.1. Lash in

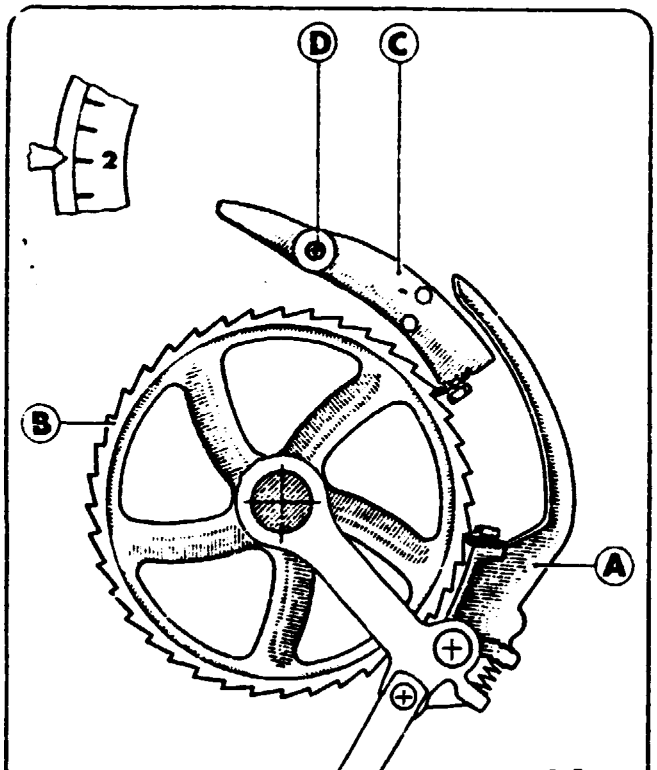
5.2. Long ends at cloth.

Group 12: A. Take-up motion (Regulator)
B. Cloth stand.

12 A. Take-up motion (Regulator)

1. Function :

Conveys the woven cloth to the cloth roll by rotating the sand roll and the cloth roll in the same degree as picks are put into the fabric.
The take-up motion is controlled as the sley moves backward.

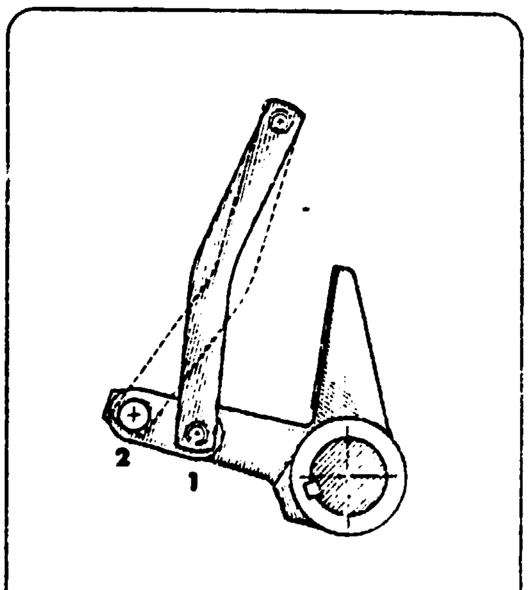


20.1

See fig. 20.1.

A take-up pawl "A" connected to the foot of the sley, rotates the ratchet wheel "B" by one tooth for one rotation of the crankshaft (or 2 teeth for a special mounting). The hold-back pawl "C" prevents a return backward. This hold-back pawl may be lifted by the weft stop motion or by a manual operated lever.

The ratchet wheel which has 60 teeth may turn 1 tooth or 2 teeth per pick according to whether the connecting rod is placed in position 1 or 2 (fig.20.2). The looms fitted with a ratchet wheel of 41 teeth, only have the no. 1 position, except in special cases.



20.2

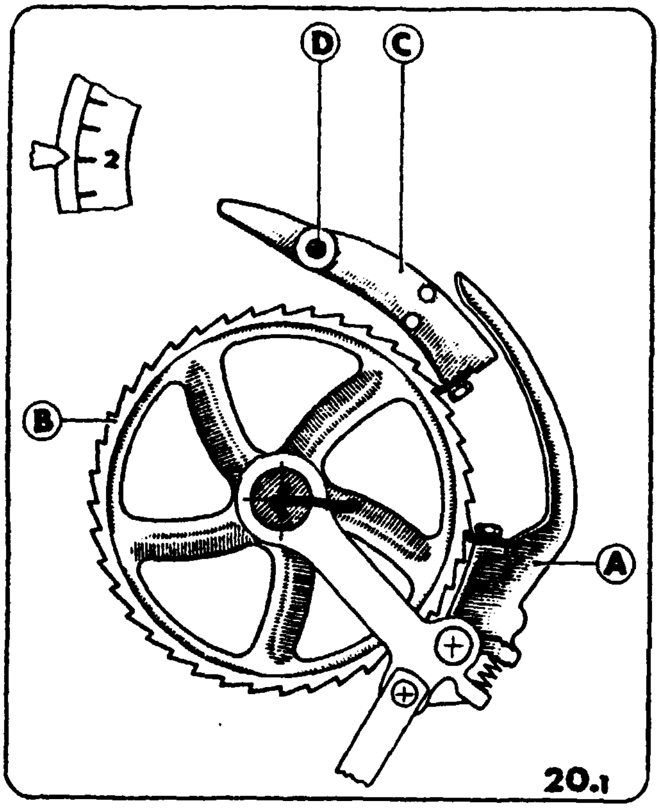
2. Parts :

2.1 Take-up roll gear
2.2 Intermediate pinion
2.3 Picking wheel
2.4 Picking wheel shaft
2.5 Picking wheel shaft spindle
2.6 Picking wheel shaft spindle bush
2.7 Picking shaft pinion
2.8 Change pinion
2.9 Brace collar
2.10 Hold-back pawl
2.11 Take-up ratchet wheel
2.12 Ratchet wheel shaft
2.13 Take-up pawl link
2.14 Rocker shaft box
2.15 Ratchet wheel shaft pinion
2.16 Ratchet handwheel

3. Assembling :

3.1 Replace take-up roll gear
Ensure that box side is facing out
Replace key in key-way.
3.2 Replace intermediate pinion and gear
3.3 Replace picking wheel shaft spindle bush, picking shaft pinion and picking wheel.
3.4 Replace picking wheel shaft spindle bushing, change pinion, brace collar.
3.5 Replace hold-back pawl in position.
3.6 Replace take-up ratchet wheel assembly
Insert ratchet wheel shaft into ratchet wheel shaft bracket -, loom- and gear-wheel.
Connect take-up pawl link to rocker shaft box.
3.7 Replace ratchet wheel shaft pinion on ratchet wheel shaft.
3.8 Replace ratchet handwheel.
Tighten nut.

4. Adjustments :



20.1

a) Position of the hold-back pawl (Fig. 20.1)

a.1 Sley position : 2

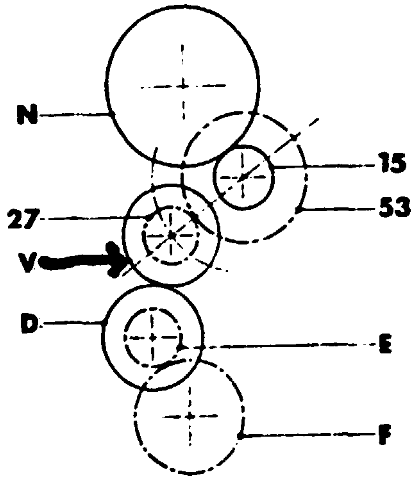
a.2 Turn the ratchet wheel so that the feed pawl "A" drops right in the base of a tooth. Adjust the position of the hold-back pawl "C" by means of its eccentric stud "D" so that it too fits into the base of a tooth.

C. Number of picks

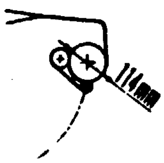
1. Set ups for normal picks :

The ratchet wheel turns forward one tooth per pick. The small connecting rod is mounted in the No. 1 position (Fig. 20.2) p.143

Number of teeth of pinions : see the figure opposite.
The number of teeth of pinion "N" depends on the sand roller cover.



a) Looms fitted with a sand roller Ø 114 mm



Ratchet wheel: 41 teeth, picks per cm

Pick range	Set up No.	Number of teeth of D	E	F	Number of teeth of pick pinion "V" =
60 to 120	1	21	42	21	Picks x 1/2
30 to 60	2	42	42	21	Picks x 1
15 to 30	3	21	21	42	Picks x 2
5 to 15	4	42	21	42	Picks x 4

Example :

In order to obtain 17 picks per cm, on a loom fitted with a ratchet wheel

5. Loom problems created by take-up :

5.1 Binding or improper mesh

5.1.1. Wavy cloth

5.1.2. Break ends

5.1.3. Slack selvedge

5.1.4. Overshots

5.1.5. Excessive wear

5.2 Pick wheel

5.2.1. Wavy cloth

5.2.2. Incorrect picks per cm

5.2.3. Excessive wear

12.B. Cloth stand

1. Function :

To hold the cloth, ensuring a tight wound up in relation to the degree at which the take-up motion delivers it.

2. Parts :

2.1 Cloth roll rack guide
2.2 Filling cam follower
2.3 Spring + spring shaft
2.4 Worm wheel shaft extension
2.5 Worm shaft
2.6 Cloth roll bearing
2.7 Spring shaft worm wheel
2.8 Floating stop
2.9 Worm crank handle
2.10 Spring shaft collars
2.11 Take-up guide roll
2.12 Guide roll pressing lever.

3. Assembling.

3.1 Replace both cloth roll rack guides.
Tighten well with 2 bolts and spacers.
3.2 Replace filling cam follower and tighten hub stud.
3.3 Assemble spring and parts on spring shaft
3.4 Insert shaft in position in cloth roll rack guide.
3.5 Insert worm spring shaft extension into cloth roll rack guide and worm shaft.
Secure with pin and split pin.
3.6 Fit cloth roll bearing onto cloth roll rack guide. F.S. and B.S.
3.7 Fit spring shaft worm wheel in position on spring shaft ensuring that floating stop is in position on spring shaft worm wheel.

3.8 Tighten up wheel on B.S. and stop collar on F.S.

3.9 Replace cloth roll racks (2).
Fasten to cloth roll rack bearing on cloth roll rack guide.

3.10 Turn worm crank handle anti-clockwise until it stops.
Adjust height of cloth roll rack by spring shaft collars.

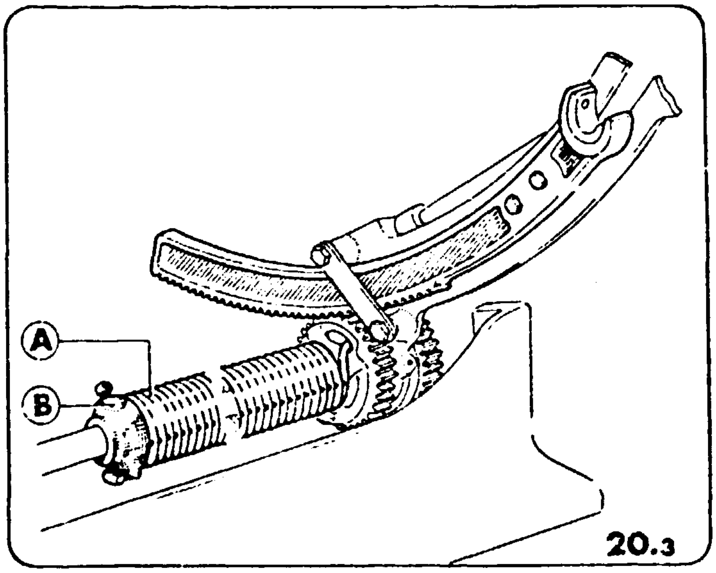
3.11 Fix guide roll bearings onto cloth roll rack guide, ensuring that bush is free. Tighten bolt.

3.12 Put take-up guide roll with felt covering in position, B.S. first.

3.13 Replace guide roll pressing lever and spring on the cloth roll rack guide.

3.14 Replace cloth roller on rack and wind-up, ensuring an even tension on both sides.

4. Adjustments :



20.3

4.1 Pre-tension of the cloth roller springs (Fig. 20.3)

If required for the manufacturing of "slippery" materials it is possible to increase the pressure of the cloth roller on the sand roller.

a) Direct taking up without cloth roller doffing device (Fig. 20.3)

- relax the springs "A" by means of the crank handle and turn the spring by the required amount.
- Proceed similarly on the other side of the loom.

Pressure of spring to allow cloth roll to rotate with sand roller without slipage.

PHASE I : CONDENSED SETTINGS

The condensed settings are a brief summary of the settings to carry out on the various loom-parts.

Its purpose is to provide the tuner with the essential information on what gauges to use and what clearances to apply when setting a certain loom part.

It is recommended to issue these condensed settings in a pocket-size booklet with each page covered with plastic (to prevent staining etc. by grease, dirty hands etc.), in order that the tuner can always carry it with him, so he can consult it when not sure about a certain setting.

No.	SETTING	SCORE	1.	2.	3.
1A	**CLUTCH**				
	LOOM POS. - ENGAGED				
	SHUTTLE POS - ANY				
	CLEARANCE				
	SPRING PLATE - CLUTCH PLATE 02mm FINGERS - CONE 1,0-2,0mm	3			
	QUICK RELEASE LEVER -FROG 0.2.04mm	3			
	CENTERING OF CLUTCH FINGERS	4			
		10			
1B	**BRAKE**				
	LOOM POS - BRAKE HANDLE TOWARDS WEAVER				
	SHUTTLE POS, ANY				
	BRAKE HANDLE -STOP : GAUGE 8.8064	- 1.0			
	SPRING STRETCH -15 mm (14-16 mm)	- 5			
	STARTING DISENGAGED				
	CLEARANCE DRUM - BRAKE BAND 0.2m EXACT (IDROPWIRE)	- 1.0			
		2.5			
1C	**MOTOR**				
	CLEARANCE + 0.2m BETWEEN BEARS	-0.5			
		0.5			
2A	**CRANK ARM**				
	LOOM POS-				
	SHUTTLE POS-				
	CLEARANCE BUSH -FOOT MINIMUM NO PLAY SLIGHT CLEARANCE, FREE TO MOVE) CRANK ARM FREE TO MOVE SIDE WAYS.	1.0			
	SPRING TYPE (AS FAROOQ) CL -CM = 5 TURNS TENSION CC = 3½ TURN TENSION	-2,0			
	LENGTH - GAUGE B.152 . FS B 150D BS	-2,0			
		5			
2B	**SQUARE REED**				
	LOOM POS.				
	SHUTTLE POS-				
	WEFT GRID IN LINE WITH FOY BACK	- 0.5			
	ALIENING REED = GAUGE B.13657	2.0			
		2.5			

NO.	SETTING	SCOPE	1	2	3
3A	ALIGN BOXES				
	I- GAUGE - POSITION FLOATING. SWELL AND FLOATING BINDER Rs.2152 +RING 50.75 + B,8065	1.0			
	BOY FRONT - GAUGE B. 8067 +SHUTTLE CLEARANCE 2mm . EXACT	0.5			
	RELEASING FLOTING SWELL LOOM POS. 1.5 CLEARANCE LEAVER- ROD 1 mm EXACT	1.0			
		2.5			
3AA	POSITION OF SHUTTLE-B.S SHUTTLE LINE ON B.S. SETTING OF PROTECTOR -GAUGE B,8078 -B8080 TO GET MARK ON BOX PLATE. CROSS CHECK -MIDDLE PIRNRING IN BATTERY COINSIDES WITH 1ST. PIRN RING ON PIRN IN SHUTTLE -FROM END OF PIRN	1.0			
	POSITION OF BOXING CHECKS. CLEARANCE BETWEEN STICK AND BOX. CHECKS -5mm. (GAUGE)WHEN SHUTTLE ON LINE	0.5			
	POSITION OF SHUTTLE - FS MEASURE DISTANCE (8.5) BETWEEN TIP OF SHUTTLE TO END OF RACE END AND APPLY SAME DISTANCE ON FS; MARK LINE	0.5			
	POSITION OF BOX CHECKS STICK TO BOX CHECKS 5mm	0.5			
		2.5			

NO.	SETTING	SCORE	1	2	3
3B	PROTECTOR MOTION LOOM POS. -8½ Cm FROM FELL OF CLOTH SHUTTLE POS.- NO SHUTTLE IN BOX.				
	BS - FROG 8mm B 8080	0.5			
	FS - FROG 2mm B 8067	0.5			
	TENSION OF SPRING MODERATE (½ - 1½ TURN)	1.0			
	DAGGER CENTRE-	1.0			
	DAGGER HIGHT -1.5mm CLEAR	2.5			
	LOOM POS. 5 mm ON FROG STEEL OR 8½ Cm. FROM FELL. NYLON BINDER - SCREW 1.5 mm B, 8068				
	SWELL RELEASING	0.5			
	LOOM POS. 6 0,2 mm				
	LIMITOR	0.5			
	1mm - B 8079				
	ADJUST . OF SWELL SPRING	1.0			
	1.0 mm -B 8079				
		7.5			
4B	PICKING MOTION -BS				
	CHECK SHUTTLE LINE AND POS. OF BOX CHECKS.				
	BOTT SHAFT GEAR LOOM POS. FDC BOTTOM SHAFT GAUGE B 8069	2.0			
	HIGHT OF PICKER -1mm B,8079	1.0			
	PATH OF PICKER -0.5mm (1-2 DROPWIRES)	1.0			
	STICK CENTRE END OF PICK	0.5			
	POS. OF SHORT LUG STRAP-FDC + BDC	0.5			
	POS OF LONG LUG STRAP -B,8073	1.5			
	6 mm CLEARANCE - POWER STRAP- STICK CAM ALIGN. WITH PICK BOWL SHUTTLE ON LINE.				
	FULL GAUGE - SHUTTLE ON LINE, CONTACT STICK AND POWER STRAP AT PICK START	1.5			
	START AND END OF PICK FS SAME SEQUENCE EXCL BOTTOM SHAFT	0.5	8.5		

NO.	SETTING.	SCORE	1	2	3
4B	PICKING MOTION -FS				
	CHECK SHUTTLE LINE AND POS. OF BOX CHECKS HIGHT OF PICKER 1mm B.8079	1.0			
	PATH OF PICKER - 0.5 mm (1-2 DROPWIRES)	1.0			
	STICK CENTRE END OF PICK	0.5			
	POS OF SHORT LUG STRAP FDC + BDC	0.5			
	POS. OF LONG LUG STRAP- B.8073 6mm CLEARANCE POWER STRAP - STICK CAM ALIEN, WITH PICK BOWL SHUTTLE ON LINE	1.5			
	FULL GAUGE SHUTTLE ON LINE CONTACT STICK AND POWER STRAP AT PICK START	1.5			
	POS. OF PICKING SHAFT RUBBER START AND END OF PICK	0.5			
		6.5			
5A	WEFT SIDE FORK				
	LOOM POS. FDC -SHUT.F.S. POS.OF CONTROL CAM GAUGE BE 2156	0.50			
	DEPTH + SIDE POSITION OF FORK FDC - SHUTTLE F,S. GAUGE 38.17	0.50			
	CLEARANCE FORK -HOOK 1 mm.	0.25			
	POS OF PUSHER -HANDLE 2mm B 8067	0.25			
	POS. OF SLACK PAWL PIN MUST ALWAYS BE BEHIND THE STUD ACCORDING TO REQ'RE	0.25			
	POS OF PICK RETURN LEVER 5 mm - 6 mm	0.25			
	CLEARANCE SCREW - PAWL 2 mm	0.50			
		2.50			

CONDENSED SETTING AND LOOM RATING -5- WERNER

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NO.	SETTING	SCORE	1	2	3
5B	MECHANICAL FEELER				
	SIDE POS. SUM FROM BUNCH	1.25			
	HIGHT 1 mm HIGHER THAU PIRN AVIS	1.25			
	DEPTH FDC FS	1.25			
	1-2 mm CLEARANCE BETWEEN PIRN AND TIP OF FEELER				
	POS OF DRWING ROD	1.25			
	3 mm CLEARANCE BETWEEN FEELER - ADJUSTING HOOK				
		2.5			
5BB	"BARCO FEELER				
	LATERAL ADJUSMENT GAUGE	1.5			
	10 mm FROM BUNCH				
	HIGHT - WHEN DIFUSSION TAKES PLACE	0.5			
	HIGHT OVER BOX PLATE - 10mm	0.5			
		2.5			
5C	CHANGE CONTROL				
	CLEARANCE- PINTIP -HOLDER	1.5			
	TIP. 1 mm				
	CLEARANCE FALL BACK PAWL	1.5			
	RATCHET WHEEL p.2 0.4 mm				
	CLEARANCE PIRN RING- MOBILE GUIDE 1 mm	1.0			
	ANGLE OF MOBILE GUIDE				
	CLEARANCE BETWEEN ADJUSTMENT SCREW 1.5 mm	1.0			
		5.0			

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TIRDC KARACHI. CONDENSED SETTING AND LOOM RATING -6- WERNER

NO	SETTING	SCORE	1	2	3
6B	<u>PIRN CHANGE</u>				
	HAMMER REST POS 5 mm (3-8 mm)	1.0			
	SETTING OF EXCENTRIC BUSH FDC - BS	1.0			
	CLEARANCE HAMMER - PIRN RING 0.5 mm (MANUAL PRESS TO LOWEST POS)	1.0			
	DEPTH OF PRESSING HAMMER. FDC. CHANGING CLEARANCE PIRN- HAMMER 2mm EXACT	1.0			
	TRANSMISSION LEVER STOP CLEARANCE PLATE - SHANK OF SCREN.				
	CLEARANCE TRANS, LEVER GUIDE - TRANS LEVER 3 mm LOOM POS, 0 - FDC- BS	1.0			
		5.0			
7A	<u>SHUTTLE EYE CUTTER</u>				
	<u>SIDE POS</u>. OF SH.EYE CUTTER BS - LOOM POS. CONTACT BETWEEN LATCH FINGER - BUNTER APPROX. 3 cm 8 mm FROM BS.	1.25			
	<u>DEPTH OF CUTTER</u> 1 mm OUTSIDE SHUTTLE WALL HIGHT OF THREAD GRIPPER - PUSHER PLATE 0.2 mm	1.25			
	<u>OPEN CUTTER</u> CAM LATCH CLEARANCE 0.2 mm	1.25			
	<u>HIGHT OF CUTTER</u> 1 mm CLEARANCE BETWEEN SIDES (TOP AND BOTTOM) MUST NOT DISTARGE SHUTTLE CUTTER MUST NOT TOUCH BOX FRONT 1 mm CLEAR.	1.25			
		5.0			

NO.	SETTING	SCORE	1	2	3
8A	<u>VIBRATOR LEVER</u>				UNDE LET (CLOT ND
8B	<u>LET [illegible]</u>				
	POS. OF BEAH FEELER	1.25			
	RATMET WHEEL BRAKE	1.25			
	5mm TENSION LET OFF PAWL FEELING ROLLER AND BACK REST CONTROL LEVER POS. OF DRIVING HOOK STOP CL - 3 mm CC - CM- 5 3 mm TENSION LEVER OTHER STOP 30 mm LET OFF DRIVING LEVER STOP CF BACK REST BEARING 10-15 mm	2.5			
		5.0			
9B	<u>WARP STOP MOTION TIMING.</u> ADJUST. OF PAWL LEVER	0.5			
	LOOM ENGAGED MOTOR STOP LOOM POS. 7. OSCILLATING LEVER RESTING ON SMALLEST	0.5			
	RADIUS OF CAM. 1 mm PLAY OF RAWL LEVER AND RELEASE LATCH				
	STOPPING POS.OF SLEY AT W.P	0.5			
	STOP LOOM POS - CROSSING OF HARNESS. ADJUST OUTSIDE CAM. POS. OF CONTROLLING CAM	0.5			
	6 Cm.				
	SSTROKE OF SLIDING BAR. CLEARANCE BETWEEN FINGER AND WIRE GRID 0.5 mm	1.0			
	ADJUST. OF CABLE LENGTH 1 mm	0.5			
	LEVER OUT OF ACTION 1-2 mm PLAY	0.5			
	HIGHT DEPTH AND ANGLE OF WP STOP MOTION	0.5			
		5.0			

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NO.	SETTING	SCORE	1	2	3
10A	TAPPETS AND TREADLE MESHING OF BOTTOM SHAFT	0.5			
	AND INTERMEDIATE GEAR C.2mm	0.5			
	DIRECTION OF ROTATION MARK ON EACH CAM MUST CORRESPOND WITH BOTTOM SHAFT SEQUENCE OF TAPPETS ALWAYS BIGGER RADIUS FOR 1.SHAFT - SMALLET FOR LAST SHAFT.	1.0			
10C	TIMING OF SHAFTS CROSSING AT 7 Cm FROM FEU (DEPENDS UPON FABRIC)	1.5			
	SIZE OF SHED 2 mm OVER RACE BOARD SHUTTLE HIGHT + 5 mm (8 mm in SPEC,CASES)	1.5			
		5.0			
11A	TEMPLES				
	~~CLEARANCE~~ LOOM POS. FDC ——— REED 1 mm	2.0			
	CLEARANCE TEMPLE -RACE BOARD.	2.0			
	SIDE PDS. SEVEBGE ON LAST RING.	1.0			
		5.0			
11B	TEMPLE CUTTER				
	CHECK BENDING AND SHARPNESS OF CUTTER LOOM POS. 10 SH.FS ADJUST LENGTH OF CONNECTION ROD. SO THE FRONT CUTTER IS LEVEL WITH SPACER. LENGTH.	2.5			
	CLEARANCE HOLDING SCREW TO PAWL 1 mm POS. 10. SH.BS	2.5			
		5.0			

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CONDENSED SETTINGS AND LOOM RATING - 9-

WERNER

NO.	SETTINGS	SCORE	1	2	3
12A	TAKE UP MOTION				
	LOOM POS. 2-FS POS. OF HOLD BACK PAWL AND TAKE UP AT BASE OF TOOTH	1.0			
	ON PATCHET WHEEL CLOTH STAND PRE-TENSION OF CLOTH ROLLER SPRING SCREW AND SLACK PAWL CLEAR. 2 mm	1.0			
	RETURN LEVER, LOOM POS 2 FS,				
	PICK RIDDEN LEVER 5 mm (3-6 mm)	0.5			
		2.5			

IV. PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. DIAGNOSTIC SKILL
3. METHOD OF DIAGNOSIS
4. PREVENTIVE MAINTENANCE
5. WARP OUT CHECKS
6. REASONS FOR LOOMSTOPS & DEFECTS
7. LOOM INTERFERENCE
8. QUALITY RECOGNITION

1. DIAGNOSTIC DEVELOPMENT

a. Purpose

To help the diagnostic and job planning abilities of the trainee.

b. Method

The trainee is to walk the section of the Weave Room, selected for the Training Course, each day looking for and fixing a particular type of flag. The trainee's diagnosis and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common flags. The defects can also be created by the Instructor to supplement those defects noted by flagging.

The suggested number of each flag is as follows :

- warp stop motion	7
- warp tension	7
- bang off	7
- ends breaking	7
- breaking weft	7
- empty pirns	7
- false change	7
- stop on change	7
- slackweft (loom stops)	7
- uneven weave	7
- double pick	7
- damaged shuttle	7
- lashing in	7
- long tails	7
- check straps	7
- check spring	7
- parallel spring	7
- broken healds	7

In order to facilitate the control on the number of flags fixed in each group, the Instructor uses the "diagnostic development"-form, as shown on page 161

The progress of the trainee in "flag repairing" is recorded on the "Completed "flag"-recognisation schedule"-form as shown in the section "Charts and Graphs" at the end of this manual.

In addition to flag fixing, the trainee has 12 looms set up and must perform the bi-monthly preventive maintenance on 2-3 looms per day so that all 12 looms, used in Phase I, are maintained each week.

For new trainees

At this point, the trainee has performed all elements of the tuner's job, but has not actually run a section. Now he is given a job load of approx. 30 %, then approx. 60 % and finally 100 % for approx. 3 weeks during which time he must fix flags, perform maintenance and loom-checks, and properly schedule his work in order to achieve optimum time utilization and keep stop-times of the looms as low as possible.

Retraining 100% load immediately.

Key point

Close follow-up by the Supervisor and the Instructor.

Tempo

The required number of flags (18 x 7 flags : 126 flags) should be repaired in approx. 21 days.

FAROOQ FLAG COLOURS :

Red - fixer
Blue - weft shortage
Yellow + smash/shuttle

Red + blue + yellow - P.M.

Red + blue + yellow - Electric

DIAGNOSTIC DEVELOPMENT

Flag	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date
Lashing in					50	30/16								
Empty pirns														
Broken weft														
Uneven weave									75	30/10				
Ends breaking														
Warp stop motion														
Warp tension	25	30/10												
Banging off														
False change														
Stopping on change														
Slack weft														
Double pick														
Damaged shuttle														
Long tails														
Check strap														
Check spring														
Parallel spring														
Broken healds														

2. DIAGNOSTIC SKILL

To enable the tuner trainee to diagnose and repair faults, the following exercises will be prepared by the Instructor for each trainee. The number of times the exercise will be performed correctly by the trainee has been already indicated. In addition to preparing the exercises, the Instructor will supplement the training by having the trainees handle flagged looms.

EXERCISES :

A. Picking

1. Loosen check strap	- bang off, bad boxing
2. Remove pick-toe	- " "
3. Loosen pick-toe	- "
4. Move out front box plate	- "
5. Remove lug strap	- " /shuttle stays in box
6. Let off friction from cluth	- " /loom runs slow
7. Raise power strap on picking stick	- "
8. Off-set dagger fingers	- "
9. Reduce stroke of picking stick	- "
10. Do nothing but stop loom	- false bang off
11. Off-set temple knife	- lashing-in/long tails
12. Lower power strap (more power)	- shuttle bounces
13. Tight up short lug	- bang off
14. Raise pick arm (less power)	- " "

B. Weft

1. Move-in cutter protector	- no change of bobbin
2. Up-set timing of cam	- " " " "
3. Loosen cutter blades	- lash-in
4. Bend side fork	- thin place
5. Drop dog finger	- no change of bobbin
6. Remove all pirns from magazine	- " " " "

C. Shedding, beating-up, let-off, take-up and stop motions

1. Loosen off warp	- slack warp
2. Bend reed	- reed mark + broken ends
3. Increase let-off stroke	- slack warp
4. Decrease let-off stroke	- tight warp
5. Disengage take-up	- loosen cloth
6. Remove brake springs	- no brake
7. Run loom without nylon in shuttle	- breaking weft, loom knocking off
8. Change setting of warp stop cam	- no stopping

Control-form

A form for recording the exercises carried out is shown on page 164 This enables the Instructor to follow the number of each exercise carried out closely; also it helps to schedule the sequence of exercises on a well-balanced plan.

Name :

DIAGNOSTIC SKILL EXERCISES

			1	2	3	4	5	6	7
PICKING	1. Loosen check strap	- bang off/bad boxing							
	2. Remove pick-toe	- " "							
	3. Loosen pick-toe	- " "							
	4. Move out front box plate	- " "							
	5. Remove lug strap	- " "/shuttle in box							
	6. Let-off friction (clutch)	- " "/loom runs slow							
	7. Raise power strap (picker stick)	- " "							
	8. Off-set dagger fingers	- " "							
	9. Reduce stroke picker stick	- " "							
	10. Do nothing but stop loom	- false bang off							
	11. Off-set temple knife	- lashing in/long tails							
	12. Lower power strap	- shuttle bounces							
	13. Tight up short lug	- bang off							
	14. Raise picker arm	- bang off.							
WEFT	1. Move in cutter protector	- no pirn change.							
	2. Upset timing of cam	- " " "							
	3. Loosen cutter blades	- Lashing-in.							
	4. Bend side fork	- thin place.							
	5. Drop dog finger	- no pirn change							
	6. Remove all pirns from magazine	- " " "							
SHEDDING TAKE-UP; BEATING-UP; LET-OFF STOP MOTIONS.	1. Loosen off warp	- slack warp							
	2. Bend reed	- reed mark broken ends.							
	3. Increase let-off stroke	- slack warp.							
	4. Decrease let-off stroke	- tight warp.							
	5. Disengage take-up	- loose cloth.							
	6. Remove brake springs	- no brake							
	7. Run loom without nylon (shuttle)	- slack weft loom stops							
	8. Change setting of warp stop cam	- no stopping.							

3. METHOD OF DIAGNOSIS

1. QUESTION WEAVER; CHECK FOR SICKS LEFT BY HIM OR LOOK AT FLAG FORM.

2. NOTE THE POSITION OF THE SHUTTLE AND IF BOXED.

3. EXAMINE CLOTH; LOOK FOR DEFECTS. FEEL TENSION.

4. CHECK LOOM FOR BROKEN OR LOOSE PARTS, PARTICULARLY :
   - BOXES
   - PICKERS
   - STICKS
   - STRAPS
   - PARALLEL MOTION

5. PICK ACROSS SHUTTLE ONCE, FEELING POWER, WATCHING BOX AND FROM THE OTHER DIRECTION ONCE.

6. IF NOTHING IS NOTICED, RUN LOOM, LISTEN, OBSERVE SPEED AND BOXING OF SHUTTLE.

7. CHECK PICKING, SHEDDING, BEATING UP AND PIRN-CHANGE FIRST. THEN LET-OFF, TAKE-UP AND WARP STOP MOTION.

8. DO NOT TRY TO FIX THE FAULT BY TRIAL OR ERROR. DETERMINE THE CAUSE FIRST AND LOOK FOR WORN PARTS. EACH CHANGE YOU MAKE MAY ADD TO YOUR DIFFICULTIES IF YOU HAVE NOT FOUND THE CAUSE.

9. USE GAUGES ALL THE TIME

To maintain quality and high production levels, looms must be in good mechanical condition; proper setting on looms must be maintained at all times.
To ensure that they are, tuners must control and check looms on a regular routine basis.

The inspection and control of looms has been scheduled on a shift basis, a daily basis and on a weekly basis. For Farooq the following schedule will be applied :

1. A tuner is responsible for the repairing flags on 48 looms (a tuner's section) Farooq - 20 looms
   A tuner is responsible for the control and checking of 16 looms (his particular section) and carrying out the preventive maintenance of these looms.

2. Preventive maintenance

   2.1 Daily maintenance and check of his 16 looms - not Farooq

   a. shuttle well boxed
   b. shuttle condition (eye, jaw, nylon, screws, surface)
   c. shuttle eye and temple cutter
   d. weft grid clean
   e. mechanical feeler
   f. warp tension.

   2.2 Bi-monthly preventive maintenance of his 16 looms . not Farooq

   In order to ensure that each loom is completely checked once per fortnight, the tuner has to check and carry out preventive maintenance on an average of 1-2 looms per day. Should an excessive amount of flag-repairs and/or daily maintenance prevent the tuner of carrying out the bi-monthly maintenance during his normal working hours, he should be asked to carry the last one out during overtime in order to respect the determined schedule.

In order to help the tuner to keep a record of his progress in preventive maintenance the form, shown on page 204, has been designed.

It shows the checks to be carried out and has columns for ticking off the looms, that has been checked.

The normal procedure for filling out the form is that the tuner writes in the column "Loom nc." the number of his looms in mathematical order (e.g. 313, 314, 315, 316 etc. up to 327) and ticks off in the day-column the day he tackled a particular loom.

Although the tuner is not obliged to check the looms in the order as appear on the form, it is advisable to maintain that order as much as possible, which will ensure that approx. a fortnight passes by between a check of a particular loom.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a loom, the Instructor checks his performance by using the form "Evaluation of Preventive Maintenance", shown in the last section, "Charts and Graphs" of this manual.

When the tuner finds that the shuttle of a loom has to be replaced, special care has to be taken in order to obtain a long life and trouble free running of the new one.

On page 169 is shown the procedure, that must be followed when fitting a new shuttle.

Daily :

a. Quick check of all 48 looms on

1. Boxing of shuttle
2. Temple knife
3. Warp tension
4. Pirn change (hammer, thread cutter)

DAILY CHECK

b. Check of 16 looms (Tuner's own set of looms)

1. warp stop motion
2. shuttle - tension of weft
3. side fork
4. feeler
5. leathers and picker

c. Preventive maintenance on 1 - 2 looms as described in paragraph 2.2 on page 189.

NEW SHUTTLE

There is a definite procedure which must be followed when fitting a new shuttle in order to obtain long shuttle life and trouble free running.

1. <u>NEW SHUTTLE</u>

   Ensure that all bolts and nuts of the shuttle are well tightened. Write date inside shuttle.

2. <u>EXAMINE OLD SHUTTLE</u>

   Marks or damage on the old shuttle will often indicate where loom adjustments are required.

   If the back is rippled, the reed alignment must be adjusted.

   Marking on the top may indicate sheds off race board or a too early setting of the crossing time.

3. <u>SET THE BOXES</u>

   Set each box in turn with the new shuttle so that the swell springs may be relaxed.

4. <u>RUN THE LOOM</u>

   Run the loom, checking each side for correct boxing without rebounding. Adjust check straps, swell springs and picking force as required. Do not let the loom make a transfer at this stage.

5. <u>CHECK THE TRANSFER</u>

   Check 2 mm clearance on delay action cam follower. Put the loom on transfer by hand. Check latch is up to correct height at 4 1/2 - 3 on timing wheel.

   Check correct shuttle position for transfer.

   Check shuttle eye cutter.

   Check temple cutter.

   Adjust height of hammer on transfer.

   Run loom, observe automatic transfer.

   Check back frequently for minor adjustments as the shuttle gets polished and set to shape.

<u>SHUTTLE CHECK</u>

The shuttle is the mirror of a loom, a quick check gives very accurate info. of the condition of the loom.

Check 5-6 looms at random and fill out form p. 169-d.

QUALITY CHANGE INSTRUCTION

PURPOSE: TO STANDARDISE LOOM SETTING ;
TO MAKE CHECKS MORE EFFECTIVE
AS ALL WILL BE MEASURING TO
SAME STANDARD.

METHOD FOR EACH CLOTH QUALITY A SPECIFICATION
OF LOOM SETTINGS MUST BE DEVELOPED.

A FORM TO BE DEVELOPED
(SEE APPENDIX)

THE FORM TO BE DISPLAYED ON EACH LOOM,
TO SHOW THE CLOTH QUALITY RUN AS WELL AS
THE SETTINGS OF THE LOOM, WITH COMMENTS
WHERE STANDARD SETTING ARE NOT ADHERED TO

FAROOQ KORANGI	QUALITY SPECIFICATION AND STANDARD LOOM SETTING. LOOM n°.........			WERNER BRUSSELS	
QUALITY STYLE		WIDTH REED		TOTAL ENDS	
WIDTH CLOTH		GM /M2		OZ/sq.yd	
WP.NE		BLEND		ENDS /1"	
WF.NE		BLEND		PICKS/1"	
REED		ENDS/DENT		SELVEDGE	
LOOM TYPE		PICK WHEEL		SIZING (TYPE/%)	

LOOM ADJUSTMENTS

DROPWIRE POS		BACKREST POS.	
DROPWIRE (THICKNESS) OR WEIGHT		WHIP ROLL POS.	
SHEDDING TIMING		NO OF SHAFTS	
LIFT			
PICKING TIMING			

BEAM CHANGE	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN
TUNER								
SECTION FITTER								
1st ROLL INSPECTION								

REMARKS.

SHUTTLE CHECKING

16.10.80

ITEM / LOOM No		A-144	A-146	A-177	A-189	A-194	A-243
WASH BOARD		YES	YES	YES	YES	DAMAGE	YES
TOP	BS	YES	YES	YES	YES	YES	YES
	FS	NO	YES	YES	YES	YES	YES
BOTTOM	BS	YES	YES	YES	YES	OK	OK
	FS	YES	YES	NO	YES	OK	OK
FRONT	BS	YES	YES	YES	NO	CUTS	CUTS
	FS	NO	NO	NO	NO	NO	NO
TIPS	BS	NO	YES	NO	NO	OK	OK
	FS	NO	NO	NO	NO	PRESSED	OK
ANGLE		OUT	OUT	OUT	OUT	OUT	OUT
SKEWER		OK	OK	OK	OK	OK	OK
TENSION		OK	OK	OK	OUT	OK	OK
THREAD GUIDE		CUTS	OK	CUTS	OK	OK	CUTS
YARN CHANNEL		YES	OK	OK	YES	OK	OK
1ST SHAFT LIFTING		OK	OK	OK	OK	OK	OK
ISSUING DATE		10.1.80	11.10.80	5.1.80	7.10.80	21.9.80	2.6.80 6.8.80
REMARKS		BOX TOP BOLTS MISSING	SHUTTLE VERY HOT	BOX TOP BOLTS MISSING	SWELL RELEASE ROD (BS) BROKEN	RACE CLOTH TORN	LET-OFF MARKS
			BOX TOP BOLTS MISSING	STAVE OUT			

193

TIRDC KARACHI	CHECK LIST FOR MOUNTING OF NEW SHUTTLE	WERNER BRUSSELS
LIFE OR PREVIOUS SHUTTLE.		= OK X = NOT OK.
LOOM NO.	DATE	SIGN.

NO.	SHUTTLE	CONDITION	CORRECTD.	NO.	LOOM MECHANISM	CONDITION	CORRECTED.
1.	PIRN ALIGNMENT			22.	STICK GUIDE		
2	SMOOTH/CRACKS - SIDES			23	BOX END CHECK		
3	----"---- - TOP			24	SHUTTLE LINE		
4	----"--- - BOTTOM			25	TENSION+HEIGHT OF DAGGER		
5	SQUARE - STRAIGHT			26			
6	NYLONS				PICKING		
7	CLAMPS			27	ROCKER SHAFT		
8	JAWS			28	PICKER CONDITION		
9	SCREWS			29	" HEIGHT		
10	TIPS			30	PATH OF PICKER		
11	THREAD GUIDE			31	STROKE - POWER		
12	GROOVE			32	CLUTCH TENSION		
13	WEFT TENSION			33	BRAKE		
14					SHEDDING		
	LOOM MECHANISM			34	LEVEL OF HARNESS		
15	CRANK ARM LENGTH			35	CLEARANCE, BOTTOM/TOP SHED		
16	RACEBOARD, SQ. REED+GRATE			36	TIMING OF WP. STOP		
17	REED CONDITION			37	MECH. FEELER		
	BOX SETTINGS			38	SHUTTLE PROTECTOR		
18	FLOATING SWELL			39	HOPPER ALIGNMENT		
19	BINDER			40	SETTING OF HAMMER		
20	BACK SHUTTLE GUIDE			41	SH. EYE CUTTER		
21	BOX FRONT			42	TEMPLE SETTING		
				43	" CUTTER		

CHECK BY ENG./SECT. FITTER = SIGN ------------ DATE ----------

5. WARP OUT CHECK

After a new warp has been put in the loom, the following checks have to be carried out by the tuner before the loom is turned over to the weaver.

A complete daily and bi-monthly maintenance check on the loom whether or not this loom is part of his own set of looms for the routine preventive maintenance.

A loom tuner noting that the warp will come out during the fortnight, will only perform the bi-monthly maintenance on that loom when the loom is down for warp changing. When the warp has been taken out and the loom has been cleaned, the tuner will make the following checks :

- 1. Shuttle
- 2. Leathers
- 3. Crank arms
- 4. Pickers - picking sticks
- 5. Straps and bumpers
- 6. Pick, stroke and power setting
- 7. Protection motion
- 8. Swords
- 9. Warp and weft stop motion
- 10. Harness straps and treadles

After the warp is in the loom, the following checks are to be made :

- 1. Harness setting
- 2. Harness timing
- 3. Warp tension
- 4. Vibrator cam
- 5. Temple settings
- 6. Warp and weft stop motion (working condition)

6. REASONS FOR LOOMSTOPS & DEFECTS

6.1 BANG OFF

1. broken or loose parts :
   a. picker stick
   b. power strap
   c. lug height
   d. check strap
   e. dagger fingers
2. warp tension
3. friction (clutch)
4. boxing
5. picker
6. Crank arm shims too tight
7. reed out of line or loose
8. pick and stroke :
   a. pick cam, point, worn out
   b. ball loose or worn
   c. timing
9. harness setting/timing, shed
10. rocker boxes and shaft
11. sword loose
12. cam shaft bearing loose or worn out
13. gear wheel worn prive
14. check spring
15. let off tight or loose

6.2 OVERSHOTS AND CUT OUT ENDS

1. pickers worn
2. warp tension
3. harness setting/timing
4. reed alignment
5. shuttle box
6. sword loose
7. pick cam loose
8. let off tight or loose
9. warp stop motion
10. bad setting : a. lugs
    b. picker stick
    c. pick shaft
11. raceboard loose
12. shuttle condition
13. pirn alignment in shuttle
14. whip roll too high or low
15. cam timing pick
16. temple incorrect to reed
17. improper mesh of take-up
18. Vibrator cam timing.

6.3. FALSE CHANGE

1. shuttle feeler
2. lifting lever slide worn
3. cam timing change
4. shuttle eye cutter
5. latch finger bunter
7. shuttle feeler spring condition
8. shuttle boxing
9. sword loose
10 . harness setting + timing

6.4. BREAKING WEFT ON CHANGE

1. shuttle boxing
2. picker screw or broken picker
3. box front
4. bad pirn
5. bad shuttle (eye, loop, jaw)
6. shuttle feeler

6.5. STOP ON CHANGE

1. weft fork
2. nylon in shuttle
3. shuttle eye
4. warp tension
5. thread guide
6. shuttle boxing
7. box front leather
8. cam timing change
9. transfer and hammer
10. pirn low, high, loose
11. hammer too high
12. swinging pirn support
13. B.S. weak picking force
14. harness settings

6.6. HANG PIRN

1. shuttle boxing
2. depth of transfer and hammer
3. swinging pirn support
4. picker worn
5. weft cam timing
6. wear in sword and rocker shaft
7. lay not centered
8. harness setting + timing

6.7. STOPPING OF LOOM

1. lack of tension in shuttle
2. harness setting/timing
3. warp tension
4. box front setting
5. fork setting
6. loose pickers
7. sley sword cracked
8. sley sword bolts loose

6.8. THICK PLACE IN CLOTH

1. take up motion gear divided
2. worn pawl steel
3. let-off incorrect
4. cloth sand roller (cloth slips)
5. gears setting or improper mesh
6. beam locks or transmission loose
7. fork setting
8. take-up incorrect
9. uneven or mixed weft

6.9. THIN PLACE IN CLOTH

1. fork not set correctly
2. pick gear divided
3. worn pawl steel
4. let-off not correct
5. sword or rocker shaft loose
6. weft grid not clean
7. crank arm bearings worn out
8. uneven or mixed weft

6.10. LASHING IN

1. shuttle eye cutter
   . holding end of weft
2. outside cutter
3. picker, worn
4. feeler tip-setting, condition
5. shuttle boxing
6. B.S front box leather
7. temple knife
8. weft out of eye
9. sword loose
10. shuttle protector
11. bottom + top of box plate
12. screw in picker
13. shuttle condition
14. box front

6.11. BREAKING WEFT

1. shuttle :
   a. nylon
   b. pirn high, low, loose
   c. eye
   d. burr
   e. groove f. loose screw
2. leather
3. boxing
4. reed alignment
5. reed loose
6. harness timing + setting
7. harness high, low
8. sword loose
9. temple incorrect to reed
10. temple cutter incorrect to reed
11. bad selvedge
12. shuttle protector
13. bottom + top of box plate
14. screw in picker
15. picker condition
16. box front
17. picking cam timing
18. temple outside of line

6.12. SMASHES

1. frogs :
   a. spring broken
   b. steel worn
   c. frog broken or worn
   d. frog setting
2. harness setting + timing
3. let-off tight or loose
4. warp stop motion
5. pirn change
6. dagger limitator missing
7. shuttle condition
8. incorrect starting of loom
9. wrong setting of shuttle box

6.13. KINKY WEFT

1. cam timing (picking)
2. shuttle boxing
3. harness setting
4. weft tension
5. whip roll not in proper position.

6.14. SKIPS

1. Harness setting + timing
2. let-off tight or loose
3. warp stop motion
4. whip roll not in proper position

7. LOOM INTERFERENCE

The tuner normally tackles one loom at a time. When more than one loom are stopped for mechanical reason, the tuner obviously has to think on what loom he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the loom, that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 looms are stopped for various mechanical reasons for which the weaver has put his flag up. When the tuner comes to the looms and he estimates the times he will need for repairing the stops,
for case a. 30 min.
case b. 10 min. case c. 5 min.

We will show two methods of tackling these stops :

Method 1

Case	Time to repair	Repair priority	lost time		
			work	waiting of loom	total
a.	30	3	30	5 + 10 = 15	45 min.
b.	10	2	10	5	15 min.
c.	5	1	5	0	5 min.
			Total lost time on 3 looms		65 min.

Method 2

Case	Time to repair	Repair priority	lost time		
			work	waiting of loom	total
a.	30	1	30	0	30 min.
b.	10	2	10	30	40 min.
c.	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 looms		115 min.

It is obvious that Method 1 is the better one of the two, since the total time lost by waiting of the looms is 65 min., whereas with Method 2 that time is 115 min.

Normally a loomtuner should never spend longer than approx. 45 min. on one job. If for one or another reason the job will take much longer time, he should interrupt his work on that job and look if flags are up for other looms. When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

KIND OF FAULT	DESCRIPTION	SOURCE AND CAUSE	RESPONSIBILITY OF TUNER
Thin places 1.	Less picks per cm than desired	When the mark occurs regularly the usual cause is a faulty weft stop motion, let-off or take-up. Irregularly the cause is often bad start up procedures by the weaver.	Stop loom - Determine cause and fix it if loom fault. Advise supervis when man made.
Thick places 2.	Too many picks per cm in a certain area.	Loom started without bringing warp to proper tension, worn, broken or improperly set parts of take-up, slack warp, etc.	as for thin places.
Weaving without weft 3.	No picks inserted	Dirty fork grid, improperly set fork	Stop loom- Determine cause a. fix
Broken pick 4.	Parts of weft yarn missing in cloth	Bad shuttle, nylon in shuttle, shuttle eye, pirn high or low in shuttle. Shuttle bouncing, temple too close to reed, diameter of pirn too large, thread cutter striking reed cutting weft.	Determine cause and fix.
Lashing in 5.	Short double picks at selvedge	Temple cutter not working correctly, weft from shuttle caught in box, improper tension on weft yarn shuttle eye not clean or rough.	Determine cause and fix.
Double pick 6.	Two picks in same shed	Weft broken and caught up again without stopping loom	Fix it.
Oily weft 7.	Oily streaks running weft wise in cloth	Oil on weft yarn, before being inserted.	Remove oily pirn and check magazine for any more oily pirns.
Over- and/or undershots 8.	Weft not weaving correctly. Weft on top of cloth	Harness not set correctly, crossed pins, broken headle, mat up, lay not properly aligned, broken or incorrectly set parts on picking motion.	Determine cause and fix it

	KIND OF FAULT	DESCRIPTION	SOURCE AND CAUSE	RESPONSIBILITY OF TUNER
9	Tangled	Tight end or ends followed by loose end or ends on the same warp yarn.	A section of the warp ends has been held back and then suddenly released. Stuck warp. Mat up at pins. Lap on beam.	Stop loom. Advise weaver.
10	Thread out	End missing from cloth	Warp stop motion not working - choked pins missing pins etc.	Stop loom. Clean choked pins or repair stop motion
11	Floating end	Warp end not weaving in place	Heddle broken at top or bottom, hanging on harness, etc .	Stop loom Determine cause and fix
12	Irregular crinkle	Wavy in warp, variation in contraction causing alternate flat crinkle and normal crinkle.	Let-off motion worn, choked or not set correctly. Top beam friction drum out of adjustment. Loose jumper motion.	Stop loom Determine cause and fix.
13	Harness skips	Warp ends floating on face of cloth	Heddle loose, broken or incorrect - slack ends, harness setting, harness timing, rib broken, heddles spaced incorrectly mat up or stop motion	Stop loom Determine cause and repair if mechanical. If mat up, advise weaver.
14	Reed mark	Bad dent or dents in reed. Looks similar to a mis-reed.	Object too large for dent being pushed through reed, such as a reed hook turned sideways to draw an end. Starting loom with an object extending past the fell of the cloth. Loom slamming ect.	Stop loom. Repair if possible if not, consult supervisor for action to be taken.
15	Shuttle mark	A fillingwise mark or abrasion of the warp yarn caused by shuttle striking warp yarn.	Improper shedding or picking motion. Shuttle getting caught in shed and distorting weave.	Stop loom. Determine cause and fix.
16	Slack end	Kinky warp end caused by end weaving with improper tension.	End running out in warp. Incorrect tension when repairing warp break. Stuck end, clinging ends.	Stop loom Advise weaver.
17	Wrong draw	Warp end weaving incorrectly	End drawn incorrectly in harness.	Stop loom. Advise weaver and/or supervisor.

WERNER AMPS LOOM RATING FORM. TIRDC

TYPE OF LOOM : CHECKED BY : DATE:

	Control of loomparts	Points	Loom No.											
1	Shuttle boxing	5												
2	Clutch	3												
3	Brake	2												
4	Protector motion	5												
5	Crank arm	5												
6	Reed & race board	4												
7	Harness setting/Timing	5												
8	Picking power	2												
9	Pick-timing	2												
10	Picker	2												
11	Take-up	5												
12	Fork	5												
13	Temple and cutter	5												
14	Transfer motion	5												
15	Mechanical feeler	1												
16	Shuttle protector	2												
17	Hammer + transmission lever cap	5												
18	Shuttle eye cutter + plate	5												
19	Pirn position in shuttle	3												
20	Shuttle eye (thread guide)	2												
21	Wavy shuttle	1												
22	Cracked shuttle	3												
23	Nylon in shuttle or fur	3												
24	Shuttle boxes	5												
25	Bunch on pirn	3												
26	Warp stop motion	3												
27	Let-off	4												
28	Warp tension	1												
29	Bumpers	1												
30	Rocker boxes	3												
	TOTAL:	100												

Depending on the weave and construction, different styles have various settings of the back rest height and the heald crossing time.

The BEAM-GAITER is responsible for the correct setting of these parts but the LOOM-TUNER should know them too, in order not to off-set a loom, when he is called to the loom.

There are three reasons for altering basic settings :

1. WEAVABILITY. To reduce the number of ends breaks by reducing the tension and strain of the warp.

2. "COVER" To give the cloth a smooth, unbroken appearance like a piece of writing paper, without any reediness.

3. PICK PACKING. To insert a high number of picks without excessive warp tension and without "bounce" at the fell of the cloth.

Conditions (2) and (3) are met by a high back rest setting and an early crossing of the healds, depending on quality of cloth.
This means that the pick is beaten up into a crossed shed, one side of which is slack. This ensures an easy insertion of the pick, the slack portion of the crossed shed offering no resistance to the pick, the crossed shed prevents the pick from springing back and the slack shed allows the ends be evenly spaced in the cloth without showing any reediness.

In the case of heavy plains this will also help weavability but would not be suitable for light plains with fragile yarns as in such cases it is important that the warp tension is shared equally between all the warp ends.

Gaiting codes have been determined for the various styles, and are shown at next page.

Farooq - only plain weave - 2 shafts 1-2/1-2
- 4 shafts 1-3/2-4
- 6 shafts 1-3-5/2-4-6

V. QUESTIONNAIRE TO

AMPS-TRAINING COURSE

FOR

LOOM-TUNERS

ON

PICANOL-LOOMS

TYPE: CM. - 52"

CC - 44"

CL - 103"

QUESTIONNAIRES

CONTENTS

QUESTIONNAIRE NO. 1

QUALIFICATION

Questions and Answers :

1. Name 8 motions of the loom.

   Sley : harness, fork, take-up, let-off, pick, transfer, warp stop motion.

2. What safety precautions should a loomtuner take before and after fixing the loom ?

   Before : - switch off motor, put on brake, release lever and safety catch.
   Stop-time sheet on cloth.

   After : - ensure all tools have been removed from moving parts
   - shuttle properly boxed.

3. What is the "warp" and the "pattern" ?

   "Warp" is a group of yarns called ends, which are wound on the warp beam.

   "Pattern" is the arrangement and manner in which the warp ends and weft ends are interwoven.

4. What should the clearance be between the race-board and the underside of the temple ?

   Clearance is 2 mm.

5. You have four flags close to each other, they are :

   a) Bang-off
   b) Wavy cloth.
   c) Cracked shuttle.
   d) Hanging harness.

   In what order would you tackle them ?

   You also have four flags on the other side of your sets ; they are :

   a) Slack warp.
   b) Bang-off.
   c) Kinky weft.
   d) Knock out bobbins.

   In what order would you tackle those ?

5. 1st case : a) bang-off
b) harness hanging
c) Wavy cloth.
d) Cracked shuttle

2nd case : a) knock out bobbins.
b) slack warp.
c) kinky weft.
d) bang-off.

6. Name two ways of checking whether the brake is binding.
a) at fork : - cut weft and start loom. Loom should stop with crank shaft at back (BDC) centre and shuttle in B.S-box.
b) at warp stop motions : - shafts have to be level.

7. How do you set harness timing ?
Healds level, harness cam can now be set.

8. You have just moved the B.S. box front to put in a new shuttle. What part must you check before starting the loom ?
a) check leathers.
b) set shuttle with gauge 2 mm.
c) Reset shuttle eye cutter and hammer.

9. What position of the looms is used as a "datum" before setting the weft cam and the follower
Sley at front centre. FDC

10. If the position of the warp stop motion is changed by moving it nearer to the harness, what is happening to the warp tension ?
The warp tension becomes tighter.

11. How do you set the vibrator cam ?
Put healds level. Whip roll cam follower on the top position of whip roll cam.

12. Before setting a harness, what would you check ?
Reed is to be square - back box plates aligned - temples are clean and not hitting race board or are too high from race board.

13. What is the difference between :

a) "weft-catching" and "lash-in" ?

b) "mats-up" and "tight ends" ?

c) "reed mark" and "reedy cloth" ?

"wrong draft" and "wrong dent" ?

a) weft catching = weft has been caught or hanging up on fork etc.

lash-in = excess yarn that has been pulled into the open [illegible] at the selvedge.

b) mat-ups entanglement = loose yarn causing several warp ends to become tangled generally between drop wires and harness.

tight end = [illegible] warp stripe (tight end) resulting from variations on one or more ends caused by accumulation of fly size around drop wires, harness or reed.

c) reed mark = thick and thin streaks down the cloth due to reed dents not being equally spaced because of damage.

reedy cloth = an appearance of the cloth where the warp ends are noticeably seperated by the [illegible] into the groups of ends reeded per dent.

d) wrong draft = the warp ends are drawn incorrectly in the harness, as a result they do not weave properly.

wrong dent = one or more ends drawn through the wrong dent in the reed, making a streak down the cloth.

14. How can you judge the length of a pick ?

From the boxing of the shuttle.

15. What must you check before setting the pick-timing ?

a. picker.

b. check strap.

c. position of shuttle in box.

d. height of the power strap.

e. picking stick.

f. distance between long lug strap and picking stick.

16. Name the five parts which wear out first on the Picanol loom.

a. check strap.

b. leather binder and boxes.

f. picking stick stop

g. pick-motion crank arm

13. What is the difference between :

a) "weft-catching" and "lash-in" ?

b) "mats-up" and "tight ends" ?

c) "reed mark" and "reedy cloth" ?

d) "wrong draft" and "wrong dent" ?

a) weft-catching = weft has been caught or hanging up on fork etc...

lash-in = excess yarn that has been pulled into the open shed at the selvedge.

b) mat-ups entanglement = loose yarn causing several warp ends to become tangled generally between drop wires and harness.

tight end = thin warp stripe (tight end) resulting from variations on one or more ends caused by accumulation of fly size around drop wires, harness or reed.

c) reed mark = thick and thin streaks down the cloth due to reed dents not being equally spaced because of damage.

reedy cloth = an appearance in the cloth where the warp ends are noticeably seperated by the reed into the groups of ends reeded per dent.

d) wrong draft = the warp ends are drawn incorrectly in the harness, as a result they do not weave properly.

wrong dent = one or more ends drawn through the wrong dent in the reed, making a streak down the cloth.

14. How can you judge the strength of a pick ?

From the boxing of the shuttle.

15. What must you check before setting the pick-timing ?

a. picker.

b. check strap.

c. position of shuttle in box.

d. height of the power strap.

e. picking stick.

f. distance between long lug strap and picking stick.

16. Name the five parts which wear out first on the Picanol loom.

a. check strap.

b. leather binder and boxes.

c. Leathers on picking motion.

d. shuttle.

e. weft feeler and housing

f. picking stick stop

g. pick-motion crank arm

h. box front leather

j. frog stop + dagger

17. What are the five most common causes of a smash ?

a. Protection motion.

b. broken shuttle.

c. high warp tension.

d. bad start by the weaver.

e. miss change.

f. speed(clutch)

18. Name the three fixing jobs which usually take most time to diagnose and to fix.

a. cut warp ends.

b. broken weft.

c. loom stops for no reason.

19. What causes overshots ?

a. bad harness setting.

b. mat-up in warp.

c. bad alignment of back box plates.

d. reed not square.

20. What must be done before setting the "weft feeler" ?

a. position shuttle in box.

b. sley position.

21. What 4 causes can make a loom run slow ?

a. clutch slipping.

b. low power.

c. brake too tight.

d. bad greasing of crank arm and bottom shaft bearings.

22. Explain the five main duties of a loom tuner.

a. preventive maintenance.

b. repair flagged looms.

c. diagnosis of faults.

d. correct checking of new warps.

e. knowledge and application of loom settings.

23. When is the warp tension the greatest during a loom cycle ?

When the reed is beating up at fell of cloth. in case of dense fabrics
Open shed when no whiproll.

24. What is "double changing" ?

Continuous change of pirns.

25. What does a red ticket signify ?

Red ticket from cloth inspection indicates a certain loom is producing second quality.

26. Give the six checks which a tuner should make on each loom of his set at the start of a shift ?

a. shuttle boxing.

b. weft feeler.

c. warp tension.

d. shuttle eye cutter.

e. temple cutter.

f. weft tension.

g. weft grid clean

h. shuttle condition

QUESTIONNAIRE NO. 2

PICKING MOTION

1. Why does the shuttle run on the race board without flying through the shed ?

   By the correct setting of the picking motion and the shuttle boxes.

2. Name 6 causes that stop the loom.

   a. broken weft.

   b. smash .

   c. bang-off.

   d. maladjustment of the weft fork

   e. broken ends in warp end

   f. bad boxing.

3. What is the parallel motion for ?

   To maintain a proper shuttle flight across the race board.

4. The pick cam hub can be moved along the shaft. Where should it be located ?

   Fully against cam shaft bearing.

5. How many times does the cam shaft turn, compared with the crank shaft ?

   1/2 turn.

6. Why is a picker stick made of wood ?

   Due to its elasticity and lightness.

7. What spring tension is advisable on the picker stick ?

   Just enough to bring back the picker stick 180° maximum turn on spring (parallel).

8. What must you do before setting the pick timing ?

   a. Shuttle in position in box.

   b. Pre-set long lug strap with gauges.

   c. Check minimum clearance of short lug strap.

9. Why do pick bowls get flats on them ?

   Worn pick cam toe ; incorrect setting of lug ; poor lubrication.

10. Where is the start of the picking action on a pick cam ?

When pick bowl comes in contact with pick cam toe.

11. How can you judge the strength of a pick ?

a) If the front box is adjusted properly and the shuttle bounces in box, it is too strong. (Watch marks on shuttle and top box plate).

b) If we have a bang-off or incorrect change the strength is not enough.

12. What is the "datum" against which a box front must be set ?

At B.D.C. with shuttle in box set with gauges: pressure of swells.

13. What setting on a loom will change when you use a new shuttle ?

Box settings, hammer settings, and picking motion, daggers, weft feeler, height of cutters.

14. What are the clearances between shuttle and box front in B.S. and F.S. boxes ?

2 mm. Set with gauges (shuttle in box).

15. Name two reasons for moving the box fronts.

a. Changing leathers or front box plates.

b. Changing shuttles.

16. What tension is allowed on a dagger finger ?

Sufficient to hold dagger fingers in contact with binders and not wear shuttle, box leather or increased power requirements.

17. If you want to check the clearance between the dagger finger and the binder, where should you set the sley ?

$\pm$ 5 mm dagger finger resting on front frog plate.

18. What parts of a picking motion wear out first ?

Cover of lower pick stick bumper, lug strap and its protection leather.

19. How many causes of bang-off do you know ?

Poor shuttle boxing ; bad pirn change ; picking assembly ; warp tension ; bad reed alignment ; clutch wear ; daggers not set correctly.

20. What kind of wood is a picker stick made from ?

Laminate.

21. How many types of shuttles are in use in the mill and what is the difference between them ?

<u>Two types</u> : one for loom type 4 boxes - with Tip
one for all other loom types - Tipless

The ones for 4 box looms are of the 90° type, the others are of the 85° type.

QUESTIONNAIRE NO. 3

BEATING MOTION

1. What is the "fell" of the cloth ?

   The edge of the cloth where the last pick has been inserted.

2. How many different kinds of temples are in use in the mill.

   2 types, with 11 and 16 rings.

3. What should the clearance be between the race board and the underside of the temple ?

   Clearance is 2 mm.

4. What faults occur when the temple thread cutter is worn ?

   Lash-ins as well as hanging ends at the selvedge.

QUESTIONNAIRE NO. 4

SHEDDING MOTION.

1. What is the first thing you would check before setting a harness ?
   Loom should be at back centre.

2. What are the three means of adjusting the height of a harness ?
   Jack straps , harness straps and treadles.

3. What clearance is required for the bottom shed ?
   Thickness of a drop wire (pin). 2mm.

4. How do you set the harness timing ?
   Level harness - set reed to required distance from fell of cloth and set harness cam (or dobby chain).

5. What does the vibrating roll do ?
   Levels warp ends - provides even tension and determines quality of cover.

6. To set vibrating roll how would you set the reed ?

   Shafts level - whip roll cam toe upwards.

7. How strong should the spring on top of the harness be ?
   To keep the treadle rolls in complete contact with the cams during a full turn of the crank shaft.

8. What does "harness hanging" mean ?
   Harness is not level due to broken harness strap wires.

9. What harness faults causes "overshots" ?
   Hanging harness.

10. If the whip roll is raised, what happens to the tension of the top shed and the bottom shed ?

    The top shed has less and the bottom shed has more tension.

11. If the top shed becomes slack, what cloth fault is likely to arise ?

    Overshots.

QUESTIONNAIRE NO.5

LET-OFF MOTION

1. When is the let-off brake handwheel used?
   To wind or rewind the warp that has been let off.

2. If the drop wires are balancing, what does that indicate about the warp tension?
   Too tight.

3. Name 4 ways of recognizing a slack warp.
   a) slack warp ends.
   b) overshots.
   c) slack cloth.
   d) bang off

4. What two factors govern the speed with which the warp is let off.
   a) beam feeler
   b) ratchet

5. Give two ways of recog .izing a tight warp.
   a) high tension on cloth
   b) loom banging off

6. What two cloth faults commonly occur due to a worn let off?
   a) thin places
   b) thick places
   c) uneven weave

7. When the take-up gear lets the cloth back, does the warp wind-up through the let-off motion?
   No - use handwheel.

QUESTIONNAIRE NO. 6

TAKE-UP MOTION

1. How many differente types of take-up motion are in use in the mill?
   One.

2. Before setting the take-up, what must be checked?
   Side or center fork.

3. When is the "pick gear" changed?
   When the construction of cloth changes and calls for a change in picks per cm.

4. Why is there no gear drive between the sand roll and the cloth roll?
   Because of increasing diameter of cloth roll as it fills up.
   The centers of the sandroller and the clothroller are pushed apart.

5. What should be checked for clearance after setting the take-up gears?
   Pawl and hold back pawl must fit into the base of a tooth.

QUESTIONNAIRE NO. 7

STOP MOTION

1. How many automatic devices are there on a loom, which will cause it to stop?

   4 namely: a) warp stop motion
   b) weft stop motion
   c) daggers
   d) shuttle protector

2. Which do you set first on a mechanical stop motion – The timing or the stroke?

   The stroke.

3. If the warp stop motion is moved near the harness, what happens to the tension of the warp?

   Tight tension.

4. How do you decide the position of the warp stop motion relative to the harness?

   By the shed.

5. How would you set a loom to stop with the harness level when the warp ends broke?

   Adjusting timing of oscillator cam.

6. A large percentage of smashes are caused by not banging off at improper boxing. What motion has to be checked?

   The dagger motion.

QUESTIONNAIRE NO. 8

MOTOR

1. Why is one tooth and the loomside marked before removing driving gears?
   To facilitate re-assembly, ensuring that the gears "mesh" in the original position.

2. What two causes can make a loom run slow?
   a) incorrect setting of the clutch
   b) drop in power
   c) bad greasing of crankarm and bottom shaft bearings
   d) break too tight.

3. Where is the speed of the loom measured?
   At the crank shaft.

4. Why do certain teeth in the gears wear more than the others?
   Transmitting or drive gears have worn teeth at the point by pick cam toe hitting the bowl.

5. What is the safety latch for?
   To prevent an accidental start up when the tuner is working on the loom.

6. What two types of brakes are used on looms?
   a) clutch brake
   b) wheel brake

7. If there is insufficient friction at the clutch, what will happen to the loom?
   Reduction in picks per minute - loom banging-off - bad change - loom stopping - shuttle fly out of shed - transfer mechanism not properly functioning - cork wears out on clutch plate.

QUESTIONNAIRE NO. 9

WEFT CHANGE

1. Where should the sley be st before adjusting the weft cam follower?
   At front center.

2. Which one should you set first, the position of the weft cam of the stroke of its follower?
   The weft cam.

3. If the mechanical-feeler is incorrectly set, what fault will be caused?
   Early changing - no bunch left on pirn possibly causing double picks.

4. What has to be checked before setting the mechanical-feeler?
   Correct position of the shuttle in the box.

5. The mechanical-feeler has to be set on 3 dimensions: height, lateral position and distance to pirn. What are these settings ?
   - Height: Feeler axis is 1 mm. higher than the pirn axis.
   - Lateral: 7-8 mm. between feeler and reserve
   - Distance: Clearance of 1-2 mm. between pirn and the tap of the feeler in the away position.

6. A recent analysis of the cause of smashes showed that quite a number of them were caused by faulty weft change action. What safety device is incorporated in the loom to prevent changing if the shuttle is not boxed?
   If shuttle is not correctly boxed, the shuttle protector strikes the tip of the shuttle and is forced forward, carrying with it the depressor, which eventually causes the transfer of the pirn to be stoppped.

7. Explain the term "double change".
   Double change means the consecutive transfers of pirns.

8. If the B.S.-box front is reset because of bang-off , what other part must be checked?

CHARTS

and

GRAPHS

V CHARTS and GRAPHS

1. Purpose

Charts and graphs have been designed for:

a. recording the progress of the trainees

b. evaluating the performances of the trainees on preventive maintenance.

2. The following charts and graphs are used :

a. The completed "Flag" - recognisation Schedule (see page 2) for recording the progress in "Diagnostic Development".

b. The Preventive Maintenance Results Efficiency (see page 4) for recording the performance of the trainee on Preventive Maintenance.

a. The Complete "Flag" - recognisation Schedule.

As explained in the chapter on "Diagnostic Development" (page 1 of Phase II), the trained has to repair at least 7 flags of a particular loomstop.
The total number of the different reason for flagging in 18, which means that the total number of flags to repair is: 18 reasons x 7 flags per reason = 126 flags.

The vertical axe of the graph "Completed Flag" - recognisation Schedule (see page 3) is divided into 126 parts and the horizontal one in 30 parts.

Each day the accumulated number of flags repaired is indicated by a mark on the crossing of the line, representing the number of flags repaired, with the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 126th flag, with the line, representing the 30st day.
That line is called the "target - line".

As long as the "actual progress line" is appearing at the left-hand side of the "target-line" the trainee progresses well and will terminate all the 126 flags within 30 days.

As soon as the first line is crossing the target-line the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

Date:.............. COMPLETED "FLAG" RECOGNITION SCHEDULE

Number of flags.

Name: ....

128

120

110

100

90

80

70

60

50

40

30

20

10

PREVENTIVE MAINTENA[illegible]E RESULTS EFFICIENCY. NAME: ....

%

95

90

85

80

75

70

65

60

55

50

45

40

35

OM Nr.:

E:

227

10622
(6 of 10)

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME VI OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

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PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

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PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

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WERNER AMPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

DRAWING FIXER'S

MANUAL

INGOLSTADT

Prepared for:

T.I.R.D.C. (UNIDO)
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BRUSSELS - BELGIUM.
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PERSONNEL SPECIFICATION

Job:	ROVING AND DRAWING FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum _ months good roving tender or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy card-room.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

DRAWING FIXER'S MANUAL

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/r ving tenders with at least 6 months GOOD spinning/roving experience.
The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (4 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice

to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you.
Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.
Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

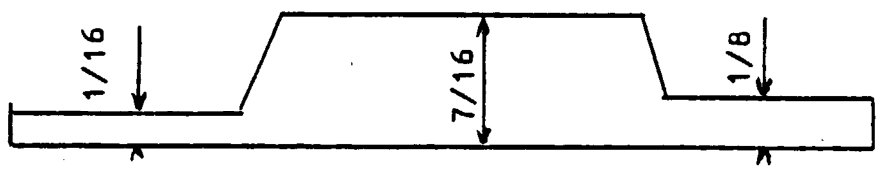
3.8 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool,box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.
A fixed position or datum is used, e.g. the position of the top rollers.
Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.
When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

plan or roller

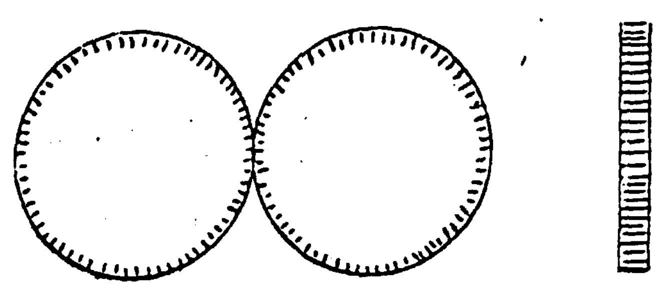
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

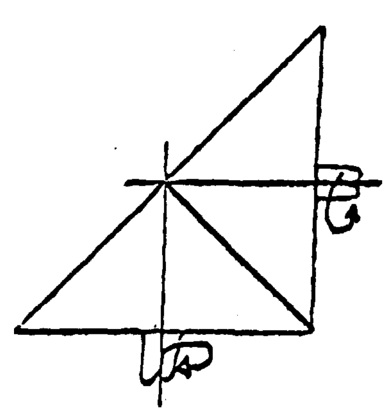
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



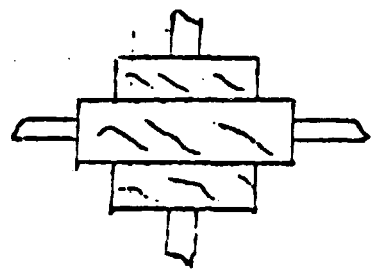
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



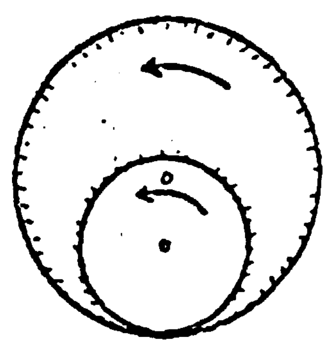
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



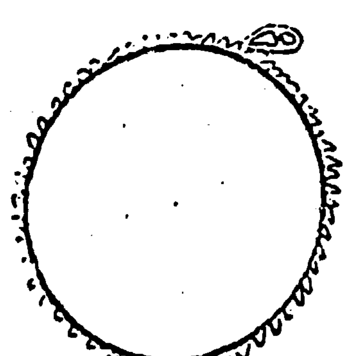
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. 120 Kg.

4 m. 6 m.

180 Kg. 90 Kg.

4 m. ? m.

180 Kg. ? Kg.

4 m. 5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

DRAWING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided into 3 groups:

1. A. Drive
   B. Gearing

2. A. Drafting system (pressure arms)
   B. Drafting system (dead weights)

3. A. The calander
   B. Tube gear
   C. Coiler turntable
   D. Feed rollers

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all three(3) groups of adjustments so that when complete, the trainee has completely set up three(3) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

GROUP 1. A. DRIVE.
B. GEARING.

1.A DRIVE.

1. DESCRIPTION.

Power for the drawing frame is provided by a totally enclosed fan-cooled motor that is suspended at the head end.

Transmission from the motor to the frame is by a flat belt.

2. PURPOSE.

The drive transmits power to the various mechanisms of the frame.

Through its pulleys, belts, gears and rolls, the movement is imparted to perform all the synchronized functions necessary to draft and coil the sliver into the cans.

The drive also powers other auxiliary and necessary mechanisms such as the hank counter, clearers and traverse.

3. PARTS.

1. MOTOR.
2. PULLEYS LOOSE AND FIXED.
3. TENSION SPRINGS.
4. SWING ARM.

4. SETTINGS.

The motor is adjustable. Throw the 2 tension springs.

A change of speed through the drive is accomplished by changing to different size motor pulleys.

- The belts should sag slightly.
- Never use a belt with more than one set of belts fasteners.
- For V-belts drive: lower the motor into the V-belts with its own weight, and tighten the nuts.
- The belt fork (swing arm) should be set and properly aligned so that any wear and tear of belt or fork must not occur. The worn out belt fork should be repaired.

GROUP 1.B GEARING.

1. DESCRIPTION.

The precision cut draft gears are located in the head end.

Drive and change gears are keyed to revolving shafts and intermediate gears are mounted on plain bearings on adjustable swing arm.

2. PURPOSE.

The draft gears drive and control the bottom rollers of the drafting system. By means of different size change gears, the ratio of speeds of various rolls can be changed to give different drafts.

3. CONSTRUCTION.

The draft gears are made with care and precision. The gears fitted to rollers and shafts are spaced for exact meshing. Gears mounted on stands and swing arms have plain bearings.

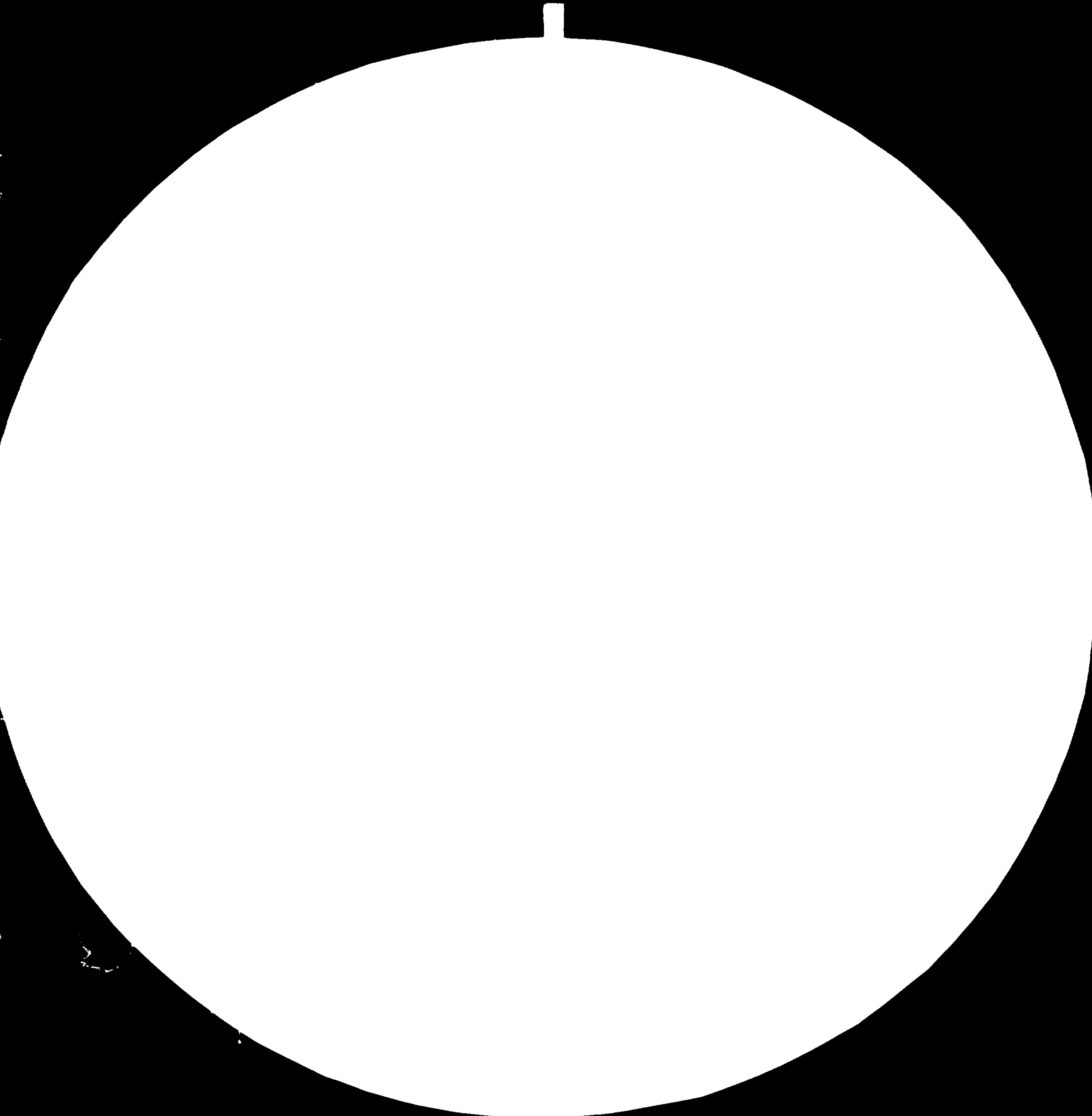
4. PARTS.

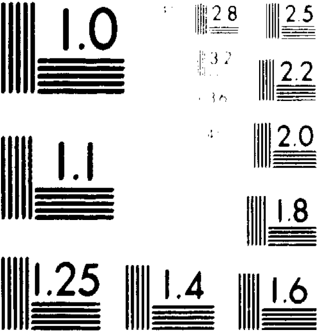
1. DRAFT GEAR.
2. BACK DRAFT GEAR.
3. SWING ARM.
4. STUD.

5. SETTINGS.

Do not mesh the teeth of the gears so deeply that they bind nor so shallow that excessive backlash will be present.

Whenever a gear is changed double-check to see that it has the correct number of teeth.



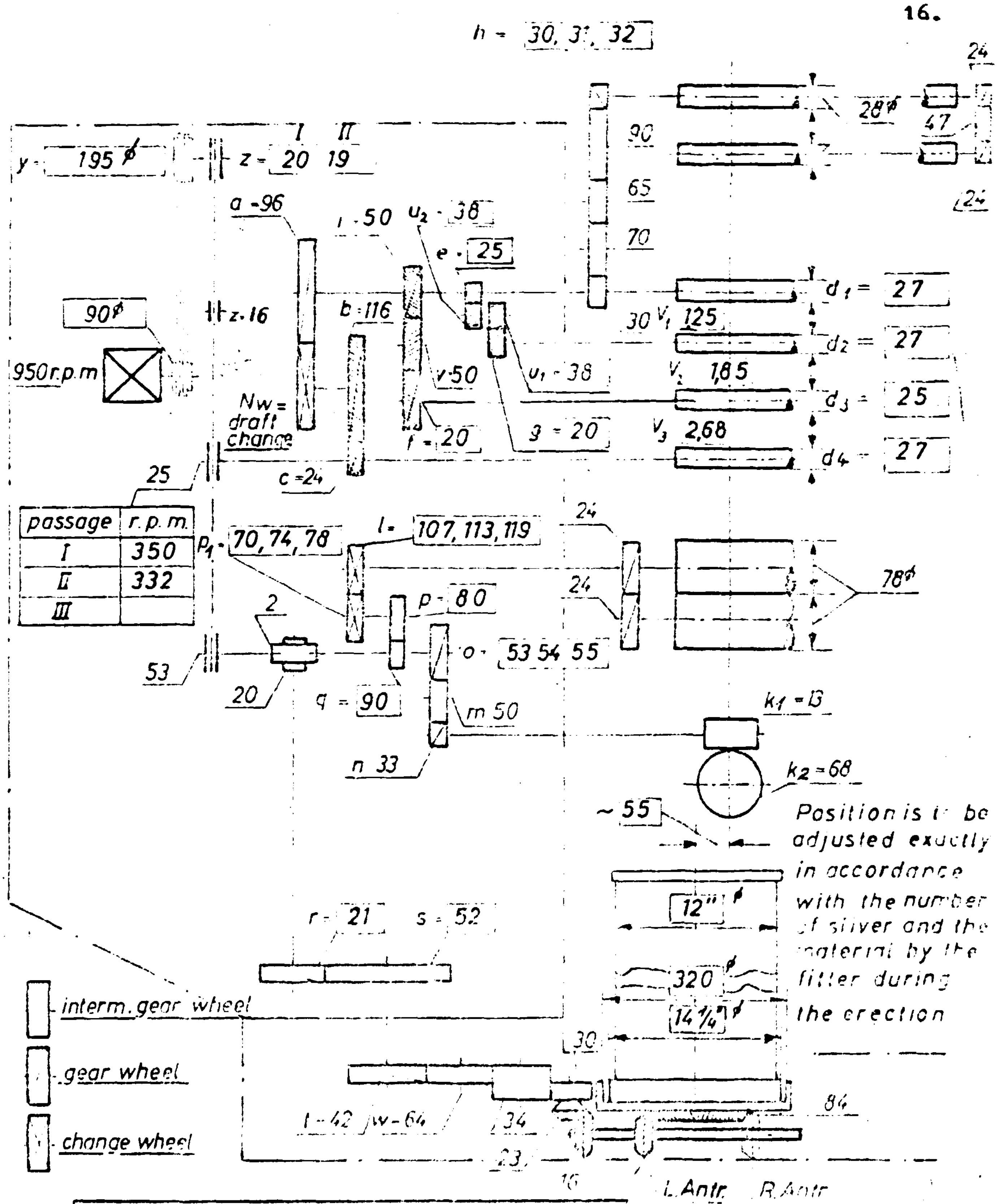


MICROCOPY RESOLUTION TEST CHART

If a gear must be forced from the shaft, do not strike it to drive it off. Use a gear puller. The gear should fit the shafts, studs or rollers snugly with no play or looseness.

See the keys and keyways are not worn and that appropriate nuts and washers are securely fastened.

Clean teeth of all gears before installation and lubricate them accordingly to lubrication instructions, before the frame is started.



Total draft	=	$\frac{d_4 \cdot b \cdot a}{d_1 \cdot c \cdot Nw}$			=	$\frac{464}{Nw}$
draft change	73	74	75	76	77	
draft	6,35	6,27	6,2	6,1	6,03	
draft						

delivery: ~30 m/min

delivery: ~28 m/min

delivery:

GROUP 2 A. DRAFTING SYSTEM.(Pressure Arms)
B. DRAFTING SYSTEM.(Dead Weights)

2.A DRAFTING SYSTEM.(Pressure Arms)

1. DESCRIPTION.
The roller stands are simple and functional.
The roll blocks are precision made and the middles and back blocks are fully adjustable in the stand. Roll stands are located at each delivery side. The stands hold the rolls parallel and horizontal.
The top pressure is loaded by springs.
The bottom rollers are straight fluted and the top rollers are covered with synthetic cots.

2. PURPOSE.
The drafting system transport the stock and through progressive higher surface speeds draw the fibers out and draft them.

3. PARTS.
1. ADJUSTING BEARING.
2. ADJUSTING BOLT.
3. RELEASE SCREWS.
4. WEIGHTING SUPPORT.
5. PIN BOLTS (a)
6. CLEARERS.
7. ADJUSTING SCREWS.
8. TENSION ROLLER.

4. ADJUSTMENTS.
1. Set spring element exactly to the center of the inserted top rollers.
2. Loosen locking screw on the adjusting bearing (1) a little and load spring arm.

3. Under the control of a water level adjust spring - arm with the aid of adjusting bolt (2) and by showing weighting support (4) in such a way that bolt part (a) protruding from the unloaded spring element is extended by 1,5 to 2,0 mm. when the spring arm is loaded. Within these values a satisfactory spring loading is ensured whereby the spring arm must be in strictly horizontal position endwise and crosswise.

   In case that the spring arm must be set higher or lower by more than 1 mm, this adjustment is to be done step by step for the whole length of machine as otherwise shafts, etc. might be endangered. If adjustment was done with the necessary care, all pin bolts (a) will be lifted by the same figure x provided that all top rollers are of equal diameter.

   After adjustment is done, recheck the seat of all locking screws.

<u>Readjustment of the spring arm</u>.

The characteristics of the loading spring ensure a satisfactory load at a lift of 1,5 to 2,0 mm. If this limit is exceeded,the load will increase respectively decrease. Therefore, loading conditions can easily be tested by measuring bolt part (a) before and after the weighting.

As is known by experience, the spring arm will have to be somewhat readjusted after about four times repeated regrinding of top rollers.

It may be pointed out once more that all top rollers must be of equal diameter in order to obtain a constant roller pressure (tolerance $\pm$ 0,1 mm.).

Experience has shown that the adjustment of the spring arm is most efficiently done by measuring bolt part (a) before and after the weighting. The water-level cannot be more than an instrument of general control. For a quick job only the front and back spring elements may be adjusted to the distance x.

The center-elements need not be checked any more. It is not necessary that x is equal at all bolts, it should only be within the indicated tolerance of 1,5 to 2 mm.

5. CLEARERS.

Adjust the clearers from the front adjusting screws in such a way that the clearer remains in the middle of the tension roller and turns slowly.

6. BOTTOM ROLLERS and roller stands.

The roll stands hold the blocks for both the top and bottom drafting rolls. These stands are made of cast iron and all contact surfaces are machined to very close tolerances. The roll blocks fit into slides attached to the stands and minute adjustments can be made. The stands are so constructed that both top and bottom rolls are kept in exact alignment when the blocks have been correctly set by gauge.

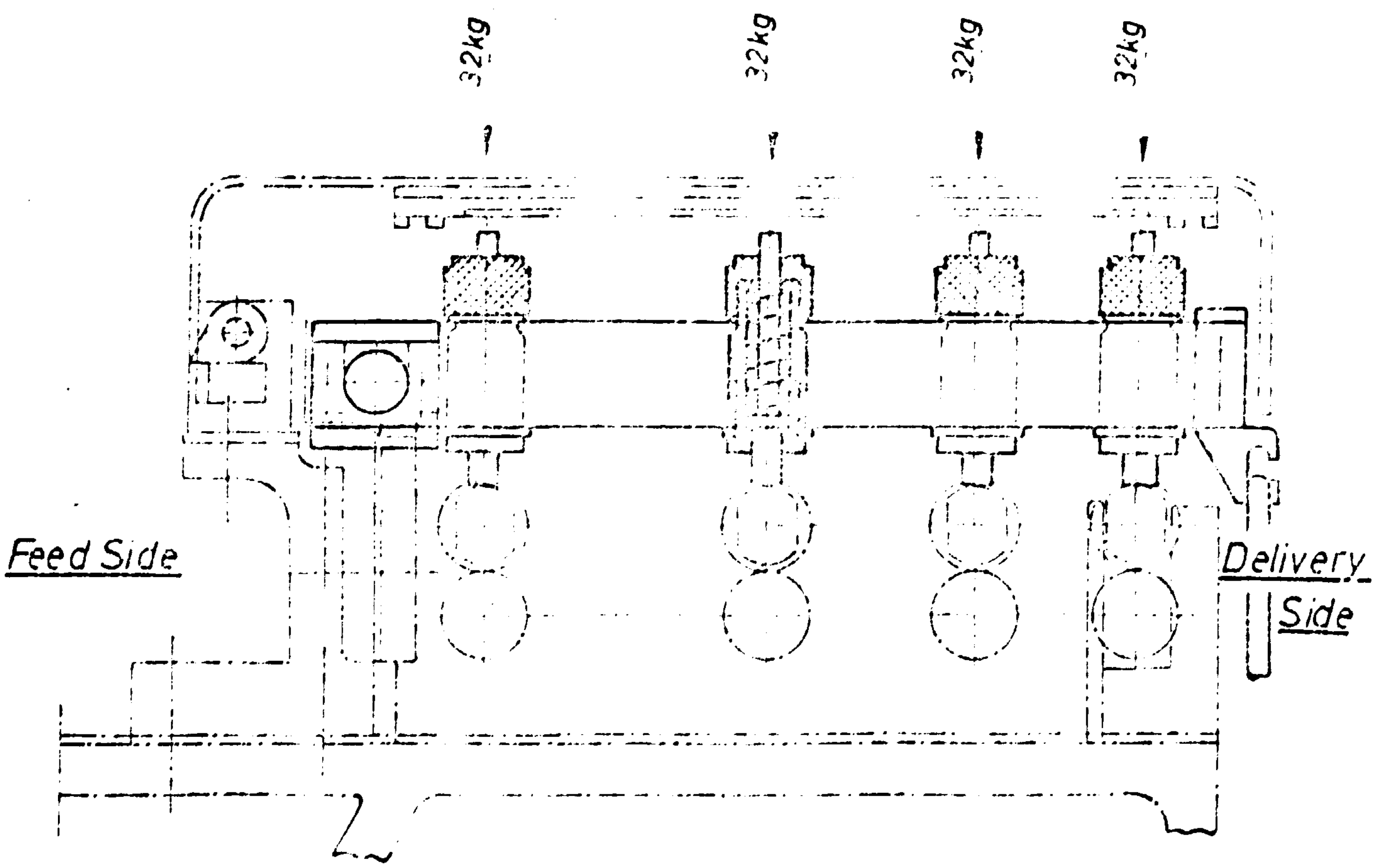
Do not disturb the front rolls when settings are made. Loosen the screws in all the roll blocks except the front ones. With appropriate gauge, space the roll blocks exactly to specifications. Begin with the second bottom roll and proceed to the back roll.

Set all the blocks for each roll before proceeding to the next one. In this way, there will not be a possibility of using the wrong gauge, and the blocks will be spaced and aligned at the same time. Tighten the holding screws lightly as the blocks are positioned.

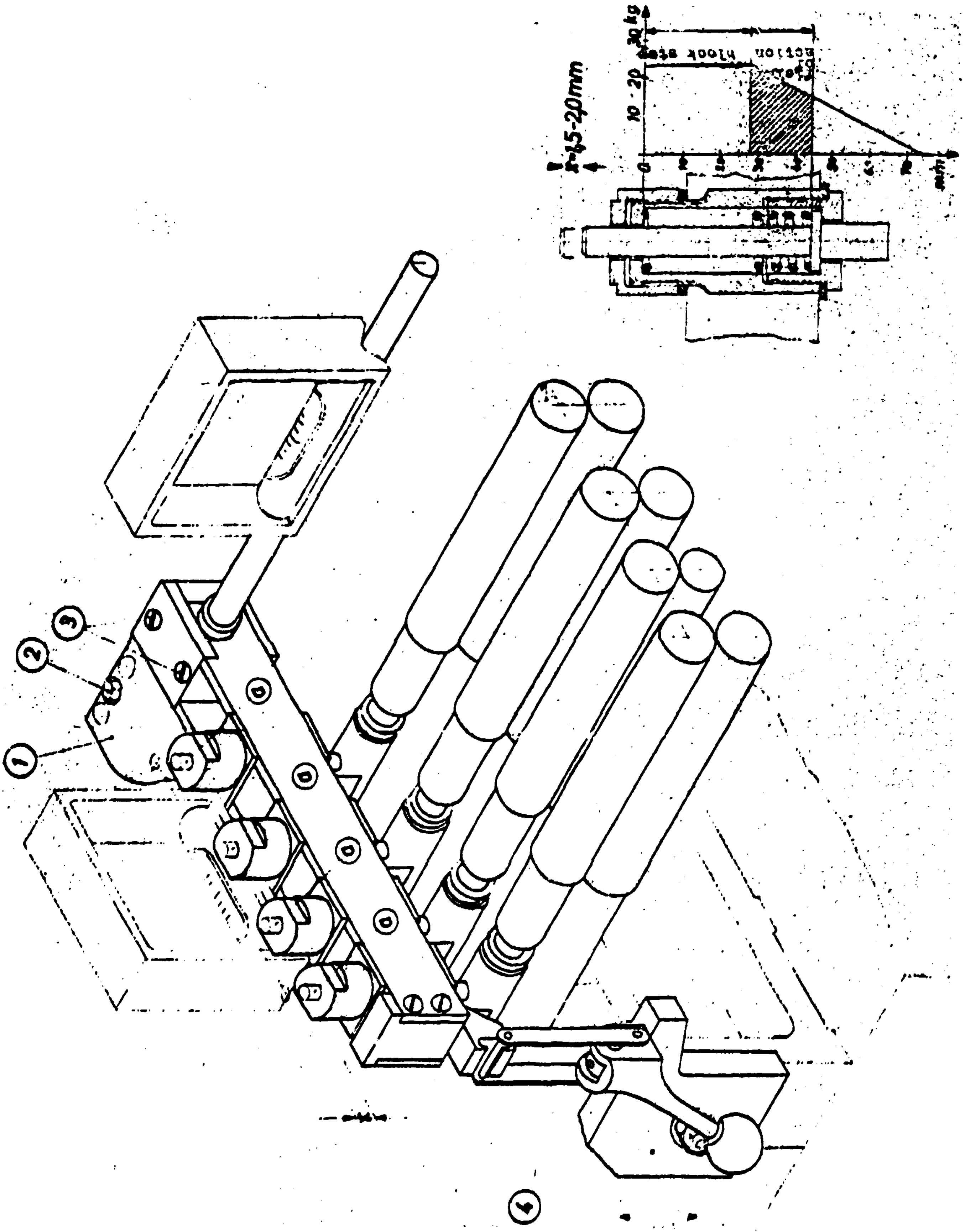
When all the blocks have been set, check back with the appropriate gauges and securely tighten the screws.
See that the rolls revolve freely without bind or end play.

When the spacing between the rolls is changed, it is necessary to adjust the top roll weights. Loosen the screws that hold the weighting units on the arms and slide them into position over the centre of the rolls.

<u>NOTE :</u> Always check the opening of the roller blocks. They must be 20 mm. Fix them if necessary. In no case the eccentricity of the rollers at any point should exceed 3/100 mm for the front roller and 5/100 mm for the back ones.



SETTING-INSTRUCTIONS OF SPRING WEIGHTING FOR DRAWING FRAMES



2.B DRAFTING SYSTEM (Dead Weights).

1. DESCRIPTION.

The roller stands are simple and functioncal. The roll blocks are precision made and the middles and back blocks are fully adjustable in the stand. Roll stands are located at each delivery side. The stands hold the rolls parallel and horizontal. The bottom rollers are straight fluted and the top rollers are covered with synthetic cots.

2. PURPOSE.

The drafting system transport the stock and through progressive higher surface speeds draw the fibers out and draft them.

3. PARTS.

1. HOOKS
2. DEAD WEIGHTS.
3. RELEASING BARS.

4. ADJUSTMENTS.

1. Bottom rollers.

The roll stands hold the blocks for both the top and bottom drafting rolls. These stands are made of cast iron and all contact surfaces are machined to very close tolerances. The roll blocks fit into slides attached to the stands are so constructed that both top and bottom rolls are kept in exact alignment when the blocks have been correctly set by gauge.

Do not disturb the front rolls when settings are made. Loosen the screws in all the roll blocks except the front ones. With appropriate gauge, space the roll blocks exactly to specifications. Begin with the second bottom roll and proceed to the back roll.

Set all the blocks for each roll before proceeding to the next one. In this way, there will not be a possibility of using the wrong gauge, and the blocks will be spaced and aligned at the same time. Tighten the holding screws lightly as the blocks are positioned.

When all the blocks have been set, check back with the appropriate gauges and securely tighten the screws. See that the rolls revolve freely without bind or end play.

NOTE : Always check the opening of the roller blocks. They must be 20 mm. Fix them if necessary. In no case the eccentricity of the rollers at any point should exceed 3/100 mm for the front roller and 5/100 mm for the back ones.

2. Dead weights.

Once the hooks are on the top rollers and zith the weights on,adjust, the releasing bars below from the adjusting between the hooks, and finally level the dead weights.

3. Clearers.

Adjust the clearers from the front adjusting screws in such a way that the clearer remains in the middle of the tension roller and turns slowly.

GROUP 3 A. THE CALENDER.

B. TUBE GEAR.

C. COILER TURNTABLE.

D. FEED ROLLERS

3.A THE CALENDER.

1. DESCRIPTION.

The calender receives the fibers from the trumpet and compresses them so that their natural cohesive qualities will cause them to retain a ropelike form for the next process. The calender rolls are mounted on plain bearings and the back roll is positively driven from the jack shaft through a change gear and an intermediate The front calender roll is driven by the back calender roll through straight gears.

2. PARTS.

1. CALENDER ROLLER.
2. BEARINGS.
3. DRIVING GEARS.
4. TRUMPET.

3. SETTING.

The back roll is mounted on plain bearings in a rigid support and should be free of either bind or end play. The front roll is also mounted on plain bearings, deadweighted in blocks that permit the roll to yield enough for passage of the fibers while compressing them into sliver form.

The calender drive gear is also a change gear, available in a suitable range of sizes. The correct gear should always be used to keep the stock under slight tension as it passes through the web gatherer and to the trumpet. The calender rolls should be kept aligned, clean, and the gears should be free of lint or other obstructions that could prevent proper mesh or could interfere with the necessary pressure on the stock

3.B TUBE GEAR.

1. DESCRIPTION.

   The tube is mounted to the gear and conducts the sliver to the delivery can.

2. PARTS.
   1. TUBE GEAR.
   2. TUBE GEAR WHEEL.
   3. CONTACT BLADE. - 4. TRUMPET.

3. SETTING.

   The tube gears are driven from the calender section. There should be a clearance of 1/16" between the top of the tube and the bottom surface of the top motion contact blade.

   The bottom contact surfacc of the tube gear is smooth and highly polished. It should be kept clean and free of nicks, scratches, or any roughness that could snag or damage the sliver.

4. TRUMPET.

   Fit the appropriate trumpet to suit the sliver count.

   Trurpet diameter : 3 - 3.5 - 4-4.5 mm.

   Emperical values : Ne 0.12 = 4 mm.
   Ne 0.14 = 3,5 mm.
   Ne 0.16 = 3 mm.

3.C COILER TURNTABLE.

1. DESCRIPTION.

The coiler turntable holds the sliver can and revolves it so that the sliver will be coiled in uniform layers in the can. The turntable is driven through a large conical gear.

Turntables require external lubrication. The drive is linked through a vertical shaft.

Th This shaft, in turn, is driven through a worm and worm gear.

2. PARTS.

1. TURNTABLE.
2. WORM AND WORM GEAR.
3. TURNTABLE BASE.

3. SETTING.

The turntable base rests on the floor and is not an integral part of the frame, but is connected to the coiler drive by a shaft. The turntable must be level and his centre offset by 55 mm. from the tube gear.

Any eccentric motion of the delivery can will have a detrimental effect on the sliver through friction on the side of the can and by uneven coiling in the can.

3.D FEED ROLLERS.

1. DESCRIPTION.

The feeding of sliver consist of two feeding guide plates for each delivery having guide slots for every sliver end.

The sliver passes under the self weighted rolls revolving on the fedding roller.

Every delivery is provided with seperate traversing sliver guide. Each sliver guide has grooves for each sliver and is adjustable in height.

2. PARTS.

1. SLIVER GUIDES.
2. FEED ROLLERS.
3. SELF WEIGHT ROLLERS.
4. TRAVERSING SLIVER GUIDE.
5. DRIVING RATCHET.

3. ADJUSTMENTS.

Adjust the height of the sliver guide to be: 1 - 2 mm. above the bottom fluted rollers.

Adjust the traverse to be : 20 mm.

PHASE II

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1. DIAGNOSTIC DEVELOPMENT
2. TROUBLE SHOOTING
3. PREVENTIVE MAINTENANCE
4. FRAME INTERFERENCE
5. QUESTIONNAIRE
6. CHARTS AND GRAPHS

DRAWING FRAMES

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job abilities of the trainee.

b. Method.

The trainee is to walk the section of the Preparation Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.
The suggested number of each defect is as follows :

- Creel	5
- Clearers	5
- Bottom roller settings	5
- Top roller setting	5
- Top roller pressure	5
- Air suction	5
- Coiler	5
	35

TROUBLE SHOOTING WITH THE SPECTOGRAPH.

If your mill laboratory is equipped with a Uster Spectrograph you can trace mechanical faults in the drawing sliver directly to the machine part that is responsible. All that is needed is a spectrogram showing the wave length at which the fault occurs, a gearing diagram of your drawing frame and a chart devised through the use of the diagram and appropriate formula.

By substituting the number of teeth in the gears that you are using for the letters in the formula, you can devise a chart for your drawing frame. Recurring faults in the sliver can then be traced directly to the machine parts that are causing them.

The Spectrograph, operating in conjunction with the Evenness Tester, provides a quick method of locating the source of any unevenness in the sliver. As the sliver is fed through the Evenness Tester, variations in weight per unit length of material being tested is recorded on a chart. The Spectrograph receives the impulses from the tester in the form of short to long signals.

These signals are sorted electronically by a method that can be compared to sorting oranges according to size. The smaller oranges will drop through small openings and the larger oranges will proceed to larger openings until finally the largest orange reaches the largest opening and drops into the bin.

This then, gives a rough idea of how the Spectrograph stores these signals, according to length, in its electronic bins. When the register button on the Spectrograph is pushed, these bins are drained and the results are shown on a chart known as a Spectrogram.

The chimmney-like peaks marked "A" are mechanical faults, which are caused by parts of the machine that are out of adjustments, or parts that are worn to such an extent that they are making constant repetitive patterns. The humps, or hill-like peaks shown at "B" are drafting waves caused by improper roll settings.

The curve "C" is a perfect Spectrogram, mathematically calculated and difficult, if not impossible to obtain in textile processing. The curve "D" is a more practical Spectrogram, higher than the perfect spectrum.

The area between curves "D" and "C" is very hard to improve and depends upon the processing and the type of fibre that is used. The area between "D" and "C" is random variation, difficult to control in staple fibre processing and our chief concern is with the peaks "A" and humps "B".

The mechanical faults at "A" can be found on the machine by looking above the peak on the Spectrogram and reading the length of this particular defect, and then looking at the chart and gearing diagram to pinpoint the source of the defect.

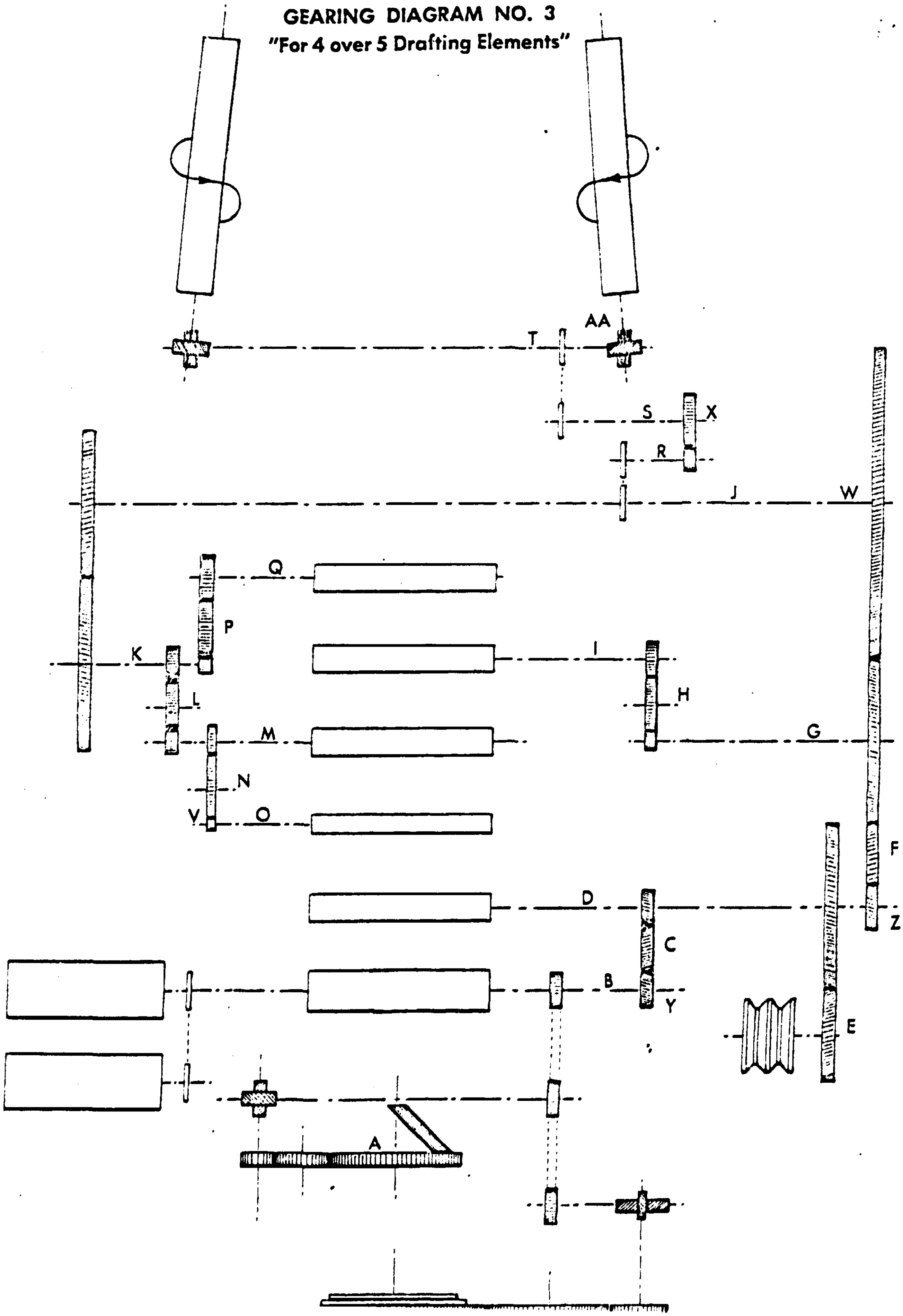
It is very simple and easy to calculate a gearing diagram for each machine that will give the length at which each roll or gear will repeat. For example, if the front roll of the drawing frame is 1 3/8 inches in diameter, we know that it will give a repeating pattern if it is eccentric, which will be 1 3/8 x 3.1416 or 4.3 inches. Therefore, an eccentric 1 3/8 inch front roll will show up as a chimney on the Spectrogram at slightly more than 4 inches. The drafting waves, or humps indicated at "B" on the diagram can be located in the same manner by using the centre of the hump as the point of location for length of defect.

The drawing frame is a versatile machine and it is possible to operate it with a wide range of gears and settings. It is, therefore, impossible to give gear diagrams and spectrograph trouble-shooting charts for every combination that can be used. The diagram, tables, charts, and formulas shown here are only representative, but from a study of them, you can interpolate any differences in your drawing frame components and compile data applicable to your individual machines.

The tube gear and calender roll data is the same for all models of the drawing frame.

The wave length shown always denoted the number of inches between like defects or variations in the sliver that cause the high peaks on the spectrogram.

GEARING DIAGRAM NO. 3
"For 4 over 5 Drafting Elements"



KEY	3 OVER 4 (Cotton)	3 OVER 4 (Synthetics)	4 OVER 5
C	$\frac{512}{(Y)}$	$\frac{460.8}{(Y)}$	$\frac{512}{(Y)}$
D	$\frac{236.8}{(Y)}$	$\frac{288.0}{(Y)}$	$\frac{236.8}{(Y)}$
E	$\frac{186.4}{(Y)}$	$\frac{226.7}{(Y)}$	$\frac{186.4}{(Y)}$
F	$\frac{12787.2}{(Y) \times (Z)}$	$\frac{15552.0}{(Y) \times (Z)}$	$\frac{12787.2}{(Y) \times (Z)}$
G	$\frac{236.8 \times (W)}{(Y) \times (Z)}$	$\frac{288.0 \times (W)}{(Y) \times (Z)}$	$\frac{20838.4}{(Y) \times (Z)}$
H	$\frac{947.2 \times (W)}{(Y) \times (Z)}$	$\frac{1152.0 \times (W)}{(Y) \times (Z)}$	$\frac{83337.6}{(Y) \times (Z)}$
I	$\frac{868.3 \times (W)}{(Y) \times (Z)}$	$\frac{864.0 \times (W)}{(Y) \times (Z)}$	$\frac{1157.7 \times (W)}{(Y) \times (Z)}$
J	$\frac{22259.2}{(Y) \times (Z)}$	$\frac{27072.0}{(Y) \times (Z)}$	$\frac{236.8 \times (W)}{(Y) \times (Z)}$
K	$\frac{25233.0}{(Y) \times (Z)}$	$\frac{28664.2}{(Y) \times (Z)}$	$\frac{250.7 \times (W)}{(Y) \times (Z)}$
L	$\frac{51907.9}{(Y) \times (Z)}$	$\frac{58966.4}{(Y) \times (Z)}$	$\frac{516.7 \times (W)}{(Y) \times (Z)}$
M	$\frac{720.9 \times (V)}{(Y) \times (Z)}$	$\frac{819.0 \times (V)}{(Y) \times (Z)}$	$\frac{7.16 \times (V) \times (W)}{(Y) \times (Z)}$
N	$\frac{1029.9 \times (V)}{(Y) \times (Z)}$	$\frac{1310.4 \times (V)}{(Y) \times (Z)}$	$\frac{10.2 \times (V) \times (W)}{(Y) \times (Z)}$
O	$\frac{386.2 \times (V)}{(Y) \times (Z)}$	$\frac{491.4 \times (V)}{(Y) \times (Z)}$	$\frac{3.8 \times (V) \times (W)}{(Y) \times (Z)}$
P			$\frac{1002.8 \times (W)}{(Y) \times (Z)}$
Q			$\frac{780.0 \times (W)}{(Y) \times (Z)}$
R	$\frac{23372.2}{(Y) \times (Z)}$	$\frac{28425.6}{(Y) \times (Z)}$	$\frac{249.0 \times (W)}{(Y) \times (Z)}$
S	$\frac{779.1 \times (X)}{(Y) \times (Z)}$	$\frac{947.5 \times (X)}{(Y) \times (Z)}$	$\frac{8.3 \times (X) \times (W)}{(Y) \times (Z)}$
T	$\frac{876.5 \times (X)}{(Y) \times (Z)}$	$\frac{1065.9 \times (X)}{(Y) \times (Z)}$	$\frac{11.9 \times (X) \times (W)}{(Y) \times (Z)}$
AA			$\frac{12.6 \times (X) \times (W)}{(Y) \times (Z)}$

WAVE LENGTH TABLE FOR TUBE GEAR AND CALENDER ROLL

Tube Gear Diameter (Inches)	Wave Length (Inches)
12	22.4
14	26.3
15	28.3
16	30.2
18	37.0
20	38.3
2″ Calender Roll	6.4

WAVE LENGTH TABLE FOR FRONT BOTTOM ROLL

Tension Gear	1⅛″ Roll	1⅜″ Roll
63	3.76	4.56
64	3.70	4.50
65	3.65	4.44

Constants have been devised to simplify calculations to obtain wave lengths for the second, third, fourth, and—when used—the fifth bottom rolls. Constants and formulas are given in the following tables:

CONSTANTS FOR BOTTOM ROLLS 4 OVER 5 DRAFTING ELEMENT

Roll	Tension Gear		
	63	64	65
¾″ Second Roll	.061	.060	.059
1⅜″ Third Roll	1.140	1.120	1.105
1⅜″ Fourth Roll	18.40	18.10	17.85
1⅜″ Fifth Roll	12.40	12.20	12.02

CONSTANTS FOR BOTTOM ROLLS, 3 OVER 4 DRAFTING ELEMENT

Roll	Tension Gear		
	63	64	65
¾″ Second Roll	6.12	6.03	5.94
1⅜″ Third Roll	11.45	11.25	11.15
1⅜″ Fourth Roll	13.80	13.55	13.35

CONSTANTS FOR BOTTOM ROLLS, 3 OVER 4 DRAFTING ELEMENT (SYNTHETICS)

Roll	Tension Gear		
	63	64	65
1″ Second Roll	7.8	7.68	7.56
1⅜″ Third Roll	12.95	12.78	12.65
1⅜″ Fourth Roll	13.68	13.48	13.28

Formulas to be used with the constants are as follows:

SECOND AND THIRD ROLLS
3 OVER 4 ELEMENT

$$\frac{\text{Constant x Break Draft Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

FOURTH ROLL
3 OVER 4 ELEMENT

$$\frac{\text{Constant x Fine Change Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

SECOND AND THIRD ROLLS
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Break Draft Gear x Fine Ch. Gear}}{\text{Total Draft Gear}}$$

FOURTH ROLL
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Break Draft Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

FIFTH ROLL
4 OVER 5 ELEMENT

$$\frac{\text{Constant x Fine Change Gear}}{\text{Total Draft Gear}} = \text{W.L.}$$

CONSTANTS FOR LIFTING ROLL OF POWER-DRIVEN CREEL

Tension Gear		
63	64	65
.1975	.1940	.1910

FORMULA:

$$\frac{\text{Constant X Lifting Roll Change Gear x Fine Change Gear}}{\text{Total Change Gear}} = \text{W.L.}$$

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Delivery can full (Frame doesn't stop).	Counter not set to zero at doff	Caution operator to always reset counter.
	Defective counter	Repair or replace counter
	Switch not properly grounded	Repair ground wire
		Clean and tighten connections.
Calender roll lap-up. (Frame doesn't stop)	Cam not close enough to switch roller.	Reset cam to specifications
	Cam loose	Tighten cam, check setting.
	Defective limit switch or wiring	Repair or replace switch.
		Clean and tighten wiring connections.
		Check insulation.
Tube choke (Frame doesn't stop).	Tube sticking	Clean pin,contact surfaces.
	Accumulation of lint in rim of tube gear.	Clean out rim with wood peg.
	Defective limit switch or wiring.	Repair or replace switch.
		Clean and tighten wiring connections.
		Check insulation.
	Too much tension on tube latch	Replace spring
		Reduce friction between contacting surfaces
Roll lap-up (Frame doesn't stop).	Broken weighting plunger or spring.	Replace plunger or spring.
		Trace and correct cause of breakage.
	Lint deposit insulates contacts	Clean all contact points.
	Defective limit switch or wiring.	Repair or replace switch
		Clean and tighten connections.
		Check insulation.
Sliver breaks at creel. (Frame doesn't stop).	Accumulation of lint on lifter	Clean top and bottom lifter rolls
	Defective limit switch or wiring.	Repair or replace switch.
		Clean and tighten connections.
		Check insulation.
	Top lifter roll sticking.	Repair or replace roll or bearing.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Choke at condenser. (Frame doesn't stop).	Defective limit switch or wiring	Repair or replace switch
		Clean and tighten connections
		Check insulation.
	Accumulation of lint between contacts.	Clean all contact surfaces.
Sliver break Between calender & can.	Trumpet bore too small	Drill trumpet with next larger drill.
	Wrong calender tension change gear.	Select and use correct gear.
	Obstruction in tube.	Clean out tube.
	Burr or rough edge on tube or gear	Remove roughness with file or sandpaper.
		Polish with crocus cloth.
	Defective delivery can	Repair or replace can.
Sliver break Between condenser & trumpet.	Trumpet bore too large	Replace trumpet with one that has smaller bore.
	Wrong calender tension change gear.	Select and install correct gear.
	Sliver trough rough or incorrectly aligned	Repair or realign sliver trough.
Sliver break In drafting element.	Draft too high for stock	Reset drafting rolls.
	Draft not allotted correctly in zones.	Reapportion draft between zones.
	Rolls sticking	Lubricate roll bearings.
		Check for wear.
	Defective rolls or roll bearings.	Repair or replace rolls or bearings
Sliver break at creel	Wrong creel tension change gear	Select & install correct gear.
	Cans not positioned correctly at creel.	Reposition cans & check concentricity.
	Rough edge on can rim	Remove roughness with emery cloth
	Tangled sliver	Check coiler of prior process.
	Top lifter roll sticking	Repair or replace roll or bearing.
	Eccentric or rough sliver guide	Realign guide, smooth with emery cloth.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY.
Uneven sliver (One delivery)	Defective drafting roll	Repair or replace roll
	Eccentric drafting roll	Replace roll
		Locate and remedy cause of eccentricity.
	Worn top roll covering	Replace or buff roll covering.
	Rough flute on bottom roll	Remove roughness with file or emery cloth.
		Polish with crocus cloth.
	Roll weighting incorrect	Install spring with correct tension (or check pressure)
	Wrong bore in trumpet	Replace or rebore trumpet
Uneven sliver (All deliveries)	Eccentric shafting or studs	Locate and replace defective shaft or stud.
		Locate and remedy cause of eccentricity.
	Defective gear	Locate and replace defective gear
		Trace and eliminate cause of defectiveness.
	Sticking shaft or bearing	Clean shaft and bearing
	Foreign object between gear teeth.	Remove object and check for damage.
	Drive belt slipping	Clean belt and pulleys.
		Tighten belt if needed.
	Wrong tension gear	Select and install correct gear.
	Defective bearing	Replace bearing.
Frame stops too quickly.	Brake too close	Reset brake.
	Moisture on brake contact surfaces.	Wipe contact surfaces with rag or soft waste.
		Locate and, if possible, eliminate source of moisture.
Frame stops too slowly.	Brake too far	Reset brake.
	Accumulation of lint on braking surfaces.	Clean braking surfaces with rag wet with quick -drying solvent.
	Worn brake contact surfaces	Replace friction ring.
		(Do not machine surface of armature)

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roll Laps.	Incorrect clearer setting	Set clearer so that it will contact roll full width.
	Cut, nicked, or rough top roll	Buff, or replace roll. Locate and correct cause of damage
	Foreing matter on rolls	Clean rolls.Locate and if possible eliminate source of trouble.
	Excess humidity	Reduce relative humidity in room. Check for condensation at machine or creel.
Reduced air suction.	Clogged plenum	Remove waste from plenum.Check for, and remove, burrs or rough edges.
	Slide assembly out of adjustment.	Check and readjust slide.
	Collector unit full	Empty and clean collector unit.
	Screen clogged	Clean screen.
	Fouled fan.	Clean fan blades.
Lint accumulates in pressurized area.	Leak at entry	Check rubber seal on filter entry assembly - replace if needed.

3. PREVENTIVE ... TENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance, the form shown on page **41** has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame, the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF THE DRAWING FRAMES PREVENTIVE MAINTENANCE

FRAME N°....... FIXER .... DATE ....

STANDARD	POINTS	
10		A. Creel Feed Rollers
5		B. Sliver guides
15		C. Top Rollers
15		D. Bottom Rollers
10		E. Top Clearers
5		F. Bottom Clearers
10		G. Settings
5		H. Coiler Tube
5		I. Coiling
5		J. Pulleys
5		K. Driving Belt
10		L. Stop Motions
100		

MILL	MAINTENANCE WORK REPORT	
WERNER INTERNATIONAL N.Y.	FORM M - 103	PAGE :

Department: PREPARATION.	Type of machine: DRAWING FRAME INGOLSTADT	Machine No.	Type of maintenance
Persons per crew:	Expected time:		

2 MONTHS		CYCLE	YEARLY	
1	Top rollers			All jobs listed under 2 months maintenance, and in addition:
2	Bottom rollers		2	Bottom rollers
3	Bottom clearers		3	Roller stands
5	Top clearers		8	Head stock
6	Covers		9	Can drive
8	Head stock		14	Gears
9	Can drive		19	Coiler
10	Counter chains		22	Creel drive
11	Doors		25	Bearings
12	Pulleys		27	Motors
13	Belts		28	Lubrication
14	Gears			
16	Sliver guides			
17	Trumpets			
18	Calander rollers			
19	Coiler			
20	Turn tables			
22	Creel drive			
23	Feed rollers			
26	Electrical appar.			
28	Lubrication			

MILL	DESCRIPTION OF THE WORK TO BE DONE 43.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

1. TOP ROLLERS

Dismantle the top rollers and send them to the roller shop.
The top rollers must be buffed or be replaced as they must be in perfect condition.
Make sure that weighting bars move easily.
Wash out and grease top roller bearings.

2. BOTTOM ROLLERS

Clean with a stiff bruch the fluter rollers in order to remove all dirt from the flutes.
Check the settings and parallelism of the bottom rollers.

3. BOTTOM CLEARERS

These bottom clearers affect the machine productivity as they aviod bottom lap ups, Replace the clearers considered bad.

5. TOP CLEARERS

In top of each set of top rollers exists a top clearer for helping the removal of the dust.
Check condition of the clearer covers and replace them if they are cut, worn out or defective.
Check position of the clearer covers and if they are properly centered.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: 2 months

Working minutes:	Persons per crew: 3	Down time in hours: 6

6. COVERS
   Check condition and function of the covers.
   Clean the covers and adjust them, if necessary.

8. HEAD STOCK
   Clean the outside of the head stock.
   Check oil level and add oil if necessary.

9. CAN DRIVE
   Clean without dismantle.

10. COUNTER CHAINS
    Check condition and tension. Clean the driving sprocket gears.
    Adjust if necessary and grease.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

11. DOORS

Check, clean the inside and outside of the doors.
Adjust if necessary. The doors must close properly otherwise they affect the machine productivity.

12. PULLEYS

Check condition of the pulleys and replace any defective one.

13. BELTS

Check the condition of the belts. Replace them if they are worn out or cut. Check the tension.

14. GEARS

Clean all gears without dismantle them.
Replace the defective ones. Grease them afterwards.
Check oil level.

MILL	DESCRIPTION OF THE WORK TO BE DONE		46.
PREVENTIVE MAINTENANCE	FORM M - 101		Page :
Type of machine and make: DRAWING FRAME INGOLSTADT		Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6	

16. <u>SLIVER GUIDES</u>

Check the guides if they do not have sharp ends or damaged and repair them if possible.
Clean them using eventually a solvent and polish.

17. <u>TRUMPETS</u>

The trumpets must be in perfect condition and of the proper size. Repair or replace the damaged ones or the ones that don't have the proper size. Check if they are properly fixed.

18. <u>CALENDER ROLLERS</u>

Clean the calander rollers and gears.
Check their condition and especially the nylon gear.
Repair or replace if necessary.

19. <u>COILER</u>

Clean without dismantling. Check properly the coilers oblique funnel. It must be in perfect condition to allow an easy pasage of the sliver. Check condition and tension of the coiler driving gears. Clean with solvent the sliver tube.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

20. TURN TABLES

Remove the plates and clean the inside.

23. FEED ROLLERS

Clean with a solvent the top rollers, bottom rollers and sliver guides, polish them afterwards.

26. ELECTRICAL APPARATUS

Call an electrician to do the following controls:

- automatic stop motions
- connections
- push buttons
- electrical bulbs

Replace the defective ones.

28. LUBRICATION.

Make a general lubrication after the maintenance.

MILL	DESCRIPTION OF THE WORK TO PE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 3	Down time in hours: 6

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MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 3	Down time in hours: 8

General

Repeat all the elements of the 3 months maintenance and also the following:

2. BOTTOM ROLLERS

   Check with a gauge the roller eccentricity.
   Dismantle the rollers and clean them properly with astiff brush in order to remove all impurities from the flutes.
   Clean the bearings.

3. ROLLER STANDS

   With the rollers dismantled, clean and check their stands.
   Before replacing the bottom rollers, put some grease on the seats.

8. HEAD STOCK

   Dismantle all gears and check all parts such as:shafts, bearings keys, supports,etc. replace the defective ones or worn out.
   Assemble the gears and mesh them properly.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 3	Down time in hours: 8

9. CAN DRIVE

Dismantle, clean and check all parts.

Assemble and grease the gears.

14. GEARS

Dismantle also the other head stock gears.

Clean and check properly shafts, keys, supports. Replace the defective damaged or worn out.

Assemble the gears and mesh them properly.

Grease them afterwards.

19. COILER

Dismantle the coiler and clean thoroughly.

Clean the inside of the coiler.

22. CREEL DRIVE

Dismantle and clean thoroughly.

Grease afterwards.

MILL	DESCRIPTION OF THE WORK TO BE DONE	50.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: DRAWING FRAME INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 3	Down time in hours: 8

25. BEARINGS

Check all bearings and replace the defective or worn out. Grease afterwards.

27. MOTORS

The electrician will make the yearly revision of the motor. He will clean the inside, and check rotor,stator and bearings. He will grease afterwards the bearings.

28. LUBRICATION

Make a general lubrication after the maintenance.

FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.
for case b. 10 min.
for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames:		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and help the trainee to understand his job.

QUESTIONS :

1. What type of working uniform, suits a mechanic?
   Short sleeve shirt.
   Tight trousers, with leather shoes.

2. What tools will be required for the mechanic?
   Set of: Tool box
   Metric allen keys
   English allen keys
   Screw drivers star and flat
   Spanners (open & close)
   Hammer (soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Callipers
   Spirit level

3. How a mechanic should file?
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.

6. Some soft metal pieces should be used in between the jaws of the vise.

4. What are the specifications of drawing frames ?

Hank sliver running on various frames: 0.144 0.150 0.170

Drafting system: 4 over 4, Dead weight & spring weight

Number of ends: 6

Number of deliveries per frame: 4

Size of cans: 12"x36"

Type of drive: V.Belts and flat belt

Top and Bottom clearers: Revolving and stationery

5. What are the functions of the drawing frames ?

To improve regularity of sliver by doubling of slivers and parallelisation of the fibres.

6. What are the basic adjustments on the drawing frames ?

1. Pressure adjustments:

   a) Spring weights: Bolt part extended by 1.5-2 mm, with levelled arms

   b) Dead weights: Releasing bars at the middle of the dead weights

2. Trumpet size: 3 mm

3. Roller slides: 20 mm

4. Top clearers: at the middle and turn slowly

5. Roller settings: 29 -32 -38

7. How to stock the lubricants ?

Different colours should be used for different lubricants

8. <u>How you classify the lubricants according to use ?</u>
Recommended lubricants should be used.

9. <u>What should be the criteria for break down maintenance ?</u>
Mechanic should first handle the machine which requires least time, so that, down time is reduced.

CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 58) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 60) for recording the performance of the trainee on Preventive Maintenance.

   c. The Management Control Chart (see page 62) for recording the progress of the trainee on the exercises of Phase I and Phase II.

a. The Complete Defect - recognition Schedule.

As explained in the chapter on "Diagnostic Development" (page 29 of Phase II), the trainee has to repair at least five defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
7 reasons x 5 defects
Per reason = 35 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 58) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day.
That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 35 defects within 12 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

COMPLETED DEFECT RECOGNITION SCHEDULE

Number of defects.

Name: ....

Date: ....

110
100
90
80
70
60
50
40
30
20
10

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

b. The Preventive Maintenance Results Efficienc.

In the chapter on "Preventive Maintenance (see page 40 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

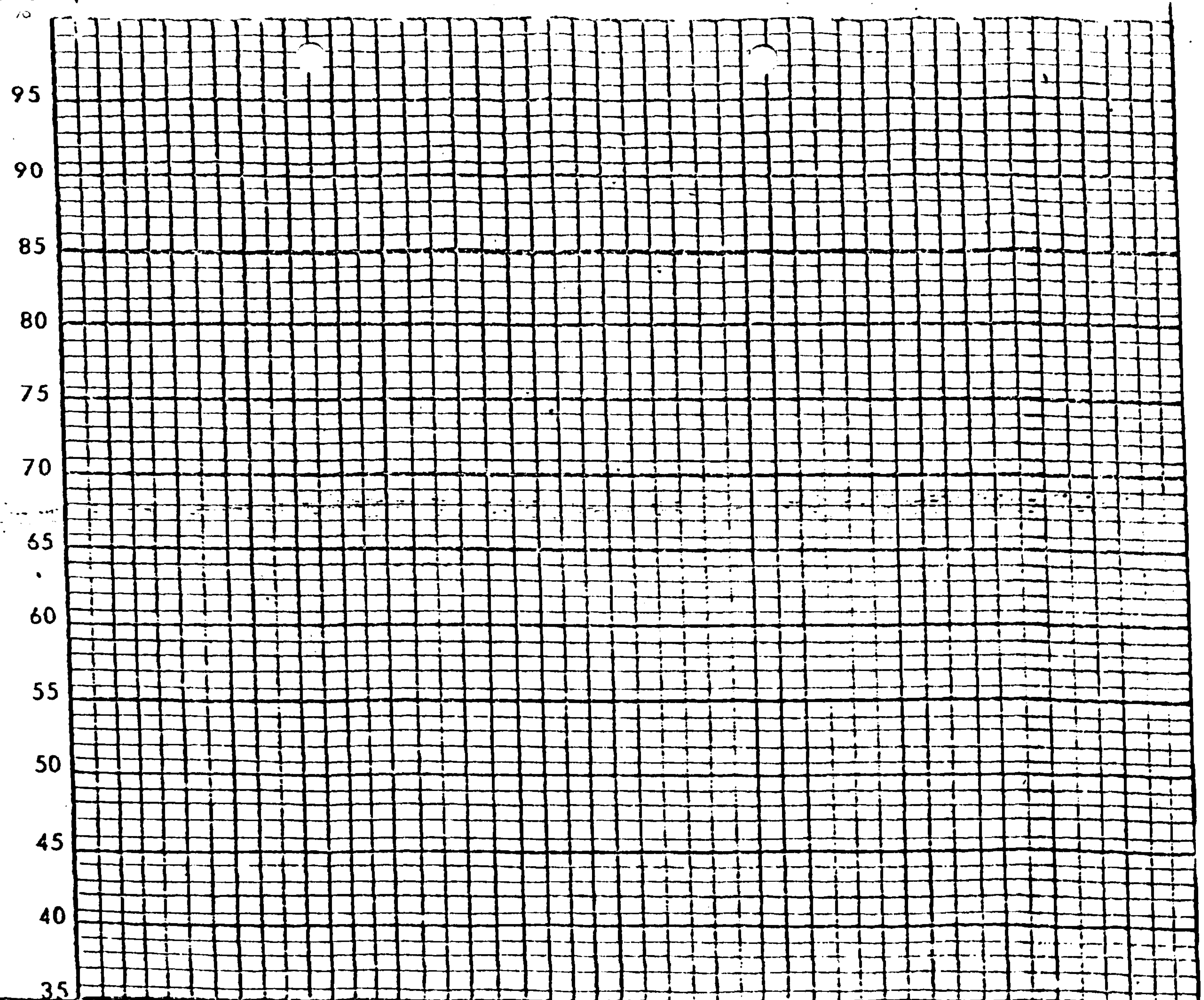
For this purpose he uses the form "Evaluation on Preventive Maintenance" as shown on page 60 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

NOTE:
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.



FRAME Nr.:

DATE:

WERNER INTERNATIONAL

Name:..............................

c. Management Control Chart.

The Management Control Chart, as shown on next page is the "log-book" of the course.

The chart is divided in two main parts, namely Phase I and Phase II.

PHASE I.

The number of days has been already inscribed on the chart, but the Instructor has to inscribe the dates, every day at the end of that day. All the six groups of exercises in Phase I are shown on the chart. When one group of exercises has been terminated by the trainee, the Instructor inscribes the frame number (s), on which the exercises were carried out, in the square, provided for it, under the group of exercises concerned and the date when the exercises were terminated.
Also he fills in the time spent on that particular group of exercises in the Training Centre (behind TC) and in the Spinning Room (behind SR).

PHASE II.

Here again the Instructor has to inscribe the dates under the number of days at the bottom of the part.
This part of the chart is divided into two sections:

a. Preventive Maintenance.

When the trainee has carried out preventive maintenance on a frame, the Instructor fils in the number of the frame, the score - the percentage of the evaluation - and the date when it was carried out.

b. Diagnostic Development.

For each type of defects recording columns appear on the chart. At the end of the day, the Instructor fills in the loom, number and date, on which the particular defect-repair has been carried out by the trainee. At the end of the course each type of defect has to be tackled as per schedule

29 (see Diagnostic Development on page 29 of Phase II).

WERNER AMPS ..DRAWING.. FRAMES MANAGEMENT CONTROL CHART NAME......................
INGOLSTADT

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

PHASE : 1

1		2		3		4		5		6	
A:DRIVE B:GEARING		A:DRAFTING SYSTEM (PRESSURE ARMS) B:DRAFTING SYSTEM (DEAD WEIGHTS)		A:THE CALENDER B:TUBE GEAR C:COILER TURNTABLE D:FEED ROLLERS							
FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE
HOURS											
TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......

PHASE : 2 PREVENTIVE MAINTENANCE

DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE

DIAGNOSTIC DEVELOPMENT

CREEL	CLEARERS	BOTTOM ROLL SET.	TOP ROLL SETTING	TOP ROLL PRESSURE	COILER	

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

62.

(7 of

FINAL REPORT

ON

THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME VII OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(7 of 10)

FINAL REPORT
ON
THE DEVELOPMENT OF A
TEXTILE TRAINING SYSTEM
IN PAKISTAN

VOLUME VII OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
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PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

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WERNER AMPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

ROVING FRAMES FIXER'S MANUAL

INGOLSTADT

Prepared for:

T.I.R.D.C. (UNIDO)
KARACHI.

Prepared at:

JUBILEE SPIN. & WEAVING
KARACHI - PAKISTAN.

Prepared by:

WERNER INTERNATIONAL
BRUSSELS - BELGIUM.
NEW YORK - U.S.A.

MARCH 1981.

ROVING FRAMES

I N D E X

PERSONNEL SPECIFICATION

Job:	ROVING AND DRAWING FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum 6 months good roving tender or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy card-room.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months GOOD spinning/roving experience.

The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (4 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you. Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.
Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

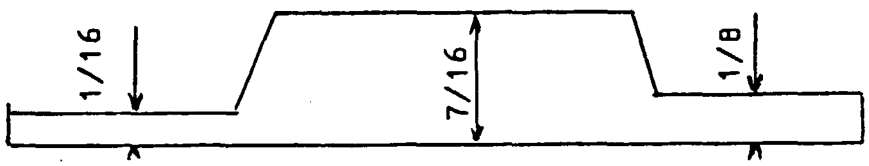
3.8 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool,box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.
A fixed position or datum is used, e.g. the position of the top rollers.
Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.
When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

plan or roller

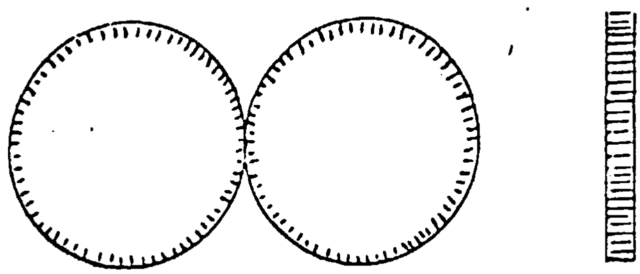
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

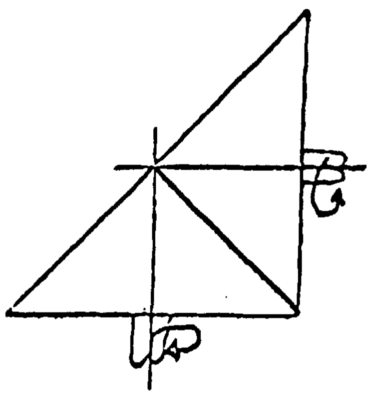
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



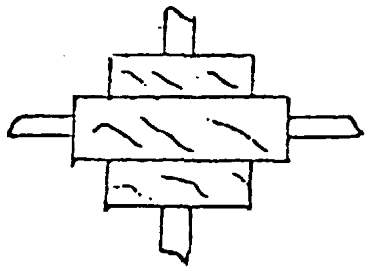
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



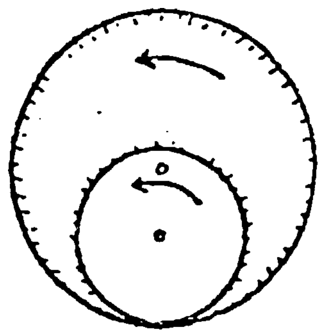
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



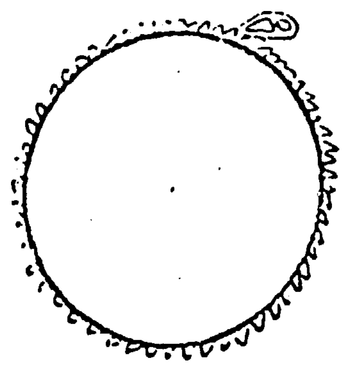
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg.		120 Kg.
	4 m.	6 m.

180 Kg.		90 Kg.
	4 m.	? m.

180 Kg.		? Kg.
	4 m.	5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

ROVING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided into 6 groups:

1. A. The drive (old model)
   B. The drive (model 5)
   C. Cone belt drive (model 5)

2. A. Bobbin carriage and drive

3. A. Spindle drive
   B. Flyers

4. The ratchet motion (model 5)

5. Drafting system UT 600

6. Change points

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all three(3) groups of adjustments so that when complete, the trainee has completely set up three(3) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

PHASE 1 OF THE TRAINING.

GROUP 1 A. THE DRIVE (OLD MODEL)
B. THE DRIVE (MODEL 5)
C. CONE BELT DRIVE (MODEL 5)

1.A THE DRIVE.

1. DESCRIPTION.

Power of the roving frame is provided by a totally enclosed, fan cooled motor that is mounted at the head end. Pulleys on the shaft drive the main shaft with the differential gear.

2. PURPOSE.

The drive transmits power to the various mechanisms of the frame. Throug its pulleys, belts, sprockets, gears and rolls, the movement is imparted to make the roving sliver and wind it upon the bobbins. The drive also powers other auxiliary mechanisms such as the hank counter.

3. CONSTRUCTION.

The roving frame has individual motor drive and the horsepower and voltage are determined by the number of spindles and mill specifications.

The driven pulley is attached to the main shaft directly below the driver pulley. Both pulleys are the plain type. The main shaft is mounted upon ball bearings that rest upon, and pinned to the samsons it extends into the head and cabinet.

4. PARTS.

1. MOTOR . (M)
2. PULLEYS FIXED AND LOOSE.
3. TENSION PULLEY (Ro).
4. SLOT WITH PIN (N + St).
5. TORSION SPRING (F).
6. BELT (R).
7. EXPANDING ARM (A).

5. SETTINGS.

Two measuring marks are to be placed by means of a pencil at Lo = 400 mm. intervals on the belt (R) when the same is untensioned (picture 1). Then the belt is laid on the belt pulleys. The arrow, imprinted on the belt's outside, has to point to the direction of course.

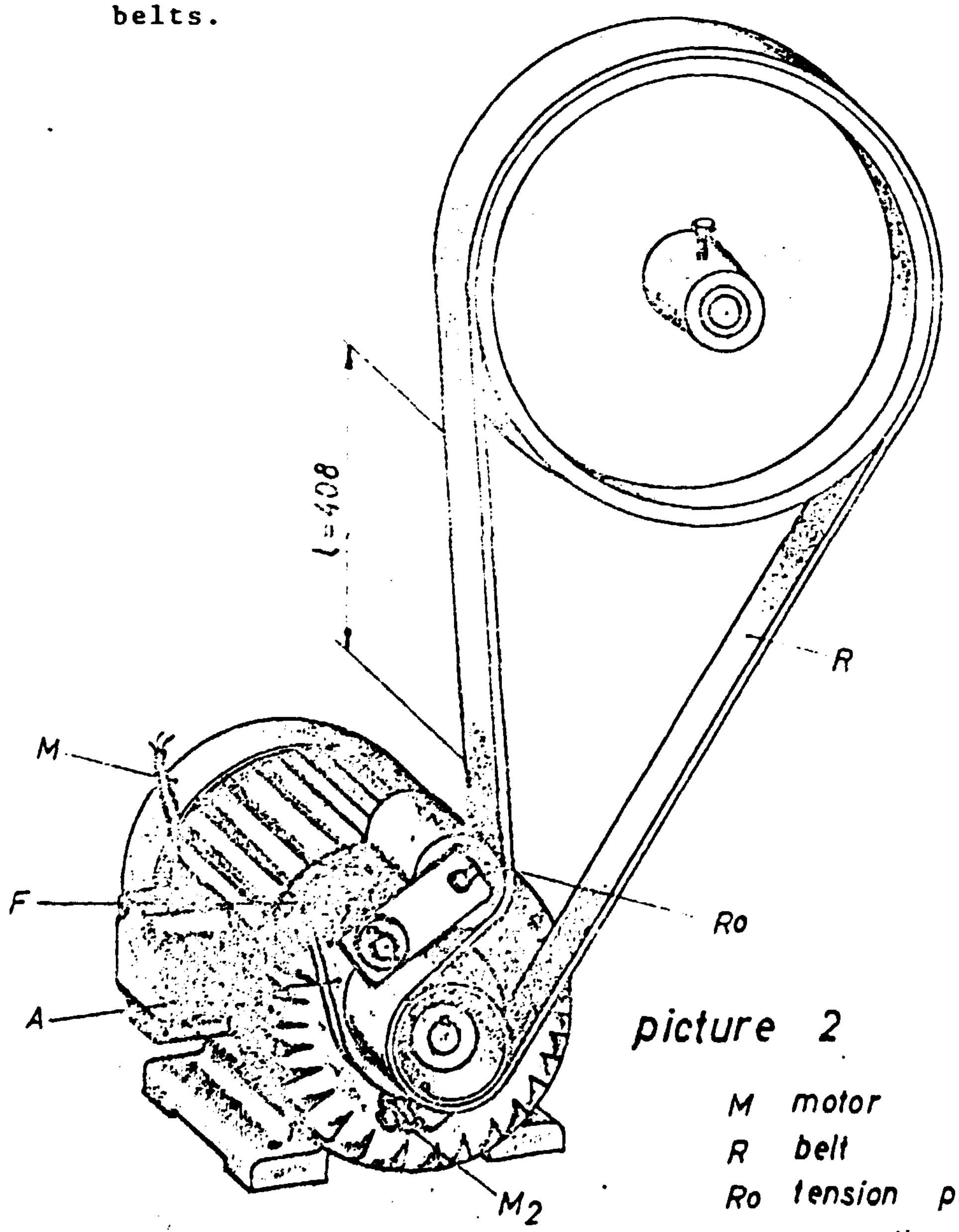
Before you start tensioning nut M_2 (picture 4) has to be loosened.

By means of an iron bar being approx. 8 mm. thick and 500 mm. long which is to be set underneath nut M1 on the expanding arm the spring tension pulley (Ro) will be squeezed against the belt by turning the expanding arm (picture 3 b) until the intervals of the measuring marks have increased from Lo = 400 mm. to L = 408 mm. (picture 1).
Picture 3c shows the position of the tension pulley to the belt when the latter is properly pre-tensioned.

In case the torsion spring (F) of the tension pulley comes to lie on the belt (R) when tensioning the same (picture 3 d), nut M1 has to be loosened and pin (StO should be latched in the next slot (N) according to the direction of arrow. For this purpose spring (F) is to be pre-tensioned somewhat by means of tongs and turning bolt (B) in the direction of arrow until pin (St) slipped into the next slot (N). After tightening the nut (M1) tensioning can be started again.

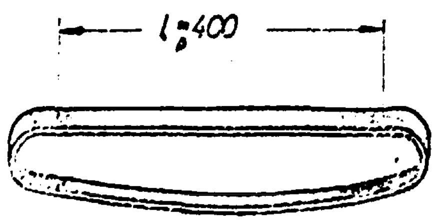
When changing the belt pulleys belt tension has, of course, to be controlled and adjusted again. We further recommend to strictly observe the instructions of maintenance given by Messrs. "SIEGLING".

The motor is mounted into slides and is adjustable,
A change of speed through the drive is accomplished by changing to different size motor pulleys.
Both pulleys must be properly aligned to avoid wear of the belts.



picture 2

M motor
R belt
Ro tension pulley
A expanding arm
F spring
M_2 nut at the expanding arm



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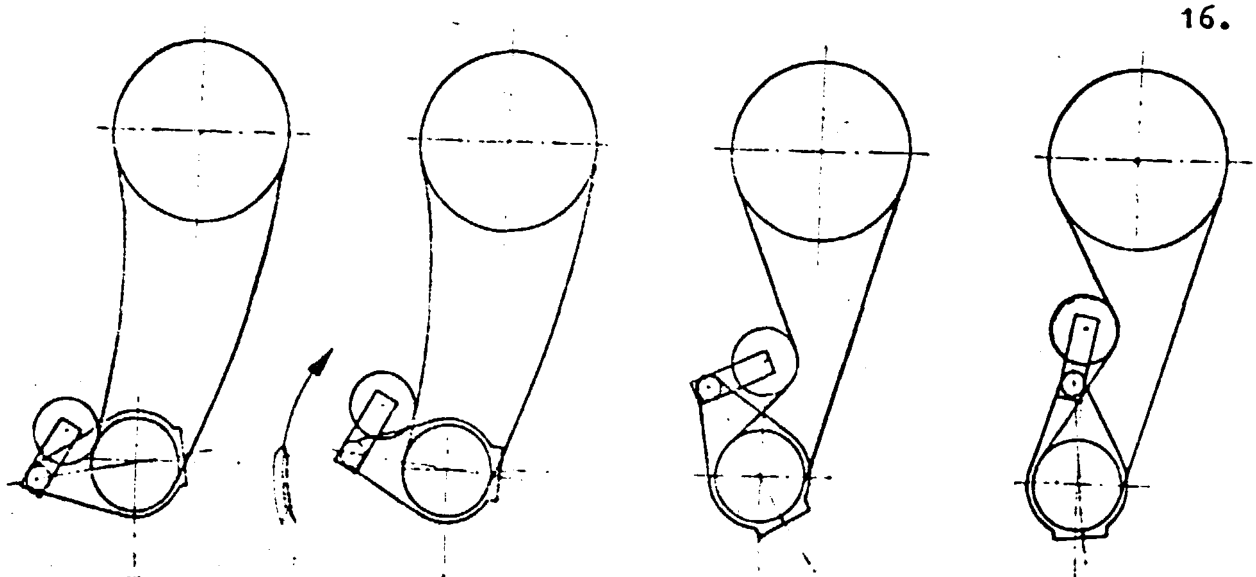
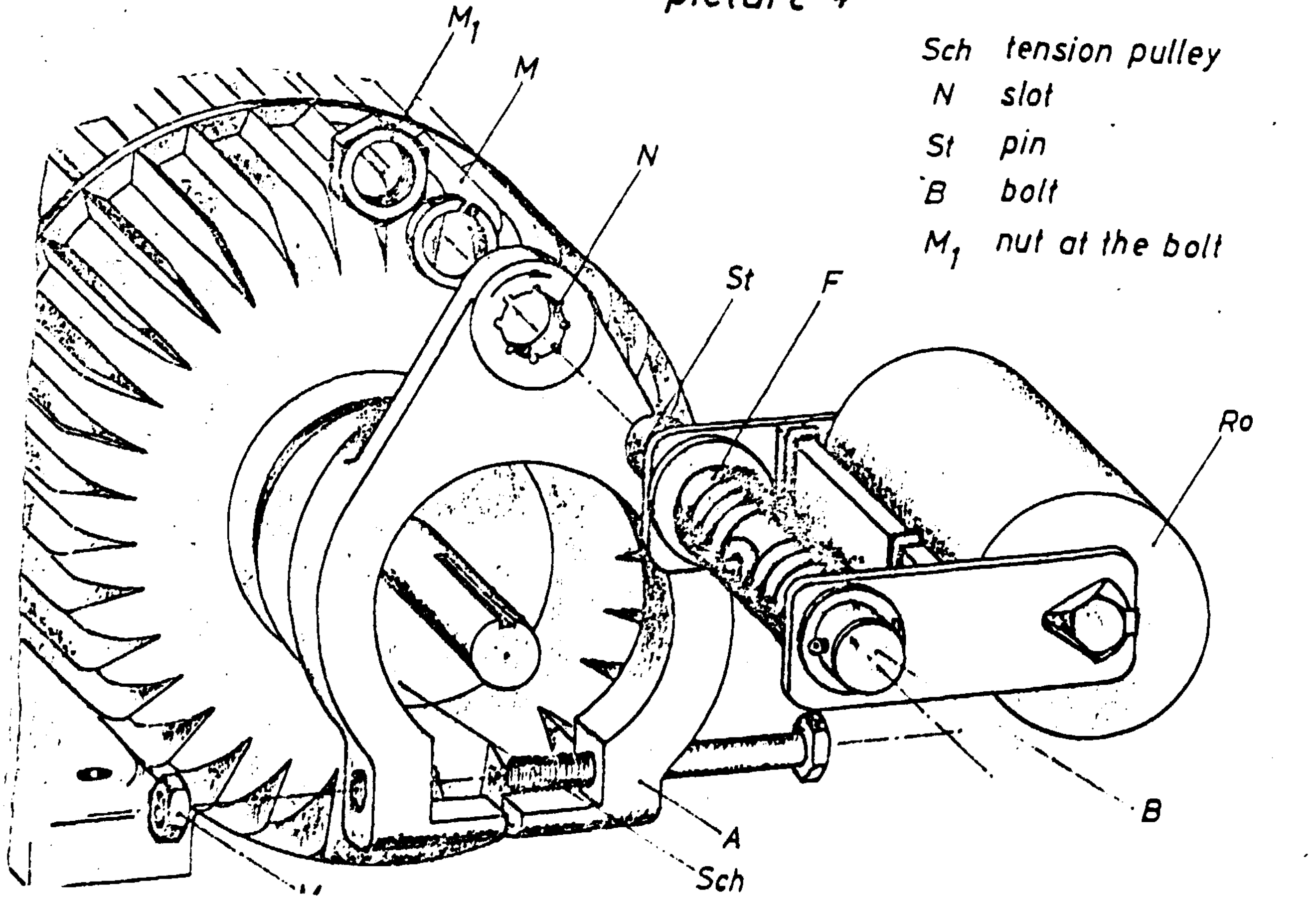


a	b	c	d
belt and tension pulley before tensioning the belt.	tensioning the belt by turning the expanding arm	right position of the tension pulley after tensioning the belt	wrong position of the tension pulley. The spring is insufficiently pre-tensioned

picture 3

picture 4



Sch tension pulley
N slot
St pin
B bolt
M_1 nut at the bolt

1.B THE DRIVE (MODEL 5).

1. DESCRIPTION.

Power for the roving frame is provided by a totally enclosed , fan cooled motor that is mounted between the 1st. and 2nd. samson below the drafting system. Pulleys on the shaft drive the main shaft with the differential gear.

2. PURPOSE.

The drive transmits power to the various mechanisms of the frame. Through its pulleys, belts, sprockets, gears and rolls, the movement is imparted to make the roving sliver and wind it upon the bobbins. The drive also powers other auxiliary mechanisms such as the hank counter.

3. CONSTRUCTION.

The roving frame has individual motor drive and the horsepower and voltage are determined by the number of spindles and mill specifications.
The driven pulley is attached to the main shaft directly above the driver pulley. Both pulleys are the plain V-belt type. The main shaft is mounted upon ball bearings that rest upon, and pinned to the samsons it extends into the head and cabinet.

4. PARTS.

1. MOTOR
2. PULLEYS
3. SLIDES

5. SETTINGS.

The motor is mounted into slides and is adjustable.
A change of speed through the drive is accomplished by changing to different size motor pulleys.
Both pulleys must be properly aligned to avoid wear of the belts.

OPERATING CONDITIONS FOR V-BELTS.

To endure good operation, the following points concerning the V-belts should be watched:

1. The belts should not be taut like violin strings. Proper belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 m. and over.

2. Never use any adhesive. The V-belts should be kept clean and dry, and should be protected from oil and grease. V-belts do not require any maintenance.

3. Forcing the belts over the grooves will damage the pull cord and reduce belt life, For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.

4. Belts and pulleys should not heat up, Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.

5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.

6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.

7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only.

BELT TENSION: The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

1.C. CONE BELT DRIVE: (MODEL 5)

1. DESCRIPTION.

The top cone drum gets drive from the main shaft through sprocket, chains and gears. An automatic device ensures uniform tension of the cone belt. The bottom cone is lifted by the Pedal 1. When reaching its top-most position, the contact lever 2 releases the switch 3 thus starting the servo-motor. Simultaneously the lifting magnet couples the servo-motor with the threaded spindle.

2. PURPOSE.

To impart a variable speed to the bobbin during the Package built. The top cone drum transmits power to the bottom cone drum through an extremultus flat belt (or V-belt) to drive the bobbin gear, so that winding of the roving on the bobbin and lifting of the rack could be achieved.

3. CONSTRUCTION.

The cone drum belt drive consists of two conical drums of hard steel fixed to the frame of the machine in the opposite direction . The come drums are supported on two anti-friction bearings on both sides. The top cone shaft extends into the head stock and is mounted on a bearing. The bottom gears to drive the bobbin gear through differential. The V-belt on the cone drums is shifted by a fork attached to a belt guide rack. On the completion of the package, the contact lever switches on the servo-motor to shift the belt on its initial position unless the belt guide get in contact with the limit switch to switch off the servo-motor. The bottom cone can be lifted by the pedal mounted on the front of frame.

4. PARTS.

1. Pedal
2. Contact Lever
3. Switch
4. Limit Switch
5. Set Screw
6. Fastening Screw
7. Set Screw
8. Slotted Lever
9. Stop Dog
10. Set Screw
11. Bearing
12. Set Screw A
13. Switch B,D I
14. Cam C, a & b
15. Cone Drum Top & Bottom
16. V-Belt
17. Servo-Motor
18. Belt Guide

5. SETTINGS.

When the doff is completed, the bottom cone is lifted by Pedal 1. On reaching its top-most position, the contact lever 2 releases the switch 3, thus starting the servo-motor. When pressing down the Pedal completely, the contact lever 2 should be adjusted such that it presses the contact pin into the switch 3 as far as it can go. The Pedal should be in vertical position when at rest and can be adjusted by screw 10. The belt guide is then moved backward until the limit switch 4 switches off. The initial position of the belt may be adjusted by set screw 5 only from tooth to tooth of ratchet wheel. The belt-guide can be adjusted by the help of cross-hole nuts arranged in front and behind the belt guide.

By loosening the fastening screws 6 and turning the set screw 7, the cone-lifting shaft should be adjusted so that it moves freely i.e. the slotted lever 8 and stop dog 9 should have sufficient space to rock in order to ensure uniform load on the cone belt.

6. REPLACING THE CONE BELT.

1) Switch off the main switch.

2) Press down the Pedal 1 completely, and screw in the set screw of the stop dog 9, until the bottom cone is fixed in its top most position. Release the Pedal 1.

3) Take out the belt from the belt guide and strip it backward off the cones. Lift the rear part of the bottom cone by putting a wooden piece support.

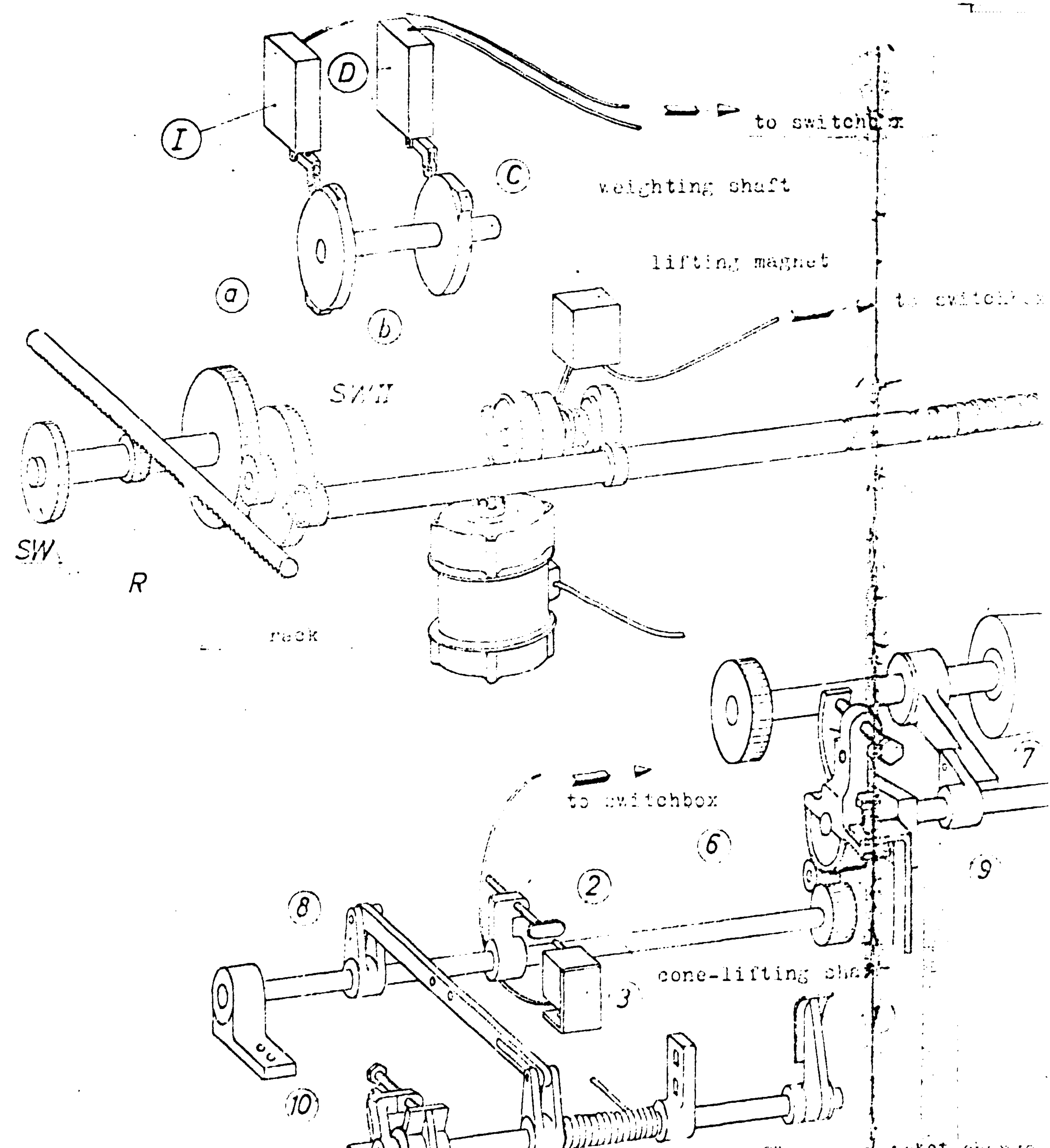
4) Knock out the taper pins located on the bearing 11 and remove the fastening screws. Swivel up the bearing and remove the belt.

5) Insert new belt considering the direction of rotation (in case of siegling flat belt) and fasten bearing 11.

6) Remove the fixing bolts from the upper rear cone bearing. In doing this make sure that upper rear cone is well supported. Swivel out bearing, take off the old cone belt and insert new one. Fix the bearing.

7) Remove the support and place the belt into the belt guide.

8) Release the set screw at stop dog 9 and check the cone lifting mechanism for proper functioning. Sufficient space should be provided at the slotted lever 8 and stop dog '9' to permit for the rocking motion of the cone lifting shaft.



SW = ratchet change

SW II = ratchet change
the ratchet m

R = pinion to alter
bobbin-cone.

SECTION 1

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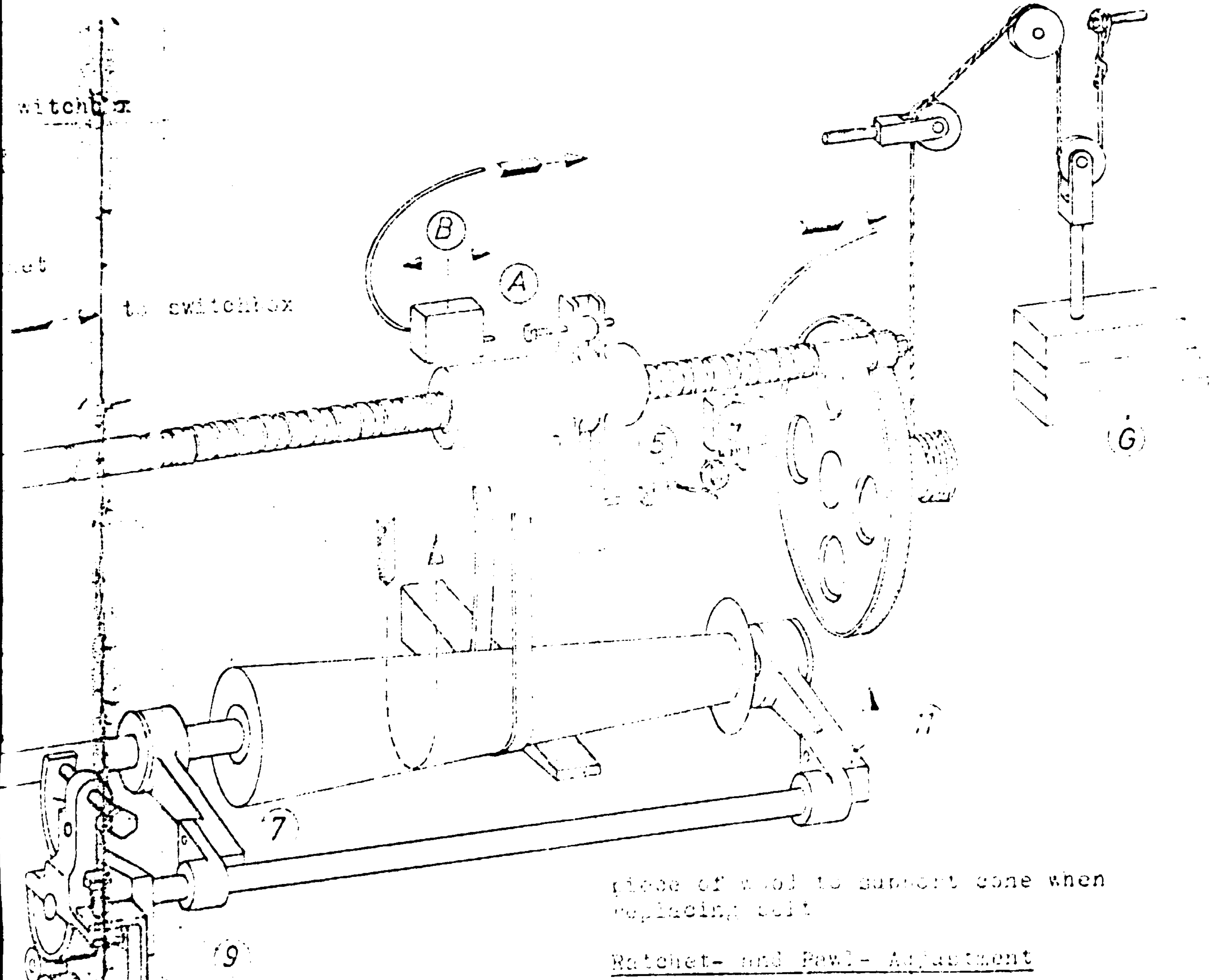
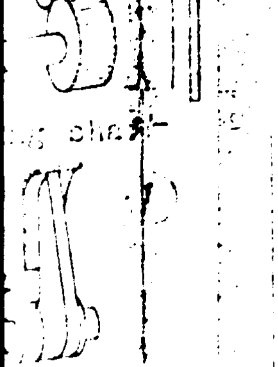
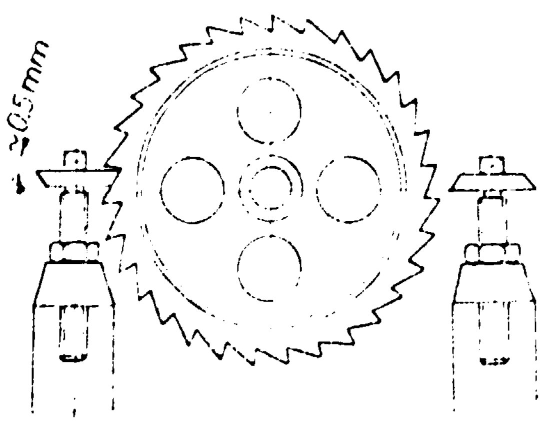




Ratchet- and Pawl- Adjustment



= ratchet change wheel

= ratchet change wheel to alter
the ratchet motion constants

= pinion to alter the shape of the
bobbin-cone.

[redacted]

SECTION 2

Spir
nger

-Frame Model
Cone Lifting and Package Building

7. STOPPING WHEN A BOBBIN IS FULL.

When having obtained the bobbin diameter desired the switch B is moved to A until the pin of the switch is pressed in the machine continues to run until the adjustable cam C (on the weighting shaft in the head stock) passes the switch D, when the machine will finally be stopped. The diameter of the bobbin should be selected so that the guide ring on the presser will not yet touch the bobbin.

8. LIMIT SWITCH.

A limit switch is provided in order to prevent the carriage from overtravelling its end positions and to avoid resulting damages, which otherwise might be the consequence of faulty control or improper adjustment of the control mechanism. To release the switch, a disc with 2 adjustable cams A and B is provided on the weighting shaft in the headstock next to the disc with cam C (bobbin stop motion).

The eams A and B are adjusted already when the machine is assembled, and with the bobbin empty. The carriage is moved into top-most and bottom most position, and the cams are moved to the position where they are as close as possible to the switch I, yet without pressing the pin. If the carr-iage should overtravel these set positions set, for one reason or another, the switch is actuated by the cams A or B, thus breaking the control circuit and stopping the machine.

GROUP 2. BOBBIN CARRIAGE AND DRIVE:

1. PURPOSE.

Carries and drives the bobbins and the bobbin rail.

2. PARTS.

- Bobbin Carriage
- Bobbin Gears
- Spindle Collars
- Bobbin Gear Shaft
- Lifter Rack
- Rack Pinions
- Counter Weights
- Chains
- Levers
- Brackets

3. SETTINGS.

3.1. (a) Levelling the bobbin Carriage:(M/C Length wise).

- Bring bobbin carriage into mid-position with hand crank.
- Check that all counter weights, pulleys and brackets if not worn out. Check if the weights are levelled and line through out the frame. If not adjust them from the chains, (shorter or longer) and replace the worn out with the new ones. When the bobbin carriage is at its top most position, the counter weights should be one inch above the floor level.
- Lift covers from the bobbin carriage.
- Take a wooden angle and check the wooden angle level of the bobbin rail by keeping the wooden angle on the roller beam.

- Check the bobbin carriage 2 or 3 times from the head stock to the end frame.
- If the level is out, loosen the rack pinions of that portion of the carriage and level the carriage by lifting or lowering the rack pinion mannually.
- Tighten the rack pinions in such a way that their tooth flanks will bear alternately up and down, thus eliminating any backlash.
- Move carriage up and down several times to check its smooth operation.

3.1. (b) Levelling of Bobbin Carriage:(M/C Crosswise).

- Take the spirit level and check the bobbin carriage level keeping the level crosswise.
- If the level is out loosen the nut in front of the rail & also the check nuts on the two adjustment bolts in the back of the rail. The right bolt lifts the rail upwards and the left bolt descend it down. These two also controls the top and bottom settings of the rack slides.
- Adjust the two bolts keeping the clearance in the slides on top and bottom. Make the level and tighten the checknuts and the front nut too.
- Now do it through out the machine and see that all the Spindle Collars are in one line. If any of the part of Carriage is a bit forward or backward adjust it by loosening the nut underneath on the lever so that the out portion of the carriage can be moved forward or backward. Finally check the carriage and collars in one line.

3.2. Adjustment of the bobbin drive gears:

- Check the spindle collars if they are not worn out.Replace with the new one.
- Check the level of the collars vertically by keeping a spirit level i.e. upright.

- Check the bobbin gears if they mesh properly and are not worn out or too tight in the spindle collar.
- Replace the worn out gears and adjust the meshing or play between the gears.
- To top bobbin drive gears should go smoothly on the collar and be seated freely with the driving gear. The height 'h' of the top bobbin gears should be of equal size, so that roving layers on the bobbin should be on same height.
- The set screws of the bobbin driving gears should be staggered by 180° in order to prevent uneven running.

GROUP 3. A. SPINDLES (OLD & NEW MODEL)
B. FLYERS

3.A. SPINDLES:

1. PURPOSE.

To drive the spindles and flyers in order to insert twist and wind on the drafted roving onto the bobbin.

2. PARTS.

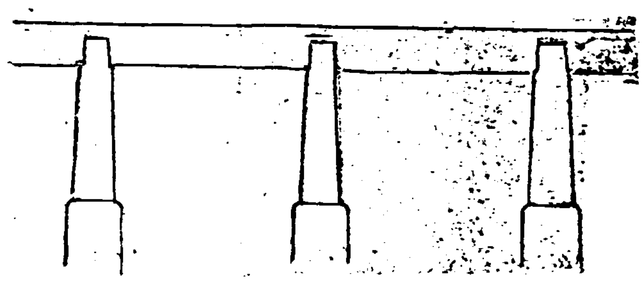
- Spindles
- Flyers
- Spindle gears
- Spindle cups (footsteps)
- Driving shaft

3. SETTINGS.

3.1. OLD MODEL.

- Check the spindles are straight and the spindle tips are not worn out.
- Check the slot and top portion of the spindle not damaged or clogged, so that flyer get jamed and not sits properly.
- Smoothen the top mose of the spindles and clean or file the slot.
- Foot steps or spindle cups should be checked. Replace the worn out with the new ones. Tighten it with screws.
- Make the spindles to rotate freely. This can be adjusted by loosening the spindle collar bolt and fixing it where the spindle revolves smoothly. Check also at top and bottom position.
- Check the spindle gears if not worn out and make the clearance between the gears accurately.

- Tighten the spindle driving gears alternately i.e. one up and one down.
- Before tightening the spindle gears be careful to have all the spindle-slots in one direction for not damaging the flyers. With the end of piece of iron strap this can be done easily as shown in fig. 3.1 (1).

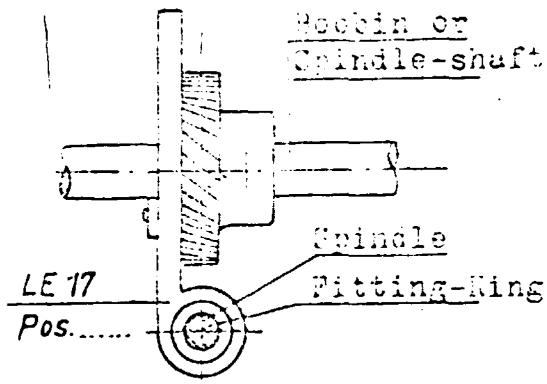


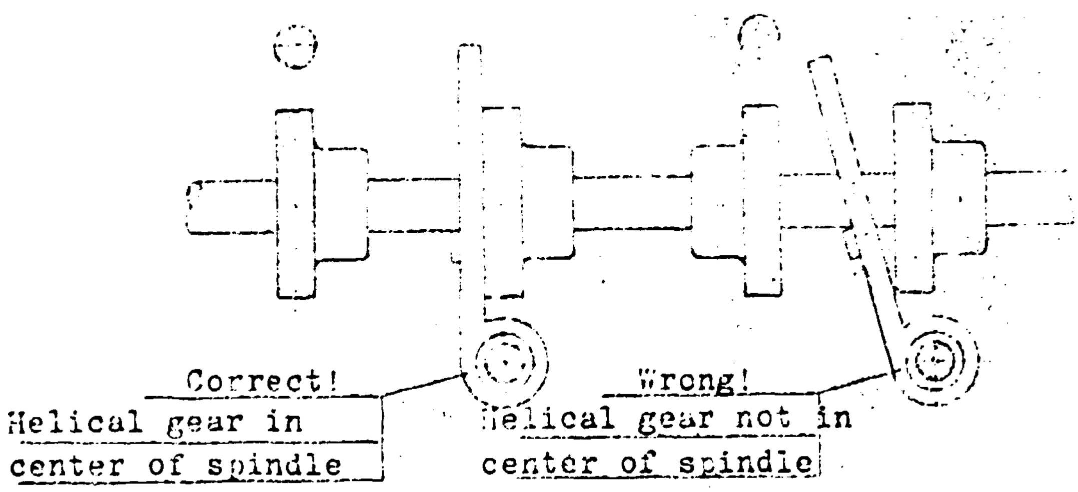
3.2. LEVELLING OF SPINDLE RAIL.

- Check the level of the spindle rail breadth wise as on bobbin carriage.
- If the level is out and the spindles are not free,loosen the nut infront side and lift of descends the spindle rail by loosening the check nut on the adjustment bolt at the back.
- Once the level is made, tighten the check nut and the nut on the front side of it.
- If the spindles are still not free it means that that part of spindle rail need forward or backward movement. For this loosen the front nut and also loosen the one nut (vertical) on back and either pull forward or push it back as it need. Tighten all the nuts when the spindles sets and revolve freely in the bolster and spindle foot steps.

3.3. ADJUSTMENT OF HELICAL BOBBIN SHAFT GEARS AND SPINDLE SHAFT GEARS (MODEL 5).

Gauge LE 17 serves for the adjustment of the helical gears on the bobbin shaft (to be used without fitting ring) and on the spindle shaft (to be used with fitting ring). The helical gears are to be positioned so that their flat slides are flush with the gauge lever. See fig.3.3 (a) and fig.3.3.(b).





3.B FLYERS.

1. FLYER INSPECTION AND RECONDITIONING.

One of the most important factors in the operation of roving frames is the maintenance of the flyers. This assembly is often neglected, even though years of hard and continued service will create mechanical conditions, which may very easily be the cause of a deterioration in the quality of the roving produced. We strongly recommend that flyers should be checked carefully on the semi-annual overhaul of the frame, with particular emphasis placed on the points illustrated below.

1. SMOOTHNESS OF NOSE.
   The nose is handtooled and polished to remove all scars and rough places resulting from wear or abuse.

2. WEAR OF KEY.
   A formed steel key, inserted by means of special equipment, assures accurate positioning with respect to both the horizontal and vertical axes of the flyer.

3. WORN LUGS.
   When necessary to replace, new lugs are brazed onto the hollow arm.

4. FIT OF LET-ON.
   The let-on is reworked to standard dimensions, thus securing a proper fit on the taper of the spindle, with all flyers at a uniform height.

5. POLISH OF HOLLOW ARM.
   The hollow arm is thoroughly cleaned and refinished on the inside. A trouble-some, expensive, but necessary operation.

6. WIDTH OF SLOT.
   The slot in the hollow arm is adjusted and gauged to the proper standard.

7. WEAR OF TIP.

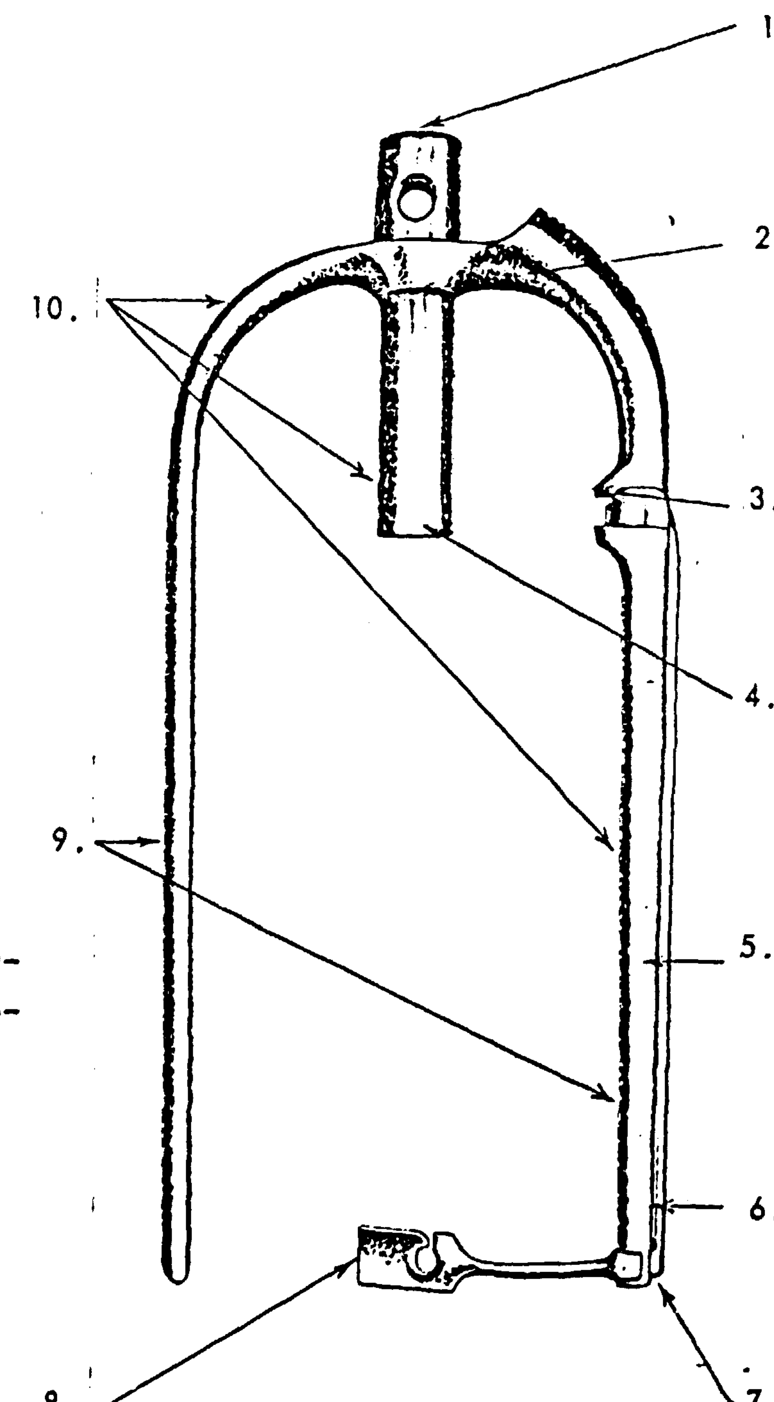
The worm tip of the hollow arm is cut off and a new one of high-grade steel is welded on electrically, thus securing a new wearing surface of unsequestioned durability.

8. PRESSER SHAPE AND BALANCE.

The presser is adjusted to secure the proper shape and balance. All roving marks are removed from the arm and paddle, leaving no rough sports to stretch and tear the roving.

9. FLYER BALANCE.

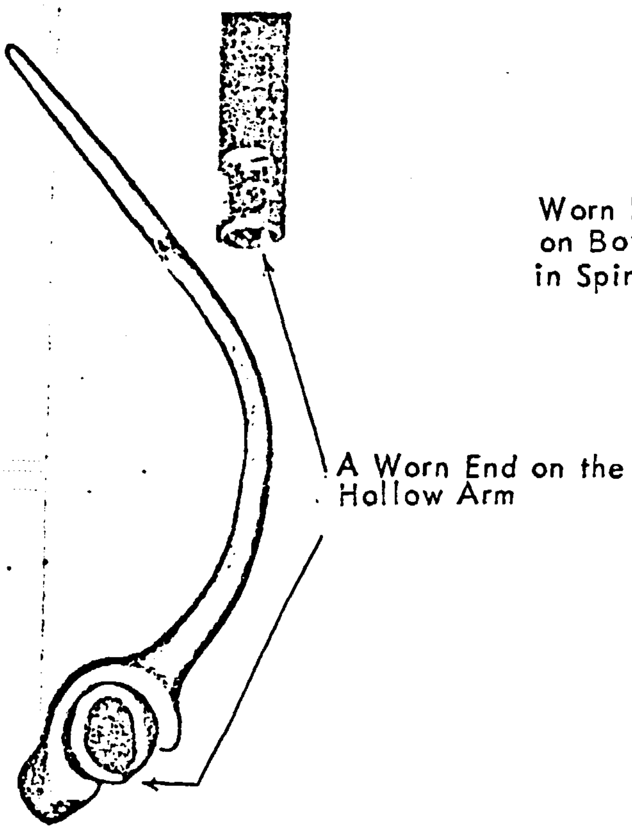
Both legs of the flyer are brought to a perfect balance, using equipment which revolves the flyer at operating speed. Balancing at speeds lower than operating speed gives results which are misleading and entirely unsatisfactory. A flyer perfectly balanced by hand will necessarily be out of frame speed, due to the uneven spread of flyer legs. Tests have shown that our method of balancing is so accurate that an excess weight of ten grains will cause violent vibration of the testing spindle.

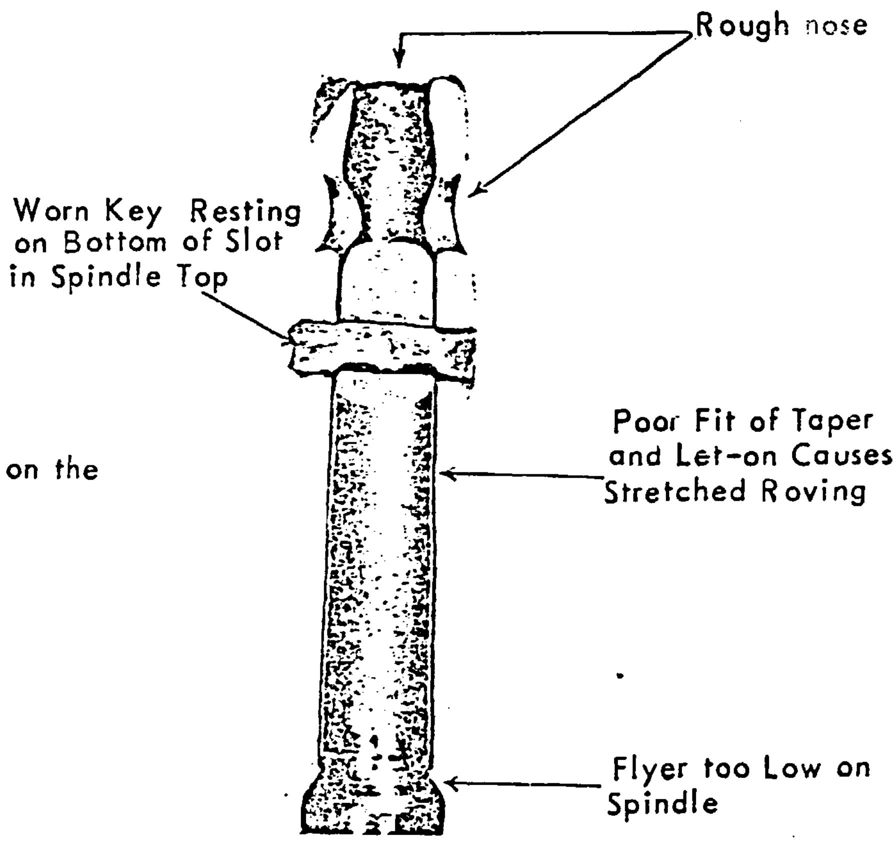


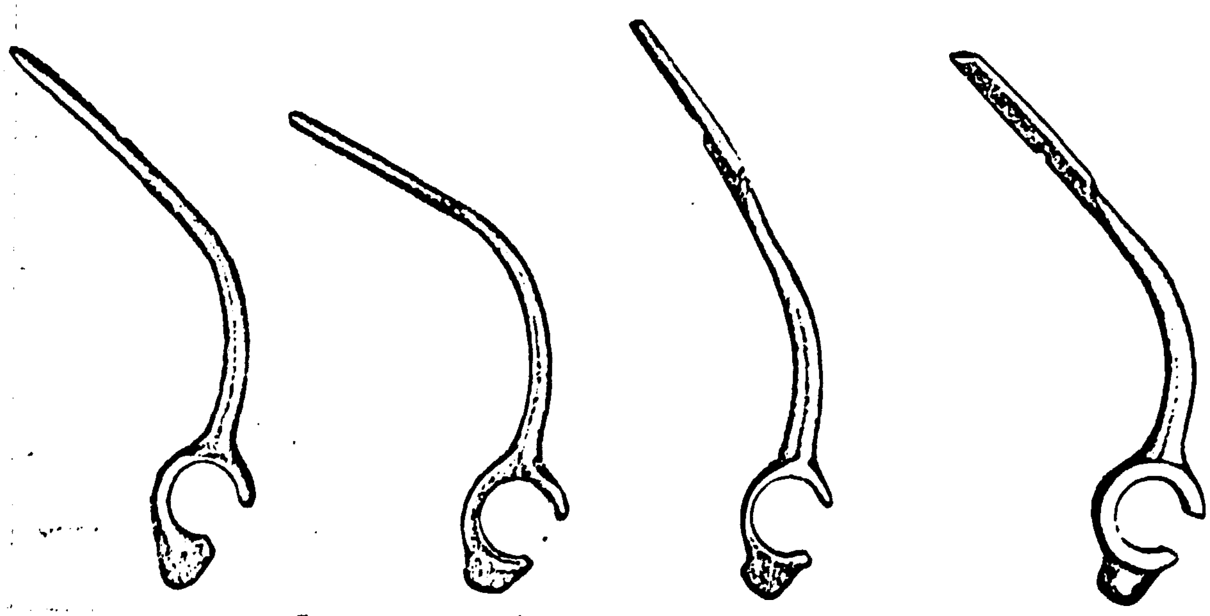
10. OVERALL POLISH.

Every part of the flyer is given a high polish to secure cotton smoothness. This makes it easier to keep dirty lint and slugs from being drawn into the ......

FLYER INSPECTION







Bent and Misshapen Presser Arms

A New Presser Showing
Correct Shape and Curvature

2. A USEFUL FIXTURE FOR REPAIRING PRESSERS.

Modern production methods in the textile industry demand and require the strictest maintenance of uniformity in the processing of fibres throughout the various manufacturing stages to which they are subjected, from the opening room to the finished yarn. Particularly is this constant vigilance necessary in the roving process, where uniform and precise tension is the important factor in securing and maintaining a consistently high quality product.

On the two previous pages, we have endeavored to illustrate and effective routine of flyer inspection. Assuming that all of the defects discovered in such an inspection have been repaired, the flyer should be in good condition for several years of usage, provided it is not damaged by rough handling or abuse.

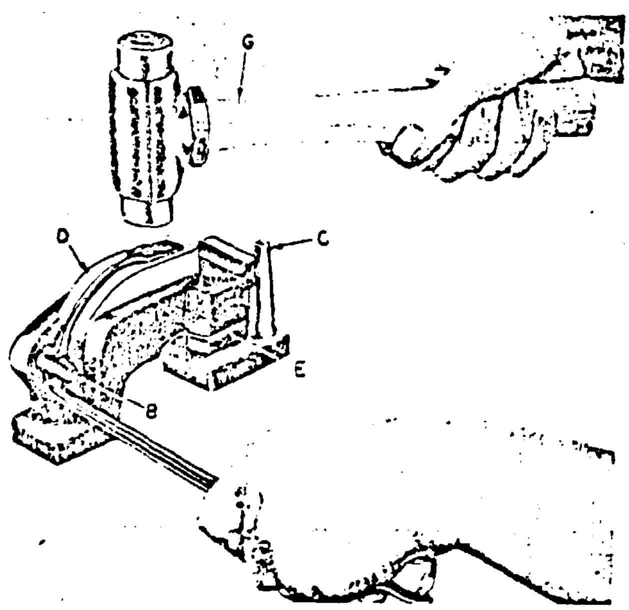
However, the condition of the Presser Assembly is often overlooked, and should not be as it has a very important function to perform. The stresses and strains to which the Presser Arm is subjected during the operation of the frame, may bring about a gradual distortion which destroys its curvature and, consequently, the balance of the flyer. Experience has shown that the Presser, in poor condition, may create a set of conditions which cause linear irregularities in the roving; the flyers operating with faulty Pressers may cause variations in the roving produced on different spindles, even though the sliver may be identical and the drafting performed effectively and with a high degree of fibre control.

To enable the mechanics in the mill to carry on an intelligent and "on the spot" repair of faulty Pressers, it has been designed the "A.R. Presser Repair Kit" .

THE "A.R." PRESSER REPAIR KIT

A cast-iron anvil weighting about five pounds is the basic element of this unit. The top of the anvil is recessed to receive the template blocks D., of which there are seven sizes, as shown in Figure 2.A tapered horn, C, Figure 1, is fastened to the base as shown in Figure 3 and 4. A slot is cut in the face of the anvil base at E. The unit is completed by the rawhide hammer G.
The major operations which can be quickly carried out with this special kit are illustrated in the accompanying figures.

FIG. 1



The Presser, after being removed from the flyer arm, can be brought to the correct shape by placing the lower bearing on the anvil horn B. The diameter of the horn is suitable for all sizes of Pressers, and its position is fixed in the anvil base. With the Presser secured on the block, and held securely by the horn of the anvil, it is quite easy to bring the arm of the Presser to the correct curvature.

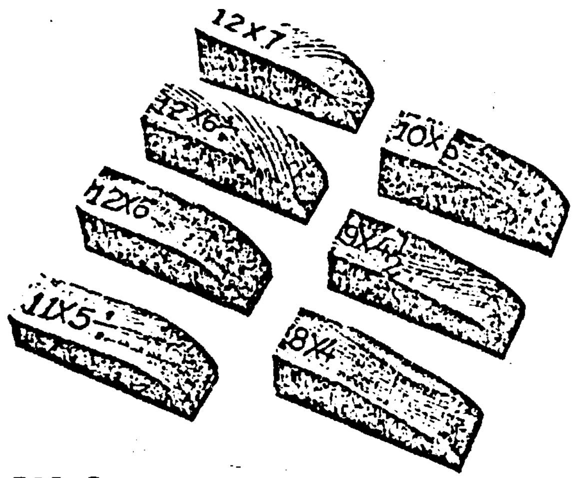


FIG.2

Each set contains seven templates of different sizes to shape Presser Arms.

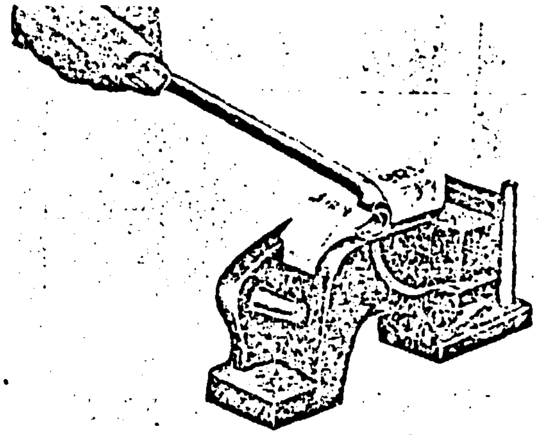


FIG.3

If the paddle of the Presser is not exactly parallel to the main axis of the flyer, it can be quickly brought to the desired position by inserting it in the slot, and bending it until it comes to the correct position.

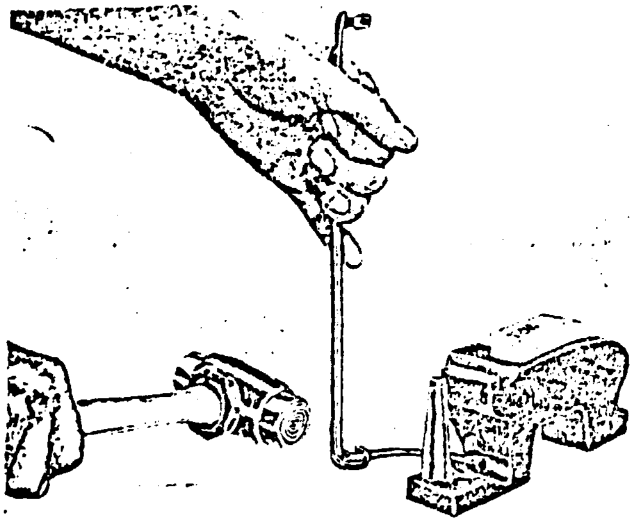


FIG.4

For shaping the shank of the paddle,in the section not in contact with the template, the Presser is put on the anvil, as shown, when a few taps with the rawhide hammer are sufficient to obtain the curvature required at the shank.

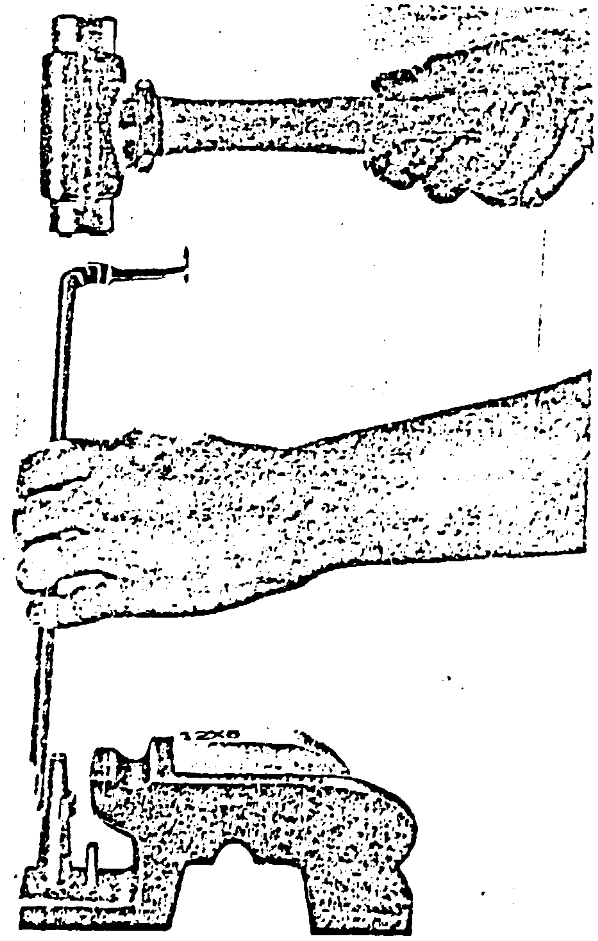


FIG.5

This illustration shows how the assembly is used to spread the bearing eye of the Presser to secure the correct fit on the flyer leg.

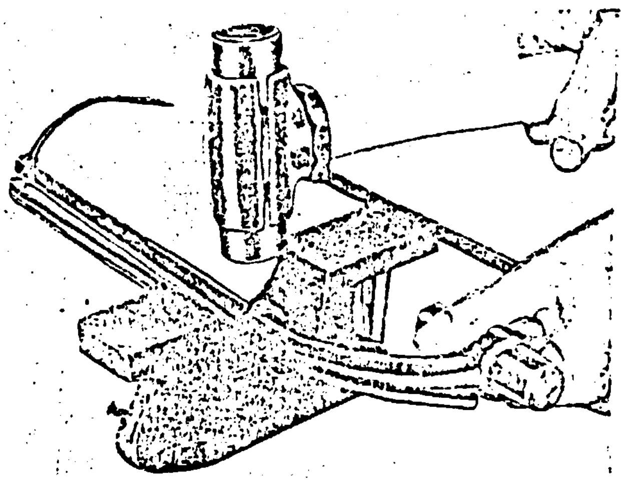


FIG.6

If the leg of the Presser is bent or misshapen, it may be brought back into shape by placing it on the top of the anvil, as shown, and tapping it with the rawhide hammer until corrected.

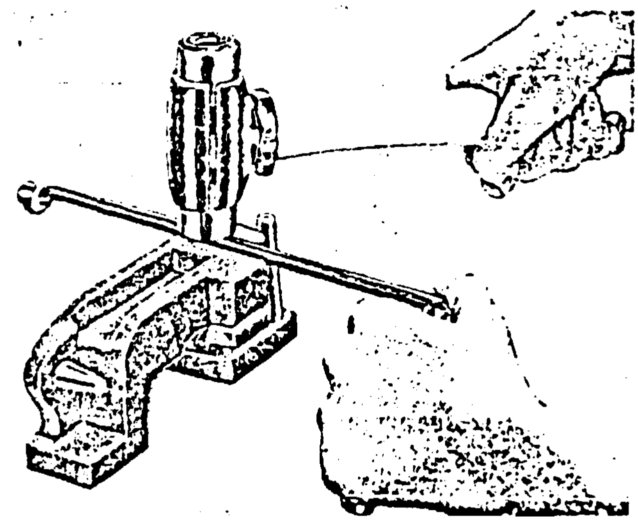
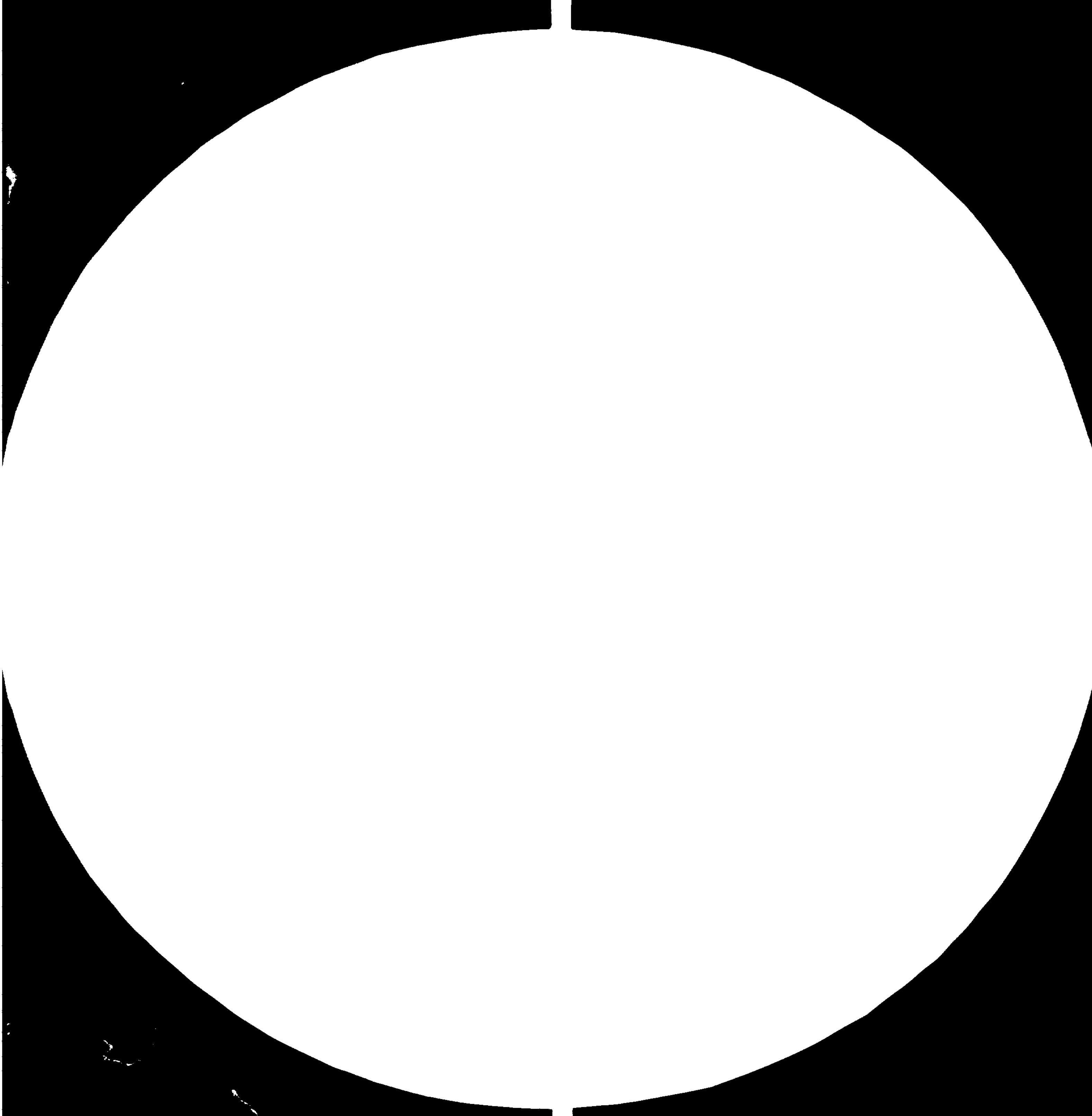
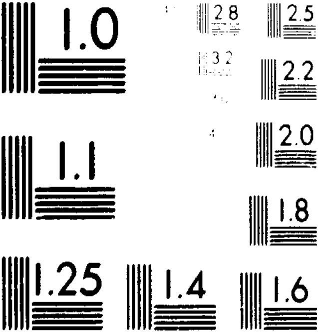


FIG. 7

After the Presser has been brought to the correct shape at critical points, it is attached to the leg of the flyer, and the eye closed by a few light strokes of the hammer while the flyer is laid in the "V" of the anvil as shown.





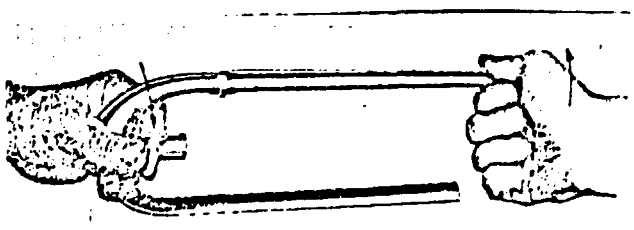
MICROCOPY RESOLUTION TEST CHART

3. ASSEMBLING THE PRESSER TO THE FLYER IN FOUR SIMPLE OPERATIONS

Inspection of flyers in need of repair shows that many of the curls and paddles have been damaged during the assembling of the presser and the flyer. Since it is important that this process, though simple, be properly done, the process employed by flyer makers is illustrated here.

Taking off the presser, Figure 1. Hold the flyer firmly at the top in left hand, solid arm down. Grasp the presser paddle with the right hand and exert upward pressure, the right hand turning from the body, the left hand toward the body. When sufficient pressure has opened the curl, it will drop free from the lugs, thereby allowing the presser to be removed from the flyer without strain.

FIG.1



To reassemble the flyer and presser, Figure 2., take the flyer in the right hand, hollow arm down. Pick up presser in the left hand, with paddle up, and insert end of the hollow arm into the boss of the presser. Continuing to hold the flyer in the right hand, Figure 3, bring the curl of the presser to rest over the slot between the lugs.

FIG.2

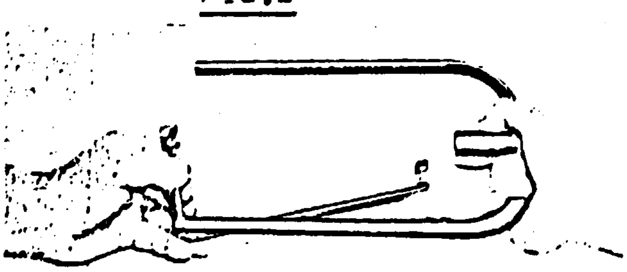
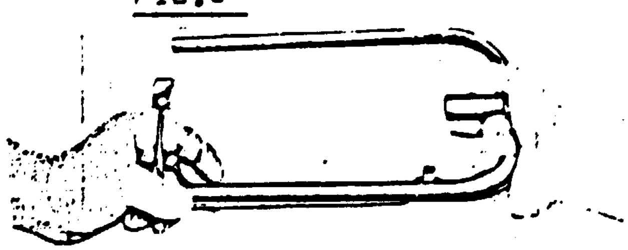
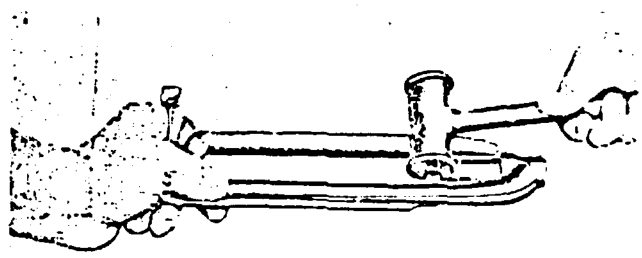


FIG.3



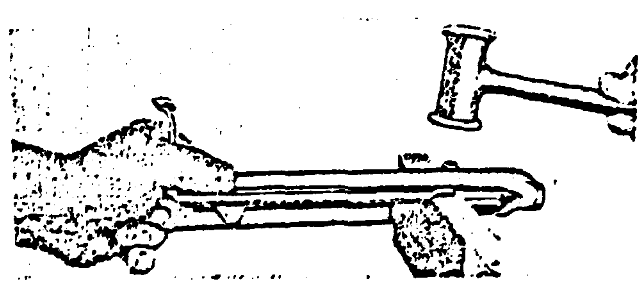
As in Figure 4, transfer the flyer to the left hand with presser in position, and rest the flyer on the bench. Use either a rawhide or a copper hammer to spring the curl of the presser onto the hollow arm of the flyer.

FIG.4



Continue to hold the flyer and presser with the left hand, Figure 5. Place the flat part of the presser curl on a hardwood block. Use either a rawhide or a copper hammer to close the curl around the hollow arm of the flyer, exercising due care to avoid distortion of the slot in the hollow arm. In the event that the presser does not move freely on the flyer, exert a slight pressure on the presser paddle, as shown in Figure 1. In case the presser continues to bind, the difficulty may be traced to the curl cramping in the slot. This condition may be relieved by tapping the edge of the curl one way or the other.

FIG.5



GROUP 4. A. THE RATCHET MOTION (Model 5).

4.A THE RATCHET MOTION. (Roving-Frame Model 5).

1. FUNCTION OF THE RATCHET MOTION.
   a) Control of the reversing gear.
   b) Reduction of the lift of the carriage as winding onto the bobbin proceeds.
   c) To move on the cone belt by a certain amount corresponding to the increasing diameter of the bobbin.

2. DESCRIPTION OF OPERATION.

As to a): (See fig.1).
The reversing bracket (1) is connected to the reversing gear through the fork (2) and the eye bolt (3).
Operated by the rack (4), the driver (5) together with the two set screws St 1 and St 2 rocks around D, thus pressing alternately on the pawls (6) and (7). The control lever (8) connected to the carriage, causes the weight relieving lever (9) to rock around E, thus putting weight onto the reversing bracket (1) and relieving it from the weight alternately.

As the carriage approaches the bottom reversing point, the reversing bracket is weighted on the left, whereas the right side is relieved from the weight, however, is held in position by means of the pawl (6). Only when the set screw St 1 forces the pawl out of the reversing bracket, the bracket drops suddenly and reverses the reversing gear.

As to b) : (See fig, 2 and 3).
To obtain a conical shape of the bobbins, the height of winding is to decrease continuously. This reduction of the lift is effected by the rack (4) which runs in the slot (10).

In each rack movement the rack is moved a given amount towards the center D, the amount being determined by the number of teeth of the ratchet wheel and the pinion R. Since the pawls are always released at the same angle, the lift H will be necessary at point A to release the pawl, whereas a lift h will be sufficient at point E (fig,3).

As to c) : (See fig. 4).
A cable imparts the threaded spindle the tendency to turn and thus to move the belt guide. This belt-guide screw, however, is blocked by the pawls 11 and 12, which engage the ratchet wheel. The reversing bracket makes the pawls engage and disengage alternately, so that ratchet wheel is turned by the pitch of half a tooth every time and the cone belt is moved correspondingly.

3. PARTS.

1. REVERSING BRACKET.
2. FORK.
3. EYEBOLT.
4. RACK.
5. DRIVER.

6.-7. CONTROL PAWLS.

8. CONTROL LEVER.
9. DELIVERING LEVER.
10. SLOT.

11-12. PAWLS.

4. SETTING.

a) Rack : Set the flyer in such a way that the eye of the presser is positioned in the centre of the bobbin (fig.3). Then adjust the rack by moving it in its slot guide at C to be exactly horizontal and to equal the dimension y given in fig, 2, In this position, the cone belt should be spaced approx. 10 to 15 mm. (13/32" to 19/32") from the rear flange of the cone (fig.5).

b) Stop screws: Press the reversing bracket against the pawl in the direction of arrow A, and set the clearance between the lug L of the eyebolt and the stop screw I for approx. 0.1 mm. to 0.2 mm. (.004" to .008"). Next press the reversing bracket in direction of the arrow B, and check, whether the pawl lifts off the reversing bracket without being hampered. The same operation should be applied to the opposite end (fig. 3A.1).

The fork of the reversing gear should be fastened in such a way that clearance is equal on either side of the bevel wheels. The length of lift H of the fork may be altered by moving the plates P1 and P2 in opposite directions. Such an adjustment may be required if despite correct setting of the fork, the backlash is too much or too little. The backlash should be as small as possible. See fig. 3A.1.

c) Turn back the set screws St 1 and St 2. Then move the bobbin rail until it arrives at the top-most reversing point and screw in St 2 until the pawl will lift off the reversing bracket and reverse the gear. The same adjustment should be carried out in the bottom reversing point. Make sure that these adjustments be made with the belt guide up and that the dimensions x and Z make a minimum of 5 mm.(13/64") immediately after reversing and even with the full bobbin, in order to secure a proper reversing suction of the reversing bracket.

d) Set the pawls according to fig. 4 and check during a trial run, whether the amount of movement is equal on either side. The indicator (13) makes it easy to take a reading of the number of teeth the ratchet has moved. Remember the pawl should always engage above the centre of the ratchet wheel according to fig. 3A.6.

In addition to the conventional ratchet change wheel (SwIO, the Ingolstadt Fly-Frame model 5 is equipped with a change wheel (SwII) on the threaded spindle. The change wheel permits alteration of the ratchet motion constant. This means that one ratchet wheel SwI can produce various amounts of movement.

Example of application : A flyer operation with SW I = 32 teeth and Sw II = 22 teeth. If it turns out that the slubbing is getting too slack and is sagging towards the end of the set, this means that a ratchet wheel SwI with a higher number of teeth would be required. Since, however, the maximum number of teeth on the SwI is 32, it becomes evident that SwII is to be altered. In this case a smaller amount of movement is desired, therefore a change wheel SwII with a higher number of teeth should be fitted, i.e. a change wheel with 23 teeth.

If conditions are reversed, proceed accordingly.

When dismantling or exchanging the change wheel SwII, extreme care should be taken that these jobs be done with the belt guide in its initial position. To make quite sure, it is recommended, to disengage the small rack in the ratchet motion next to the pinion R, otherwise it might happen that due to turning the threaded spindle to the ratchet wheel SwI, the belt guide is not yet in its initial position whereas this position has already been attained by the small rack.

As a result, the servo-motor might start nevertheless when operating the pedal, and, under circumstances, the slot guide carrier might be damaged. As the belt guide reaches its initial position, the small rack may be engaged again. The pinion R for the ratchet motion may have between 14 and 19 teeth.

A higher number of teeth will give a more steep bobbin cone, whereas a smaller number of teeth should be selected where a more flat cone is desired.

5. DETERMINATION OF THE RATCHET.

Yarn tension is regulated by the ratchet throughout the entire build-up. Its adjustment depends no only on material, roving count and twist but also on the threading of the roving into the tip of flyer, the number of press finger wrappings and the flyer revolutions, which have a certain influence on the roving thickness $\delta 2$.

Yarn tension must not be excessive - the roving between front roller and flyer must still droop slightly. With large package sizes it is particularly important to maintain constant yarn tension throughout the whole build-up or still better, have it diminish slightly towards the end. It is not always easy to check this, especially at high flyer speeds.
Experience and a sure touch are necessary for satisfactory adjustment, and the fitter or spinning foreman can only acquire these patient trial-and-error.

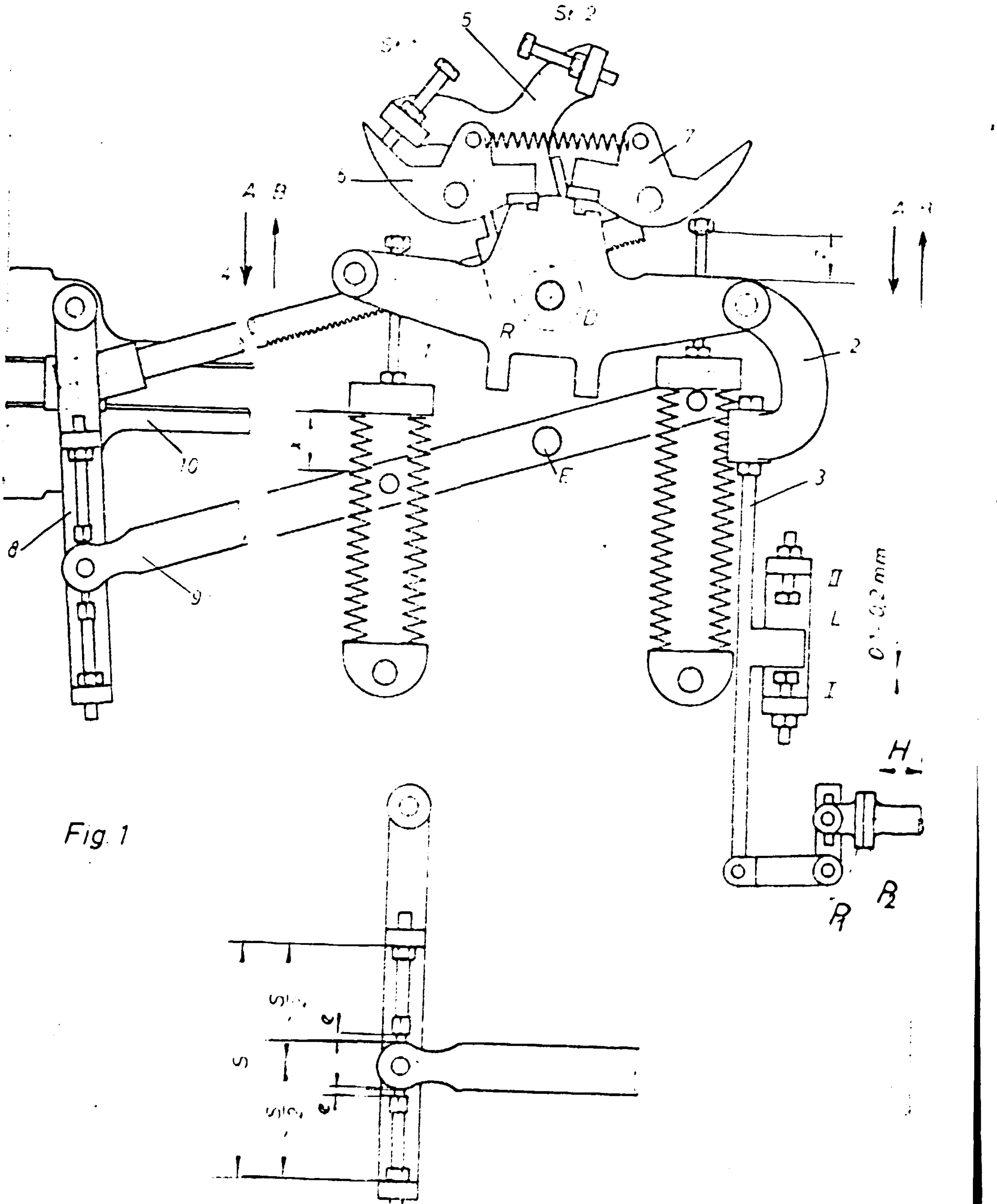


Fig. 1

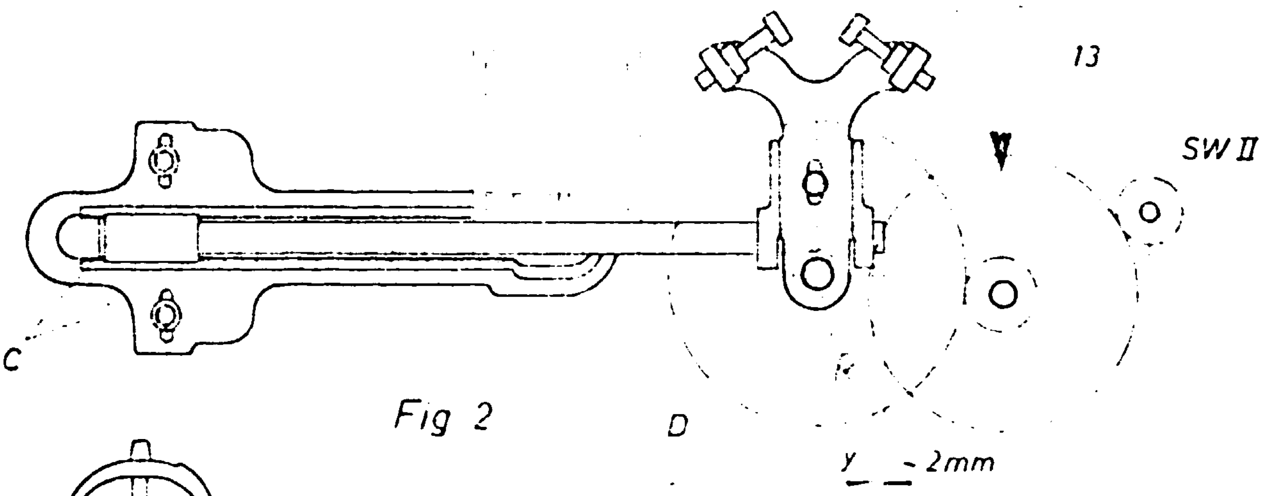


Fig 2

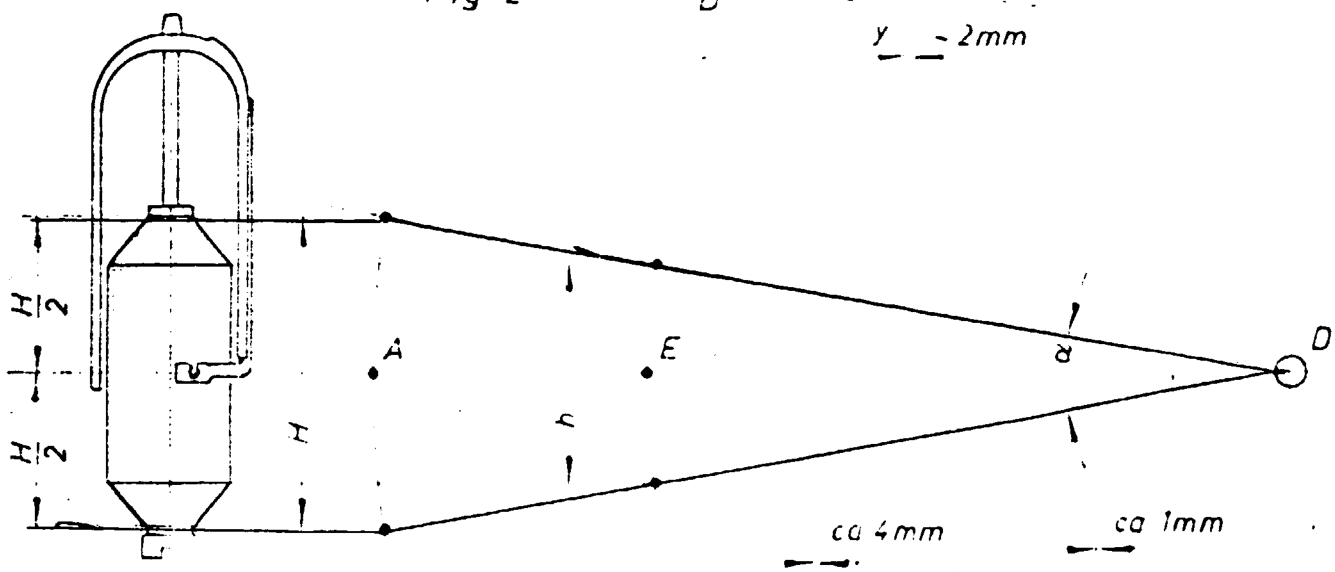


Fig. 3

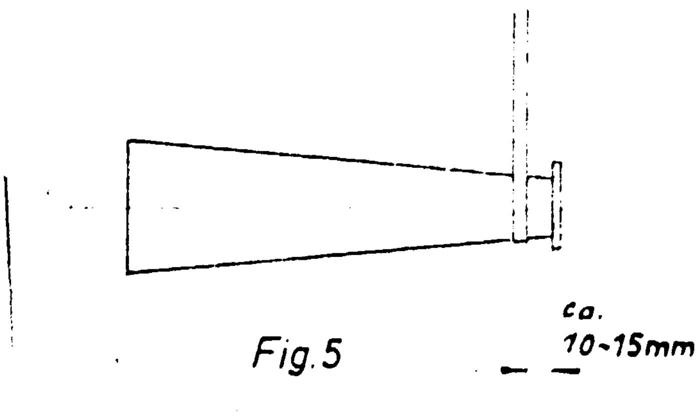


Fig.5

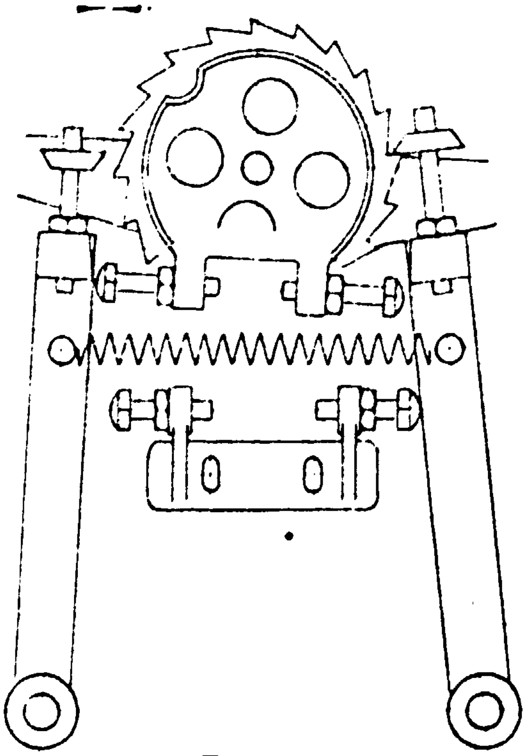


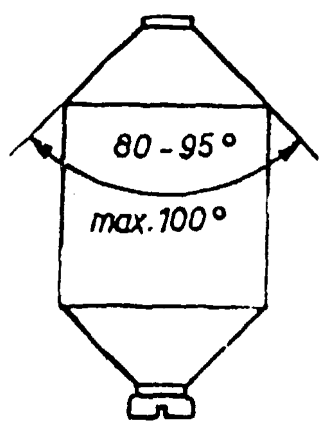
Fig 4

6. BOBBIN SHAPE.

It is possible to influence the package cones by changing the pinion on the shaft of the reversing ratchet wheel (for shifting the rack). The toothed rack must be properly engaged afterwards, and the cradle on the reversing mechanism has been made adjustable for this purpose. It must be possible to push the rack to and fro without difficulty.

Package cones should be neither too steep nor too flat. Steep cones means loss of weight, whilst constant trouble results with cones that are too flat. Normal cones range between 80 & 90 degrees, with 100 degrees as maximum (Fig. 4.3)

Figure 4.3.



7. FAULTS NOTED & REMEDIED DURING TEST SPINNING.

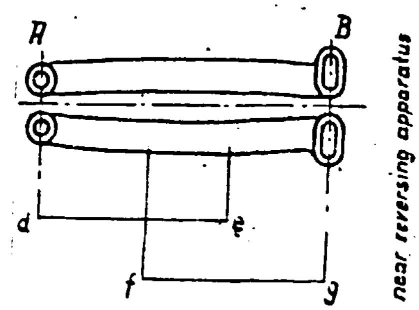
- Both bobbin ends are too flat, angle w is too large, windings slip off.

Remedy: (Fig. 4.4.)

a) Change to a bigger rack pinion. The shaper slides close at B (near reversing apparatus).

b) Shift the stroke of the engaging pin of the rack toward B i.e. transpose the lift d - e to f - g. For this purpose, loosen the adjusting screw on the rack gear to move the rack, and tighten it after shifting the guide pin from d to f.

Figure 4.4.



- Both bobbin slants are too pointed, angle w is too small.

  Remedy: (Fig.

  a) Change to a smaller rack pinion.

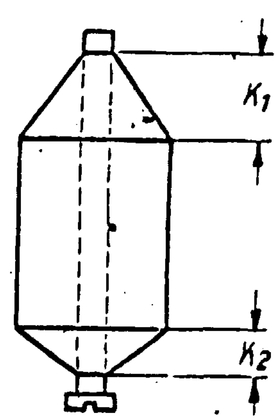
  b) Shift the stroke of the engaging pin of the rack towards A i.e. transpose the lift f - g to d - e. For this purpose loosen the adjusting screw on the rack gear to move the rack, and tighten it after shifting the guide pin from f to d.

The two slants k1 and k2 are of unequal length.

Remedy: (Fig. 4.5.)

a) Adjust the shaper slide bracket.
Lifting the bracket makes the upper slant (k1) longer.
Lowering the bracket makes the lower slant (k2) longer.

Figure 4.5.



Faulty switch of cone belt.

During reversing action, the cone belt advances slowly instead of jerks.

Locate where the running belt brushes against the guide. The belt should be pushed ahead only at the incoming side of the upper cone. Also, see whether the cone built rack jams in the cradle guide. If possible avoid increasing the weight on the cable, as this would make it more difficult to reset the reversing apparatus after each doff.

8. ADJUSTING THE MACHINE WITH MATERIAL.

8.1. Carriage and traverse change gears.

Bobbin and flyers are mounted on one front and one back spindle at the drive end, and the necessary fibre material made ready at the feed. These two spindles are run with material, to make the preliminary adjustments.

First clean thoroughly all surfaces coming into contact with the fibres, and rub them with chalk powder (rolls, flyers). During the first winding layer, watch carefully that the pull between roll and flyer is loose and even. If it is not, correct at the starting position of the cone belt. If the pull is too strong the cone belt (28) must be shifted a little towards the end of the machine with the adjusting screw on the cone rack and vice verse. After each correction winding must be started over empty bobbin, until the roving tension is uniform throughout the whole traverse.

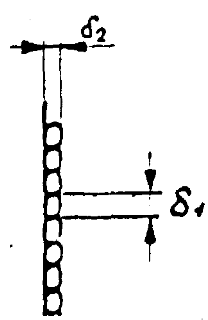
If the cone belt has to be moved more than 12 mm. or so from the stipulated position, the cone change wheel (same pattern as the twist change wheel) must be replaced by one wheel with one tooth more or less. If the belt has been shifted towards the thick end on the top cone, cone change wheel with one more tooth must be fitted, otherwise one with one tooth less. Repeat the test with the first winding layer until the pull is even over the entire length.

Roving count trails should be carried out at an early stage. For correct settings on the machine the roving count must be right.

With the first winding layer on the hard bobbin, the mean diameter of the layer will be somewhat larger than that of the consequent windings over the soft roving. Hence the roving should be only just under tension for the first layer.

When winding onto the empty bobbin the lift of the carriage (δ_1) must be checked. The roving should be wound on so that the bobbin is hardly visible. The carriage lift is governed by the carriage change wheel W: more teeth meam more lift (Fig. 4.6.)

Figure 4.6.



As further layers are wound on, verify that the right traverse change wheel S has been selected. When the ratchet wheel turns half a tooth, the cone belt and cam must be advanced sufficient to ensure the right transmission at the cones for correct winding on the particular bobbin diameter. The thickness of a winding layer (δ_2) may vary somewhat, due to count fluctuation, windings with more or less pitch, use of different twist coefficients, climatic conditions, and the properties of the fibre material being processed. Consequently the traverse change wheel S arrived at by calculation may not be right in every case. If the pull becomes harder with each winding, not enough traverse is being performed. A traverse change wheel with more teeth is needed, or vice versa.

If this preliminary test shows the bobbin take-up to be correct and the roving count to be right, an extended trial is then made. Pairs of front and back bobbins are mounted, two at the drive, two in the middle (or two sets of two pairs if the machine is long), and two at the end. The drafting arrangements are to be saddled only for the spindles in question. Set the stop counter to the desired yardage. Start up the machine with the adjustments shown to be right in the preliminary trials and wind the bobbins full.

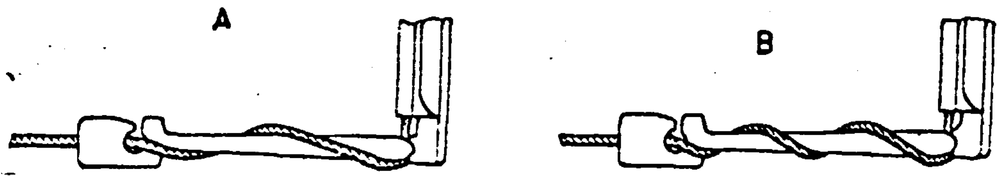
Observe the function of all machine components closely while it is working. Check in particular the take-up of the roving and the bobbin build, uniform loose pull during the first winding layer (i.e. correct belt position at the start), correct pitch of the windings on the bobbin, correct traverse length and free end of bobbin after the first winding layer, uniformly loose pull throughout the winding cycle (well chosen traverse change wheel) and uniform shape of the top and bottom bobbin cones.

Adjusting the winding tension.

The winding tension on the bobbin depends on the number of wraps round the press finger and the way the roving is introduced into the top of the flyer.
More wraps on the press finger, i.e. roving braked close to the winding-on point, gives harder bobbins and better build for the same tension in the spinning part.

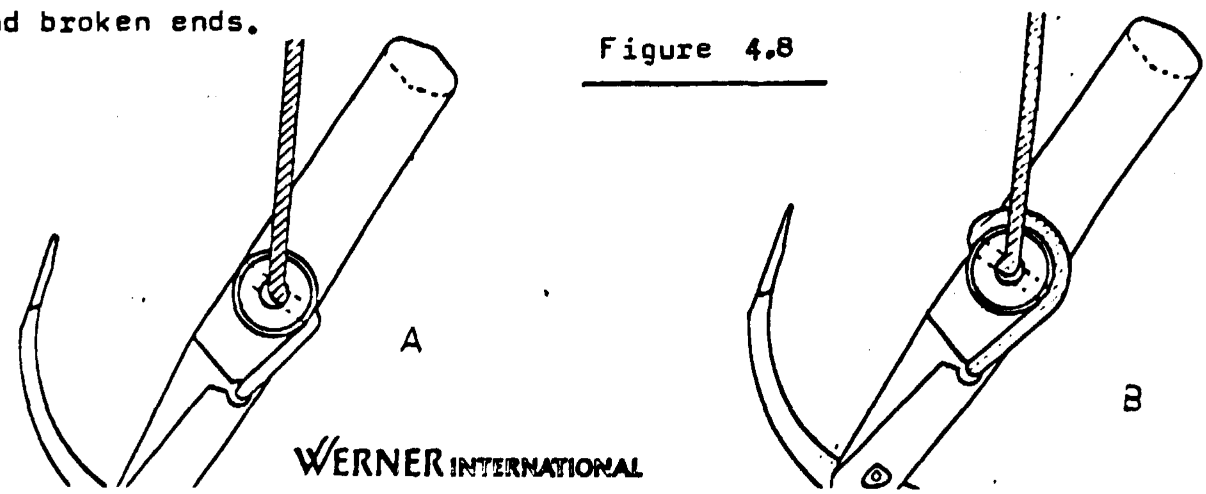
With soft-twisted rovings for all counts, and often for extra-coarse yarns too - such as Ne 0.45 - 0.55s (1310 -1073 tex)- it is advisable to lead the roving straight in as shown in Fig. 4.8A instead of wrapping it round the top. The roving is then not stressed excessively, ensuring good running.

Figure 4.7



With large high-speed flyers (such as 14 x 7" for 1200 rpm) for medium to hard twist and medium to fine counts, the roving tension can often be regulated better by using a 3/4-turn at the top of the flyer as in Fig. 4.8B. This additional wrapping makes the bobbins harder with less variation between them, eliminating differences in bobbin diameter. In this case the tension must be loose, and the roving must sag visibly. Maximum bobbin weights can be achieved in this way. Because the roving is highly stressed by the braking action at the top of the flyer when passing through the flyer tube, with too weak twist this may lead to false draft and broken ends.

Figure 4.8



Other methods of introducing the roving give very poor twist between flyer and drafting arrangement. The roving flutters, precise adjustment is impossible, wide differences in the bobbin diameters occur, and the running is poor.

The number of wraps round the press finger influences the winding tension and hence the bobbin hardness. The bobbins should not be wound too soft, since this means a loss of weight and thus poorer efficiency.

The wrapping used on the press finger is governed by the strength of the roving, i.e. length and twist. More wraps mean more stressing of the roving, which may end up by causing broken ends.

Fig. 4.7 shows the usual methods of wrapping. For soft-twisted rovings the method shown in A should be applied, for normal or hard-twisted rovings, B. To increase the bobbin weight with hard-twisted rovings, the top of the flyer can be wrapped in addition (see Fig. 4.8 3)

Make sure that the press finger is not wrapped insufficiently either. Only 1 1/2 finger wraps are employed mainly with weak twist and man-made fibres.

Unfortunately no firm rule n be laid down, because the surface condition, material being spun and room's air condition all exercise a very large influence. Strongly fluctuating climatic conditions for instance may compel a change in the threading-in.

Checking the roving tension.

If there is no one available with the necessary feeling for the roving tension, it is advisable to have a whole roving bobbin sorted through. Sorting is done by comparing the weights of equal lengths from different winding layers. The bigger the roving length taken for comparison, the more exact the result will be, i.e. the better the differences will be pin-pointed. The biggest roving length that can be used for comparison is the length of the first winding layer on the bare bobbin. This length is therefore ascertained, then the same length L is reeled off from each layer and weighed on a precision balance. The value obtained are plotted in the correct sequence on millimetre graph paper; irregularities are revealed unmistakably. It must be remembered, however, that certain faults may have been present in the sliver already.

It is not advisable to test entire bobbins with the Uster instrument, because deviations of the instrument may easily lead to false conclusions. On the other hand instruments with mechanical feeler devices are very good.

Roving breaks and how to remedy them.

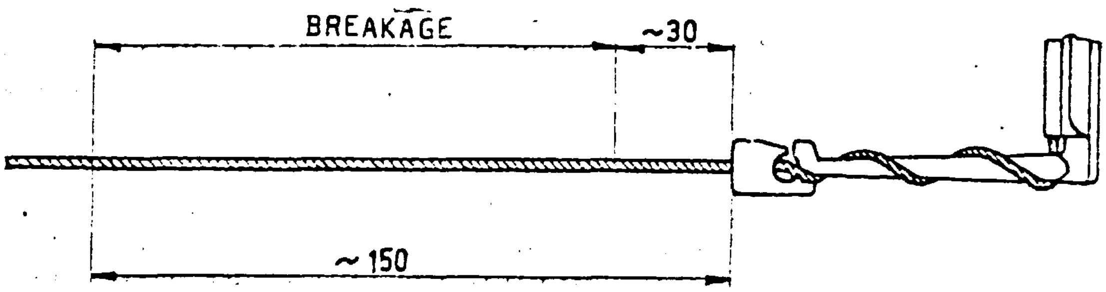
Badly adjusted roving frames may produce disastrous results, and an erector should never fail to observe the machine for a few hours after putting it into commission. The trial run with a few spindles is no guarantee that the whole machine will run satisfactorily.

Broken rovings due to badly adjusted machines are easily recognized because the break is usually 30 - 150 mm. from the press finger (Fig. 4.9) . Owing to the breakage the roving is not entrained further, and causes a second breakage between flyer and drafting arrangement, i.e. the roving remains intact inside the flyer.

Such breakages can always be traced to excessive winding tension or inadequate roving twist, unless the press finger is clogged up. In order to remedy the trouble, the tension must be reduced by fitting a different traverse change wheel. If this does not put matters right, fewer warps must be used on the top of the flyer or press finger.

If none of these measures is successful, there is nothing left but to increase the roving twist. With big bobbins more twist will not come amiss in any case, because the roving is stressed more on the creel of the ring spinning frame by the heavier bobbin weight.

FIGURE 4.9



GROUP 5. DRAFTING SYSTEM UT 600:

1. DESCRIPTION.

The roller stands are simple and functional. The roller blocks are precision made and the middle and back blocks are fully adjustable in the stand. Roller stands are located at each joint of the bottom roller. The stands holds the rolls parallel on a plain 30 degrees inclined front to back. Top arm is spring loaded.
The front and back rollers are flunted, the middle or apron roll is Knurled.

2. PURPOSE.

The drafting system transport the stock and through progressive higher surface speeds, draw the fibers out and draft them into sliver roving.

3. PARTS.

See figures and Text.

4. SETTINGS.

1. MOUNTING.

a) The top arms and clamp brackets are slid onto the support bar, which is then mounted in the support slides as shown in Fig 1 ready to be fixed in the stands. The distance from the centre of the support bar to the centre of the delivery roller is 205 mm.

The top rollers and cradle units are mounted in the top roller retainers and each top arm is located correctly between two fluted sections in accordance with the gauge. All the top arms are then weighted and the clamp brackets are tightened with a torque of 2.5 mkp by means of a torque spanner. A higher torque is unnecessary, the form-fit between the clamp bracket and support bar guaranteeing an adequate grip.

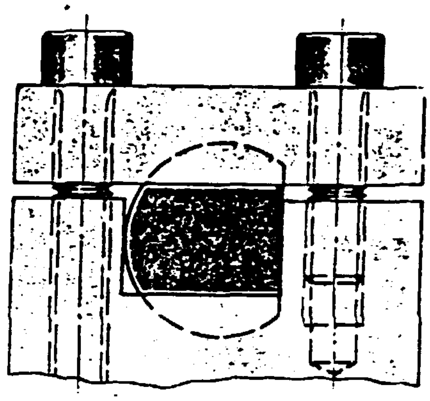


Fig.1

2. HEIGHT SETTING OF TOP ARMS.

The No.620-1117 height setting gauge, which is intended for both the UT 600 and UT 620 top arms, must, before use, be adjusted according to the arm design. Proceed as follows:

Set the gauge (Fig.2 and 3) at the diameter (1) of the front top roller used with the arm by turning the block (2), which is provided on each side with one of the numbers 27, 28, 31 or 35, until the number corresponding to the front roller diameter, as seen from above, is adjacent to the adjustable front slide (3) of the gauge. Then adjust the block (2) in its slot (4) so that the notch (5) is adjacent to the notch (6) in the front slide (3) designating the arm and cradle type. To facilitate this the three motches in the slide (3) are provided with the type references of the arm and cradle on the side of the slide next to the arm.

In order to locate the lug (7) of the pointer (8) under the arm body without interfering with the top roller retainer, the gauge is adjustable by means of the two slides (3 & 9).

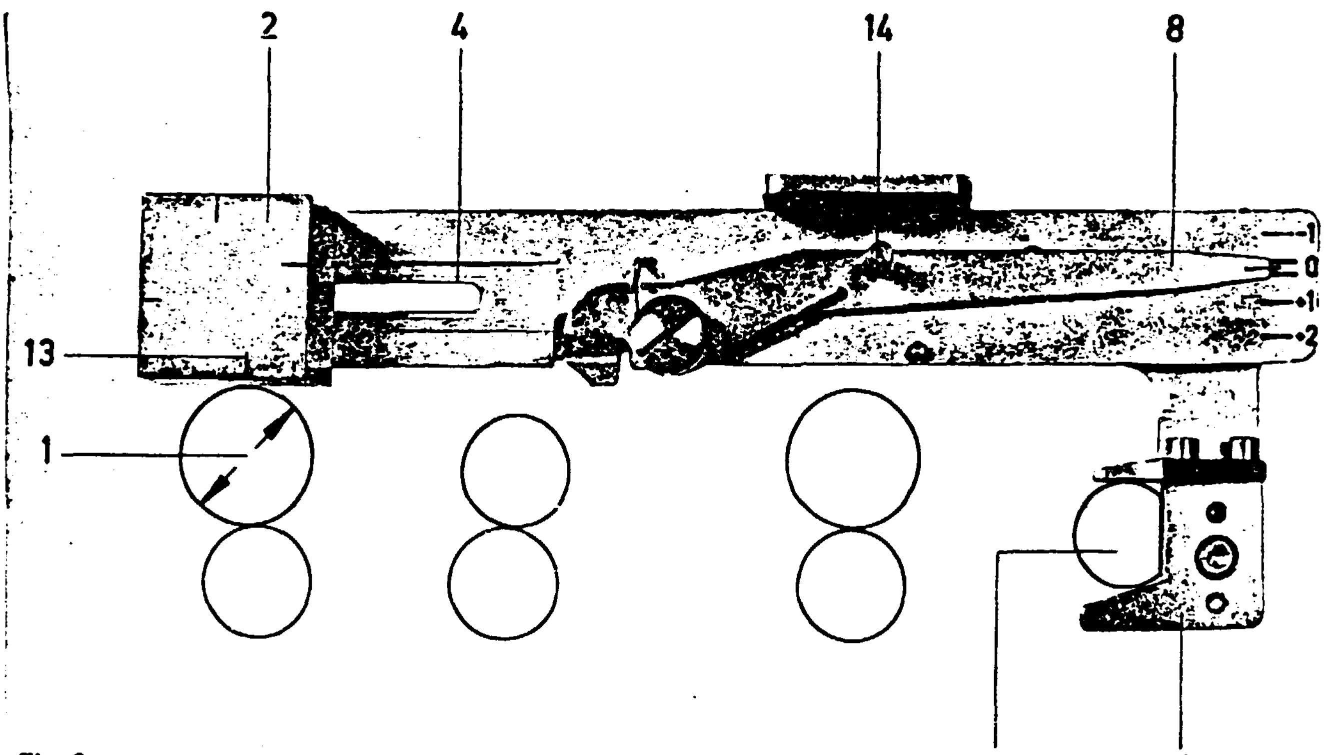


Fig. 2

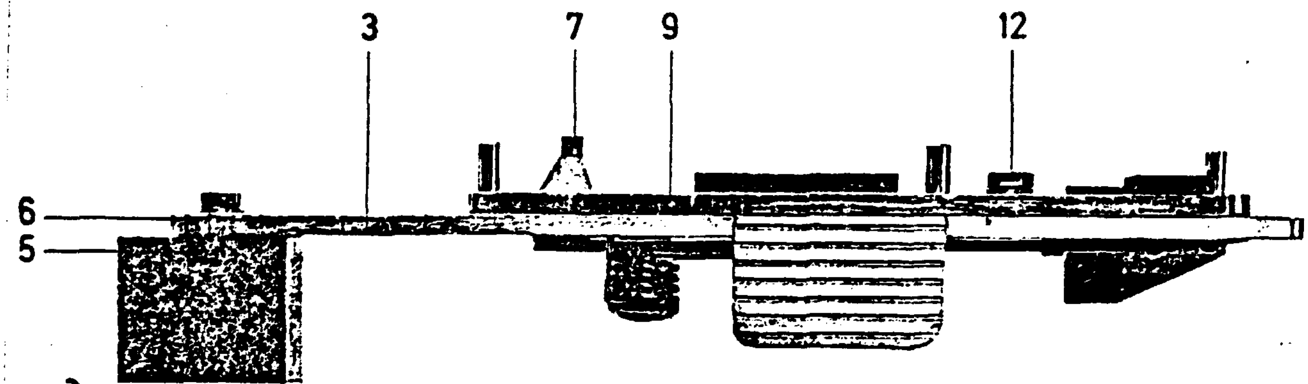


Fig. 3

Apply the gauge to the right of the arm, as viewed from the spindle, so that the support bar(11) is located in the bracket (10) of the gauge. After loosening the hexagon screw (12), adjust the front slide (3) until the block (2) is in the correct position in relation to the front roller, viz. when the mark (13) on the side of the block is aligned with the center of the top roller, When making this adjustment, ensure that the slide (9) of the gauge rests firmly on the support bar.

To apply the gauge, raise the pointer (8) at the stud (14) until the lug (7) is located under the arm body. Push the gauge in the direction of the arm until the location studs rest against the arm body. Lower the pointer to bring the lug into contact with the underside of the arm.

Turn the height setting screw on the clamp bracket until the pointer attains approximately a mid position between the two longer graduations at 0 on the scale. The arm is thus set parallel to the drafting field (Fig 4).

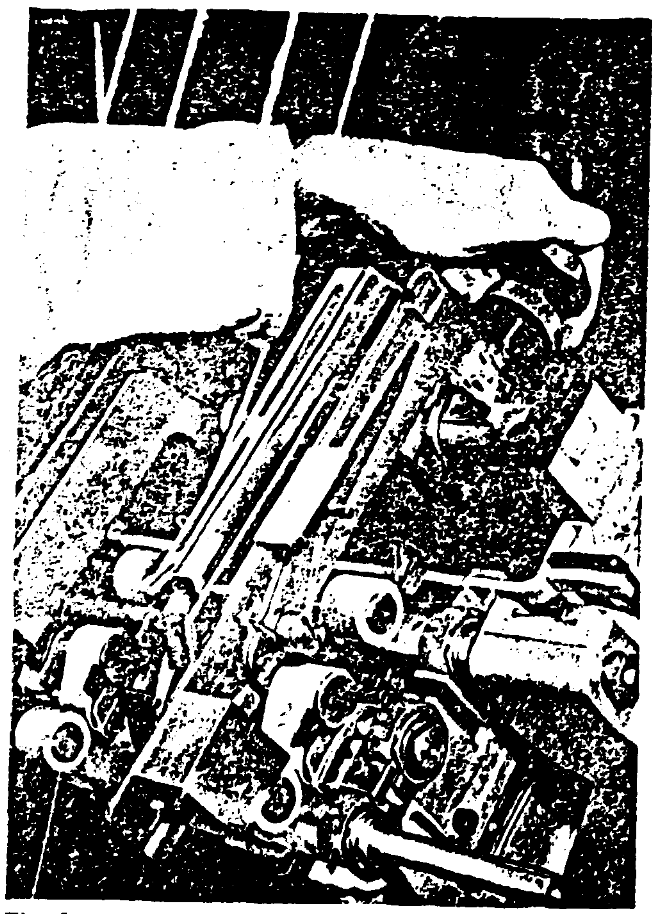


Fig. 4

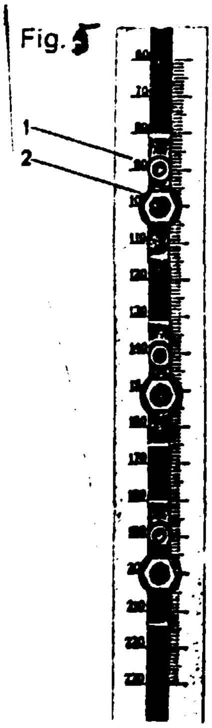
Release and weight the arm two or three times to check the position of the pointer, which should automatically take up its position between the two graduations at 0. When this mid position has been attained, the height setting of the arm is correct. If not, the arm must be reset. Ensure that the locking nut of the height setting screw is tightened properly after each setting.

Set all the arms in the frame in the same way and then make a second check.

3. <u>TOP ROLLERS SETTING.</u>

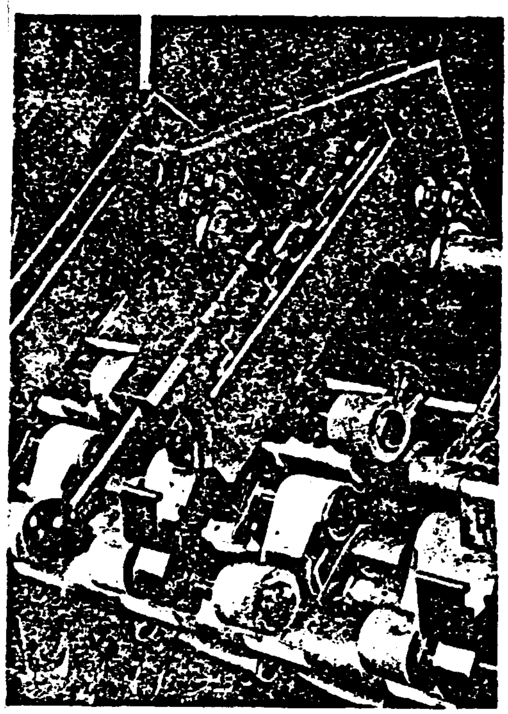
Tables are available showing the settings of the top roller retainers for each drafting design. These settings are determined on the basis of the centre line of the support bar. The top roller retainers are set with the arm released and are fixed by means of hexagonal screws (2) according to the settings recommended in the tables for the scale (1) on the arm body (Fig.5). The edges of the retainer surface serve to mark the correct division, the front edge indicating the settings for the back roller and the rear edge, the settings for the middle and front rollers.

Fig. 5



For settings on a large scale the top roller setting gauge 4.629-1022-1 can also be used (Fig.6)

Fig. 6



For adjusting the top roller settings by means of this setting gauge the required top roller settings are first to be made on one arm in accordance with the values given on the setting chart. The setting gauge is then adjusted to the settings on the pilot arm.

For setting the gauge (Fig.7) and also the top roller retainers the top arm must be in the relased position. Hold the gauge by its ball knob (10) and place it on the top arm body in such a way that the location (3) with its hook-shaped nose locks behind the arm body. The little pegs on the setting rings (9) reach through the longitudinal slot of the arm body until they touch the top roller retainer in which position they are tightened.

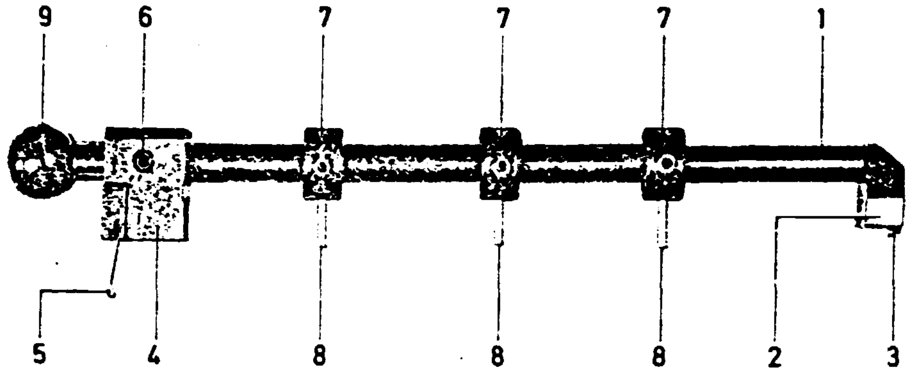


Fig. 7

In order to prevent the gauge from shifting on the arm body, a fixing device (4) has been provided in front of the ball knob; the tensioning spring (5) of this device grips under the front end of the arm body. Location (3), the tensioning spring (5) and the U-shaped support of this fixing device ensure the correct and safe position of the gauge on the arm body, nevertheless the gauge can be easily removed and fitted to another top arm.

When the threaded pin (6) is loosened, the fixing device (4) can be shifted on guiding rod (1); this is essential for the use of the gauge on the UT 600 and UT 620 top arms, which have arm bodies of different length.

In order to set push the fixing device (4) in the direction of the support bar until the tensioning spring (5) acts with sufficient pressure to enable the gauge to rest firmly on the arm body.

When the setting gauge has been adjusted the real setting of the top arms can be made. To this effect the gauge must be put into the top arms; the hexagonal bolts on the top roller retainers are loosened so that the top roller retainers can be shifted to the little pegs of the setting rings (3); in this position they are tightened again.

4. SETTING OF THE APRON NIP.

The apron nip "m" refers to the distance between the bottom apron guide bar and the front edge of the cradle. It is primarily the choice of cradle spacer which determines the quality of the yarn. Nine cradle spacers in different colours are available for various fibre types and qualities.

No. of Cradle Spacer	Colour	Count	Apron Nip "m"
2.5	red	above 1.5	3.0 - 3.5
3.0	yellow	1.0 - 1.5	3.0 - 4.0
3.5	green	0.6 - 1	3.5 - 5 0
4.0	blue	below 0.6	4.0 - 7.0
5.0	white		
6.0	grey		
7.0	black		
9.0	brown		
11.0	colourless		

After removing the top apron unit from the top roller retainer, the spacer between the cradle and holding spring can be removed or fitted with a handy lever, without disassembling the complete unit.

5. CHECKING OF THE WEIGHTING PRESSURE.

The pressure of the weighting springs in the top roller retainers can be adjusted with infinite variation by means of screws. The standard weighting pressure is set on the arms before they leave the factory of the drafting manufacturers.

With the help of a device for checking nipping pressures (Fig.16) the pressure on each top roller can be increased when adjustments are made to cater for a different type of fibre, e.g. when change is made from cotton to chemical fibres.

Standard weighting in Kp:

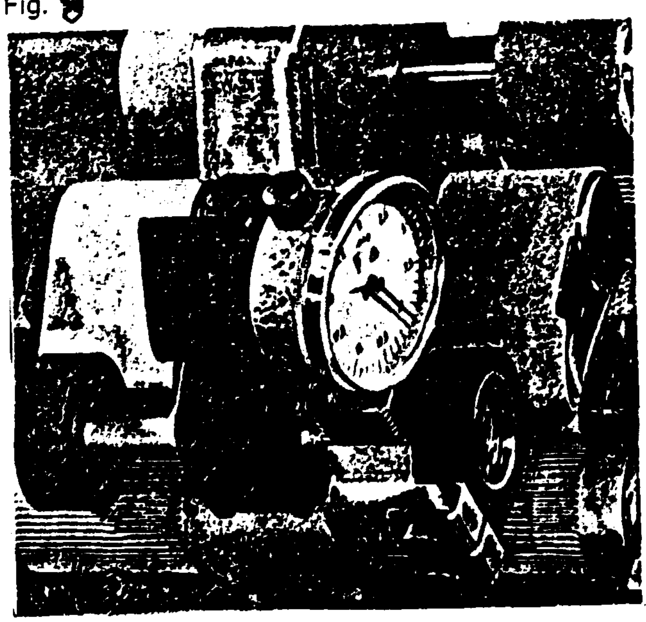
1	16
2	12
3	13

Fit measuring head, the arbor and the boss wheel. Place the apparatus on a plane surface and set the dial indicator at zero.

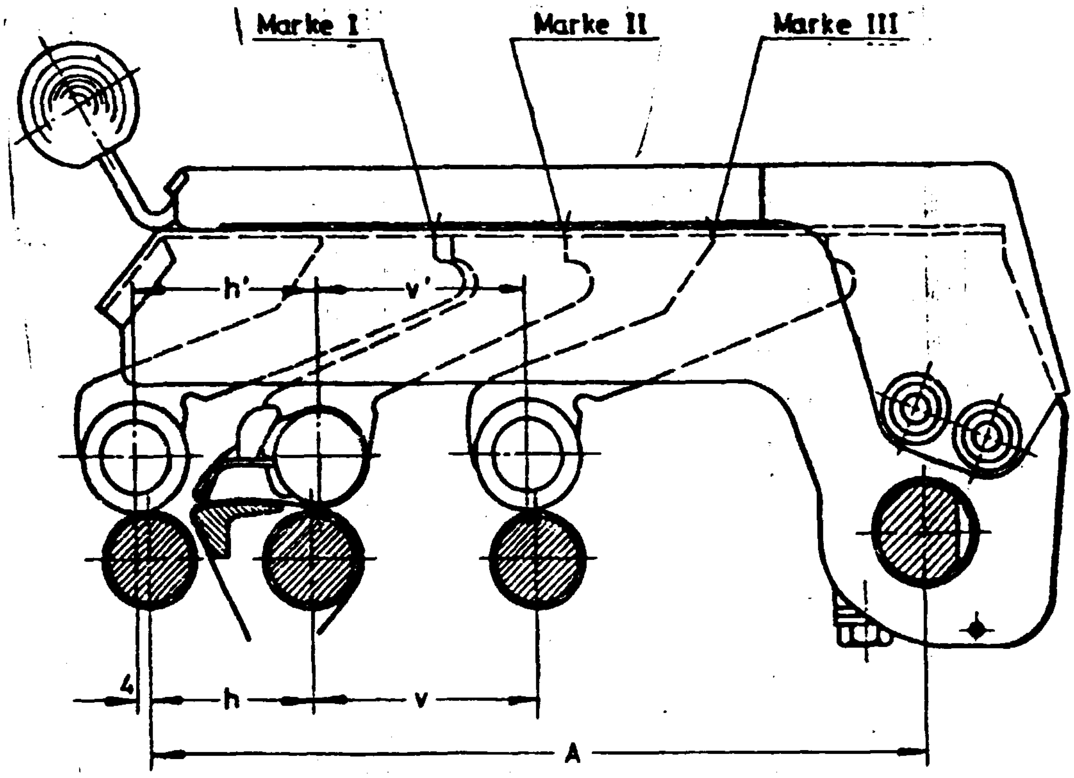
Fit the apparatus into the top roller retainer instead of the top roller.

Read the values in Kp on the dial only with the machine running and all top arms weighted.

Fig. 8



Setting Table for UT 600 Speed Frame,40 mm staple length (with suspended condensers).



A = 205 mm Constant		Mark I	= 186 Constant
h = 47 mm Constant	h' = 53 mm Constant	Mark II	= 147 Constant

v (mm)	v' (mm)	Mark III
50	45	118
51	46	117
52	47	116
53	48	115
54	49	114
55	50	113
56	51	112
57	52	111
58	53	110
59	54	109
60	55	108
61	56	107
62	57	106
63	58	105
64	59	104
65	60	103
66	61	102
67	62	101
68	63	100
69	64	99
70	65	98

GROUP 6. CHANGE POINTS.

6.1. SPINDLE SPEED:

To alter the spindle speed, the motor pulley is occasionally changed if required. Usually the motor pulley is changed if the fine counts or synthetic fibres are processed.

PROCEDURE FOR CHANGING:

- Unfasten the nut M2 of the tension Pulley bracket to release the tension on the belt.
- Loosen the two bolts on the Pulley.
- Remove the belt by Pushing & Pulling it out.
- Pull out the motor Pulley by light hammering or using the Puller.
- Mount the required size Pulley by pushing it on the motor shaft. The motor Pulley is gripped by the key on the motor shaft. Tighten the two bolts on the Pulley.

6.2. DRAFT CHANGE GEAR: (NW)

To calculate the total draft change gear. See the gearing diagram. By changing the D.C. (NW) we alter only the main draft.

PROCEDURE FOR CHANGING:

- Remove fixing screw of draft change gear (NW).
- Unfasten the screws of the crown gear bracket & the draft change gear, swing out the bracket (lever).
- Change draft change gear (NW).
- Swing in the bracket, adjust tooth clearance & tighten bracket screws.
- Tighten fixing screw on the draft change gear.

6.3. <u>BREAK DRAFT CHANGE GEAR: (B)</u>

To calculate the break draft change gear, see the gearing plan by changing this gear we alter the total draft.

<u>PROCEDURE FOR CHANGING:</u>

- Remove the nut on the B.C.D.W. (B).
- Unfasten screw on the bracket and the gear 'C'.
- Swing out the bracket along with the gears 'C' & 'B'.
- Take-off break draft change gear 'B' and fit the new gear.
- Swing in the bracket, adjust tooth clearance and tighten the bracket screw.
- Tight fixing nut on the break draft change gear.

6.4. <u>TWIST CHANGE GEAR:</u>

<u>PROCEDURE FOR CHANGING:</u>

- Open the cover of the twist gear (DW) and unfasten the twist gear nut.
- Unfasten the bolt on the bracket holding the carrier wheel (i.e. next to the twist change gear). Disengage the carrier wheel from twist change gear.
- Remove the twist gear and fit the new one.
- Engage the teeth of the carrier wheel with twist change gear and adjust the tooth clearance & tighten the nut of the bracket.
- Secure the twist change gear by fixing the nut.
- Grease the gear and close the cover.

6.5. LAY CHANGE GEAR: (WW)

With the lay change gear the speed of the up and down motions of the carriage are varied. The optimal lay change gear can be established only by trails when putting the machine into operation with materials. (See group 4)

PROCEDURE FOR CHANGING:

- Switch off the machine open the covers and clean the grease and fluff.
- Unfasten the lay gear nut.
- Loosen the nut on the carrier gear bracket and disengage it from next carrier gear which disengage lay gear on the other side.
- Replace the lay gear (WW) with required one and tighten the nut.
- Lift the carrier gear with the help of the handle on the bracket, adjust appropriate clearance between the carrier gears teeth and the lay gear teeth.
- Secure the lay gear by fixing the nut properly tight.
- Grease the gears and close the covers.

6.6. TENSION CHANGE GEAR: (RATCHET)

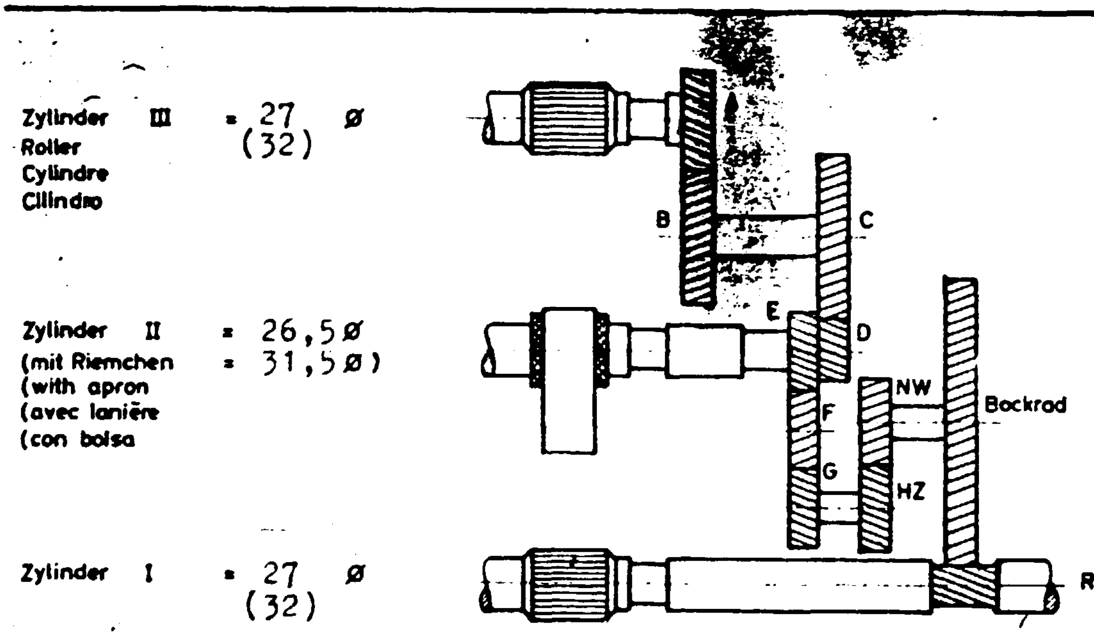
The tension change gear advances the cone belt and also regulates the bobbin speed. If the cone belt is to advance more per traverse, a smaller tension change gear must be fitted and vice verse. The optimal tension change gear can be established only by trails when putting the machine into operation with material.

PROCEDURE FOR CHANGING:

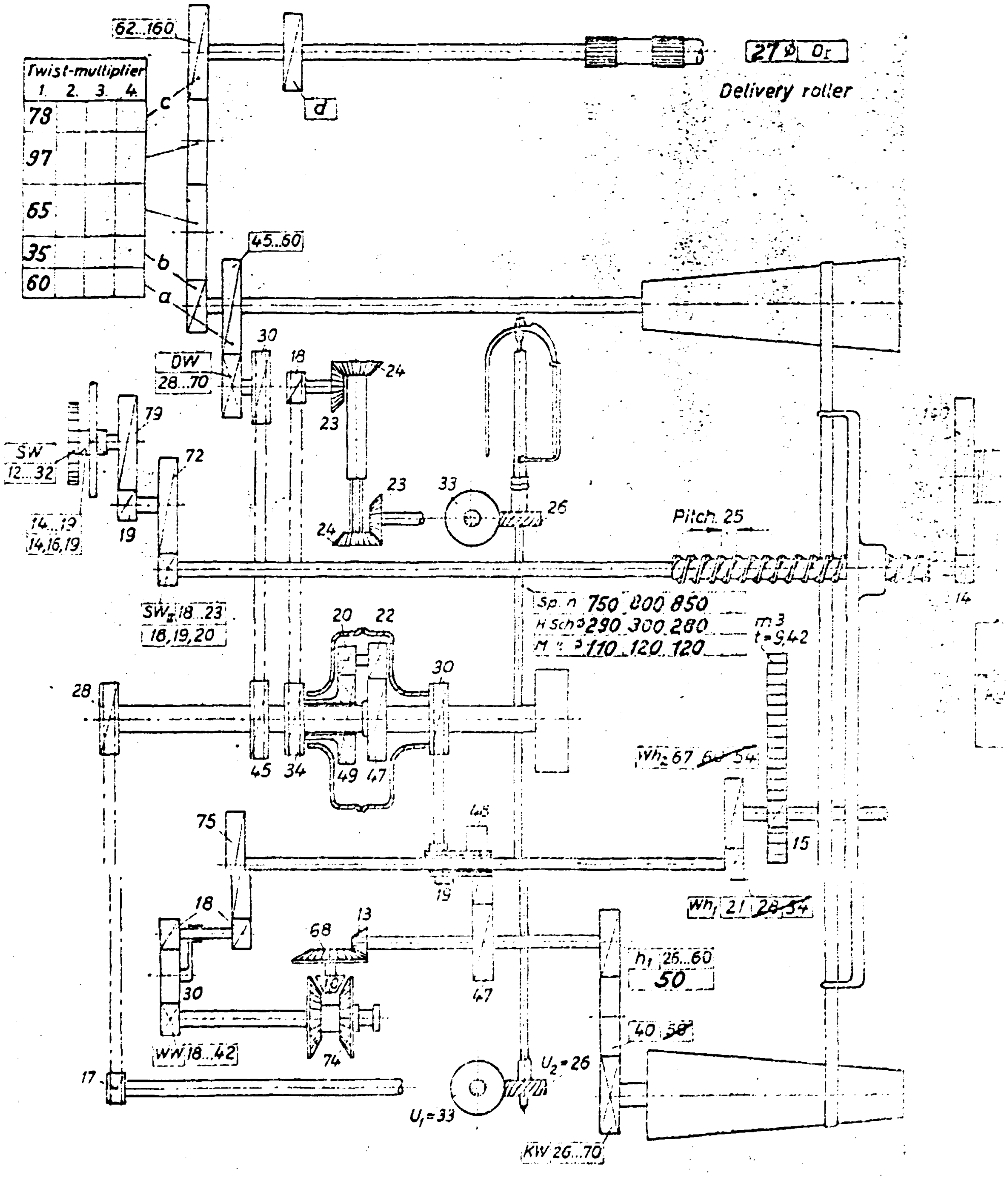
- Remove the tension change gear nut.
- Press the spring lever so that the stop bolt releases

the Tension change gear.

- Exchange tension change gear.
- Tighten nut secure.
- Adjust the stop bolts. (See Package Build).



Rad Gear Roue Rueda	Zähne Teeth Dents Dientes
A	25
C	49
D	21
E	30
F	30
G	28
Bockrad Crown wheel Roue de tête de cheval Rueda de corona	110
Ritzel Pinion Pignon Piñon	26



Interm. gear wheel   Gear wheel   Change wheel

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING
3. TROUBLE SHOOTING
4. PREVENTIVE MAINTENANCE
5. FRAME INTERFERENCE
6. QUESTIONNAIRE
7. CHARTS AND GRAPHS

ROVING FRAMES

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job planning abilities of the trainee.

b. Method.

The trainee is to walk the section of the Preparation Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.
The suggested number of each defect is as follows :

- Creel	5
- Traverse motion	5
- Flyers	5
- Top rollers	5
- Pressure Arms	5
- Aprons	5
- Trumpets, Condensers	5
- Clearers	5
- Building motion	5
- Bobbin shape	5
- Lift	5
- Tension	5
- Spindle driving gears	5
- Bobbin driving gears	5
	70

SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING

There should be sufficient twist in the roving to eliminate any danger of stretching as the bobbin unwinds. In general, where the overhead cleaning is used in the spinning room, additional twist may be quite desirable to prevent the disarray of the fibres in the strand by the air current.

INSUFFICIENT TWIST.

This is a condition which may have serious effects on the production in both the card room and spinning room. It may stretch the roving, excessive ends down in spinning, too much fly, and dirty frames. The apparent increase in production as a result of an increase in front-roll speed will probably be off-set by time lost in putting up ends, cleaning flyers and top rolls, and other incidental stoppages.

EXCESSIVE TWIST.

This condition will cause a loss of production as well as possible difficulties in the spinning room where undrafted roving will cause hard ends, grooved rolls, and needless waste and stoppages.
In case where the cotton is not up to standard or where there is an inherent fibre weakness, added twist may be helpful in maintaining production in the card room.
Finally, the longer the staple, the less twist, coarser rovings require less than the finer counts.

LAY.

There have been a large number of mathematical computations concerning the proper lay. However, competent card-room technicians have found that, when the lay is regulated on the first layer to show wood equal to one-half the diameter of the roving between two successive layers, a well-built, solid, and satisfactory bobbin will be constructed.

TENSION.

The regularity and control of the tension has an important effect on the quality of the roving as well as the production and efficiency of the roving frame. Tension is affected by several factors temperature, humidity, the diameter of the strand, and variations therein. For many years, designers and technicians have been seeking a means or assembly for levelling off the effects of these variations to the greatest possible extent.

Since the diameter of the strand of roving of a given weight is affected by the twist, changes in the twist gear must generally be accompanied by a change in the tension gear. Low twist requires a "slacker" tension than normal or hard-twist roving. Tight tensions should always be avoided because stretched and uneven roving will invariably be made. Furthermore, practical experience has shown that roving which has been stretched on the roving frame will also be stretched in the spinning frame creel.

While the first layer of roving is being placed on the bobbin, the tension must be tight enough to assure satisfactory winding on the bare bobbin at the second traverse where at least a portion of the winding will take place on a diameter smaller by the thickness of the half layer resulting from the start of the set. Tension is also affected by variations in bobbin diameter; therefore, bobbins should be systematically checked, at least once a year. Bobbins which are smaller in diameter than the standard will be soft at the start but, in general, will build up their diameter faster than normal until they reach the diameter of the remaining bobbins on the frame, after which tension will be equalized.

If the tension at the finish of the set is too tight, a larger tension gear should be used to eliminate this source of bad roving. The amplititude of vibration, from the nip of the front roll to the top of the front line of flyers, is about 1" to 1 1/2" wide when the tension is correct. If the tension at the start of the set is correct and undergoes a progressive slackening, the chances are that the cone belt is slipping as a result of lack of lubrication of the bobbins, gears, bolsters, and other moving parts driven by the bottom cone through the differential. Variations in tension can also be caused by a worm-out cone belt, lack of tension in the cone belt, or an inefficient or dirty cone belt.

Frequently cone-belt slippage is caused by the lack of lubrication or a poor fit in the bearing on the small end of the bottom cone.

EXCESSIVE END BREAKAGE.

Cut drawing; improper tension; loose couplings on spindle gear or bobbin gear shafting; rolls not set properly or accurately; broken teeth in head-end gearing; loose gearing slipping on shafting; cone belt defective or slipping; traverse motion badly set; roving running off top roll or apron, dirty gearing with roots of teeth with impacted waste; improper humidity. Excessive breakage at single ends is generally caused by worm-out top rolls; a can of faulty sliver, tangled or cut; worn bobbin gear causing jumping bobbins, laps on middle or back rolls, worn, rough, or hollow top rolls.

SLACK ENDS.

Cone belt slipping,carriage not moving uniformly due to faulty traverse motion; bolsters dry or clogged with waste; undersized bobbins; presser not correctly shaped or wrapped; single in the sliver; stretched roving.

SLUBS.

These can be caused by bad piecing at the drawing; drawing frame waste worked into the sliver; an end breaking at front-roll delivery and attaching itself to the neighboring ends; waste accumulating in the flyer eye and leg; dirty clearers; lack of pressure on top rolls.

CUT ROVING.

Rolls set too close for staple; broken teeth in the various gear trains; badly worn cap bars; gears improperly meshed, too deep, or the contrary; loose roll joints; excessive draft, worn top rolls, and lack of lubrication.

CARE OF BOBBINS.

Card-room bobbins are today an expensive accesory and should, therefore,receive the care and maintenance necessary to prolong their useful life and effective use.

Every card room should have the necessary bobbin gauges to assure the use of bobbins with standard dimension of the barrel, top bearing, and gear hole. If the barrels vary in size, it will be almost an impossible task to establish a satisfactory tension throughout the set.

Every time the frame hands make a manual adjustment of the cone belt to correct tight or loose ends, there is bound to be some loss of production and bad work. At least once every year the bobbins should be gauges for barrel dimensions; those which do not pass the "go and no go" test should be sent to the boiler room and destroyed. Wear at the top bearing will cause the bobbin to vibrate while in motion.

This "wobbling" creates many unnoticeable but harmful linear irregularities in the roving. The same effects are the result of worn gear holes. Under no circumstances should roving be removed by cutting with a sharp knife. No matter how carefully the knife is handled, it will not belong before the surface of the bobbin is full of splinters and rough places. The layers of roving remaining on the bobbin, if any should be rolled off.

Finally, the full bobbin doffed from the frame should be carefully packed and arranged in the truck. Throwing bobbins around causes, in the course of time, a lot of tangled bobbins and expensive roving waste. The trucks should be cleaned out every time they are returned from the spinning room, and plainly marked so that they will be used for transporting roving and nothing else.

TROUBLE SHOOTING.

The intent of this section is to aid in diagnosing and correcting trouble in the functioning of the Roving frame. To this end, trouble shooting tables have been developed which list trouble symptoms, possible causes, and suggested remedies. In the final analysis, however, the best trouble shooting aid is the thorough comprehension of the Roving frame and its principles of operation.

1. TROUBLE SHOOTING TABLES.

Should trouble occur, check first with the frame tender. His observations will usually aid in quickly diagnosing the source of trouble. If, however, the cause is still undetermined, reference to the following tables should, when coupled with the fixer's knowledge and logical analysis of the situation, result in localizing the source of trouble.

2. PRELIMINARY CHECK.

a) Visual inspection. Observe the three colored indicator lamps located on top of the head-end cabinet. Note which lamp or lamps are lit as an indication of the trouble. Observe the position of the top motion switches and the main power fuse disconnect switch. Check the roving on the bobbins.

b) Visually check for physical damage to such things as the flyers and the drafting system.

3. FUNCTIONAL ASSEMBLY TROUBLE SHOOTING.

Preliminary check.

The following checks must be made before proceeding with the applicable trouble shooting chart. Failure to perform these checks can result in long periods of machine down-time and hours of unnecessary labor.

a. Temperature and Humidity.

Often the cause of troubles, which appears to be caused by frame malfunction, is in fact the result of external forces. Temperature and humidity, for example, are effected by the physical location of a frame with respect to windows and doors. A continuous draft will effect the temperature and humidity in a given area, resulting in an abnormal number of ends down, because of the adverse effect on the sliver and roving.

b. Individual Slack Roving.

This would appear to be the result of not enough tension; however, often this is caused by incorrect sliver weight.

c. Lubrication.

Component failure and oil leaks often are caused by the use of inferior lubrication, not enough lubrication, or the use of the wrong type or weight lubricant which does not equal that recommend for prolonged trouble-free frame operation.

4. OVERALL TROUBLE SHOOTING CHART.

The following chart describes the checks that should be made to localize the functional area causing the trouble.

A. OVERALL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roving uneven or produced in slugs.	Overarm weight not correctly set.	Adjust.
	Top Rolls worn.	Replace worn rolls.
Layers or roving on bobbins are not uniform	Defective flyers.	Repair or replace the flyer.
Taper or diameter of package incorrect.	Defective builder.	Refer to Builder Trouble-Shooting Chart

B. MECHANICAL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Frames does not start (Power on)	Doors or cover open.	Close doors.
	Thermal overload relays knocked off.	Reset overload.
Roving uneven (slubby)	Top rolls not correctly set.	Adjust setting.
	Cots damaged.	Recover
	Top roll binding.	Relubricate or replace.
Layers on bobbin not uniform.	Roving not properly threaded on presser.	Rethread presser.
	Presser damaged.	Replace.
	Presser loose on hinge.	Replace or tighten.
Tension too tight on some ends.	Insufficient roll pressure.	Adjust pressure arm.
	Light sliver.	Correct at drawing.
Tension too loose on	Heavy sliver.	Correct at drawing.
	Plugged flyer tube.	Remove plug.
	Flyer grommet worn, glazed or not turning.	Replace grommet.
Improper tension-general.	Builder improperly set.	Check starting point, starting tension, escapement setting,builder weight.
	Improper lay or tension gears for size roving.	Change lay and/or tension gears.
End ribboning.	Package diameter too small.	Break back end and doff package.
Excessive sliver breaks	Creel not turning.	Check creel drive.
	Creel turning too slowly.	Change sprocket.
	Bad piecings.	Instruct operator.
	Defective sliver.	Check at drawing.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Excessive sliver breaks	Tension too tight or too slack.	Change tension gear or builder settings.
	Improper lay.	Change lay and/or tens: gear.
	Insufficient twist.	Change twist gear.
	Plugged flyer tubes.	Remove plugs.
	Presser improperly threaded,worn or sticking.	Check and correct or replace.
	Defective sliver	Check at drawing.
Cutting ends on start-up.	Lost motion in flyer drive system.	Check gears, key in he end drive gear.
	Starting too fast	Call the electrician.
Ends slacken at start-up.	Builder not wound back to proper starting point.	Check and, if necessar adjust
Run over or loop over.	Builder gears packed with lint or set too deeply.	Clean or adjust settin (Refer to Chapt.5,
	Builder weight ob-structed.	Check and correct caus
	Builder triggers or escapement improperly set.	Check and adjust.
	Frame stopped on change.	If by stop motion, res traverse limit switch.
	Defective presser	Replace.
Incorrect full package	Full bobbin lint limit switch improperly set or defective.	Adjust or replace.
Excessive presser wear.	Presser run against bare spindle.	Never run frame withou bobbins on spindle.
Steel rolls fail to turn.		
	Twist gear out of mesh	Mesh twist gear.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual flyer does not rotate.	Drive gear damaged.	Replace gear.
Excessive flyer vibration.	Flyer out of balance or warped.	Replace flyer.
	Damaged flyer gears.	Replace gears.
Spindles fall or fail to traverse.	Builder in neutral.	Reset builder
	Lay gear out of mesh.	Reset lay gear.
	Defective compound.	Replace compound.
	Defective key or gear drive shaft in main gear case.	Replace key or gear.
Yellow light stays on when frame running.	Low oil pressure.	Check oil level, oil line fittings, oil pump

C. BUILDER.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Taper of package incorrect.	Incorrect setting of the slides.	Adjust.
	Builder weight cable defective.	Replace cable.
Tension on bobbin too loose or too tight; ends down.	Incorrect ratchet setting.	Replace gear.
	Starting tension incorrectly set.	Check adjusting screw.
Package diameter too large or too small.	Defective or incorrectly bobbin knock off switch.	Replace or readjust.

D. SPINDLE AND BOBBIN.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual bobbin fails to rotate.	Bobbin not seated on	Seat bobbin correctly.
	Defective bobbin drive bolster.	Replace spindle.assembly
	Drive shaft bobbin gear defective.	Replace gear.
None of the bobbins rotate.	Defective compound.	Replace compound.

E. FLYER.

FAULT	POSSIBLE CAUSE	POSSIBLE REMEDY
Individual flyer does not rotate.	Defective flyer drive gear on bolster.	Replace flyer gear
	Drive shaft flyer gear defective.	Replace drive shaft flyer gear.
None of the flyers	Defective top universal joint.	Repair or replace universal.
Flyer vibrates and shakes when operating.	Incorrect alignment.	Check alignment.
	Bolster or foot step defective.	Repair or replace bolster or foot step.
	Teeth of flyer gears stripped.	Replace defective gear.
	Flyer out of balance or warped.	Repair.
Excessive wear of presser.	Misalignment of flyers.	Check alignment.

F. DRAFTING SYSTEM.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Roving uneven; slugs of roving; ends continue to come down.	Overarm weight not set correctly.	Adjust arm.
	Top roll worn. <u>CAUTION</u>: Never buff the middle top roll.	

G. CREEL.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Portion of creel fails to feed sliver.	Creel coupling loose or defective.	Repair or replace coupling.
Entire creel drive fails to operate.	Drive chain or chains defective.	Repair or replace defective chain or chains.
	Change gear for creel drive out of mesh.	Mesh gears.
	Drive shaft or needle bearing defective.	Replace defective shaft or bearing.
Creel rolls do not turn smoothly.	Loose chain.	Reset chain tension.

H. LUBRICATING SYSTEM.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY.
Components in main gear case or builder defective because of lack of lubrication.	Oil level below recommended quantity.	See lubrication schedule
	Incorrect type lubricant.	
	Oil pump defective.	Repair or replace pump.
	Oil lines blocked or open.	
Excessive wear of shafts,flyers,bobbins, and spindle gears.	Oil level below recommended.	See lubrication schedule.
	Incorrect type lubricant.	
Excessive wear of drafting element parts.	Recommended lubrication schedule not followed.	See lubrication schedule.
	Incorrect type lubricant	
	Open or incorrect size oil line.	Repair or replace oil line.

I. BASIC MALFUNCTIONS.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Surface Breaks:	Tension too tight, lay too close or too open.	Change tension gear.
On Bobbin.	Insufficient twist.	Change twist gear.
End Down.	Bad piece-up on sliver.	Piece- up again.
	Poor quaility stock.	
	Stock weight to light.	Replace with correct weight sliver.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
Cutting ends on start-up.	Output shaft flyer gear loose or defective.	Tighten gear key; replace gear.
	Top universal joint defective.	Replace defective universal joint.
	Defective compound.	Replace compound.
Ends slack on first on bobbin.	Bobbin tension incorrectly set.	Adjust starting tension screw.
	Frame not wound all the way back.	Rewind ratchet.
Ends too tight.	Bobbin tension incorrectly set.	Check tension bar.
Ends slack while frame is running.	Spring pin sheared in compound.	Replace compound.

4. PREVENTIVE MAINTENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per week.

In order to help the fixer to keep a record of his progress in preventive maintenance,the form shown on page 87 has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame,the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF THE ROVING FRAMES (SIMPLEX) PREVENTIVE MAINTENANCE

FRAME N° ...... FIXER .... DATE ....

STANDARD	POINTS	
5		A. Creel
10		B. Condensers
10		C. Top Rollers
10		D. Pressure Arms
8		E. Clearers
8		F. Flyers
5		G. Lift
3		H. Traverse Motion
7		I. Level of Bobbin Rail
5		J. Shape of Bobbin
2		K. Condition of Driving Belts
3		L. Condition of Cone Drum Belt
2		M. Starting Point of Cone Belt
5		N. Tension
5		O. Spindle Gears
5		P. Bobbin Gears
5		Q. Spindles
100		

MILL	MAINTENANCE WORK REPORT		
WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE:	
Department: Preparation	Type of machine: ROVENG INGOLSTADT	Machine No.	Type of maintenance:
Persons per crew:	Expected time:		

CYCLE

2 MONTHS(8 wks)										Yearly (48 weeks)				
No	Machine Part	G	A	R	No	Machine Part	G	A	R	No	Machine Part	G	A	R
1	Top rollers													
2	Pendulum arm										8 Week maintenance			
3	Cradles													
4	Aprons top + bot.									1	Top rollers			
5	Clearers top + b.									2	Pendulum Arm			
6	Tension rolls									7	Bottom rollers			
7	Bottom rollers									11	Bobbin rail			
8	Condenser + sliver guides									14	Spindles			
9	Traverse bar									15	Spind.+Bob gears			
10	Covers									16	Head stock			
11	Bobbin rail									17	Cones			
12	Bobbin guides.									21	Flyers			
13	Chains + rail pulleys									22	Gears			
14	Spindles									23	Gap gears			
15	Spind + bob gears									24	Motors			
16	Head stock									25	Electr.apparatus			
17	Cones									26	Bearings			
18	Cone belt									27	Roving compound			
19	Belt drive									28	Traverse drive			
20	Break									30	Levelling			
21	Flyers									32	Lubrication			
22	Gears													
23	Gap gears													
25	Electr. apparatus													
27	Roving compound													
31	Creel													
32	Lubrication													

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

1. Pressure Top Rolls
   It is necessary to buff the top rolls after 3-4 months in order to have a perfect surface which is very important. In case that the top rolls are still in good condition we recommend to clean them in order to remove the grease and cotton wax and avoid lap ups.
   Attached is a recommended cleaners list.
   Remove the accumulation of fibres on the roller shafts.

2. Pendulum Arms
   Clean only the pendulum arms.
   The setting of them is done yearly.

3. Cradles
   Dismantle the cradles.
   Repair damages and if necessary replace them.

4. Top and Bottom Aprons
   Check the condition of the aprons and clean them.
   Replace the damaged, cut or worn out.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

5. Top and Bottom clearers

Check the condition and operation of them.
Replace the damaged or defective ones.

6. Apron Tensors

Remove and clean the shafts of the rollers.
Check the condition of the cradles if necessary center them in order to have the apron at the center of the fluted part of the second roll.

7. Bottom Rollers

Clean with a stiff brush the fluted rollers
Remove all dirt from the flutes.

8. Condensers

Check the condensers and inlet condensers
Replace the defective ones. Check if they are of the proper size and if properly positioned.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

9. Traverse

Clean the guiding rails of the traverse and lubricate with mólycote
Check functioning condition
The traverse movement must be 12 m/m

10. Draft Roller Gearing Covers

Clean and adjust if necesary

11. Bobbin Rail

Clean and check the bobbin rail. The bobbin rail must move freely.
Clean carriage guide and apply Molykote.

12. Lift Rail

Clean and check the lift rail and lubricate with graphite

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

13. Chains and Rollers

Clean and check the chains, rollers and counter weights of the bobbin rail
Lubricate afterwards
For doing that, support the carriage and let it sit down on supports.

14. Spindles

Check the free movement of the spindles in the spindle collars and lubricate.
If it is tight remove the spindle, clean and lubricate the spindle collar.
Raise spindles, check oil level in foot step bearings.

15. Bobbin and Spindle Driving Gears

Clean the driving gears without dismantling them
Lubricate afterwards

16. Head Stock

Clean thoroughly the head stock without dismantling the parts.
Lubricate afterwards

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

17. Cones

Check condition of the cones and adjust if necessary.

18. Cone Belt

Check if the belt is not worn out, damaged or cut

Replace if necessary

Clean the inside with a brush or solvent.

Check loading of cone drum belt.

19. Cone belt movement

Clean without dismantling the cone belt movement

Check for the easy movement

Clean and inspect cone belt fork.

20. Brake

Check and adjust the brake (if existing)

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

21. Flyers

Clean thoroughly the flyers and check the condition of the spindle slot fix if damaged
Align flyer spindles by bringing the flyer driving slots in line.
Thorougly clean the flyers checking the height of the seat on each one.

22. Gears

Clean all gears without dismantle them. Replace the defective ones.
Grease them afterwards.

23. Reversing Gears

Clean without dismantling

25. Electrical Apparatus

An electrician must check the electrical apparatus.
He must also clean with compressed air the electrical panel and check all contacts.
Check the functioning of the photo-cell (if existing).

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING INGOLSTADT	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

27. Differential (roving compound)

    Change the oil or grease it.

31. Creel Drive

    Dismantle the covers of the creel drive and clean the gears.
    Check condition of the creel rollers.

32. Lubrication

    Make a general lubrication after the maintenance.

MILL	DESCRIPTION OF THE WORK TO BE DONE	96.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

GENERAL

Repeat all the elements of the 9 week maintenance and also the following

1. TOP ROLLERS
   Buff the rollers and grease the rop roller bearings.
   Every 2 years clean the bearings with a mixture of 90% gasoline and 10% spindle oil.
   Grease them again once the bearings are clean and dry.

2. PENDULUM ARMS (SPRINGS)
   Set as follows the pendulum arms:
   (a) Check the height of the pressure arms. The indicator lever must remain between the two lines close to "0".
   (b) Check the pressure with the dial gauge.The oressure must be: 16-12-13 Kgs.

   see attached design B

7. BOTTOM FLUTED ROLLERS
   Check and eventually reset the settings of the bottom rollers.
   Check also the distance between the front roller and pendulum arm shaft (it must be 205 mm).

11. BOBBIN RAIL
    Check the leveling, rest if necessary.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING FRAMES INGOLSTADT	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

14. Spindles

Change the spindle base oil.
Dismantle all spindles and check the spindle collars (base)
Replace the defective ones.

15. Driving Gears

Dismantle, clean, and grease the driving bobbin and spindle gears.
When re-assembling check and set properly the meshing.

16. Head Stock

Dismantle all gear and clean all elements such as shafts, keys, pins etc. Replace the defective ones.
When re-assembling check and set the meshing.

17. Cones

Check the conditons of the bearings and cones.
Clean and grease the bearings.
Repair damages.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVING FRAMES INGOLSTADT	Type of maintenance: YEARLY

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

21. <u>Flyers</u>

Clean the inside of the hollow arm and nose (where passes the sliver)
Repair or replace the damaged flyers and presser.

22. <u>Gears</u>

See point 16.

23. <u>Reversing Gears</u>

See point 16.

24. <u>Motors</u>

The electrician will make the yearly revision of the motor
He will clean the inside of the motor and check, rotor, stator and bearings.
Grease the motor bearings.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING FRAMES INGOLSTADT	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

25. Electrical apparatus

To be revisioned.

26. Bearings

Check all bearings as per instructions of the manufacturer

Replace the worn out bearings
Grease afterwards.

27. Differential (roving compound)

Remove the oil and open the compound.
Check gears and keys. Clean the inside, close it and put back
fill oil.

28. Traverse Drive

Dismantle the drive, clean and check the parts.
Grease afterwards.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVING FRAMES INGOLSTADT	Type of maintenance: YEARLY	
Working minutes: ;	Persons per crew: 4 persons	Down time in hours: 8 hours

30. Oil Level

Check the oil level.

32. Lubrication

Make a general lubrication after the maintenance.

Suitable clearners for the top rollers
- clean petrol
- gasoline (boiling point 100 - 130°C)
- methyl acetate
  ethyl acetate

Attention

These cleaners are explosive

Instead the following they dont burn

ethylene trichloride
perchlorethylene

FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.

for case b. 10 min.

for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames:		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and help the trainee to understand his job.

QUESTIONS:

1. <u>What type of working uniform, suits a mechanic</u>?

   Short sleeve shirt.

   Tight trousers, with leather shoes.

2. <u>What tools will be required for the mechanic</u>?

   Set of : Tool box
   Metric allen keys
   Screw drivers star and flat
   Spanners (open and close)
   Hammer (soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Callipers
   Spirit level

3. <u>How a mechanic should file</u>?
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.

6. Some soft metal pieces should be used in between the jaws of the vise.

4. <u>What are the specifications of the machines ?</u>

RIETER 1967 and 1969 - GS and F 1/1. Ingolstadt 1958 and 1970.

1. Drafting system: Sussen UT 600 3/3 Double Apron.
2. Drive: V-belt and flat belt.
3. Lift: 250 mm.
4. No. of spindles: 132.
5. Flyer type: Aluminum.
6. Builder motion: mechanical.
7. Type of suction: none.
8. Clearer rollers: yes.
9. Bobbin size: Ø 40 mm. Length 270 mm.
10. Hank roving running on the roving frames 0.75 upto 1.08 C
11. Hank sliver on various frames: 0.144 upto 170

5. <u>How to stock the lubricants ?</u>

Different colours should be used for different lubricants.

6. <u>What are the functions of Roving frame ?</u>

To convert sliver into a soft twisted strand, wound on package, for easier handling at ring creel.

1. Drafting.
2. Twisting.
3. Winding.
4. Building.

7. <u>How you classify the lubricants according to use ?</u>

Recommended lubricants should be used.

8. <u>What should be the criteria for break down maintenance ?</u>
Mechanic should first handle the machine which requires lea: t time, so that, down time is reduced.

9. <u>What are the basic Roving adjustment of Frame ?</u>
   1. Level and alignment of machine.
   2. Motor alignment and belts.
   3. Bobbin carriage alignment.
   4. Spindle alignment.
   5. Bottom roll setting and alignment 47-58 mm.
   6. Top roll/Settings: Front + 4 ; Middle:-2 mm, Back + 3 mm.
   7. Top arm pressure adjustment at: 0.
   8. Adjustment of gearing head.
   9. Building motion adjustment.
   10. Traverse motion adjustment 10-15 mm.
   11. Creel tension: 1.0.
   12. Flyers and pressor alignment & balancing.
   13. Adjustment of top and bottom clearers.
   14. Spindle and bobbin driving gears alignment: use gauge on model 5.
   15. Adjustment and checking of pressure: 16-12-13 Kg.

10. <u>What are normal changes required at Roving frame ?</u>
   1. Total draft change wheel.
   2. Break draft change wheel.
   3. Creel tension change wheel.
   4. Twist wheel.
   5. Lay gear.
   6. Lifter wheel.
   7. Tension gear (ratchet).
   8. Top and bottom roller settings.
   9. Top roller pressure.
   10. Spacers.

11. <u>What the following expressions mean ?</u>

a. Draft ?

b. Twist ?

c. Hank Roving ?

a. The amount of stretching applied to the thick sliver to produce a roving.

b. The twist means: one inch length of rove is twisted as many times as indicated, e.g. 0.8per inch.

c. The count of sliver.

12. <u>What is draft and where does it occur ?</u>

The draft is the drawing out of the fibres and it takes place in the drafting zone (between back and front rollers).

13. <u>How many spindles per machine ?</u>

Depending on machine 132, 172 (Intermediate)

14. <u>What is the weight of a bobbin ?</u>

1¾ lbs. approximately on 10x5

15. <u>What is the weight of a can & how many yards of sliver are in it?</u>

Approximately 12 lbs.

16. <u>How many doffs per can ?</u>

Approximately 7.

17. <u>How many R.P.M. does the flyer do ?</u>

Approximately 700 revolutions per minute.

CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 109) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 111) for recording the performance of the trainee on Preventive Maintenance.

   c. The Management Control Chart (see page 113) for recording the progress of the trainee on the exercises of Phase I and Phase II.

a. <u>The Complete Defect - recognition Schedule</u>.

As explained in the chapter on "Diagnostic Development" (page 72 of Phase II). the trainee has to repair at least five defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
14 reasons x 5 defects.
Per reason = 70 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 109) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day. That line is called the "target-line".

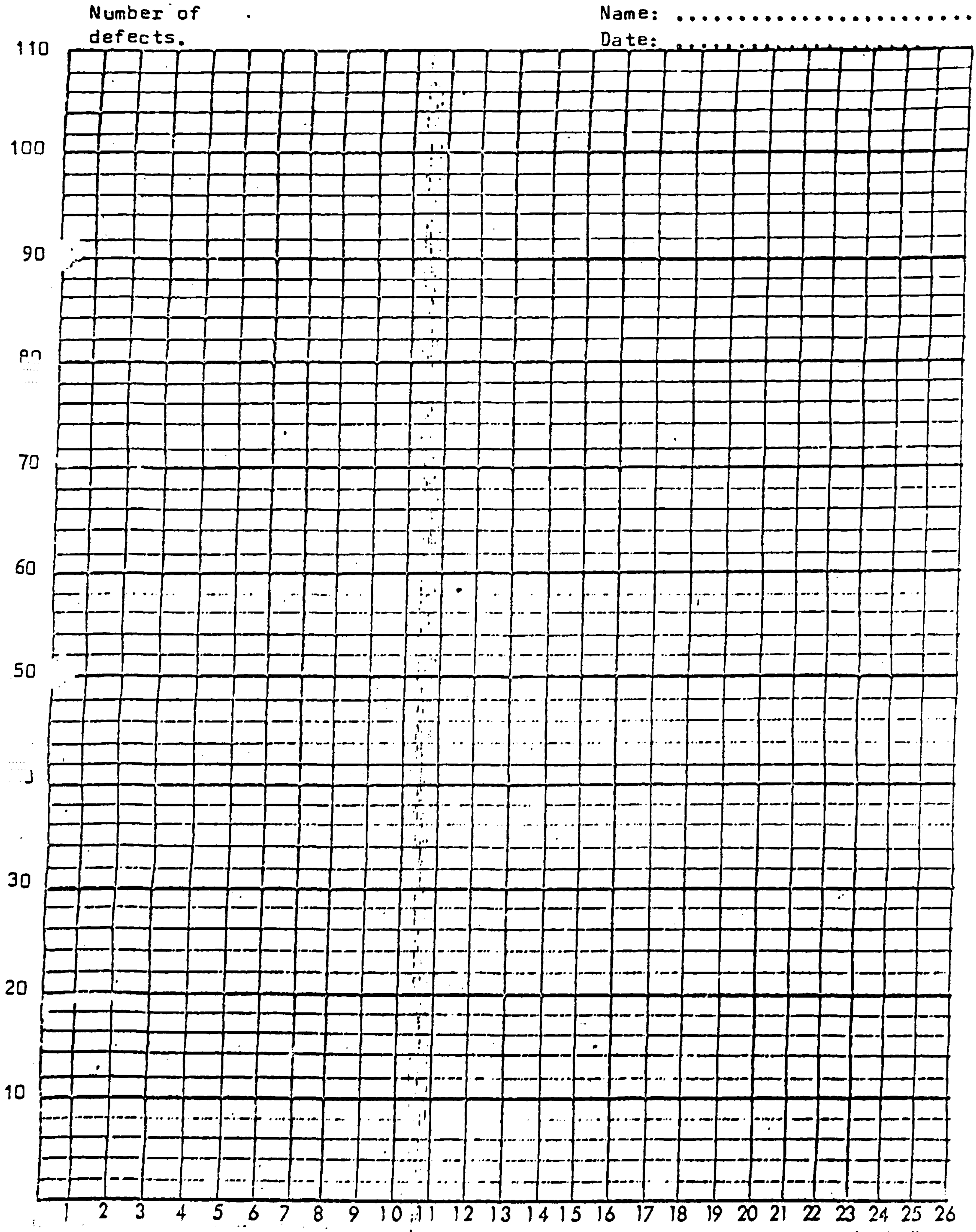
As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 70 defects within 18 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

COMPLETED DEFECT RECOGNITION SCHEDULE

Name: ....

Date: ....



b. The Preventive Maintenance Results Efficiency.

In the chapter on "Preventive Maintenance (see page 86 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Eva uation on Preventive Maintenance" as shown on page ; of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

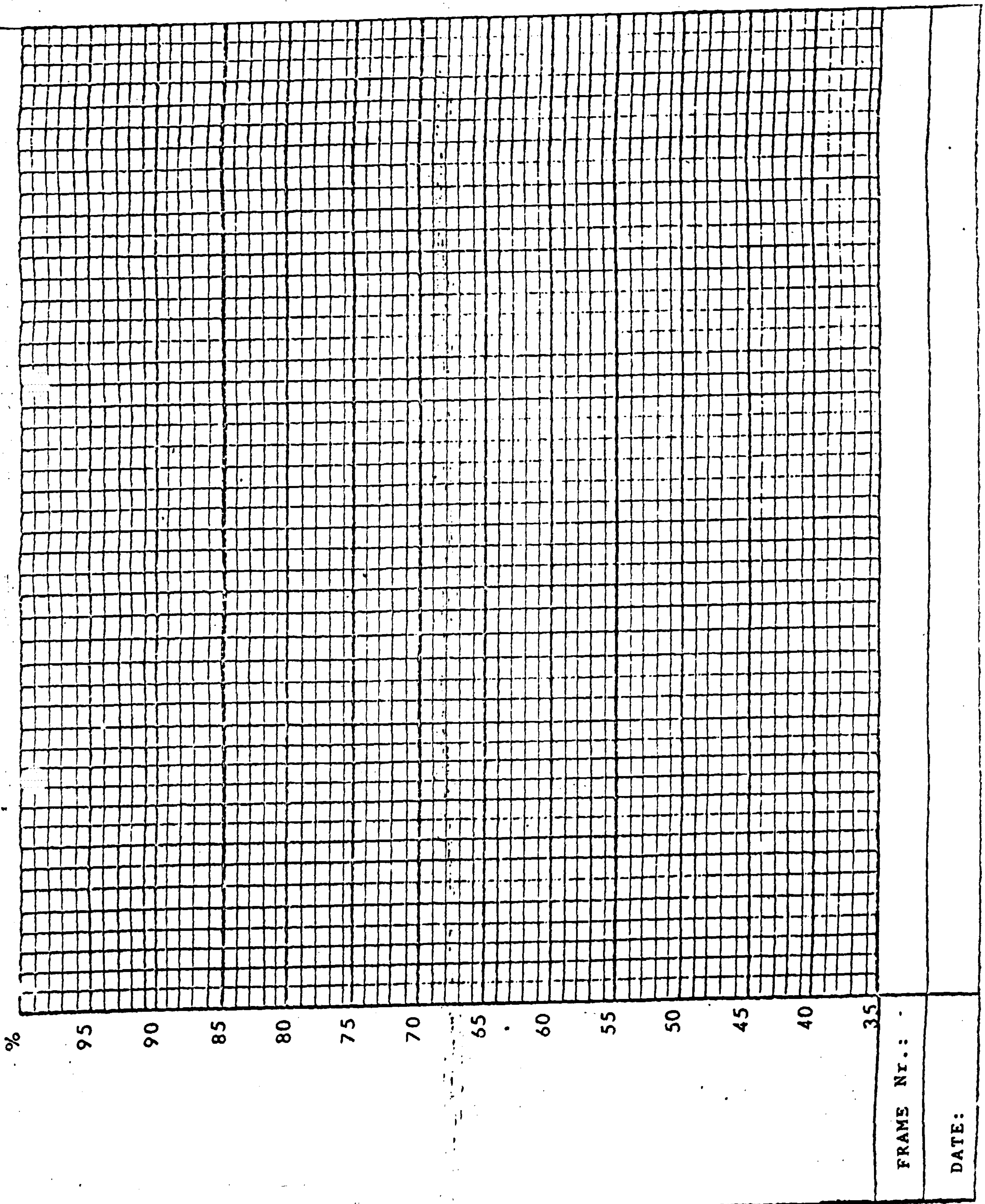
That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

NOTE:
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

The Preventive Maintenance Results Efficien...

Name:..............................



c. Management Control Chart.

The Management Control Chart, as shown on next page is the "log-book" of the course.

The chart is divided in two main parts, namely Phase I and Phase II.

PHASE I.

The number of days has been already inscribed on the chart, but the Instructor has to inscribe the dates, every day at the end of that day. All the six groups of exercises in Phase I are shown on the chart. When one group of exercises has been terminated by the trainee, the Instructor inscribes the frame number (s), on which the exercises were carried out, in the square, provided for it, under the group of exercises concerned and the date when the exercises were terminated.
Also he fills in the time spent on that particular group of exercises in the Training Centre (behind TC) and in the Spinning Room (behind SR).

PHASE II.

Here again the Instructor has to inscribe the dates under the number of days at the bottom of the part.
This part of the chart is divided into two sections:

a. Preventive Maintenance.
When the trainee has carried out preventive maintenance on a frame, the Instructor fils in the number of the frame, the score - the percentage of the evaluation - and the date when it was carried out.

b. Diagnostic Development.
For each type of defects recording columns appear on the chart. At the end of the day, the Instructor fills in the loom, number and date, on which the particular defect-repair has been carried out by the trainee. At the end of the course each type of defect has to be tackled as per schedule (see Diagnostic Development on page . of Phase II).

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WERNER AMPS   ROVING... FRAMES INGOLSTADT   MANAGEMENT CONTROL CHART   NAME......................

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

PHASE : 1

1		2		3		4		5		6	
A:THE DRIVE(OLD M) B:THE DRIVE(NEW M) C:CONE BELT DRIVE		A:BOBBIN CARRIAGE AND DRIVE		A:SPINDLE DRIVE B:FLYERS		A:THE RATCHET MOTION(MODEL 5)		A:DRAFTING SYST. UT 600		A:CHANGE POINTS	
FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE
HOURS											
TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......	TC :......	R :......

PHASE : 2   PREVENTIVE MAINTENANCE

DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE

DIAGNOSTIC DEVELOPMENT

APRONS	TOP ROLLS	TRAVERSE	PR.ARM	BUILDING	TRUMPETS	CREEL	FLYERS	CLEARER	B.SHAPE	TENSION	LIFT	SP.GEARS	BOB.G.

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

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(8 of

FINAL REPORT

ON

THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME VIII OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(8 of 10)

FINAL REPORT ON THE DEVELOPMENT OF A TEXTILE TRAINING SYSTEM IN PAKISTAN

VOLUME VIII OF TEN VOLUMES

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PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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MANAGEMENT CONSULTANTS

MANUAL VII

WERNER AMPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

ROVING FRAMES FIXER'S MANUAL

SACO-LOWELL ROVEMATIC

Prepared for:

T.I.R.D.C. (UNIDO)
KARACHI - PAKISTAN

Prepared by:

WERNER INTERNATIONAL
BRUSSELS - BELGIUM
NEW YORK - U.S.A.

MARCH 1981.

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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PERSONNEL SPECIFICATION

Job:	ROVING AND DRAWING FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum _ months good roving tender or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy card room.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

ROVING FIXER'S MANUAL

1.0 OUTLINE.

1.1 OBJECT.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 SELECTION.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months GOOD spinning/roving experience. The recommended test results are shown in the personnel specification.

1.3 TRAINING COURSE.

The course covers the following aspects:

1. Knowledge in general.

2. Manual Skills

3. Basic of Engineering.

4. Mechanics tasks and responsibilities.

1.4 INSTRUCTOR.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (4 weeks).

1.5 GENERAL.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice

to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you.
Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.
Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

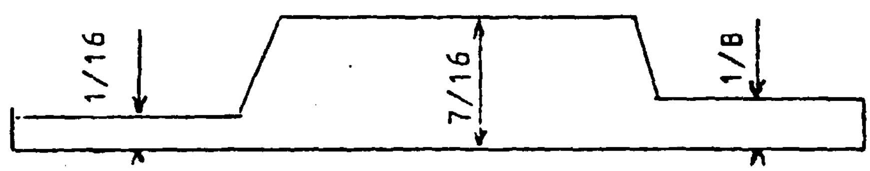
3.0 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool,box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.
A fixed position or datum is used, e.g. the position of the top rollers.
Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.
When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

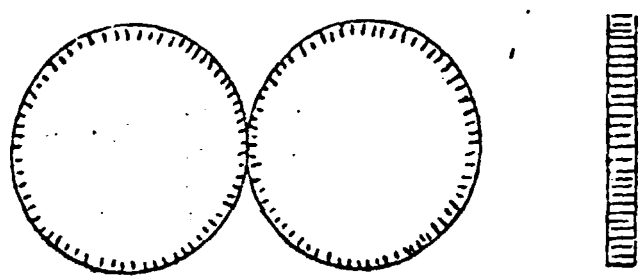
Bearings:
plan or roller
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

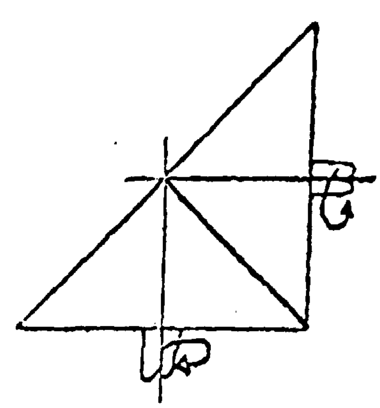
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



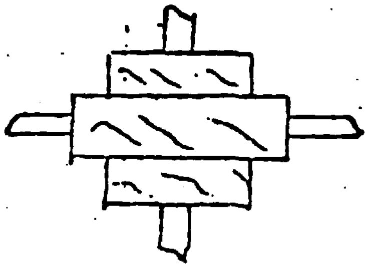
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



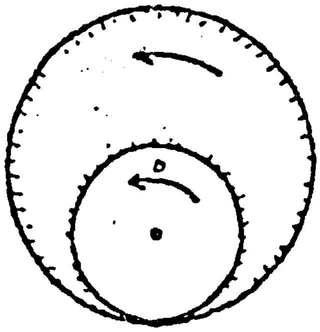
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



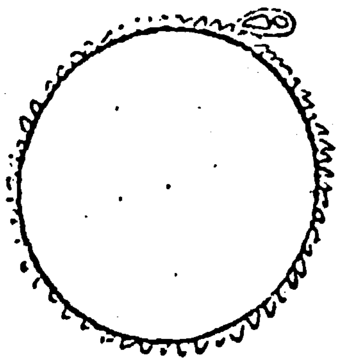
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg.		120 Kg.
	4 m.	6 m.

180 Kg.		90 Kg.
	4 m.	? m.

180 Kg.		? Kg.
	4 m.	5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

ROVING FRAMES

PART 1 PHASE 1

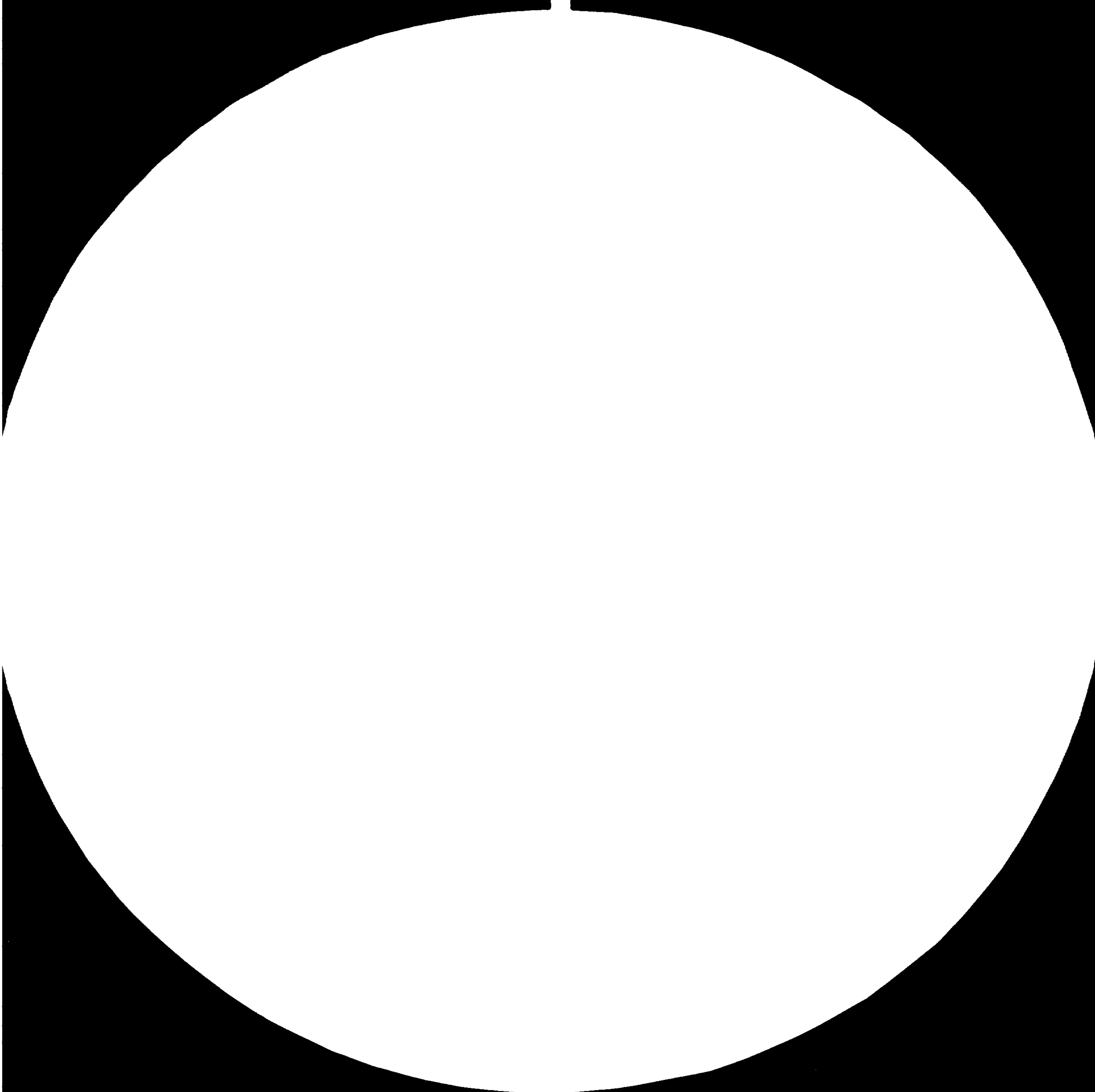
A. **PURPOSE.**

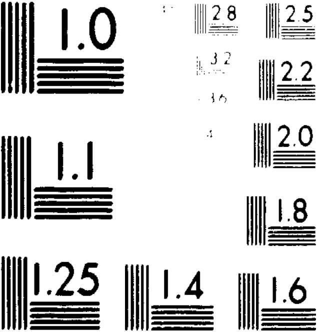
To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. **METHOD.**

Major frame adjustments are divided into 6 groups :

1. A. The Drive.
2. A. The Builder.
3. A. Spindles.
   B. Flyers.
4. A. Main Gear Case And Shafts.
   B. The Compound.
   C. The P.I.V.
5. A. Drafting System.
   B. Draft Gearing.
   C. The Traverse Motion.
6. A. Safety Devices.




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all six (6) groups of adjustments so that when complete, the trainee has completely set up six (6) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

PHASE-I OF THE TRAINING

GROUP-1:

A. THE DRIVE:

1. DESCRIPTION:

The Rovematic roving frame is normally powered by a 20-hp electric motor, voltage and cycles conforming to the mill's power supply. Power is transmitted to the frame's mechanisms by means of belts and sheaves. Multiple V-belts are usually used for the constant speed drive, with a single wide belt employed for the varible speed drives. There are two types of these varible speed drives, the principal difference being in the method of changing speed. Both have varible pitch driven sheaves and means of changing belt tension to effect a change in the frame's operating speed.

One type of drive automatically changes the speed of the frame at a predetermined point of the package build for each set of bobbins. It is controlled by the DuoSpeed Automatic Regulator. For this drive, the motor is mounted on a tiltable base. An arm and crank, driven by a small gear-motor, cause the base to tilt forward or backward to move the motor closer to or further from the driven sheave. Tilting the motor toward the driven sheave slackens the tension of the drive belt. The spring inside the sheave pulls the flanges closer together, forming a larger working diameter. The action reduces the rpm of the driven sheave increases belt tension, spreads the flanges to create a smaller working diameter, and speed the frame. The change point and ratio of speeds are adjustable and can be set to local requirements.

The second variable speed drive is recommended for frames that have frequent changes requiing different speeds. The motor mount fits into bevelled grooves in the base. A long screw is run in or out to move the motor forward or backward. The belt tension causes the driven sheave flanges to move in or out, changing the working diameter of the sheave and regulating the speed of the frame.

The Rovematic drive consists of a base-mounted electric motor, driver and driven sheaves, belts, and clutch. The driven sheave is attached to a stud, on the opposite end of which is a 21-tooth drive gear meshed with a 54-tooth gear on the main shaft.

2. PURPOSE:

The drive transmits power to all components of the frame except the wind down mechanism, which has a separate motor. The clutch ensures smooth starts and stops and absorbs some of the stress of rapid acceleration.

3. PARTS:

See figures IA.1 and IA.2.

4. SETTING:

4.1

Align the driver and driven sheaves with a straight edge or othe perfectly straight object. Any misalignment will cause frayed belts and loss of power. Keep the belts tight. Adjustment to belt tension is made by loosening the motor and sliding it forward or backward on the base.

4.2 DUOSPEED AUTOMATIC REGULATOR:
(See Figure IA.1)

Set the switch at the P.I.V. cam arm in the head end cabinet to initiate the change from fast to slow speed at the desired point of the package build. The small outside cam on the crankshaft of the gear reducer determines the minimum slow speed. Set this cam so that it will stop the control motor with the arm in correct position for slow speed desired. For instance, on an FB Model frame with an 8" diameter drive sheave, the arm in vertical position will give a speed of 1360 RPM. With the arm lowered all the way to horizontal position, the flyer speed will be 680 RPM. Therefore, the ratio between these speeds is determined by the angle of the arm at each speed. The inside cam determines the high speed and should be set to stop the arm at the correct position. When the P.I.V. is reset at the doff, the arm is automatically moved upward until stopped by this cam.

4.3 MANUALLY ADJUSTABLE VARIABLE:
SPEED DRIVE: (See Figure IA.2)

To set this drive, turn the adjusting screw at the back of the motor base counterclockwise to move the motor away from the driven sheave and speed the frame. Turn the screw clockwise to move the motor closer to the driven sheave and slow the frame.

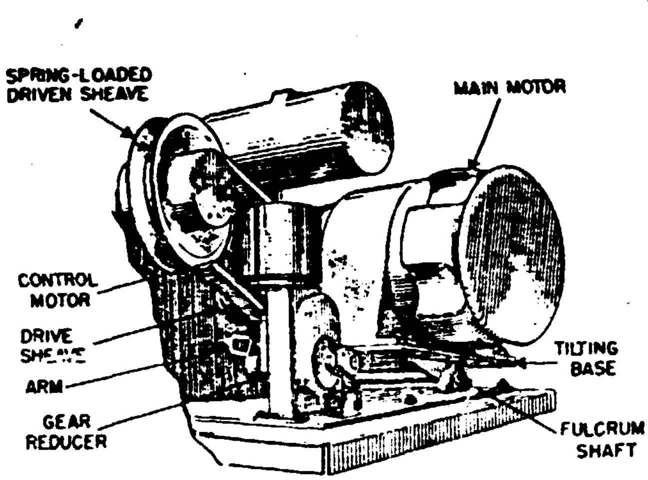


Figure 1A.1 Variable speed drive with the DuoSpeed Automatic Regulator.

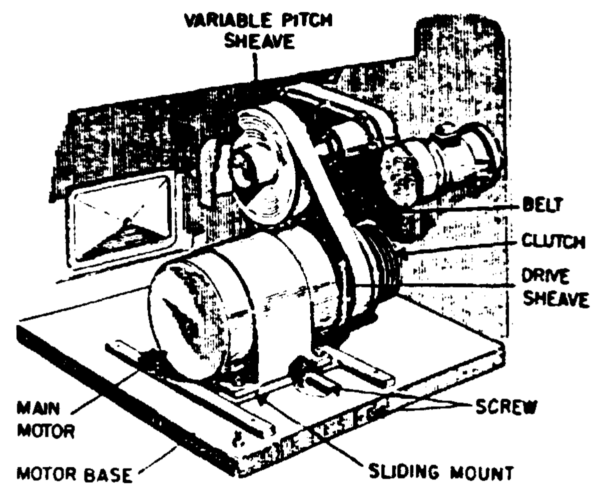


Figure 1A.2 Manually adjustable variable speed drive.

4.4 OPERATING CONDITIONS FOR V-BELTS:

To endure good operation, the following points concerning the V-belts should be watched:

1. The belts should not be taut like violin strings. Power belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 m. and over.
2. Never use and adhesives. The V-belts should be kept clean any dry, and should be protected from oil and grease. V-belts do not require any maintenance.
3. Forcing the belts over the grooves will

damage the pull cord and reduce blet life. For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.

4. Belts and pulleys should not heat up. Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.

5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.

6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.

7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only.

Blet tension:

The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

GROUP-2:

A. THE BUILDER:

1. DESCRIPTION:

The builder mechanism, Figures 2A.1 and 2A.2, housed in a separate case attached to the main gear case, performs a dual function; controlling taper and controlling tension. Taper results from the incremental shortening of each successive traverse of the bobbin and is controlled by the taper change gear. Tension is dependent upon the precise control of the output speed of the P.I.V. to effect an incremental reduction in bobbin speed with each successive layer of roving added to the bobbin diameter. This is governed by the tension change gear.

Through the P.I.V. it replaces the cones and cone belts of the conventional roving frame and provides precise, mechanical control of the winding speed. Its various mechanisms must be set to close tolerances.

Basically, the builder mechanism consists of two parallel lead screws on which firing gears traverse vertically. These gears mesh with the long gear which is normally held stationary but which is rotationally biased by a cable and tensioned by a weight. A shaft, driven by the lay gearing in the main gear case, contains a pinion which meshes with the screw gears attached to the bottom ends of the lead screws. Rotation of the pinion rotates the lead screws in opposite directions causing one firing gear to traverse downward and the other upward.

The downward-traversing gear will eventually engage the firing plunger which telescopes within the firing sleeve attached to the rocker. Attached to the same end of the rocker is the triggers which are small steel levers, pivoted to each end of the rocker, the lower end of which engages the top of the firing post. This engagement prevents the rocker from turning. Thus, as the firing gear continues downward, it forces the firing plunger to telescope within the firing sleeve and, in so doing compress the spring. Meanshile, the flange of the firing plunger engages the ramp of the trigger and continued motion forces the trigger to pivot until its lower end moves off the firing post. The instant this happens, the restraint on the rocker is removed and the spring, which, by then, has been highly compressed, forcefully drives that end of the rocker downward. The opposite end of the rocker, obviously, moves upward andits trigger, under the influence of the trigger torsion spring, latches itself on top of the opposite firing post. This sequence is a variation of what is commonly known in the design field as a "load and fire" operation.

At the instant of firing, several builder functions occur simultaneously: (See Figure 2A.2)

(1) Attached to the rocker is the rocker shaft which extends back into the main gear case to operate the reversing clutch in the lay gear train. Therefore, when the rocker "rocks over" to the opposite firing position, the reversing clutch is actuated and this results in reversal of the direction of rotation of the lay gearing and its drive to the builder. This causes the builder lead screws to reverse their rotational direction and, consequently,

the firing gears to reverse their direction of traverse. The lay gearing also provides an input to the compound and, when the builder "fires", the resultant reversal causes a change in direction of spindle traverse.

(2) Mounted on the end of the rocker shaft is a pair of escape pawls positioned by the adjustable pawl pin attached to the rocker. The upper ends of the pawls engage the teeth of the escapement wheel and prevent the wheel from turning under the rotational bias of the builder weight. When the rocker pivots, the pawl pin forces one of the pawls out of engagement with the escapement wheel and allows it to rotate (approximately 10°) until the next tooth engages the second pawl to stop further rotation.

(3) The escapement wheel is fastened to the end of the tension gear shaft so that each time the escapement wheel lets off, the tension gear rotates a corresponding amount. This, in turn, drives the tension gear train to cause proportionate rotation of the pin gear which, being keyed to the cam shaft,,results in a corresponding incremental rotation of the builder cam. (Refer to Figure 2A.3) Because the P.I.V. control arm, protruding from the side of the main gear case, engages the cam, this cam movement results in an incremental reduction in the output speed of the P.I.V. to cause the bobbin speed to slow down slightly in order to maintain proper tension. Note that the cam and P.I.V. correspond in function to the cones and cone belt of conventional frames.

(4) Behind the pin gear is the eccentrically mounted follower gear, the two gears being connected by a connecting link through which rotational movement of the pin gear is transmitted to the follower gear. By virtue of the taper gear train, this effects a proportionate movement of the taper change gear. Attached to the opposite end of the taper change gear shaft is a face gear which engages the teeth in the long gear. (Refer to Figure 2A.1). Thus, each time the escapement wheel lets off, the face gear rotates to allow the long gear to rurn a proportionated amount. This, inturn, causes the firing gears to rotate on the lead screws, by a small amount to effect a foreshortening of their length of traverse. Because of this foreshortening, the subsequent firing of the builder will occur earlier than with the preceding traverse of the firing gear. With the builder being forced to fire at progressively shorter intervals, the spindle traverse is correspondingly shortened so that each layer wound on the bobbin is shorter than the preceding layer. This results in the building of the familiar taper-ended bobbin, the amount of taper being governed by the taper change gear.

Because of variations in mill conditions and stock, the follower gear is provided with two pins which afford an option as to whether the progressively steepaning of taper is to be minimized or accentuated. If, in the starting position, the link is connected to the right hand pin in the follower gear, the rounding of the taper will be minimized. If the link is

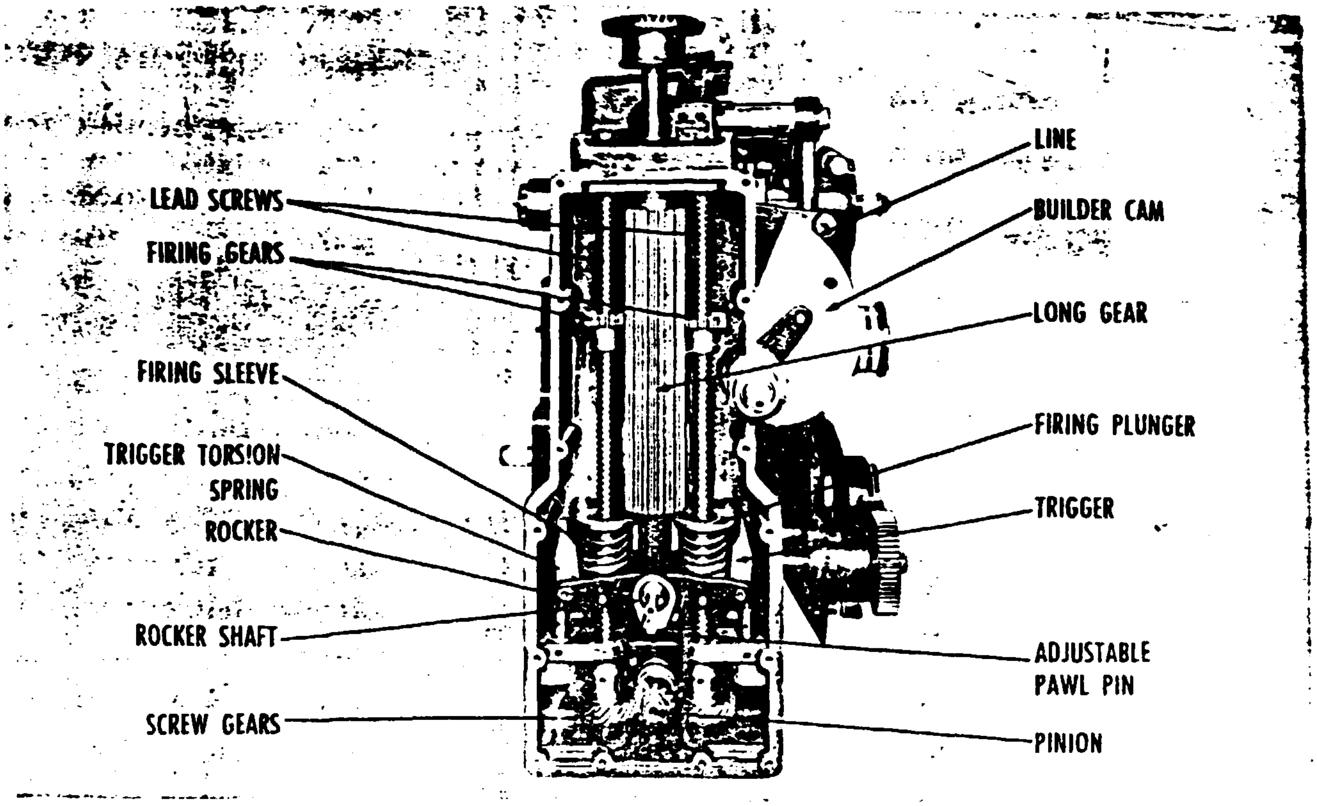


Figure 2A1 Rovematic builder -- front cover of the case removed.

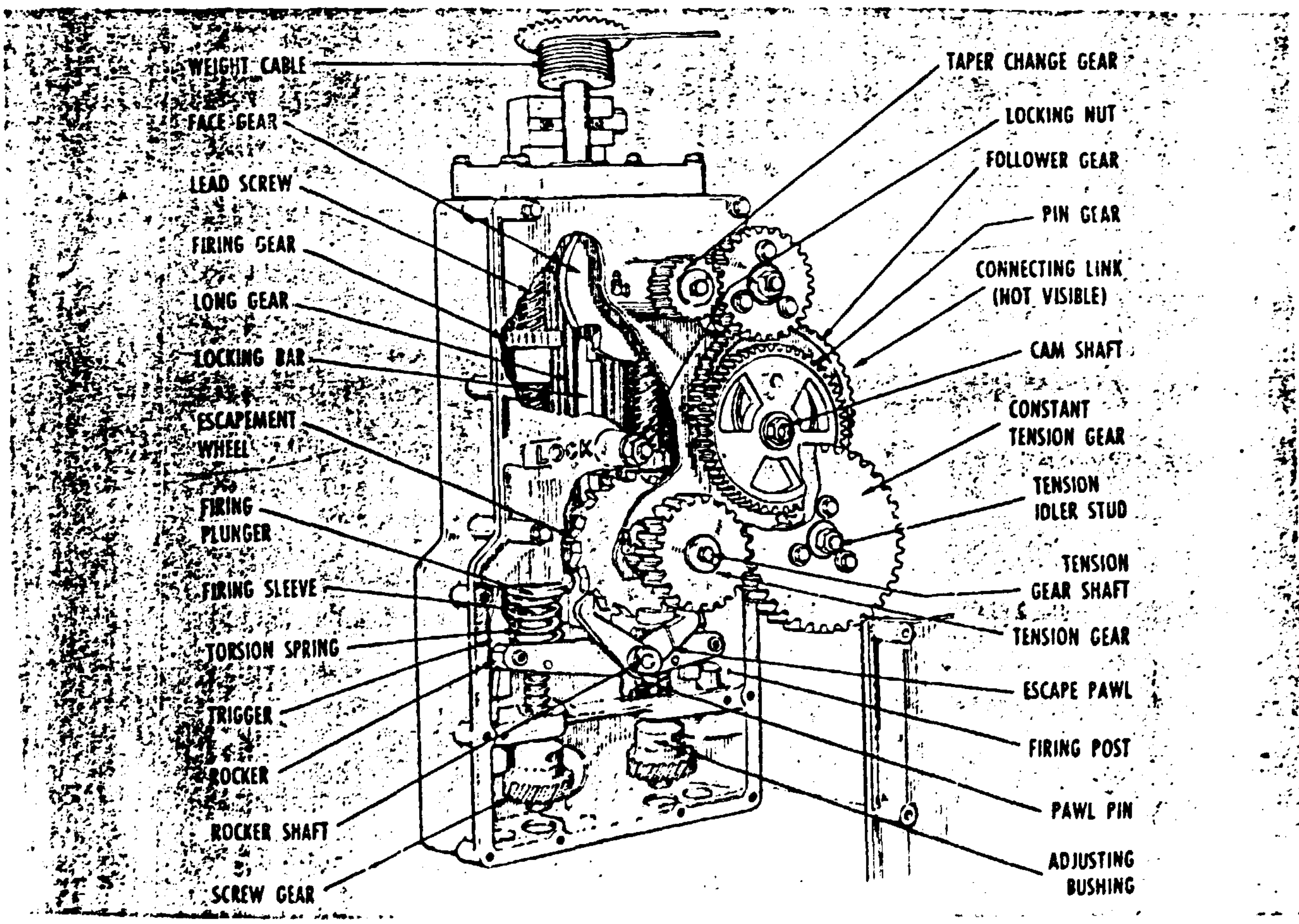


Figure 2A2 Rovematic builder -- part of front cover cut away.

connected to the left hand pin, the rounding effect will be accentuated.

Mounted on the back of the builder case is an adjustable limit switch, actuated by the builder firing gears, which serves to prevent the Rovematic from stopping itself on a traverse change. Also associated with builder is the full bobbin knock-off switch by the cam follower arm. (See Figure 2A.3)

NOTE

Always rewind the builder to its starting position before making settings or adjustments. Drain the oil by removing the plug from the bottom of the case before making internal settings.

Should it be necessary to work on the builder mechanism with the builder bottom cover removed and with the frame running the oil line must be blocked off. Failure to block the oil line will result in oil being sprayed out from the builder components. Before changing any gears on the builder turn the frame off and tighten the lock nut. After changing gears on the builder be sure to loosen the lock nut.

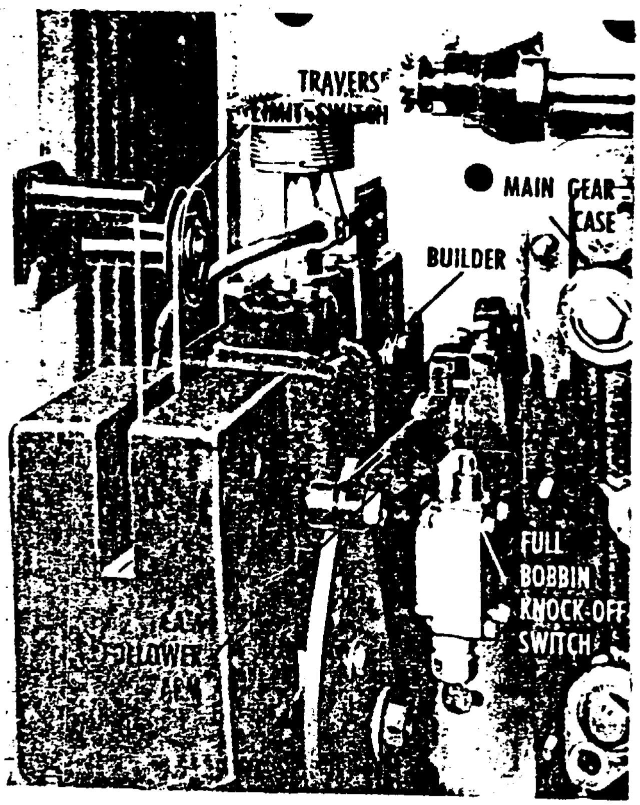


Figure 2A3 Builder and main gear case location.

2. PURPOSE:

The builder mechanism performs a dual function: controlling taper and controlling tension. Taper results from the incremental shortening of each successive traverse of the bobbin and is controlled by the taper change gear. Tension is dependent upon the precise control of the output speed of the P.I.V. to effect an incremental reduction in bobbin speed with each successive layer of roving added to bobbin diameter. This is governed by the tension change gear.

3. PARTS:

See Figures 2A.1 and 2A.2.

4. SETTINGS:

4.1 BUILDER TRIGGER:

This setting involves two operations - setting the gap on the firing post and setting spring compression.

4.1A SETTING GAP ON FIRING POST:
(See Figures 2A.4 & 2A.5)

1. Loosen the two ½" locknuts on the bottom of the builder screws to disengage the builder screw gears from their adjusting bushings so that the builder lead screws can be turned by hand.

2. Turn the builder screws by rotating the adjusting bushings to traverse the firing gears upward and release pressure on the compression springs. Starting on the side of the builder that has the rocker up, set the gap between the bottom of the trigger and the top of the firing post to within .050" and .060".

3. To set this gap, loosen the 5/16" setscrew that locks the firing post screw the post up or down until the correct setting is obtained. Tighten the setscrew to lock the firing post in position.

4. Unlatch the trigger from the firing post and pivot the rocker so that the opposite

end is up. Set the gap between the trigger and post on this side in the same way.

CAUTION

After setting, recheck to make sure that the gaps do not exceed .060". Excessive gap will permit the teeth of the reversing clutch to disengage and let the spindles drop.

4.1.B SETTING SPRING COMPRESSION: (See Figures 2A.4 & 2A.5)

1. Start on the side of the builder that has its trigger latched onto the firing post. Rotate the lead screw by turning the adjusting bushing to force the firing gear down against the firing plunger. Continue turning until the plunger telescopes within the firing sleeve and compresses the spring.

2. A retaining ring near the bottom edge of the firing plunger normally rests against the bottom edge of the firing sleeve. As the plunger telescopes a gap develops between the retaining ring and the bottom edge of the sleeve. This gap should be set to 9/16" to 5/8" at the instant the trigger trips off the firing post.

CAUTION

Keep the gap within the above prescribed limits.

3. If the trigger does not trip at this point, or if it trips before the 9/16" to 5/8" gap is reached, the position of the trigger must be adjusted.

To make this adjustment, loosen the screw on which the trigger bushing is mounted and rotate the bushing. Since this bushing is eccentric, the lower end of the trigger will move relative to the firing post and the correct gap can be make. Tighten the screw to lock the bushing in place.

4. Set the other side of the builder in the same way.

CAUTION

Insufficient spring compression can result in sluggish action and permit the builder mechanism to slip back into neutral.

4.2 SETTING THE ESCAPEMENT:
(See Figure 2A.4)

1. Set the rocker in the neutral (horizontal) position.

2. Loosen the setscrew between the two pawls that locks the eccentric pawl pin. Rotate the eccentric pin until the tops of the pawl teeth are an equal distance from the bottom of the tooth space of the escapement wheel.

3. Lock the eccentric pin by tightening the setscrew.

NOTE

If set incorrectly, the pawls could let the escapement wheel skip and cause improper taper and tension.

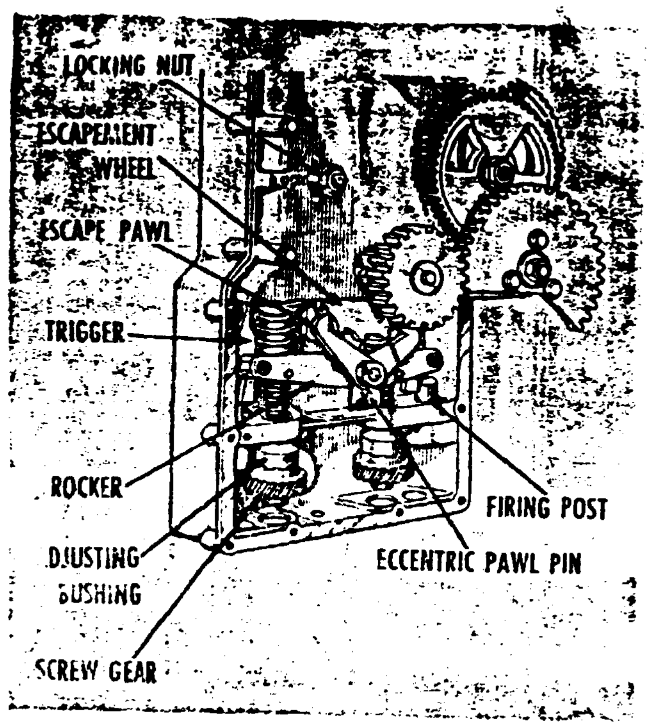


Figure 2A4 Rovematic builder.

4.3 <u>SETTING THE BOBBIN TRAVERSE</u>:
(<u>See Figure 2A.5</u>)

1. Have the line on the builder cam aligned with the pitman roll.

2. There are two different bobbin lengths for the FB Model frame, a short bobbin (15 5/16" over-all) and a long bobbin (15 ¾" over-all). When these bobbins are mixed or used interchangeably, make a mark 7/8" from bottom of a long bobbin or 5/8" from bottom of short bobbin. On FB Model frames using long bobbins exclussively and on all FC Model frames, make a mark ¾" from bottom of bobbin. Measure 14" upward from this mark on all FB Model frames and 12" on all FC Model frames and amake another mark on the bobbin. Place this bobbin

on a spindle and loosen the two screw gears.

3. With the wind down button, traverse the spindle either up or down until the eye of the presser is in line with one of the marks on the bobbin. If in line with the bottom line, set the right hand builder screw; if the top line, set the left hand screw.

NOTE

Do not attempt to increase traverse beyond 14" on FB Model frames or beyond 12" on FC Model frames.

4. To set the builder screw, rotate its adjustable bushing until the trigger trips off the firing post.

5. Engage the builder screw serrations with the mating serrations of the adjusting bushing and tighten in place.

6. With the wind down button, traverse the spindle so that the eye of the presser is in line with the second mark on the bobbin. Rotate the appropriate adjusting bushing. until the trigger trips from the firing post. Engage the builder screw gear and tighten in place.

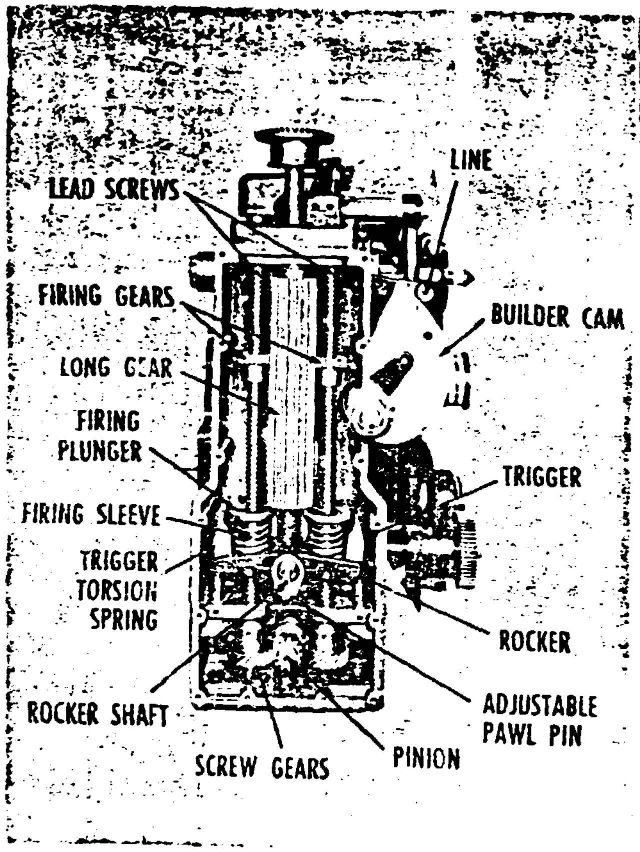


Figure 2A5 Rovematic builder.

4.4 SETTING THE BUILDER WEIGHT:
(See Figure 2A.6)

1. Lift the weight to the desired height.

2. Wind the cable by hand onto the hub of the builder rewind gear. Do not twist or hink the cable.

CAUTION

Don't let the weight touch the base of the cabinet when the bobbin is full. See that the weight has free movement at all times. Otherwise, the long gear would fail to turn when the builder fires, which would effect tension and traverse.

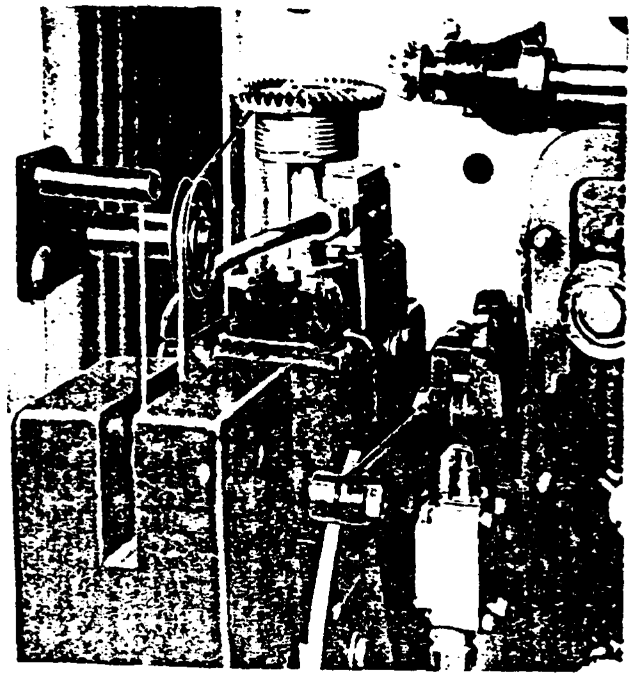


Figure 2A.6 Builder weight.

4.5 SETTING THE CONNECTING LINK:
(See Figure 2A.7)

1. Lock the builder with the locking nut.

2. Remove the pin gear.

3. Remove the link and re-engage it with the desired pin on the follower gear.

4. Replace the pin gear with the pin vertically in line below the gear center and engage the pin and link.

5. Unlock the builder.

NOTE

The position of the connecting link determines whether the taper is to be straight or rounded. At the start of the doff, the pin is vertically below the center of the gear and engages one end of the link. If the other end of the link engages the right hand pin of the follower gear, a straight taper will result. If the link engage the left hand pin, a rounded taper will result.

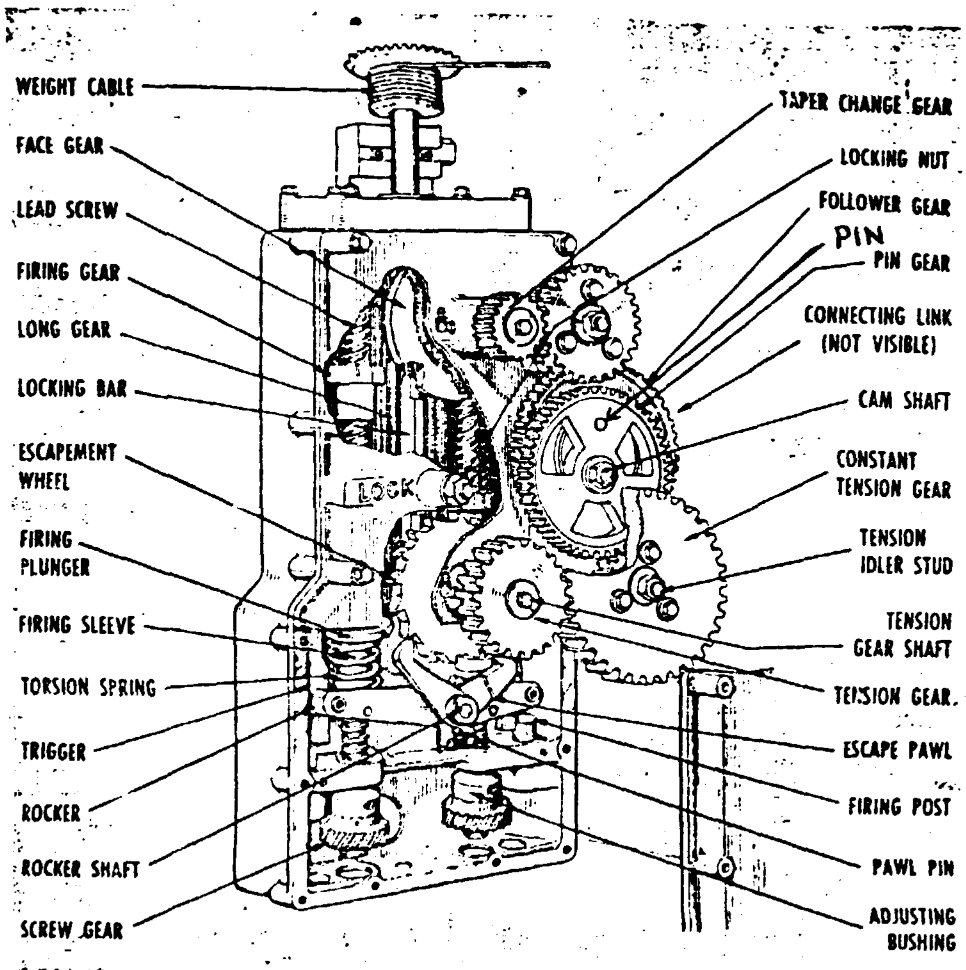


Figure 2A7 Rovematic builder.

4.6. <u>SETTING THE STARTING POINT</u>:
(<u>See Figure 2A.8</u>)

1. Loosen the jam nut and back off the rewind stop adjusting screw.

2. Wind builder back with handwheel until line on cam is under cam follower. Release handwheel.

3. If the line is not exactly aligned with the cam follower because of incremental latching action of the escapement, loosen the screw that holds the cam to the shaft arm and move the cam until aligned. Tighten the screw.

4. Run the rewind stop adjusting screw to approximately $\frac{1}{8}$" of the stop lug located on the back side of the follower gear and tighten jam nut.

NOTE

Clearance is needed between the rewind stop lug and screw to provide over-travel so that the escapement will latch in the same place each time the builder is rewound to the starting point. Check this setting by traversing the spindles with the rewind button to cause the builder to fire several times - then rewind the builder to the starting point. If needed, increase the clearance between the stop and screw until correct latching is attained.

4.7 SETTING THE STARTING TENSION:
(See Figure 2A.8)

The cam follower arm is in two sections, the P.I.V. lever and the cam lever. Their positions are controlled by a single adjusting screw. Turning this screw causes the P.I.V. lever to move relative to the cam lever.

The P.I.V. lever cannot move unless the unit is operating.

CAUTION

Do not move the adjusting screw with the P.I.V. stopped. To do so will break the levers.

1. Piece up one or more ends. Wind the builder back to the starting point and have the presser about 4" from the top of the bobbin. Start the frame and check the tension of the roving between the front rolls and the flyer.

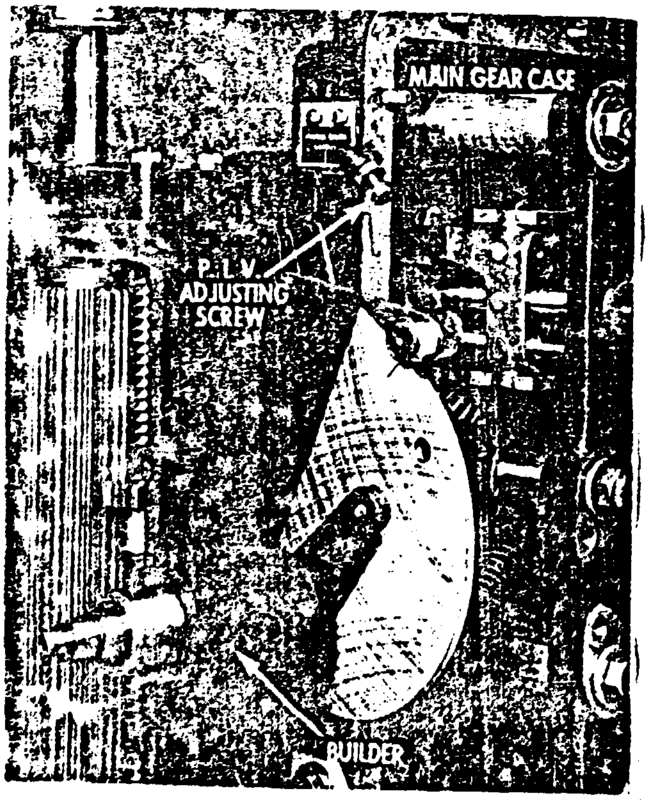


Figure 2A8 Builder cam linkage.

2. If the tension is too slack, loosen the jam nut and slowly turn the adjusting screw clockwise until the desired tension is reached. For the first partial layer, this tension should be slightly tighter than normal.

3. If the starting tension is too tight, turn the screw counterclockwise slowly until desired tension is reached.

4. After the machine has wound the first partial layer, made the top change, covered up the partial layer, and has again reached the bare portion of the bobbin, the final adjustment can be made for desired running tension.

5. Tighten the jam nut to lock the setting.

4.8 <u>SETTING THE TRAVERSE LIMIT SWITCH</u>:
(<u>See Figure 2A.3</u>)

The last coil or two placed on the bobbin as the machine stops has less tension than those placed at normal speed. The limit switch prevents the machine from stopping at the traverse change because these slightly looser coils at the taper could cause sloughing of the roving. Actuated by the firing gears, this switch; overrides the stop motion circuit and prevents the stop motion switches from stopping the machine at the traverse change. The switch is adjustable so that it can be set to the individual mill's conditions.

1. If the machine coasts to a stop too close the taper, loosen the switch bracket screws and move the switch up.

2. If the switch is actuated too far from the traverse change and limits the effectiveness of the stop motions, lower the switch to obtain greatest possible traverse length with stop motion protection consistent with quality.

4.9 SETTING THE FULL-BOBBIN LIMIT SWITCH:
(See Figure 2A.9)

1. Run the frame until the exact desired bobbin diameter is reached.

2. Stop the frame.

3. An adjusting screw aligns the P.I.V. lever with the plunger of the full-bobbin limit switch. Loosen the jam nut on this screw and turn the screw down until it actuates the switch.

4. The green signal lamp will light when the switch contracts close.

5. Tighten the jam nut on the screw.

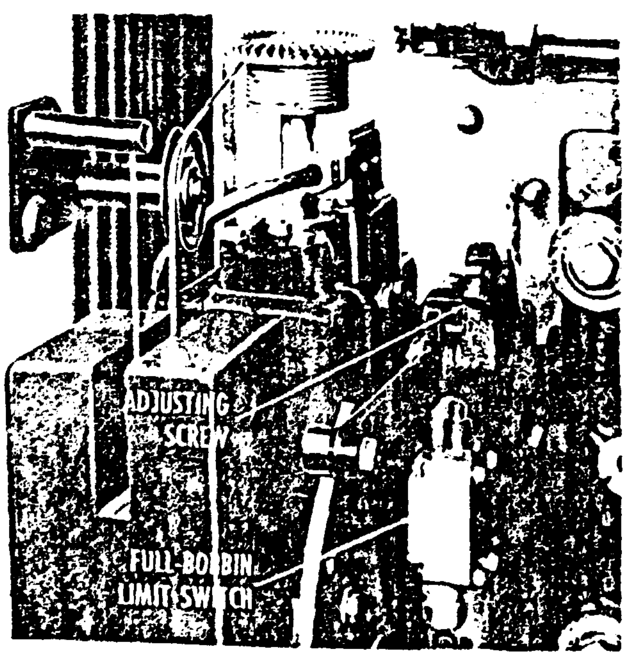


Figure 2A9 Full-bobbin limit switch.

4.10 SETTING THE TENSION AND TAPER GEAR MESH (See Figure 2A.10)

1. Rewind the builder to the starting point.

2. The change gear on the upper stud in the taper change gear and the lower stud in the tension change gear. For changing either of these gears the lock nut must be tightened to lock the builder. This prevents the upright shaft from turning and allowing the weight to drop to the floor.

3. To change the tension or taper gear, loosen the three 5/16" screws on the face of the constant gears, loosen the nut the idler stud and slide the gears out of mesh.

4. Change gears and slide constant gear into mesh with new gear.

5. Rotate gear until teeth mesh.

6. Tighten idler stud nut and constant gear screws.

7. Unlock the builder and check the starting point on the cam. If its position has shifted it can be corrected in the following way:

1. Loosen the three 5/16" screws on the face of of the tension constant gear.
2. Turn builder rewind gear manually until line on cam is again in line with pitman roll.
3. Turn tension gear until pawl contacts ratchet tooth.

NOTE

Since you cannot see the position of the pawl in relation to the ratchet teeth, the tension gear is turned until contact is felt.

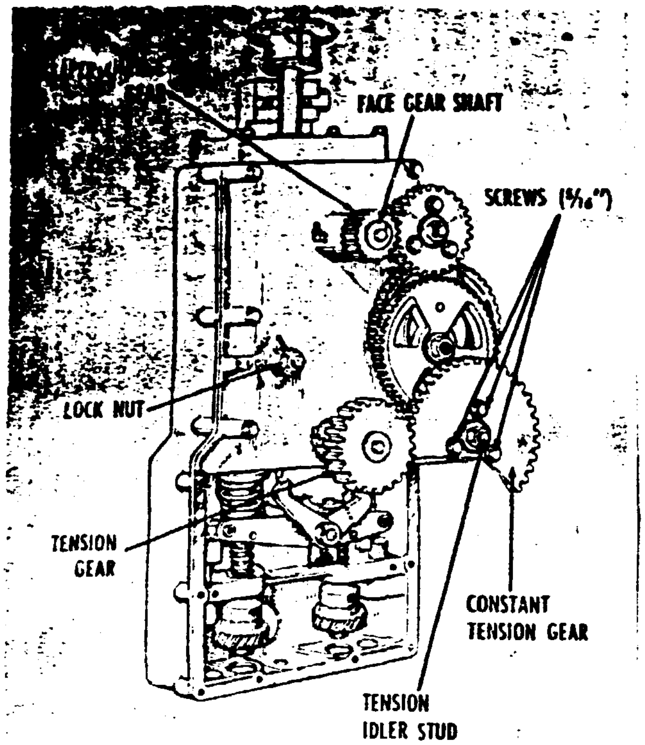


Figure 2 A/c Rovematic builder.

4. Tighten the three screws in the face of the constant tension gear and again check alignment of the cam and pitman roll.

5. If alignment is still not correct, loosen the constant tension gear screws again turn the tension gear in direction opposite to first setting to bring ratchet tooth in contact with the pawl.

6. If not possible to exactly align the cam and pitman roll with the gears, loosen the two bolts of cam and move the cam to correct position.

7. Tighten bolts and recheck all settings.

GROUP-3:

A. SPINDLES
B. FLYERS

3A. SPINDLES:

1. DESCRIPTION:

The Rovematic spindle is a telescoping assembly composed of two tubes known as the spindle and bolster. A lead screw within the assembly causes the spindle to teaverse up and down in the bolster.

As shown in Figure 3A.1, the spindle assembly consist, basically, of two telescoping tubes - the outer known as the bolster, and the inner, the spindle. While the spindle is free to traverse in and out of the bolster, the two parts are keyed together by double key and must turn in unison.

A lead screw mounted within the hollow an assembly and held in a fixed axial position by a ball bearing carried in the bolster, engages a nut which is integral with the spindle. Thus, if the screw and spindle turn at the same speed, no traverse of the spindle will result. However, if the screw turns slightly faster than the spindle, the spindle will traverse up. If it turns slightly slower, the spindle will traverse down. Note that the traversing is accomplished without reversal of either spindle or screw, but merely by slight changes in the relative speed.

The lower end of the spindle assembly is located by a tapered roller bearing in the bottom of the spindle case. The bronze bushed flyer gear which runs free on the bolster is carried in a sealed ball bearing mounted in the top of the case.

This bearing plus the bottom tapered bearing, jointly support the spindle assembly. Fastened to the top of the spindle is a plastic, hexagonal-shaped bobbin spur which supports and drives the bobbin.

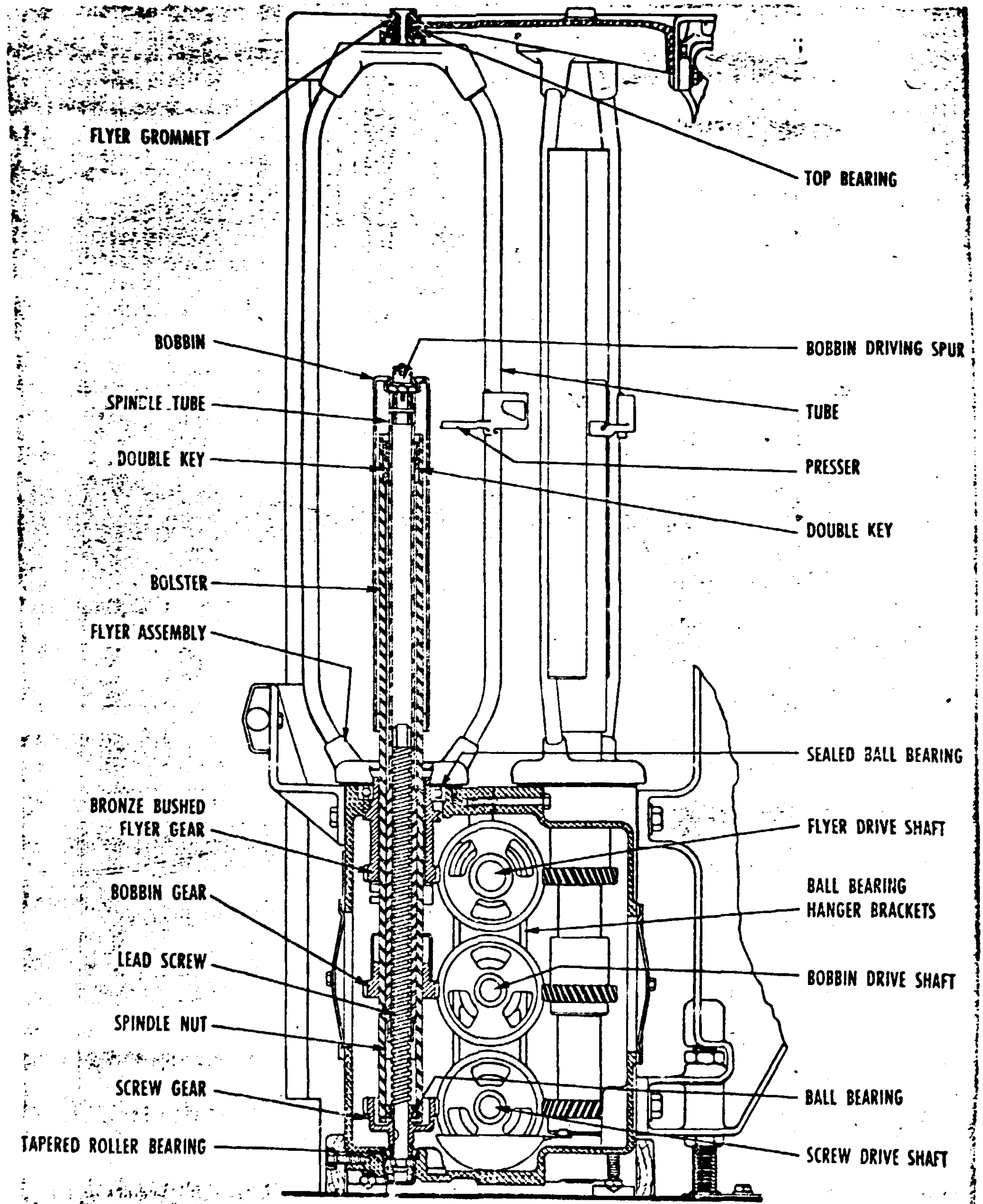


Figure 3A1 Rovematic spindle and flyer assembly.

2. PURPOSE:

The spindle supports the bobbin and rotates to from the package of roving. It traverses vertically in a predetermined pattern to lay the strands of roving in evenly spaced wraps around the package. The spindle speed slows in incremental steps as each wrap is placed so that the roving tension remains the same as the package diameter builds up.

3. PARTS:

See Figure 3A.1.
Coupling, Split gear, spindle case and Universal joint.

4. SETTINGS:

The spindles are mounted in cases. These cases are in sections, each of which holds eight spindles, four in the front half and four in the back half of the case. By removing the front line of flyers and spindles, the front half of the case can be removed from the machine. Access covers can be removed for routine inspection and servicing. Although the spindle case assemblies are interchangeable, they are numbered and the halves should be reassembled in original pairs.

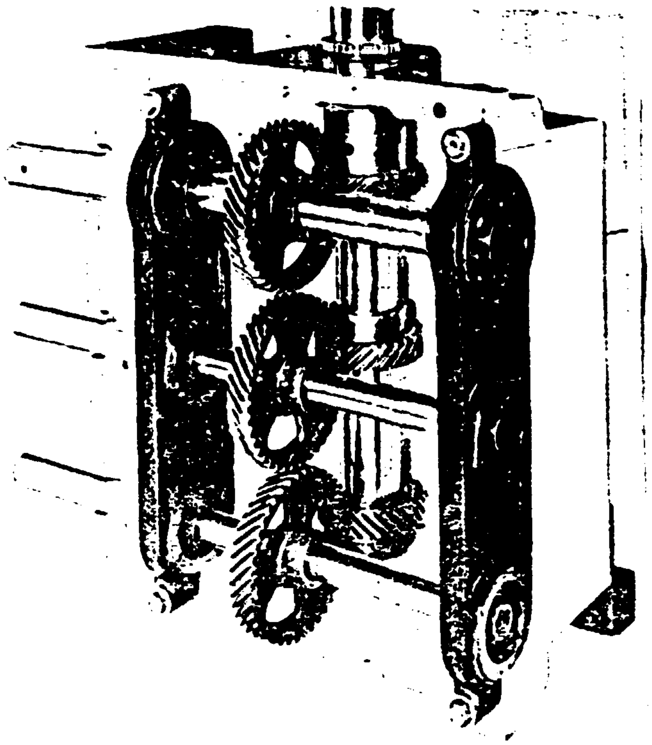


Figure Spindle case and gears.

4.1 REMOVING SPINDLES:

1. Remove the flyer.

2. Remove main spindl bearing retaining washers or bearing cover and gasket when present.

3. Re-engage the flyer with the flyer gear spline. For front line flyers, turn the flyer sharply couterclockwise; for back line flyers turn clockwise. This movement disengages the flyer gear from the top drive shaft gear.

4. Slide the flyer gear up to clear the spindle case. Tilt the spindle to disengage the bobbin gear from the middle drive shaft gear.

5. Lift the spindle from the case.

NOTE:

1. If more than two spindles are removed mark them so that they can be returned to their original position.

2. On the FC Model Rovematic the bottom of the spindle engages a plastic pump body, which may be accidently dislodged when the spindle is removed. If the pump body is displaced, replace it in the recess in the bottom of the spindle case and rotate the pump body until the two keyways engage corresponding guides in the recess. When properly engaged the pump body will slide easily into the recess and will be locked against rotation.

On the FC Model Rovematic, particular care must be taken to prevent damage to the threads at bottom end of the spindle. Make certain that these threads are fully re-engaged with the pump body when the spindle is installed.

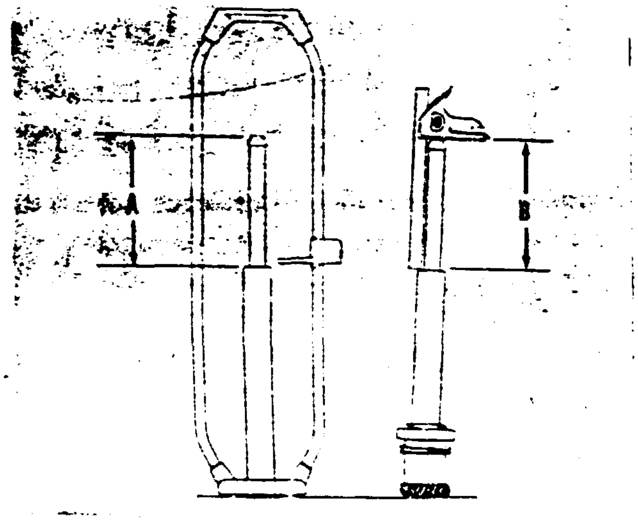
Reverse this procedure to install spindles. When a spindle is replaced it is necessary to level the top with that of adjacent spindles.

This setting can be made precisely with the use of a square as shown in Figure 3A.2.

4.2 SPINDLE HEIGHT ALIGNMENT:

When a spindle is installed it is necessary to set its traverse height to that of the other spindles in the machine. Set a combination square to the distance A on any spindle already installed and aligned. (Figure 3A.2.) Place the square on the spindle being installed as shown at B. With the flyer and bobbin gears out of mesh, rotate the spindle or screw until the spindletraverse up or down to the gauge setting.

Figure 3A.2



2

4.3 REMOVING SHAFTS, GEARS, OR BEARINGS:
(See Figure 3A.3)

1. Siphon oil from bottom of spindle case.
2. Remove flyers from front half of case.
3. Remove spindles from the front half of case.
4. Remove the guard rail brackets, the metal cover plates, and the wood base strip.
5. Remove the cap screws that hold the spindle case assembly together and remove the front half of the case.
6. Loosen the three couplings on both ends of the affected shaft assemblies.
7. Slide couplings back on shafts that are to be removed.
8. Loosen the two cap screws of each bearing bracket of the affected section.
9. Remove the assembly of shafts from the machine.

4.4 REMOVING SECTION OF SHAFT FROM ASSEMBLY:

1. Loosen the eccentric locking collars on the bearings that hold the shaft in position.

2. Drive the spring pins from the shaft that is to be removed.

3. Slide the shaft out of the bearing housing.

4. Remove gears as necessary. Heat (up to 350° F.) will soften the retaining compound used to secure the gears to the shaft and will make removal easier.

NOTE

Always place gears so that they can be replaced in the same order they are removed.

If the bearing is defective, it can be replaced by removing the tru-arc retaining ring, lifting the bearing from the housing, installing a new bearing and replacing the retaining ring.

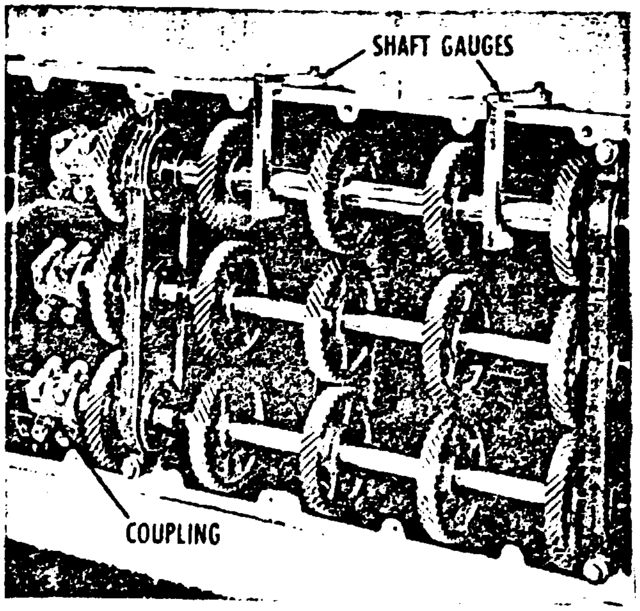


Figure 3.13 Using the shaft gauges.

4.5 REPLACING SHAFTS, GEARS, OR BEARINGS:

1. Reverse above procedure to replace shafts, gears, or bearings.

NOTE

When replacing gears on the shaft, apply 2 or 3 drops of Loctite Retaining Compound to the shaft before sliding the gear into place and pinning it. Wipe off any excess compound.

2. Replace any worn or damaged pins.
3. Align end of shaft with ends of other two shafts in the assembly.

NOTE

Be sure that back line of flyers are oriented and that tops of spindles are level with other spindles.

4. Hang shaft on back half of spindles case.

5. Align with shaft gauge No. 3Z665.

6. Fasten shafts in bearing brackets with cap screws.

4.6 ALIGNING GEARS: (See Figures 3A.4 & 3A.5)

1. Install the gear aligning gauge No. 3Z710-1A, in one of the spindle holes adjacent to the centre shaft section.

2. Align the gear on the top shaft to the $\frac{3}{4}$" stud on the aligning gauge.

3. To adjust the position of the shaft, loosen the eccentric locking collars on the bearings and move the top shaft so that the gear is aligned.

4. Tighten locking collars.

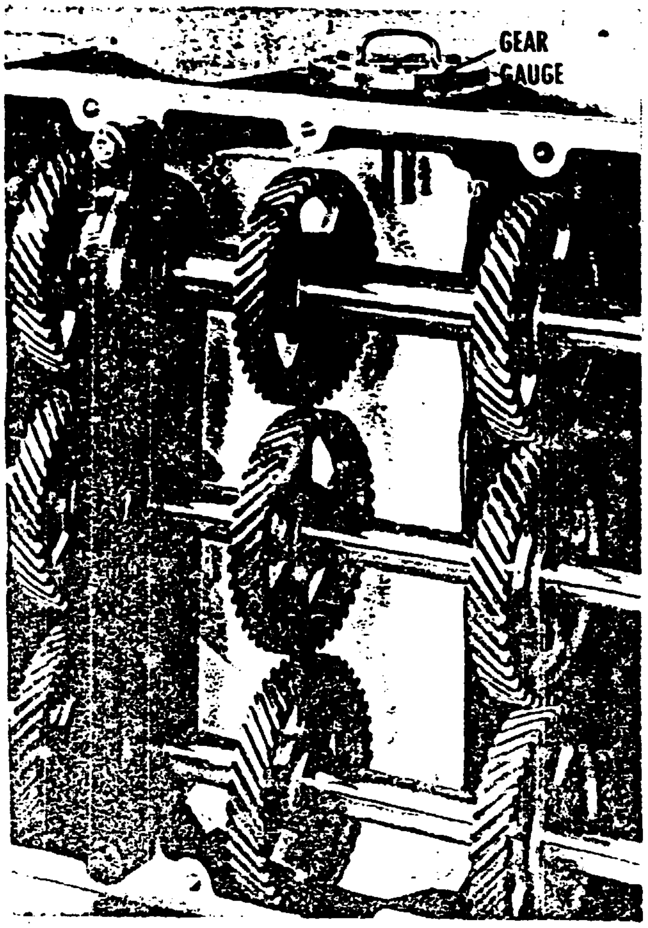


Figure 3A4 Using the gear gauge.

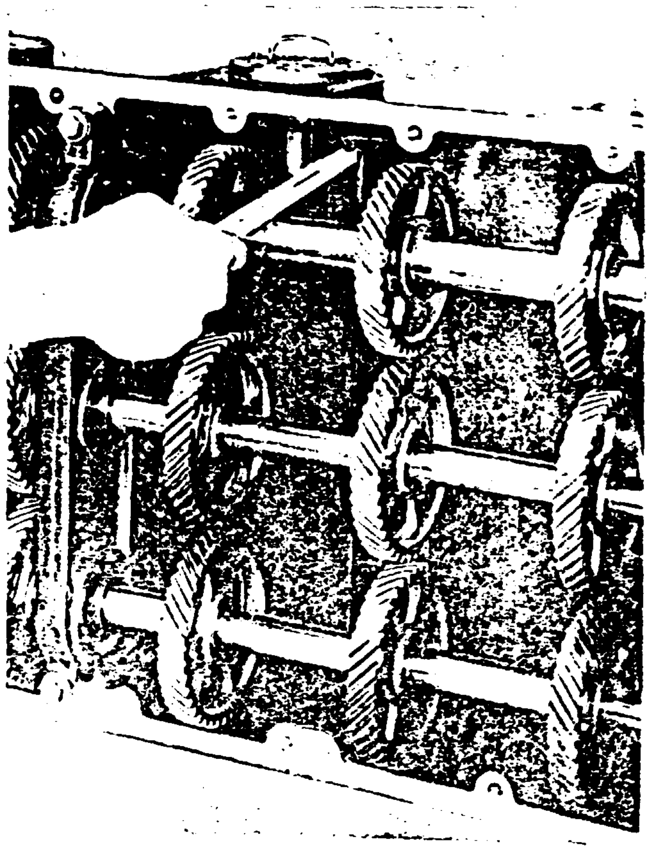


Figure 3A5 Aligning the gears.

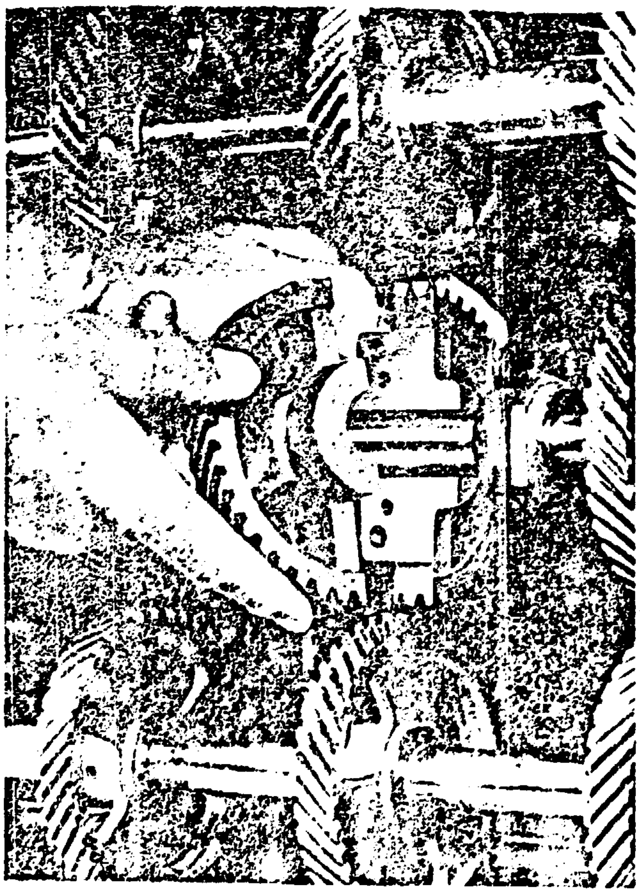


Figure 3A6 The split gear.

NOTE

The locking collars must be turned in the direction of shaft rotation before the setscrews are tightened.

5. When the top shaft is positioned, use a straight edge to set the other two shafts.

6. Slide the splined coupling onto the splined section of the shafts and tighten in position.

7. Lay the front half of the spindle case on the floor and apply bead of Permatex No. 2C around outer rim of case and around each hole to form an oil-tight gasket when the two halves of the case are joined.

8. Place the spindle case in position and screw in the two special bolts on each end of the case. Tighten these bolts to 200-inch pounds with preset torque wrench. Insert the cap screws and tighten to 200-inch pounds.

CAUTION

Do not tighten screws more than 200-inch pounds.

9. Inspect and clean interior of spindle case.

10. Install the spindles and flyers.

11. Refill the spindle case with recommended amount of oil as specified in the Rovematic Lubrication Manual.

4.7 SPLIT GEARS: (See Figure 3A.6)

1. Remove the spindle.

2. Remove the access cover.

3. Drive the spring pin out of the hub of the defective gear.

4. Slide the gear on the shaft to make room for the new gear.

5. Separate the two halves of the split gear, place on the shaft and join.

6. Apply Loctite Grade EV or HV to screw threads, insert in holes of gear hub and tighten.

7. Align the gear on the shaft and secure with spring pin.

NOTE

In some locations it will not be possible to slide the old gear out of the way and it must be removed. If it is only necessary to remove the gear rim, it can be broken off with a hammer. Cover the gear with a cloth so that broken pieces will not fall into the spindles case.

If it is necessary to also remove the hub it can be broken with the Hub Breaker, Part No. 3Z712-1A. Place the breaker over the hub, tighten the chisel point with a wrench and strike the end of the chisel screw sharply to break the hub.

CAUTION

Check case and remove any metal particles.

4.8 UNIVERSAL JOINTS: (See Figure 3A.7)

Removing Universal Joints:

1. Remove the four locknuts and four socket head cap screws on the joint.
2. Separate the two halves of the center member - note that these parts are keyed together.
3. Loosen the four hex cap screws in the hubs.
4. Remove the joint.

Replacing Universal Joint:

1. Install end yoke and center yoke on head end of shaft.
2. Install other end yoke and center yoke on end of other shaft.
3. Secure the coupling with the key, the four locknuts and four socket head cap screws.
4. Tighten hex head cap screws in the hubs.

NOTE

Be sure center yokes are correctly seated on the key... that end yokes are tighten on the spline.

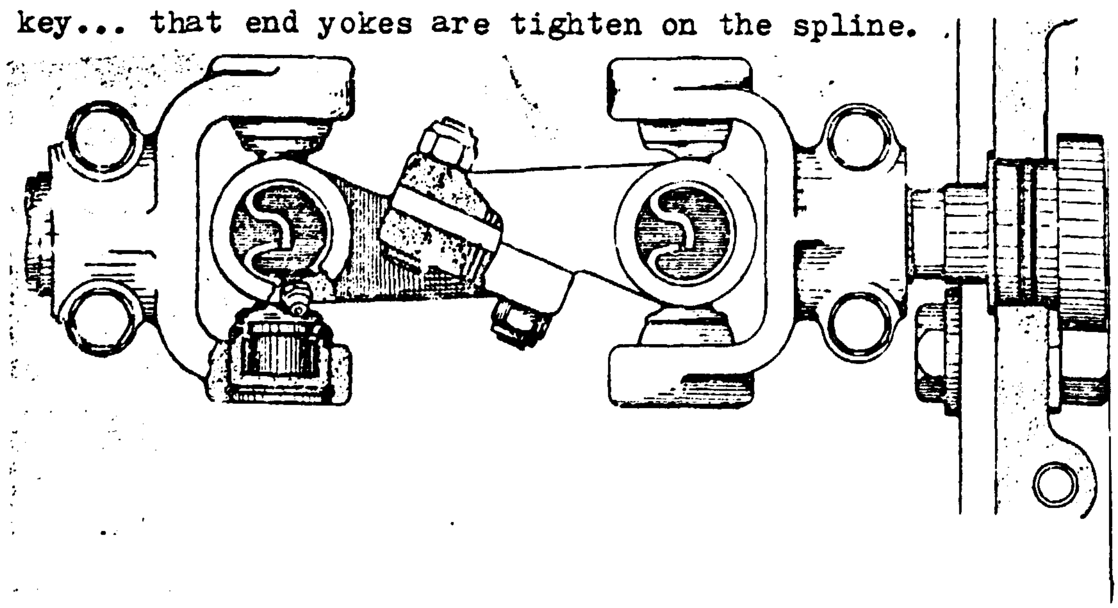


Figure 3A7 The universal joint.

WERNER INTERNATIONAL

3B. FLYERS:

1. DESCRIPTION:

The Rovematic flyers are rigidly constructed and dynamically balanced for optimum performance at top speeds with minimum deflection of vibration. They have airfoils to minimize windage and air turbulence. Both top and bottom bearings are antifriction.

Functionally, this flyer, refer to Figure 3B.1, performs the same operations as a conventional flyer. From the operator's standpoint, however, the two principal differences are in thread-up and in not having to remove the flyers for doffing.

In threading, the roving is passed through a tube extending from the nose of the flyer to an opening just below the presser. Thread-up is accomplished by use of a plastic leader. The tube provides a smooth, gently radiused passageway for the roving and eliminates the need for wrapping the roving around the flyer nose as with conventional flyers.

The flyer grommet traps twist in the long strand between the front roll and the top of the flyer. This action strengthens the roving in the critical area and also drives the twist close to the bite of the front roll. The flyer is supported by ball bearings at both top and bottom. The top bearing is rubber mounted to cushion vibration or slight misalignment.

The presser is designed to apply consistent pressure throughout the build of the package.

The point of contact between the presser paddle and the package surface remains relatively fixed due to the limited deflection of the flyer.

As previously mentioned, the flyer is driven at constant speed by the top drive shaft in the spindle case. The bobbin receives its drive from the middle drive shaft and spindle traverse is accomplished by the bottom drive shaft. These three shafts connect to the head end cabinet assembly by universal joints and regulation of these shaft speeds is a function of the head end control gearing.

2. PURPOSE:

The flyers revolve at a constant speed to place the roving, by means of a presser, onto the faster rovolving bobbin. The roving enters a grommet at the top of the flyer, passes down through a tube in one of the legs to the presser, and thence to the bobbin.

3. PARTS:

See Figure 3B.1.

4. SETTINGS:

1. Assemble the back line of flyers first. Place the splined end of the flyer legs should be parallel to the spindle case with the presser toward the foot end of the frame. Make sure the flyers are seated correctly.
2. Install the front line of flyers by beginning with the first flyer from the head end and setting it at an angle as shown in Figure 3B.2a. Rotate this flyer by hand until it is parallel to the

rollar beam as shown in Figure 3B.2a. Set the remaining flyer in the front line parallel to the roller beam.

3. Due to the location of the driving spline, it may not be possible to set the front line of flyers exactly parallel as shown. If such is the case, set the flyer at the angle shown by the second flyer, Figure 3B.2b, and not at the angle shown by the third flyer.

4. If a presser touches the adjacent flyer, set the affected front line flyer one spline.

Figure 3B.1

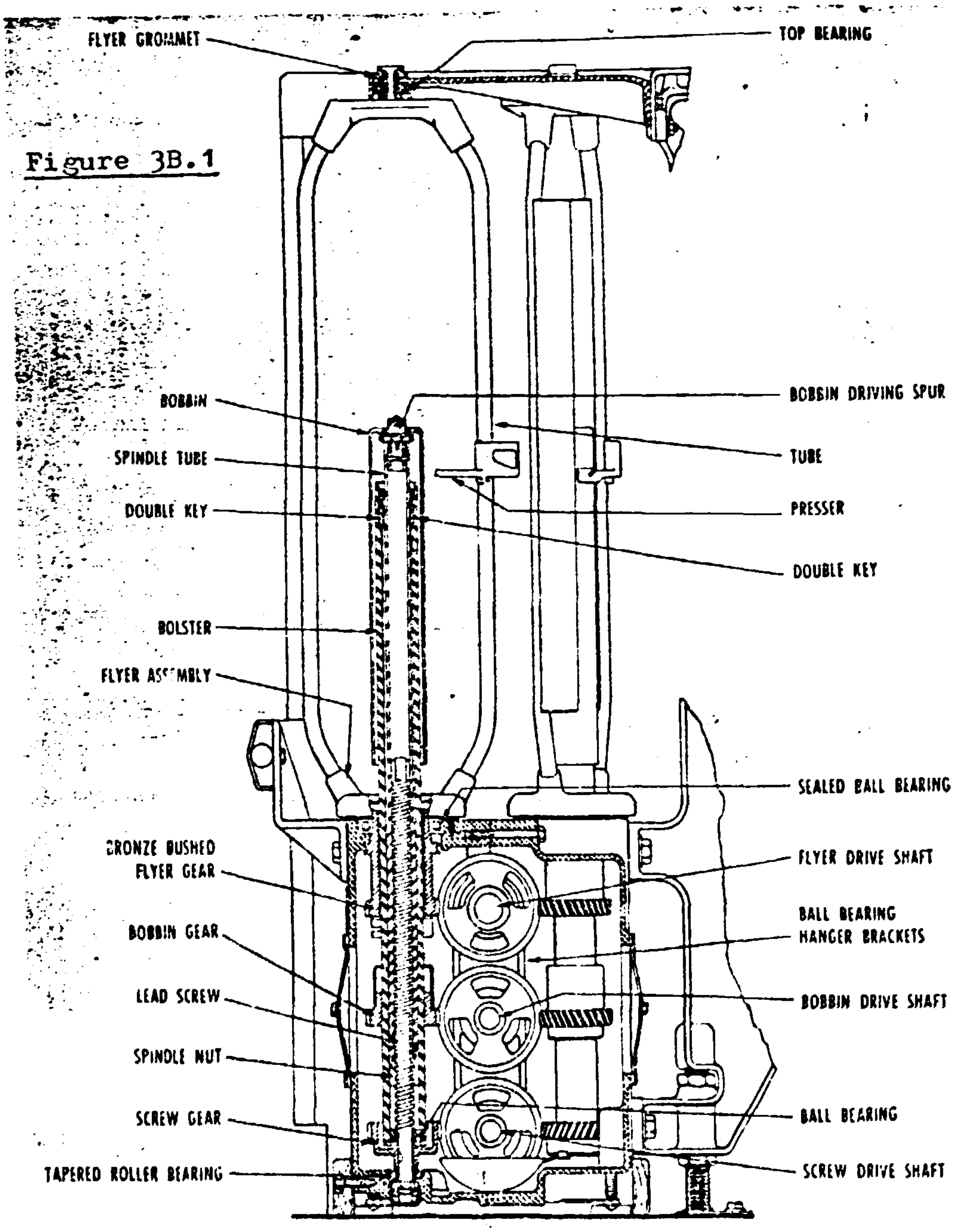


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Figure 3B.2a.

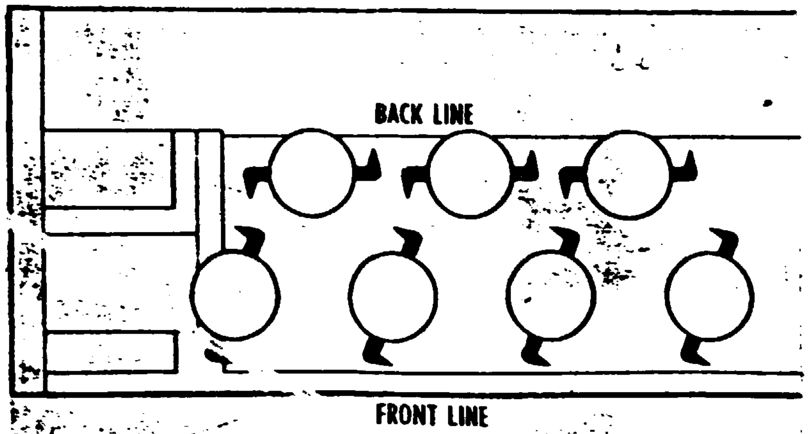
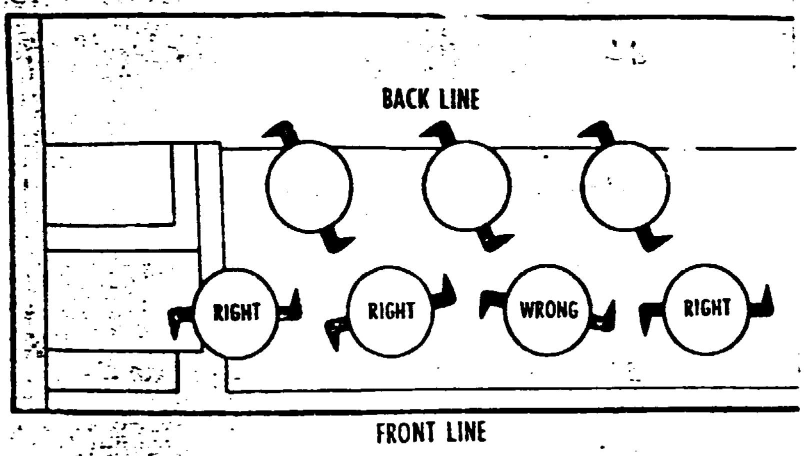


Figure 3B.2b.



4.1 REMOVING FLYER FROM MACHINE:

1. Number each flyer and bracket for identification as to location.

2. Remove the flyer grommet.

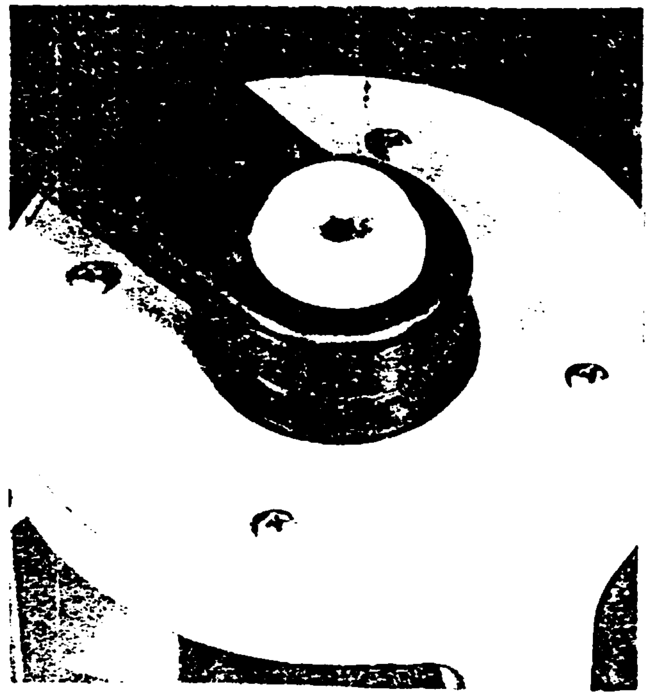
3. Remove the two screws that hold the flyer bracket to the roller beam. If shims are present, keep them with their particular brackets.

4. Lift the flyer to disengage the splined connection and remove the flyer from the machine.

CAUTION

The flyer must be handled carefully because damage to the legs or airfoil could seriously affect the flyer's balance.

Figure 3B.3



4.2 REMOVING FLYER TOP BALL BEARING:
(See Figure 3B.1)

1. Remove the flyer bracket.
2. Remove the housing ring.
3. Remove the ball bearing.

Reverse the above procedure to replace a top ball bearing.

4.3 REASSEMBLING FLYER IN FRAME:

When it is necessary to reassemble all or most of the flyers, the following procedure is is recommended;

a) Assemble the back line of the flyers first Place the splined end of the flyer over mating spline of spindle; be sure flyers are seated correctly. Legs of the flyers should be parallel to the spindle case.

b) Install flyer bracket assembly (short bracket) on the flyers and fasten in position finger tight, with 3/8-inch by ¾-inch hex head cap screws and 3/8-inch washers. Set flyers as detailed below in 4.4.

c) Install frontline of flyers, position each so that they lag the back line of flyers by approximately 60 degrees. This is necessary to allow the pressers to clear the adjacent and to facilitate doffing.

4.4 ALIGNMENT FLYERS WITH SPINDLES:

1. Place flyer gauge, on spindle as shown in Figure 3B.4.

2. With the bobbin wind down pushbutton, raise or lower the spindles until the centering pin in the flyer gauge just enters the top hole of the flyer.

3. If needed, loosen the flyer gauge pin to best position for setting.

4. If pin is not centered in hole, shim the flyer bracket to align and level the flyer.

5. Tighten bracket and recheck setting.

The presser can be removed from the flyer by driving out the hinge pin.

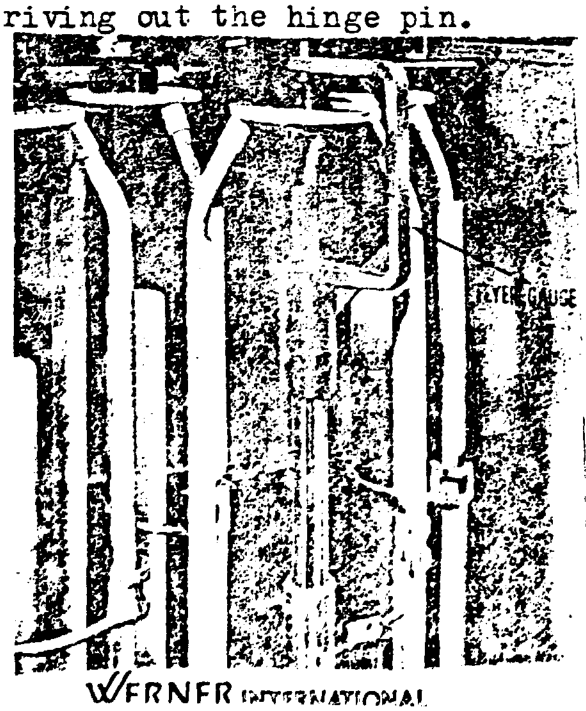


Figure 3B.4

GROUP:4:

4A. MAIN GEAR CASE AND SHAFTS.
4B. THE COMPOUND.
4C. THE P.I.V.

4A. MAIN GEAR CASE:

1. DESCRIPTION:

The Main Gear Case is an oil-tight compartment located in the head end cabinet. It has an easily removed cover for access to the lay and twist change gears and the P.I.V. unit. An inner cover can be removed to provide access to all the components within the case.

2. PURPOSE:

The Main Gear Case houses the component, P.I.V. unit, lay and twist gearing, and components of the flyer and spindle drive.

3. PARTS:

See Figures 4A.3 to 4A.7 and 4A.10,11.

4. SETTINGS:

4.1 REMOVING THE GEAR CASE COVER:
(See Figure 4A.1)

1. Siphon the oil from the case.
2. Remove the kick plate at the base of the cabinet.
3. Remove the 22 nuts and washers that secure the cover assembly to the case.
4. Remove the cover assembly.

4.2 <u>REPLACING THE COVER:</u>
<u>(See Figure 4A.2)</u>

1. Apply a bead of Permatex No. 2C on the flange of the cover to form an oil-tight gasket.

2. Put the cover in place and tighten the 22 nuts securely.

<u>NOTE</u>

Do not tighten each nut in a single operation. Proceed from one nut to the next and tighten them progressively in stages so that the cover will be uniformly sealed.

3. Fill the gear case with recommended amount of oil to specifications listed in the Rovematic Lubrication Manual.

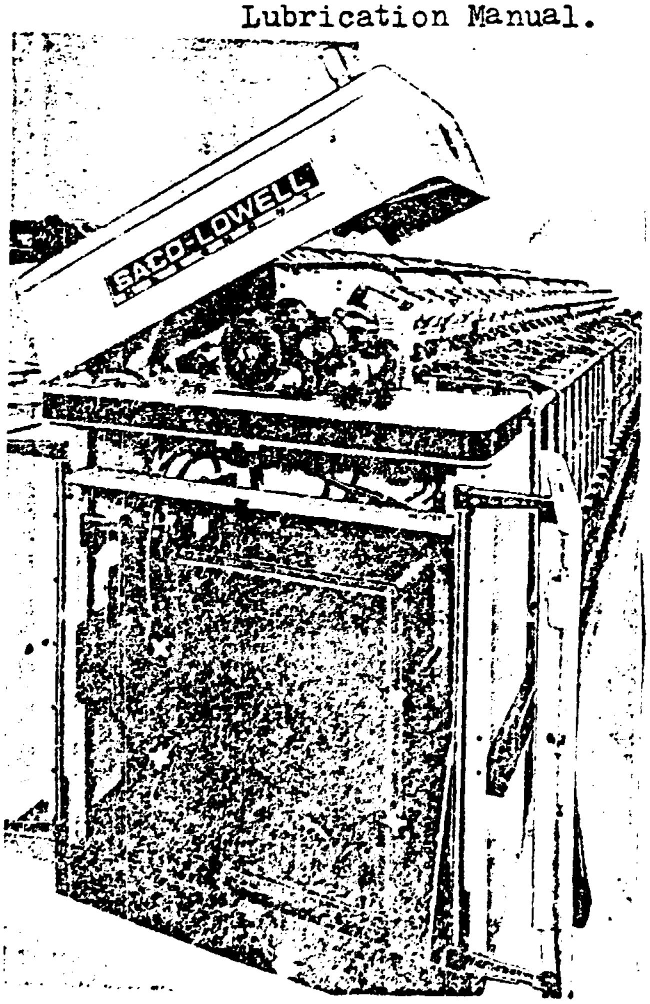


Figure 4A1 Main gear case — front cover in place.

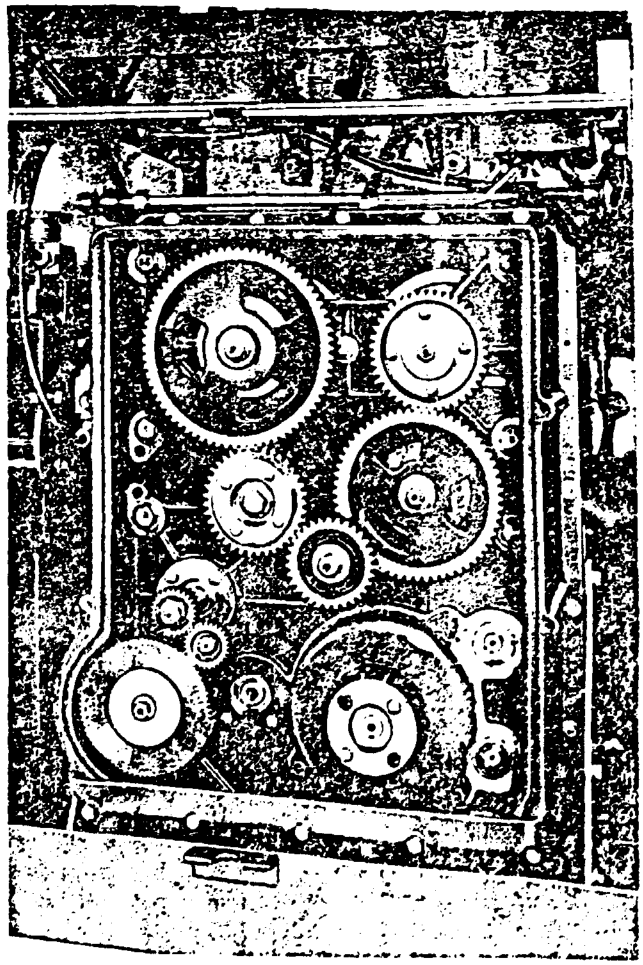


Figure 4A2 Main gear case — front cover removed.

ROVEMATIC GEARING DIAGRAM FOR MODELS FB-1B AND FC-1B

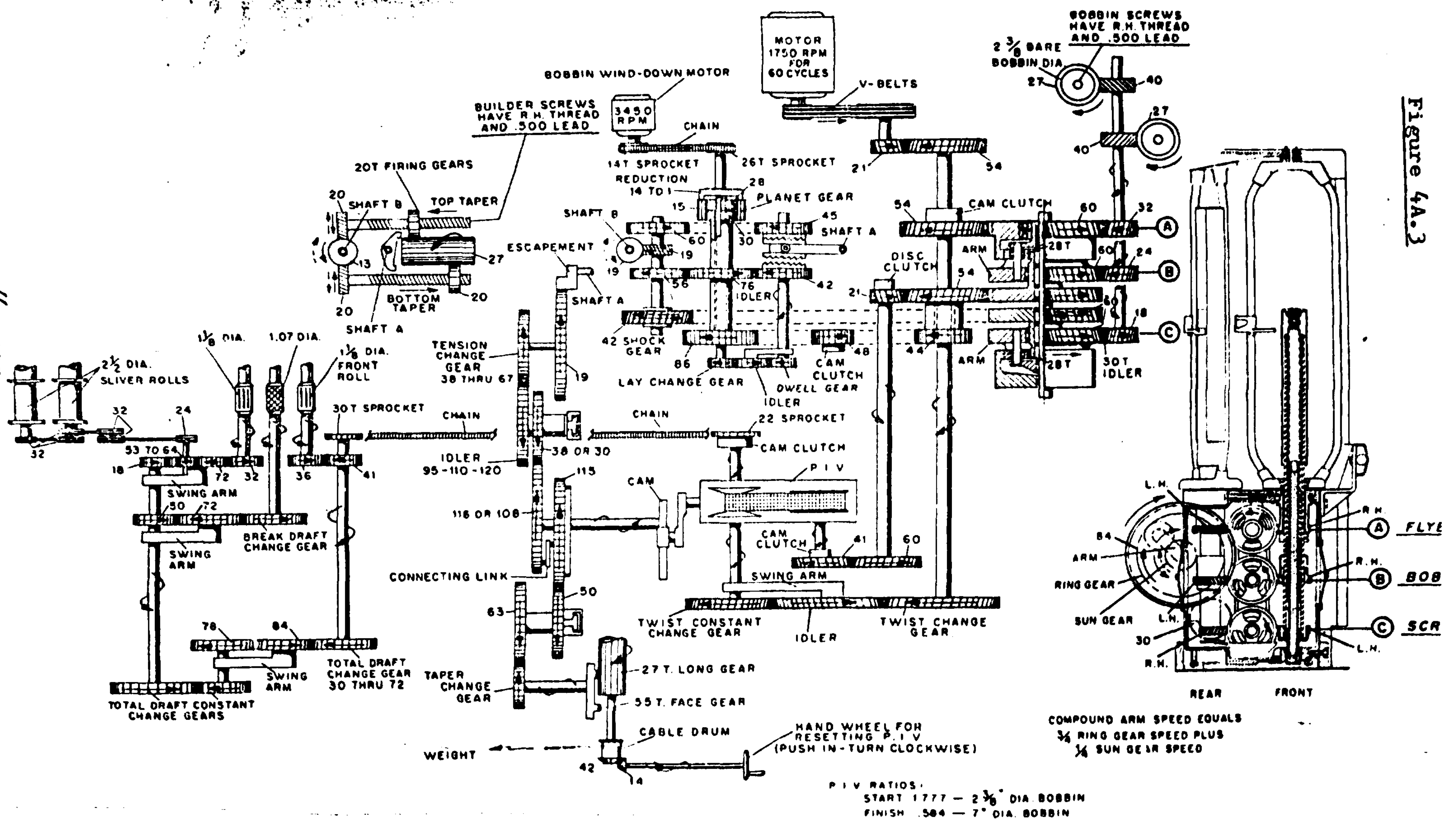


Figure 4A.3

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4.3 SHAFTS:

It is sometimes necessary to remove one of the shafts and its assemblies for repair or replacement. Removal of the front cover assembly of the main gear case is necessary to gain access to the compound and to the flyer, bobbin, and screw output shafts.

4.3.1 LAY SHAFT:

Removing the Lay Shaft: (See Figure 4A.3 & 4A.4)

1. Remove the front bearing cap.
2. Remove the twist constant gear and the swing arm.
3. Withdraw the shaft slowly.
4. Remove each component from the shaft and line up in order of withdrawal.

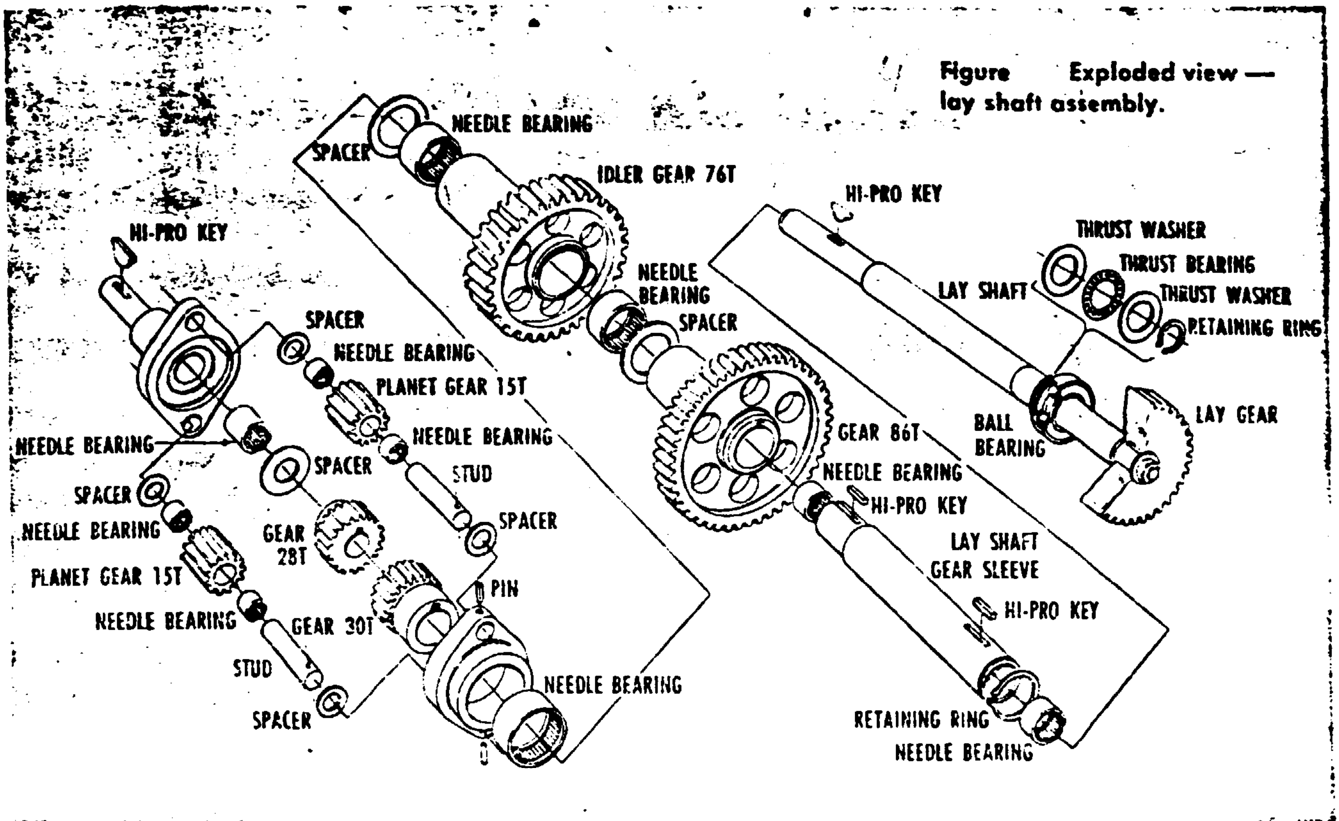
Replacing the Lay Shaft:

1. Reassemble parts on shaft as it is replaced.
2. Align all keys and keyways.
3. Replace twist constant gear and swing arm.
4. Replace front bearing cap.
5. Check shaft for end play. There should be approximately .010" end play to avoid binding Shim behind front bearing cap if necessary.

CAUTION:

Use extreme care to see that washers and thrust bearings do not drop down into the gear case during removal and replacement of the shaft.

Figure 4A.4



4.3.2 REVERSING SHAFT: (See Figure 4A.5)

Mounted on the reversing shaft are the shock gear, reversing gears, and a helical gear. The lay shaft must first be removed in order to remove the reversing shaft.

Removing the Reversing Shaft:

1. Remove the bearing cap.
2. Run a cap screw into the tapped hole in the end of the shaft to aid in removal.
3. Withdraw the shaft from the gear case.
4. Remove each item from the shaft and place in order of reassembly.

Replacing the Reversing Shaft:

Reverse above procedure to replace the reversing shaft. Provide approximately .010" end play to prevent binding.

4.3.3 CLUTCH SHAFT: (See Figures 4A.3 & 4A.5)

It is necessary to first remove the lay shaft and the reversing shaft, the lay constant dwell gear, the swing arm assembly, and the front bearing cap before the clutch shaft can be removed. Mounted on the clutch shaft are the lay constant dwell gear, the clutch shaft bearing, the lay reversing clutch and the clutch gear.

Removing the Clutch Shaft:

1. Remove the nut that secures the lay constant dwell gear assembly and remove the assembly.

2. Loosen the nut the bolds the swing arm assembly in place.

3. Remove the swing arm assembly.

4. Remove the bearing cap, which is secured with hex head cap screws.

5. Remove the clutch shaft assembly.

6. Remove the twist constant gear and the idler gear to provide access to reach the gears and bearings as the shaft is removed.

7. Support the clutch gear and pull the clutch shaft forward until the clutch slides from the shaft.

8. Remove the clutch shaft.

Replacing the Clutch Shaft:

Reverse the above procedure to replace the clutch shaft.

NOTE

Be sure the bronze washers are replaced in their correct locations.

Check for end play, which should be approximately .010". Shim behind behind cap if necessary.

Figure 4A.5

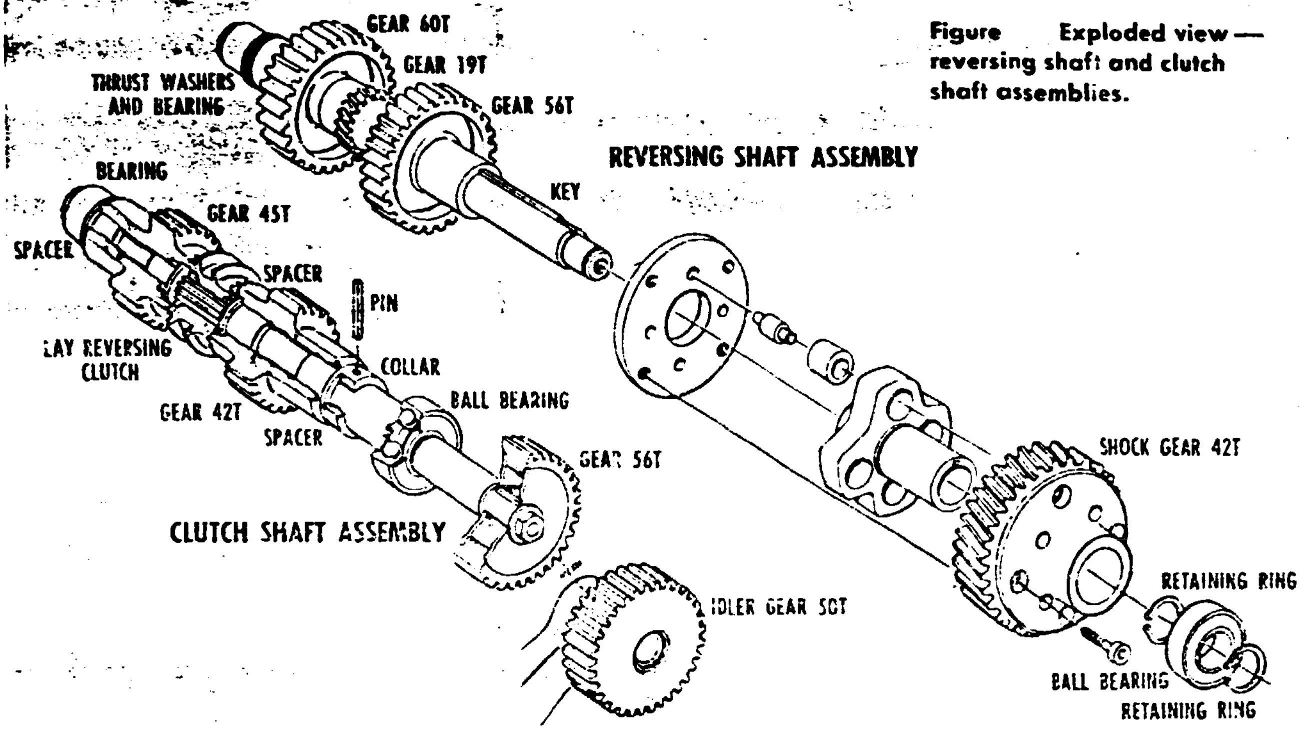


Figure Exploded view — reversing shaft and clutch shaft assemblies.

4.3.4 <u>LAY TRAIN CLUTCH AND SCREW SHAFT IDLER</u>: (<u>See Figures 4A.6 & 4A.7</u>)

The clutch can be removed by removing its retaining nut and pushing the stud back toward the inside of the gear case. The screw shaft idler is removed in a similar way, but its replacement is more difficult. Extreme Care is required to align the stud with its mounting hole and to get the thrust bearings and washers up over the necked-down part of the stud.

4.3.5 <u>THE MAIN SHAFT</u>: (<u>See Figure 4A.6</u>)

Two men are required to remove the main shaft from the back of the gear case.

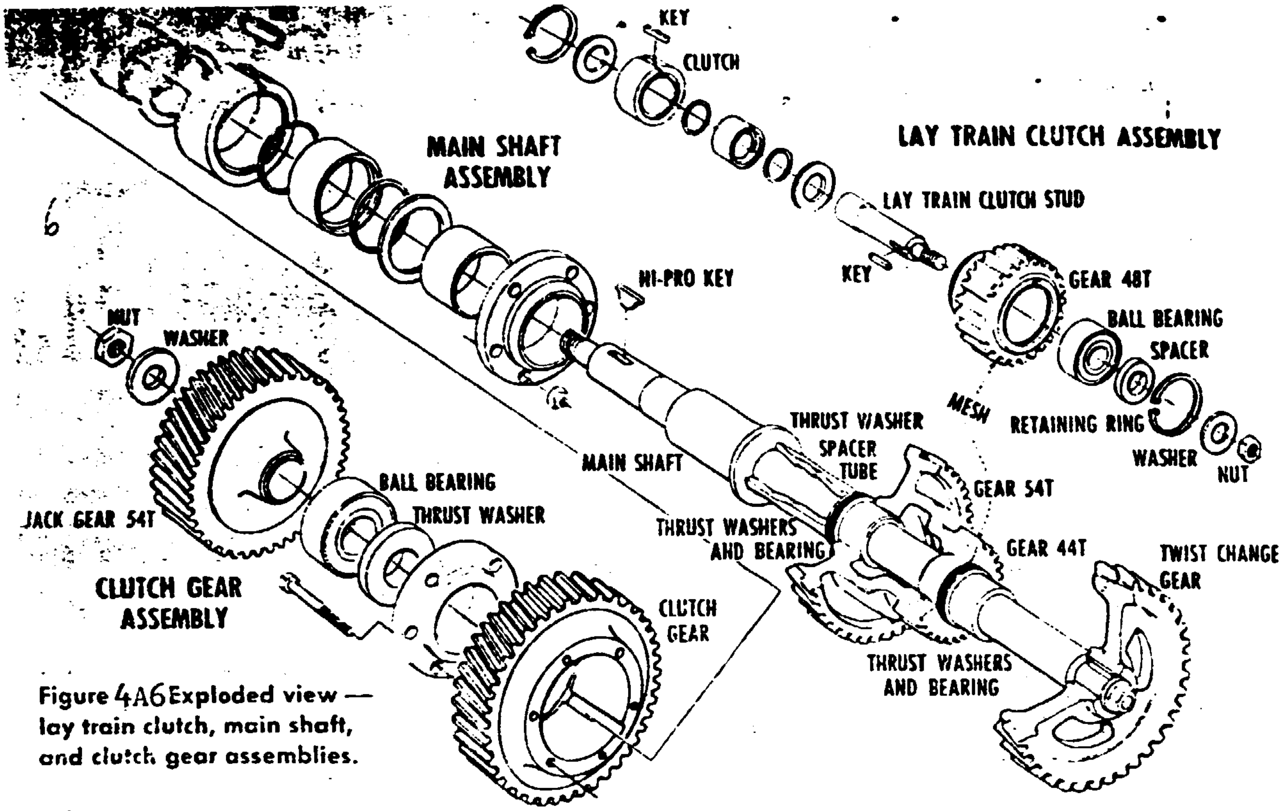


Figure 4A6 Exploded view — lay train clutch, main shaft, and clutch gear assemblies.

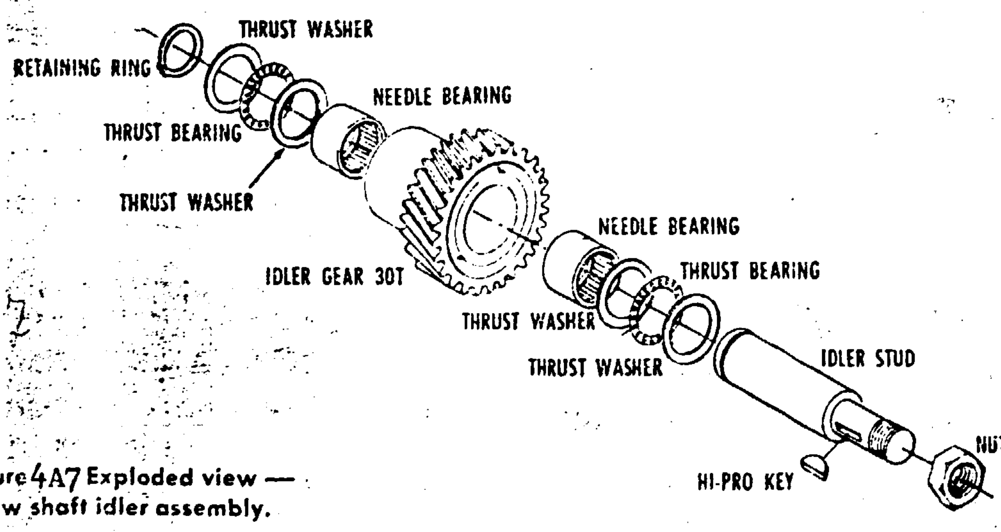


Figure 4A7 Exploded view — screw shaft idler assembly.

Removing the Main Shaft: (Figure 4A.8 & 4A.9)

1. Remove the flywheel and pulley assembly from the jack shaft.

2. Disconnect the oil line from the jack shaft housing.

3. Remove the jack shaft and housing.

4. Remove the jack gear.

5. Remove the bearing cap.

6. Remove the twist change gear.

7. Pull the shaft from the back of the gear case.

8. If the special tool, Part No. 32735-1A is not used, a long screwdriver, a length of bar stock, or a wire must be inserted behind the main shaft as it is withdrawn to catch the gears, bearings, and washers and prevent them from falling into the gear case.

Replacing the Main Shaft:

Reverse the above procedure to replace the main shaft. Shim behind bearing cap if necessary to prevent binding.

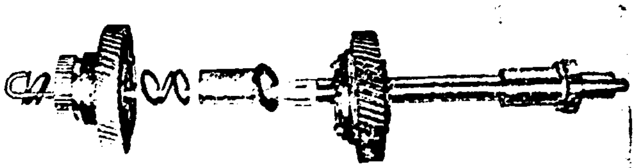


Figure 4A8 The main shaft assembly and disassembly tool.

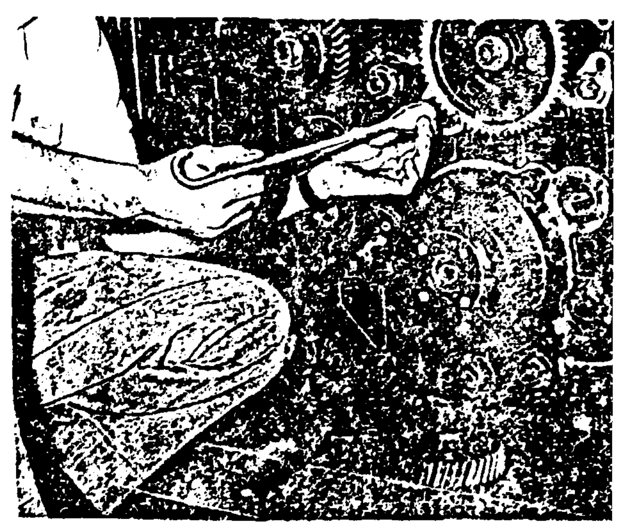


Figure 4A9 Using the main shaft tool.

4.3.6 FLYER OUTPUT SHAFT, BOBBIN OUTPUT SHAFT: (See Figure 4A.10 & 4A.11)

1. Loosen the universal joint splined hub.

2. Unfasten the locknut that holds the flyer shaft gear.

3. Remove the front bearing retaining ring.

4. Withdraw the shaft.

Reverse the above procedure to replace either of these shafts.

4.3.7 OIL PUMP: (See Figure 4A.11)

The oil pump is driven by a pin in the screw drive shaft. A slot in the end of the pump rotor shaft engages this pin.

Removing the Oil Pump:

1. Disconnect the oil line at the top of the pump housing.

2. Remove the pump cover plate and housing.

3. Withdraw the pump rotor.

NOTE

Use care in disassembling so that the pump vanes and springs are not lost.

Replacing the Oil Pump:

Reverse the above procedure to replace the oil pump.

4.3.8 <u>SCREW DRIVE SHAFT</u>: (<u>See Figure 4A.11</u>)

After the oil pump has been removed, the screw drive shaft is removed and replaced in the same way as the bobbin and flyer drive shafts.

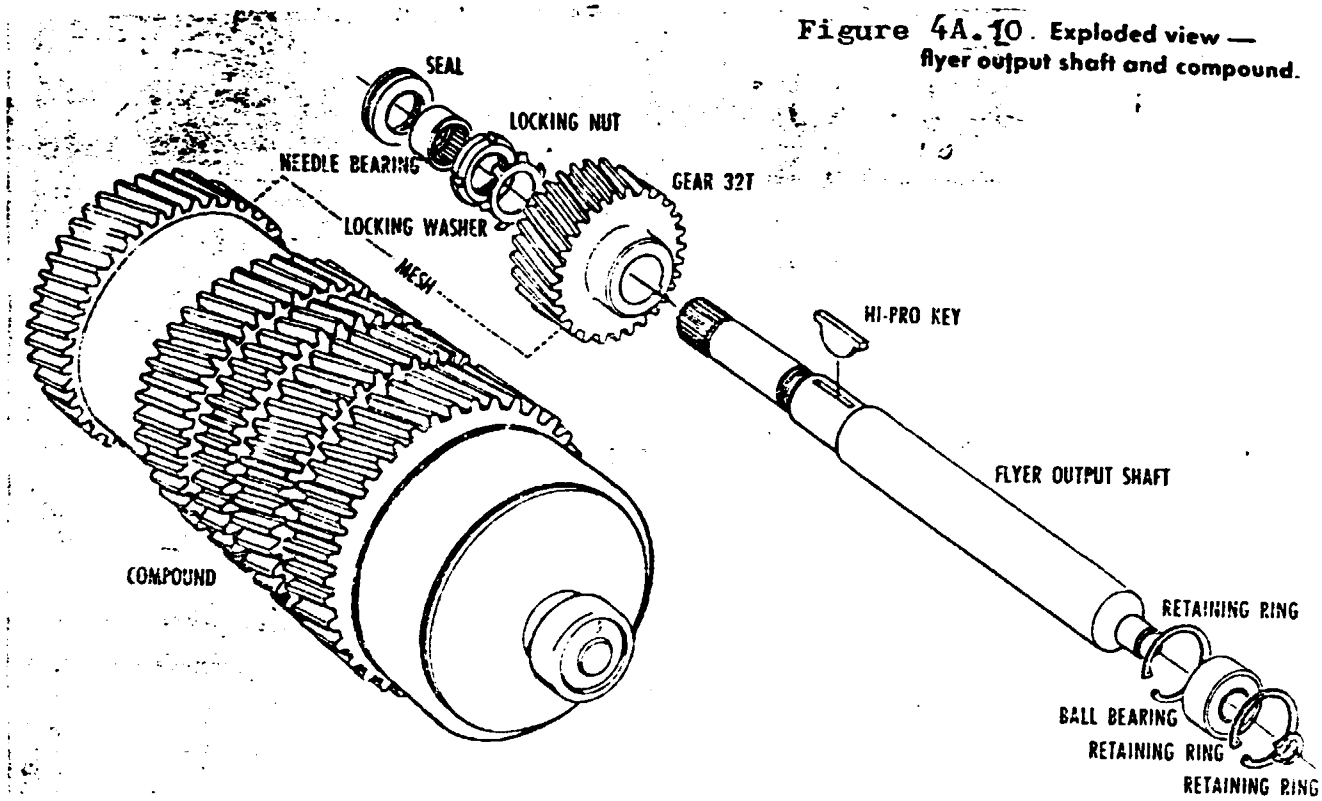


Figure 4A.10. Exploded view — flyer output shaft and compound.

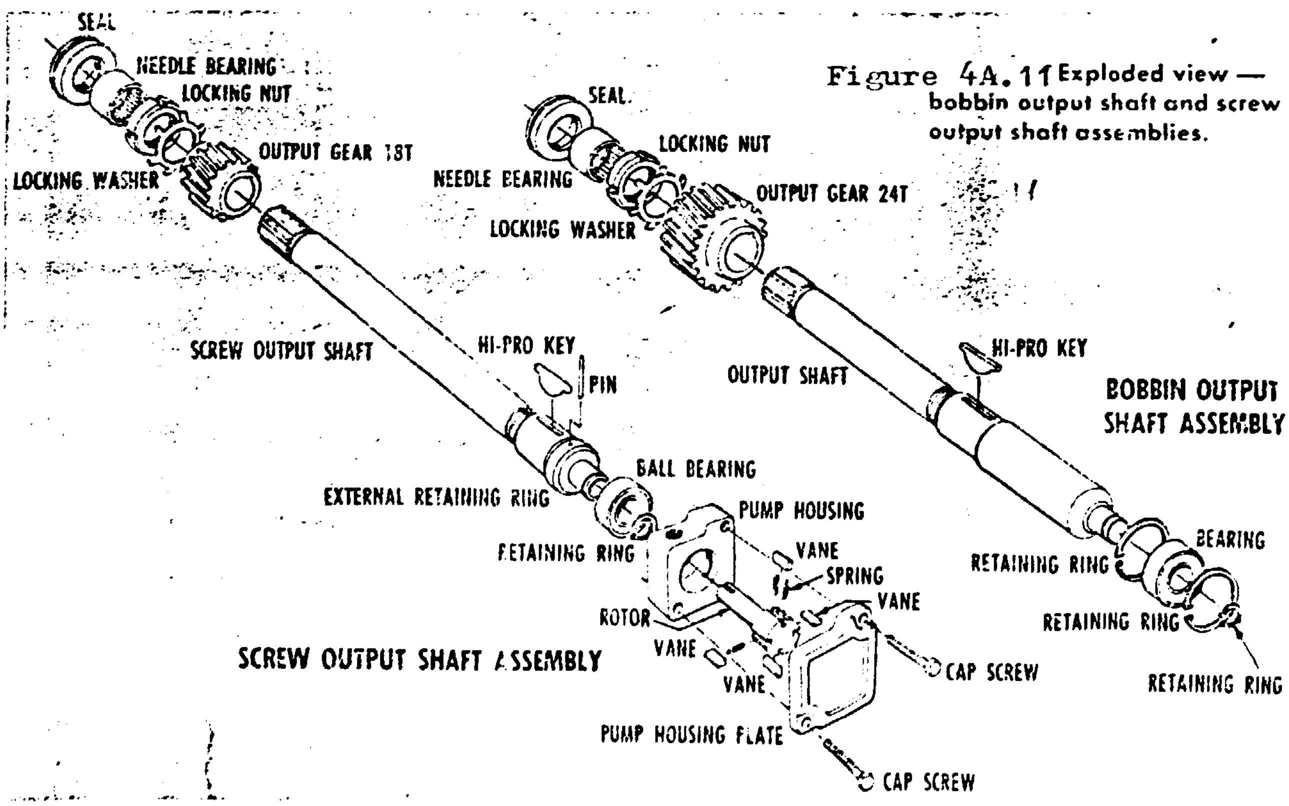


Figure 4A.11 Exploded view — bobbin output shaft and screw output shaft assemblies.

4B. THE COMPOUND:

1. DESCRIPTION:

The compound, Figure 4B.1 consists of two differentials mounted in tandem on a common shaft and is designed so that the output of the first differential will feed information to the second differential. All rotating members are mounted on antifriction bearings.

As indicated, the main motor transmits a constant speed A to the compound's flyer drive gear. This, in turn, is geared directly to the top, or flyer at constant speed.

Compounded with the flyer drive gear is the bobbin ring gear which meshes with planet gears. The planet gears are carried in a cage integral with the bobbin driving gear and mesh with the bobbin drive sun gear.

2. PURPOSE:

Drive from the main motor is transmitted through the compound, which drives and controls the spindles and flyers.

3. PARTS:

See Figure 4B.1.

4. SETTINGS:

4.1 Removing the Compound:(See figures 4B.2, 4B.3 & 4A.3)

1. Remove the cover assembly.

2. Remove the twist change gear.

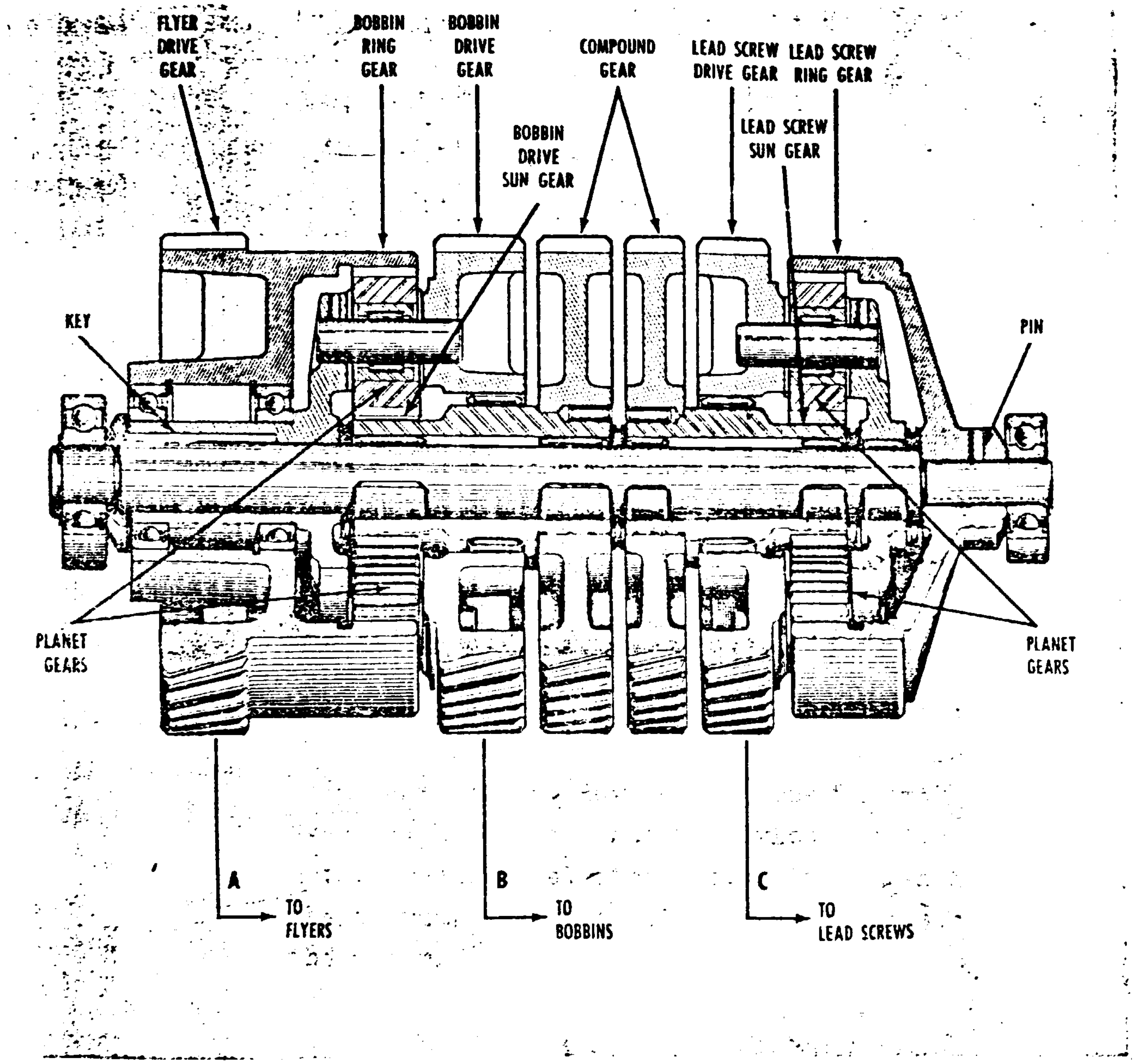


Figure 4B1 Cross section view of Rovematic compound.

3. Remove the screw shaft idler.

4. Remove the three socket head cap screws that hold the bearing housing for the compound.

5. Pull the entire compound from the case. Withdrawal can be made easier by having someone manually rock the flyer back and forth.

NOTE

The compound is a heavy unit and must be removed with care. A jig can be made in the mill shop (Figures 4B.2 and 4B.3) that will aid in the removal, replacementand positioning of the compound.

4.2 Replacing the Compound:

1. Support the back end of the compound as it is inserted in the gear case.

2. Work the compound back into the case as far as it will go.

3. Install the screw shaft idler.

4. Install the bearing on the compound shaft.

5. Align the bearing housing of the compound with the holes in the gear case.

6. Insert the three socket head cap screws and tighten securely.

7. Check compound for end play. There should be no more than .010" or less than .005" end play. If there is no end play, shim between the bearing cap and front bearing; if too much end play, remove shims.

8. Install the twist change gear.

9. Replace cover assembly.

10. Insert recommended amout of oil as instructed in the Rovematic Lubrication Manual.

11. Install the front cover and secure with four knobs.

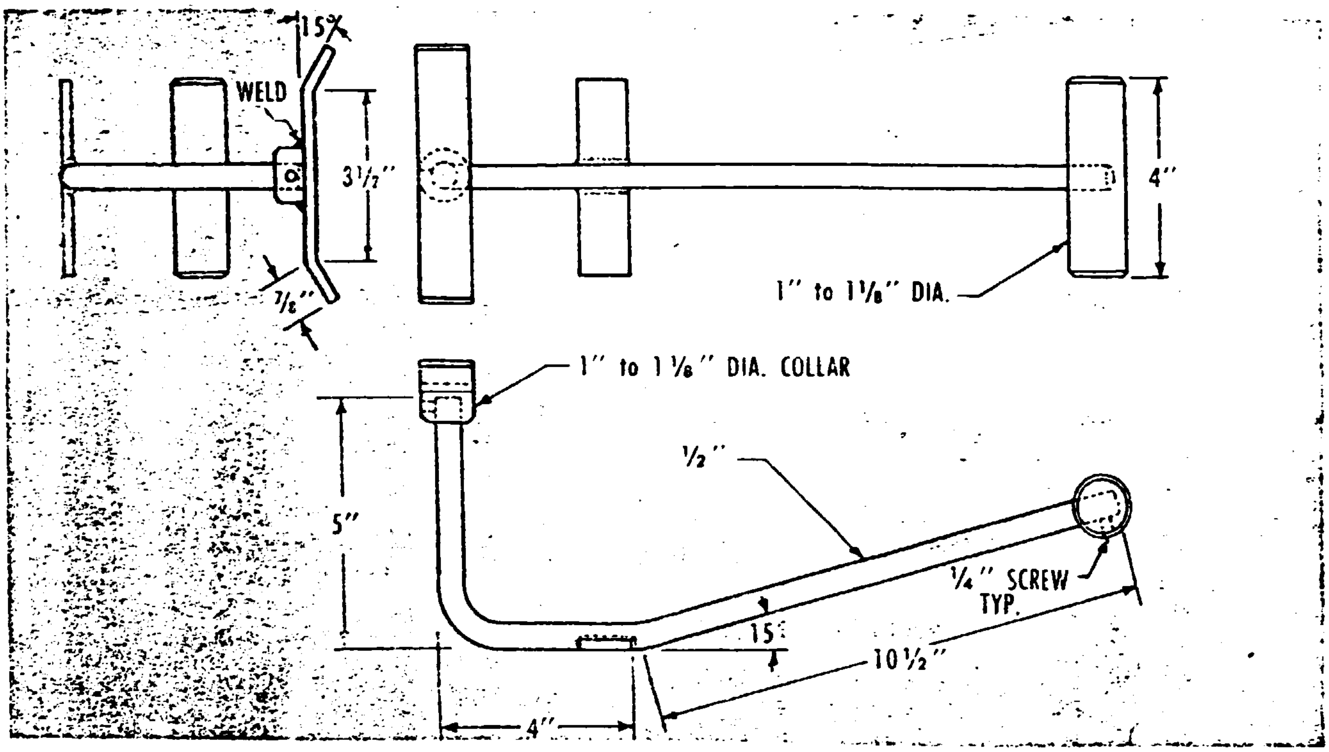


Figure 4B2 Jig for removing compound.

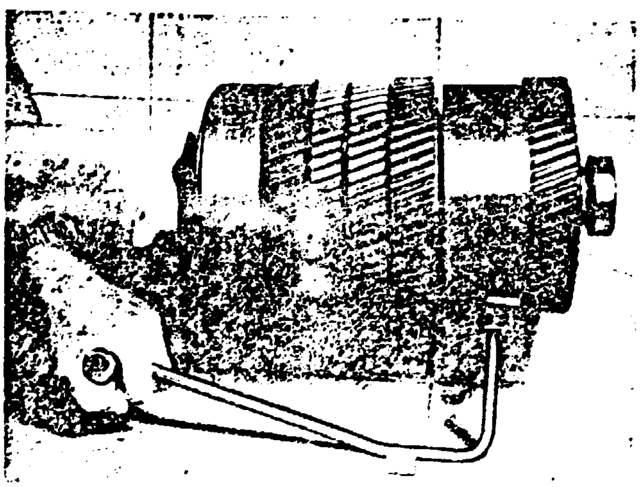


Figure 4B3 Using the compound assembly jig.

4C. THE P.I.V.:

1. DESCRIPTION:

The Rovematic P.I.V. (Positively Infinitely Variable) unit is composed of two sheaves with adjustable flanges connected by a chain. The mounting is so constructed that as one sheave opens to give a smaller working diameter for the chain, the other closes, to form a greater working diameter. In this way the ratio between the two sheaves changes to vary the speed but the chain tension remains constant.

2. PURPOSE:

Since the delivery speed and flyer speed of the Rovematic are constant, provision must be made to slow the spindle speed as the diameter of the package builds up. The P.I.V. provides this spindle speed reduction, controlled by the builder cam and governed by the tension change gear. The P.I.V. performs the same functions as the cones and cone belt of conventional roving frames. The input of the P.I.V. can be compared to the top cone and the output to the bottom cone. The positive mechanical action and precise settings of the P.I.V. make it far superior to the cone and belt arrangement.

3. PARTS:

See Figures 4C.2 to 4C.5.

4. SETTINGS:

4.1 CHAIN CONTROL:

In normal operation, gradual wear of the end of the P.I.V. chain slats will cause slackening of the chain. This will introduce a slight discrepancy in the output speed of the P.I.V. unit. If not periodically readjusted, difficulty will be experienced in maintaining proper roving tension throughout a doff. It is recommended, therefore, that the P.I.V. chain tension be checked at regular intervals - preferably every two months. Occasionally, chain replacement may be necessary.

Manufacturers recommendations - The P.I.V. chain tension should be checked before the frames is put into operation then rechecked at 250 hours, 500 hours and 1000 hours of operation. Check every 1000 hours thereafter. To check the tension, proceed as follows after the packages have been doffed.

1. Remove the front access cover from the main gear case.

2. Using the builder rewind wheel, position the P.I.V. so that the chain is level horizontally and the sheave flanges are the same distance apart.

3. Cut off all power to the machine.

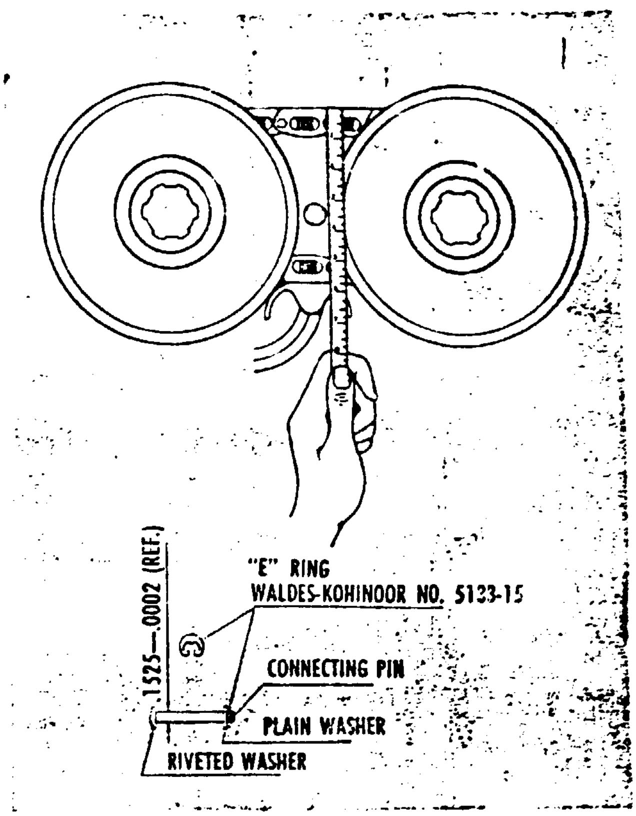
4. Unmesh the twist gear to give access to the chain.

5. With a ruler, measure from the top of the chain to the bottom of the chain as shown in Figure 4C.1. The distance must be from 5¾" to 5 7/8". If the distance is outside the above limits, the chain tension must be adjusted.

6. To adjust the chain tension, loosen the locknut on the chain tension shaft. Turn the tension shaft counterclockwise with a screwdriver to tighten the chain. Turn the shaft clockwise to loosen the chain. Rotate the sheaves while making the adjustment.

7. Tighten the locknut on the chain tension shaft when the correct tension is obtained.

FIGURE 4C.1



4.2 INSTALLATION OF NEW CHAIN:

Before attemping to remove the old chain, the connecting pin in the new chain should be removed and replaced several times in order to become thoroughly familiar with the coupling.

1. Pull the chain tension arm down and tie in position.

2. Loosen the locknut and turn the chain tension shaft clockwise with a screwdriver to loosen the chain.

3. Rotate the chain until the "E" ring of the connecting pin is visible between the wheels at the top.

4. Remove the connecting pin, being careful to not drop it into the gear case.

5. Remove the chain.

6. Slide the new chain over the shoe on the torsion arm and around P.I.V. sheaves.

7. Align the two ends of the chain and insert a wire through the holes to hold the chain together.

8. Insert the connecting pin, while withdrawing the wire.

9. Release the chain tension arm, adjust the chain tension.

4.3 REMOVING THE P.I.V. INPUT SHAFT;
(See Figure 4C.2)

1. Remove the collar and clutch drive at the back of the P.I.V. input shaft.

2. Remove the gear case access cover.

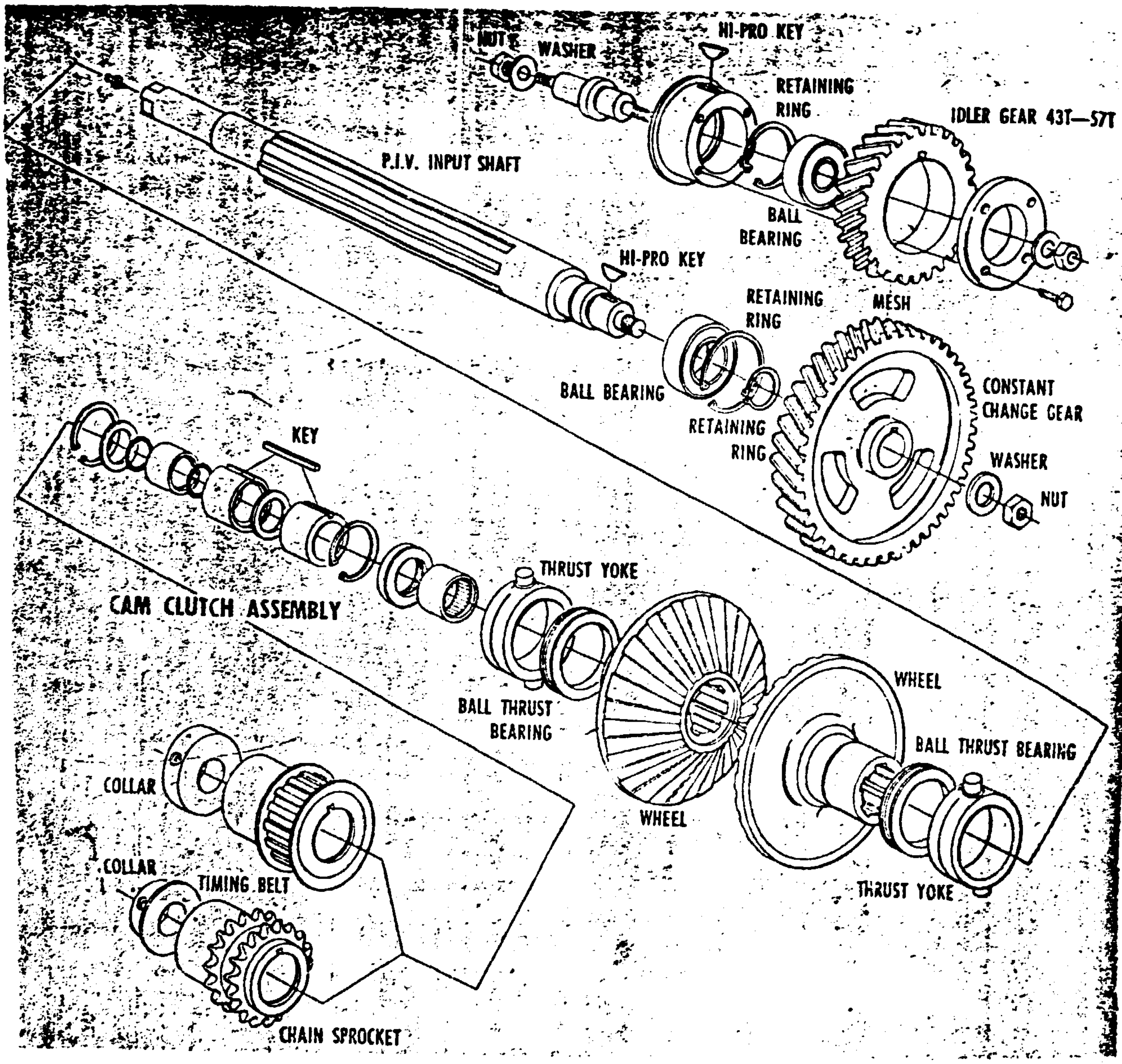
3. Remove constant change gear from the P.I.V. input shaft.

4. Remove the tru-arc retaining ring that holds the bearing to the housing.

5. Pull the P.I.V. input shaft from the machine.

To reassemble the P.I.V. input shaft, reverse the above procedure.

FIGURE 4C.2



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4.4 <u>REMOVING THE P.I.V. OUTPUT SHAFT</u>:
<u>(See Figure 4C.3)</u>

1. Remove the gear case access cover and front gear case assembly if necessary.

2. Remove 41-tooth clutch gear.

3. Remove the retaining ring from the housing.

4. Remove the shaft and bearing assembly.

To reassemble the P.I.V. output shaft, reverse the above procedure.

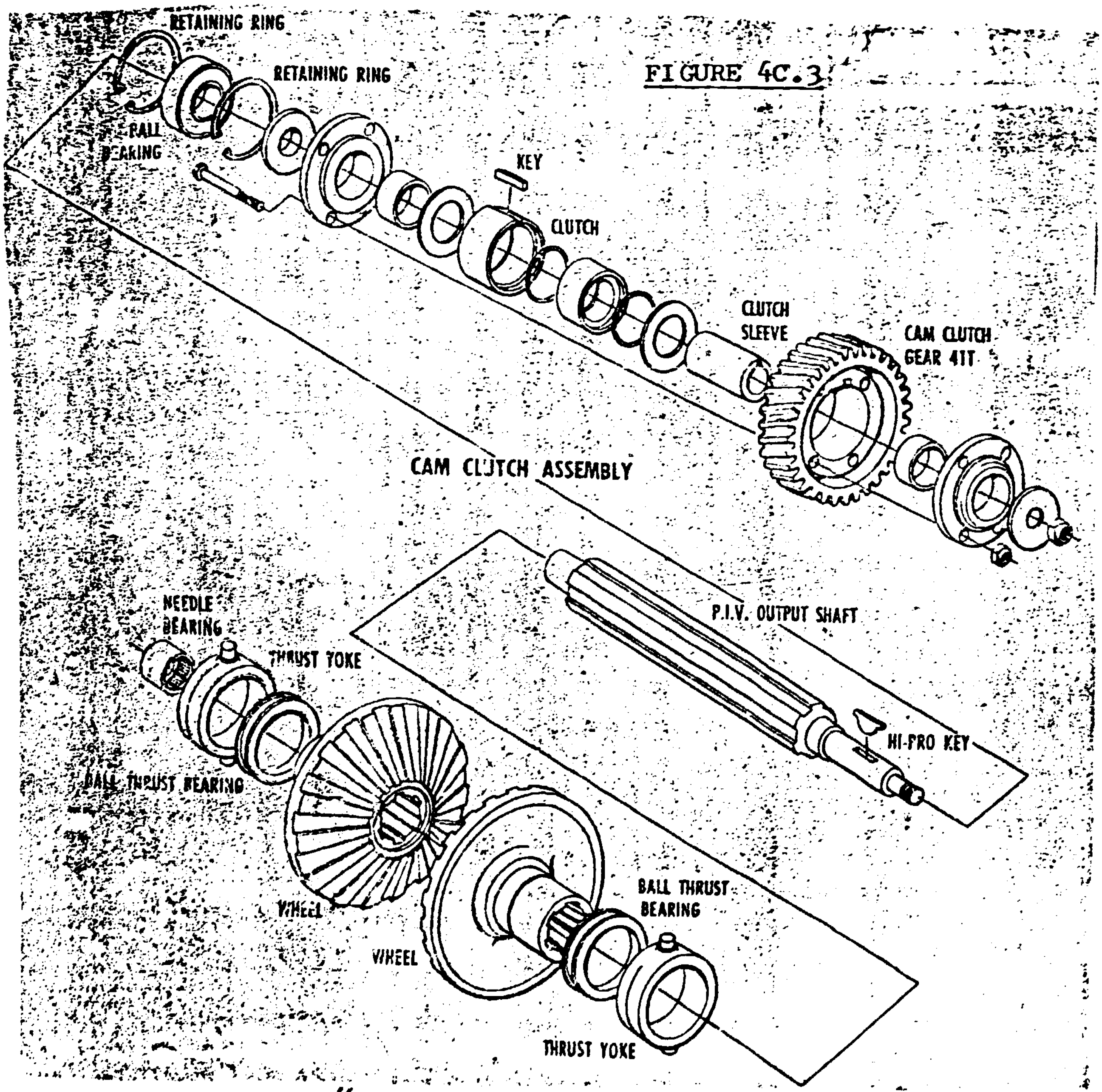

FIGURE 4C.3

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4.5 REMOVING THE P.I.V. JACK SHAFT: (See Figure 4C.4)

1. Remove the 60-tooth gear and the P.I.V. Jack shaft bearing cap.

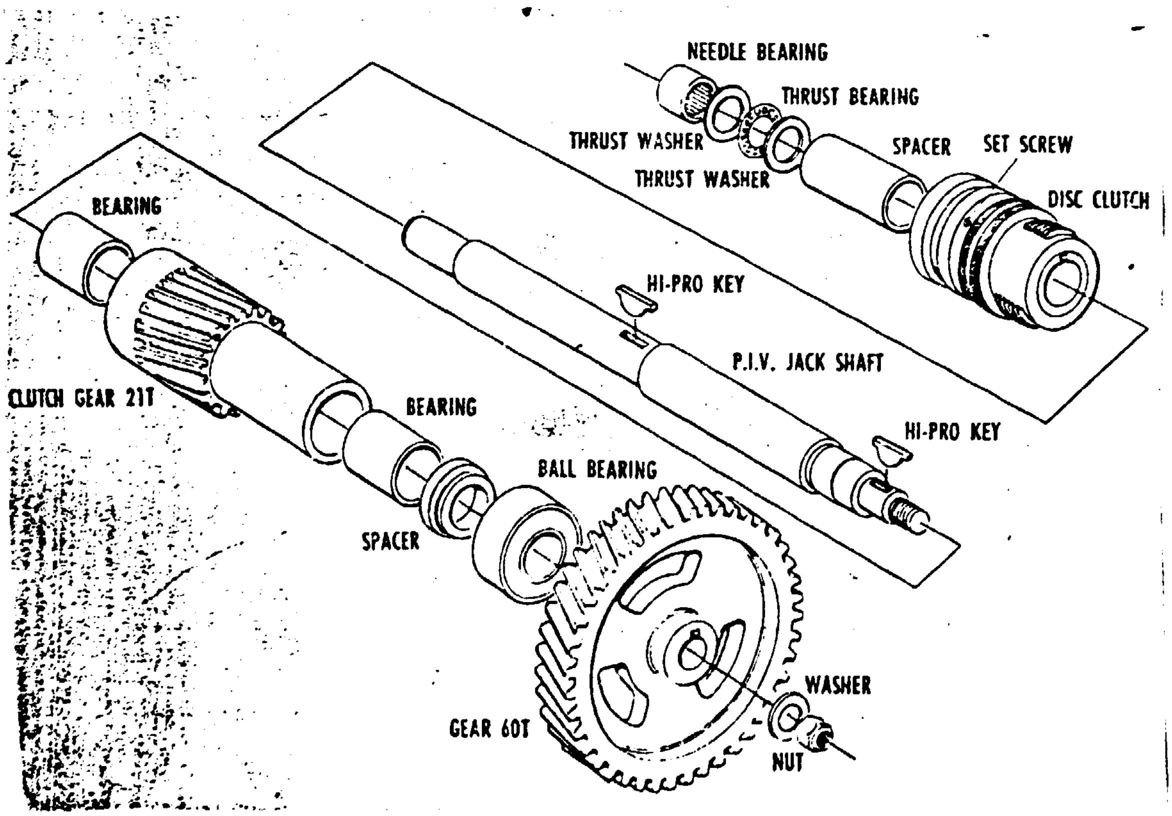
2. Disengage the clutch and turn the shaft so that the setscrew located near the center of the clutch, inside the gear case, is exposed.

3. Loosen this setscrew.

4. Withdraw the shaft.

Reverse the above procedure to reassemble the shaft. Shim behind the bearing cap if necessary to prevent binding.

FIGURE 4C.4



4.6 DISC CLUTCH ADJUSTMENT:

The disc clutch mounted on the P.I.V. jack shaft transmits the bobbin winding speed to the compound. Normally it is disengaged only when running up loose roving. The clutch is preset and should not need adjustment under normal operating conditions. However, if unexplained slackening of the roving occurs, the clutch may need adjustment. In which case proceed as follows:-

1. Remove front access cover from main gear case.

2. A leaf spring is looped over the knurled ring of the clutch and one end of the spring engages two slots to prevent the ring from rotating. Insert a screwdriver under the loop of the spring and disengage the end from the slots.

3. Turn the knurled ring counterclockwise to tighten the clutch until a locking action is felt when the clutch is engaged and disengaged with the lever.

4. Re-engage the spring with the slots in the knurled ring.

4.7 REMOVING THE DISC CLUTCH HANDLE ASSEMBLY: (See Figure 4C.5)

1. Remove the gear case cover assembly and the vertical gasket strip on the right hand flange of the gear case.

2. Withdraw the locking pin, and the clutch handle assembly can be slid from the shaft and removed from the gear case.

GROUP-5:

A. DRAFTING SYSTEM.
B. DRAFT GEARING.
C. THE TRAVERSE MOTION.

5A. DRAFTING SYSTEM:

1. DESCRIPTION: (See Figures 5A.1 and 5A.2)

Four drafting systems are available for the Rovematic. The 1B spring-weighted system is the single apron type and will process all fibres in the 7/8" to 2" staple length range. The 1C system has magnetic top rolls and will handle fibres 7/8" to 2". The 1D is a similar and will process staple up to 3" length.

The 12F drafting element is designed for processing long staple fibres in the 2" to approximately 8½" staple length range. It is a double apron system, which can be converted to a single drafting zone,system by using a gap roll to drive the top apron. It is equipped with the Adjusto-Ratch, which permits the back roll setting to be minutely and precisly adjusted with the machine running.

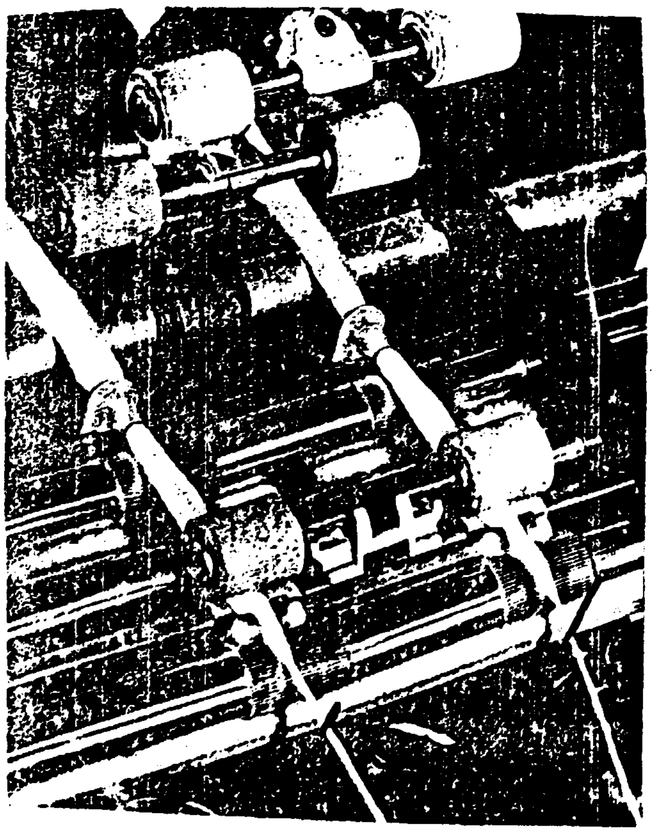
The Model FB-1B drafting system used is constructed on the well known FS-2 principle. The system contains three lines of top cushion rolls, the rop rolls being spring-weighted against the bottom rolls by top arm weighting units. The front and middle top rolls are the "loose bars" type. The back line has the "locked bars" construction to acheive superior holding of the incoming sliver. All rolls, top and bottom, are mounted in antifriction bearings.

The roll stands are rugged castings with contact surfaces milled to close tolerances. The 1B stand is attached to the roller beam with two cap screws.

The bottom steel rolls of the Rovematic extend in joined sections the length of the machine. They are driven by gears in the head end cabinet. The different roll diameter of the drafting system are shown in 4.2.

Accessories for the drafting system include clearers, vacuum flutes for waste removal and ends-down stop motion rensors, the drafting element requires only periodic lubrication.

The 1B element has cot-covered antifriction top rolls, spring-weighted; the 1C and 1D elements have a cot-covered front and middle roll and a fluted plastic covered back roll, all of which are magnetic; the 12F element has cot-covered antifriction front and back rolls and an antifriction apron-covered middle roll, all spring - weighted.



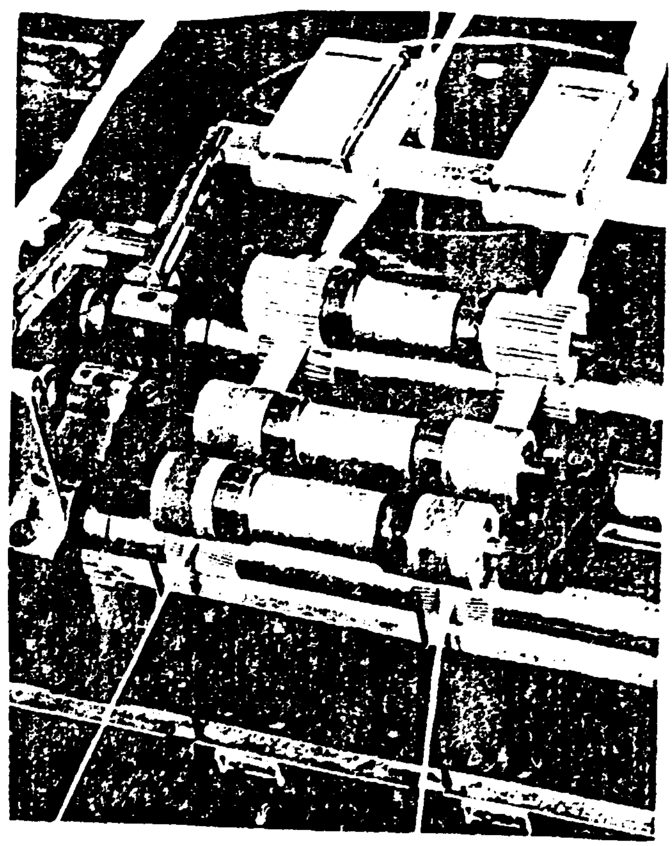


Figure 5A1 The 1B drafting ... WERNER INTERNATIONAL

2. PURPOSE:

The drafting system transport the stock and through progressive higher surface speeds, draw the fibres out and convert the sliver into roving form.

3. PARTS:

3.1 Bottom Rolls.
3.2 Top Rolls.
3.3 Apron.
3.4 Clearers.
3.5 Gears.

4. SETTING (1B DRAFTING SYSTEM): (See Figure 5A.3)

4.1 ROLL STAND: (See Figure 5A.4)

Assemble the roll stands on the beam but do not tighten screws or bolts. Obtain reel, wire, and appropriate aligning blocks.

1. Move the roll slide blocks so the aligning equipment can be installed between the front and middle blocks.

2. Attach reel support block to head end roll stand with button on front of block against front roll block.

3. Attach wire position block to foot end roll stand with button against front roll block.

4. Place reel assembly on reel support.

5. Pull ratchet pawl up on the reel assembly.

6. Feed wire from reel around and under the wire guide and reel support block.

7. String wire to foot end and place over wire guide and wire position block.

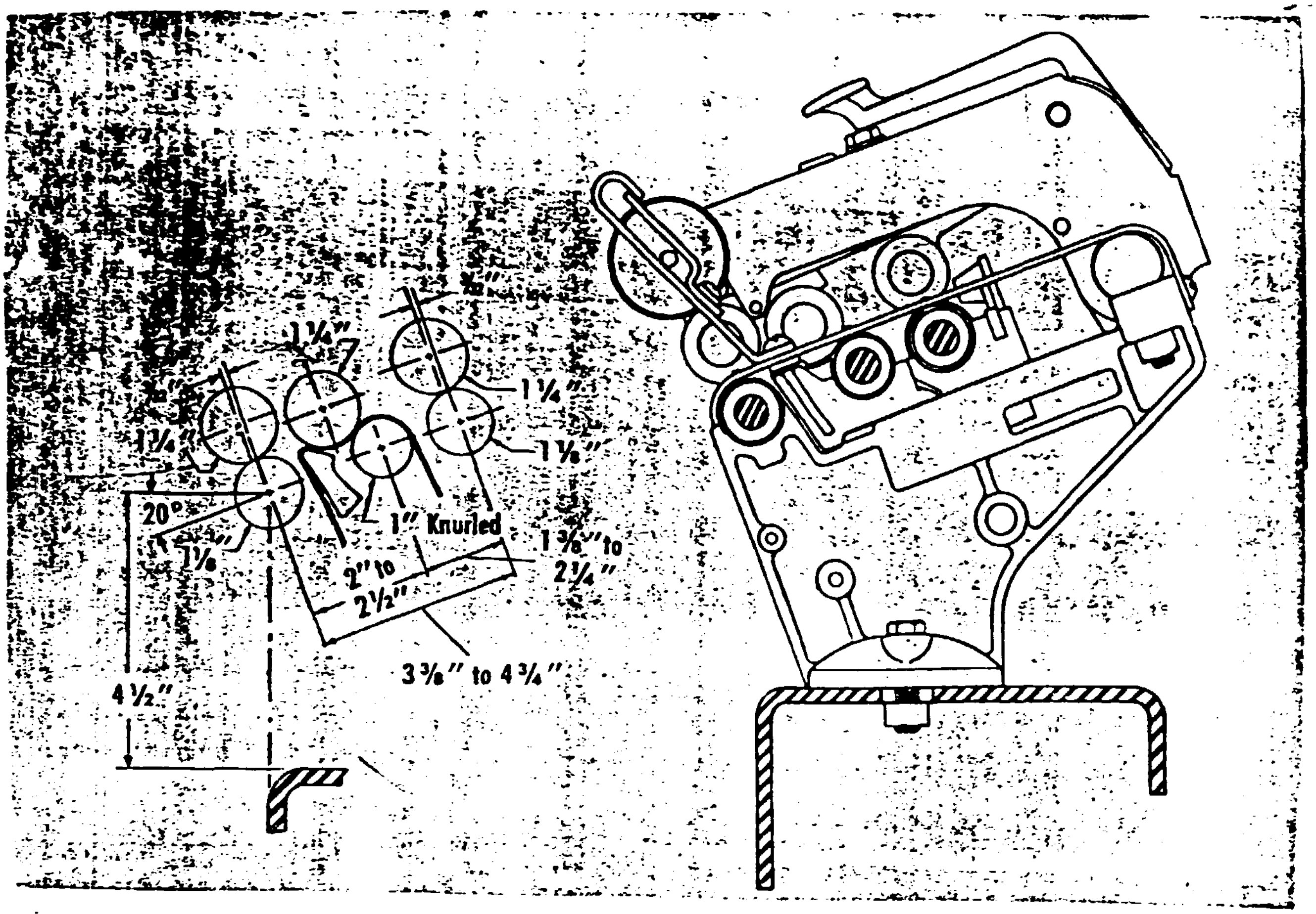


Figure 5A3 The 1B drafting system.

4.2 BOTTOM AND TOP ROLLS:

After the roll stands have been aligned, install the bearing caps on the blocks. Turn the rolls as the caps are tightened to see that they do not bind. Tighten all the roll joints with the special wrenches. Install appropriate gears at the head end.

DRAFTING SYSTEM-1B	BOTTOM ROLLS	TOP ROLLS	SPRING PRESSURE IN LBS.
Front Roll Diameter	1⅛"	1¼"	50
Middle Roll Diameter	1.07*	1¼"	37
Back Roll Diameter	1⅛"	1¼"	40

*Effective diameter.

The front and back rolls are fluted and the middle roll is knurled.

8. Place hook at end of wire on front edge of beam. Turn crank to tighten wire until ratchet in crank slips.

9. Beginning at number two roll stand, place roll stand aligning block on roll stand slide.

10. With tip of aligning block against front steel roll block, align and level roll stand. Use shims if needed.

11. Align stands lengthwise by centering the steel roll bearings and the apron bar.

12. Repeat this procedure at each roll stand.

13. Secure the rolls by installing a few of the roll bearing caps.

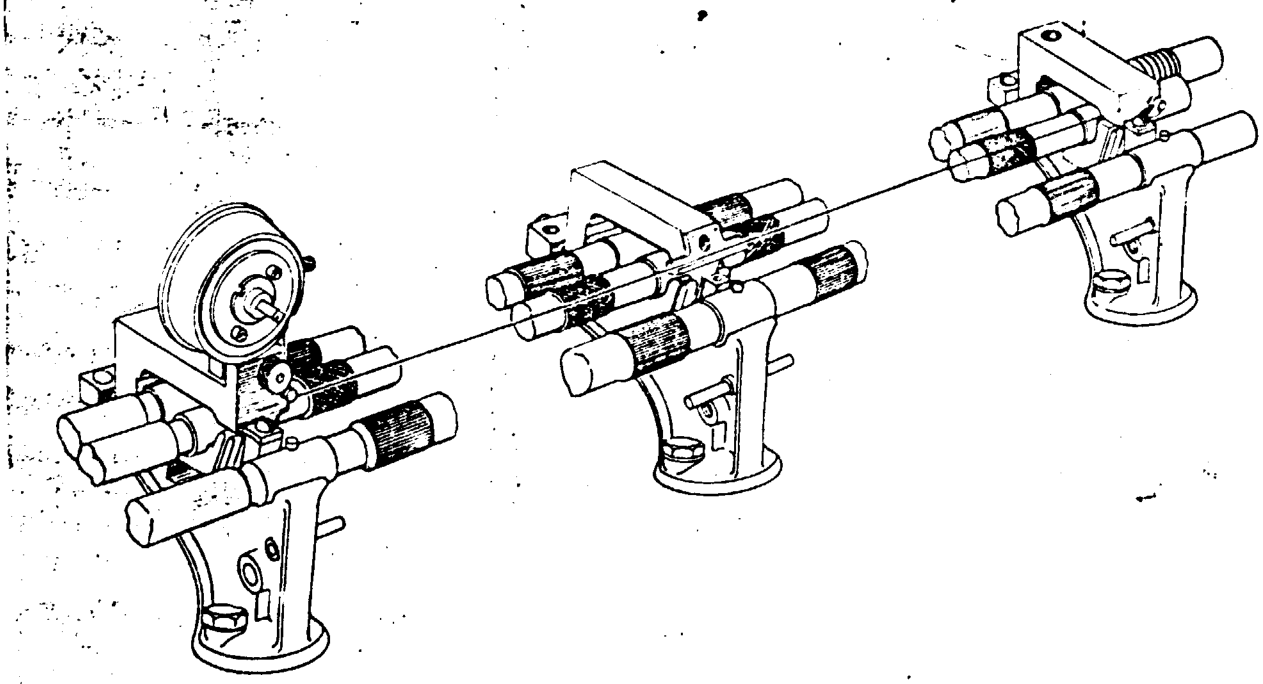


Figure 5A4 Aligning the roll stands.

The 1B drafting system is constructed on the Shaw principle. The front and middle top rolls are the loose-boss type and the back rolls are the lock-boss type. The front and back top rolls overhand the bottom rolls 3/32".

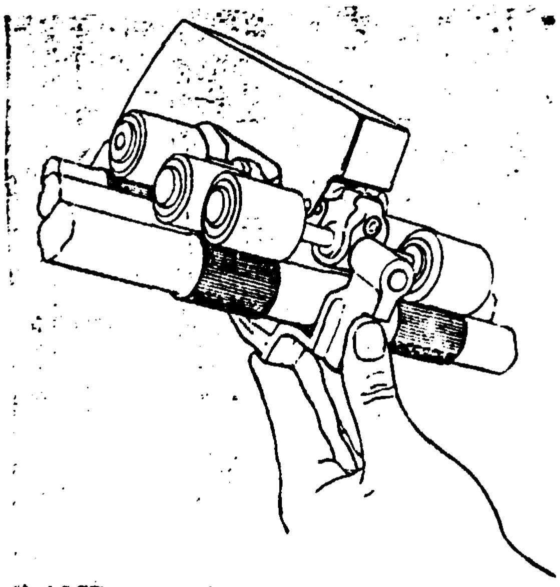
CAUTION

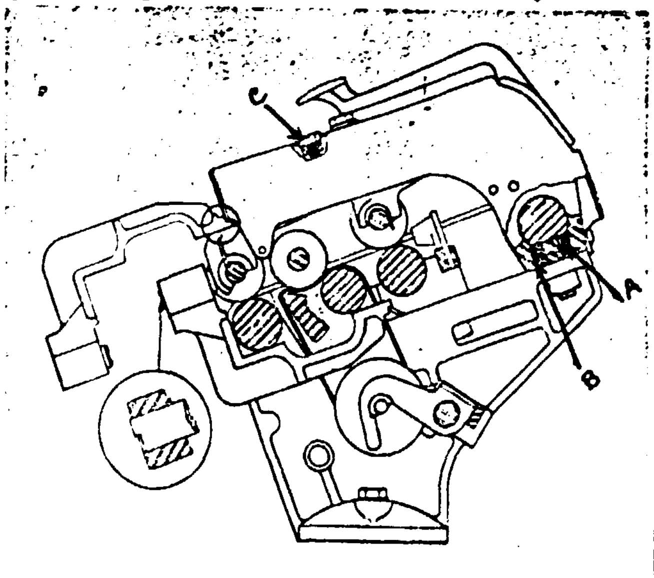
Do not buff the middle top rolls. To do so will change the gap between the apron and the top roll at the nose of the apron bar. The middle top roll can be buffed and used as front roll. Replace a damaged or undersize middle roll with one of correct diameter.

Three gauges are used to set the top rolls of the 1B drafting system. They are the weight horn bar gauge, the front top roll gauge, and the back top roll gauge. (See Figures 5A.5 to 5A.9).

4.3 WEIGHT HORN BAR GAUGE: (See Figures 5A.5&5A.6)

To use the weight horn bar gauge, remove the bearing caps, place the gauge as shown in Figure 5A.5 and position the weight horn bar against the back leg of the gauge. Tighten the bar securely.





4.4 FRONT TOP ROLL GAUGE:
(See Figures 5A.7 & 5A.8)

The front top roll gauge is used as follows:

1. Set the front top rolls with the middle line of rolls in position before installing the back line of rolls.

2. Release the weight lever and loosen setscrew A in the weight adjusting dog; tighten setscrew B. (See Figure 5A.8)

3. Apply weight and check the space between the lip of the weight horn and the top of the front top roll support. This space should be approximately $\frac{1}{8}$". (See Figure 5A.8)

4. With the weight horn set, place the front top roll gauge in position against the front steel roll, Figure 5A.7. The gauge must also contact the middle steel roll and the plunger must rest against the front roll support.

5. With the gauge in the above position, loosen setscrew B in the weight adjusting dog until the bottom step on the gauge plunder is fluch with the outside of the gauge. Adjusting screw C must be kept flush with the top of the weight horn while this setting is made. (Figure 5A.8)

6. When screw B and the bottom step of the plunger are fluch, tighten screw A in the weight adjusting dog. The gauge should now register between the two steps of the plunger.

Referring to Figure 5A.8 positions 1,2 and 3:

Position-1: The end of the gauge has two milled steps $\frac{1}{8}$-inch and $\frac{1}{4}$-inch.

Position-2: Checks the space between the top of the weight horn and the top of the front top roll support.

Position-3: Final step-checks spacing which should be between $\frac{1}{8}$-inch and $\frac{1}{4}$-inch.

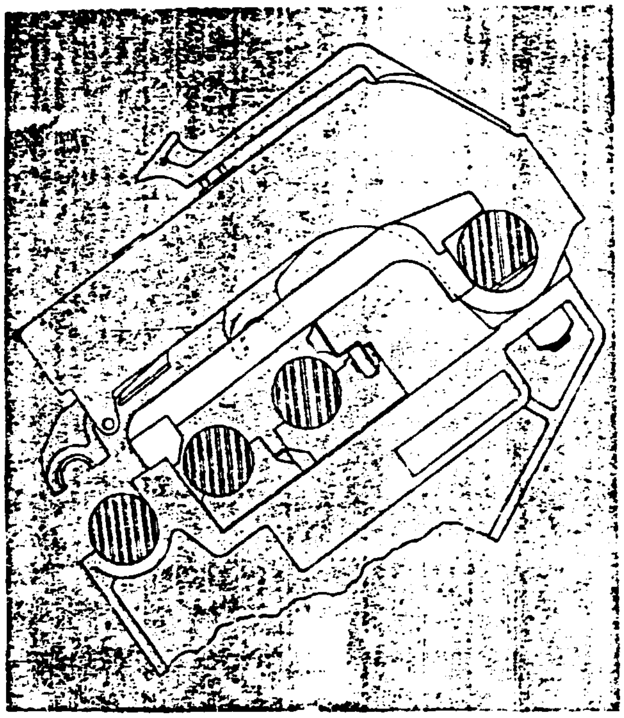


Figure 5A5 Weight horn bar gauge, side view.

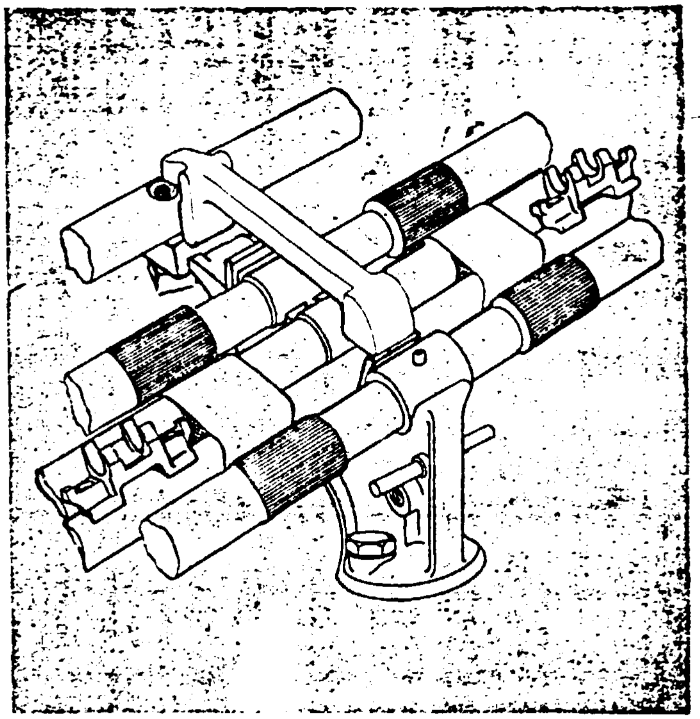


Figure 5A6 Weight horn bar gauge, top view.

4.5 BACK TOP ROLL GAUGE: (See Figure 5A.9)

The back top roll gauge is used as follows:

1. Install the back top roll gauge with the locating blocks on the roll bearing caps and the locating pins against the back of the needle bearing housing.

2. Depress the locking device and turn to hold the gauge in position.

3. Set the back top roll support before installing the back top rolls.

4. Loosen cap screw A and position the back top roll support down against stop C in the bar of the gauge.

5. Tighten cap screw A.

6. After both of the back top roll supports have been set, install the back top rolls and loosen screw B.

7. Align the back top roll parallel with the bar of the gauge and tighten screw B.

8. Recheck settings of the top rolls for overhang and see that the top roll are parallel with the steel rolls.

9. When weight is applied to the weight horn, the back top roll will move forward approximately 3/32". The gauge compensates for this movement.

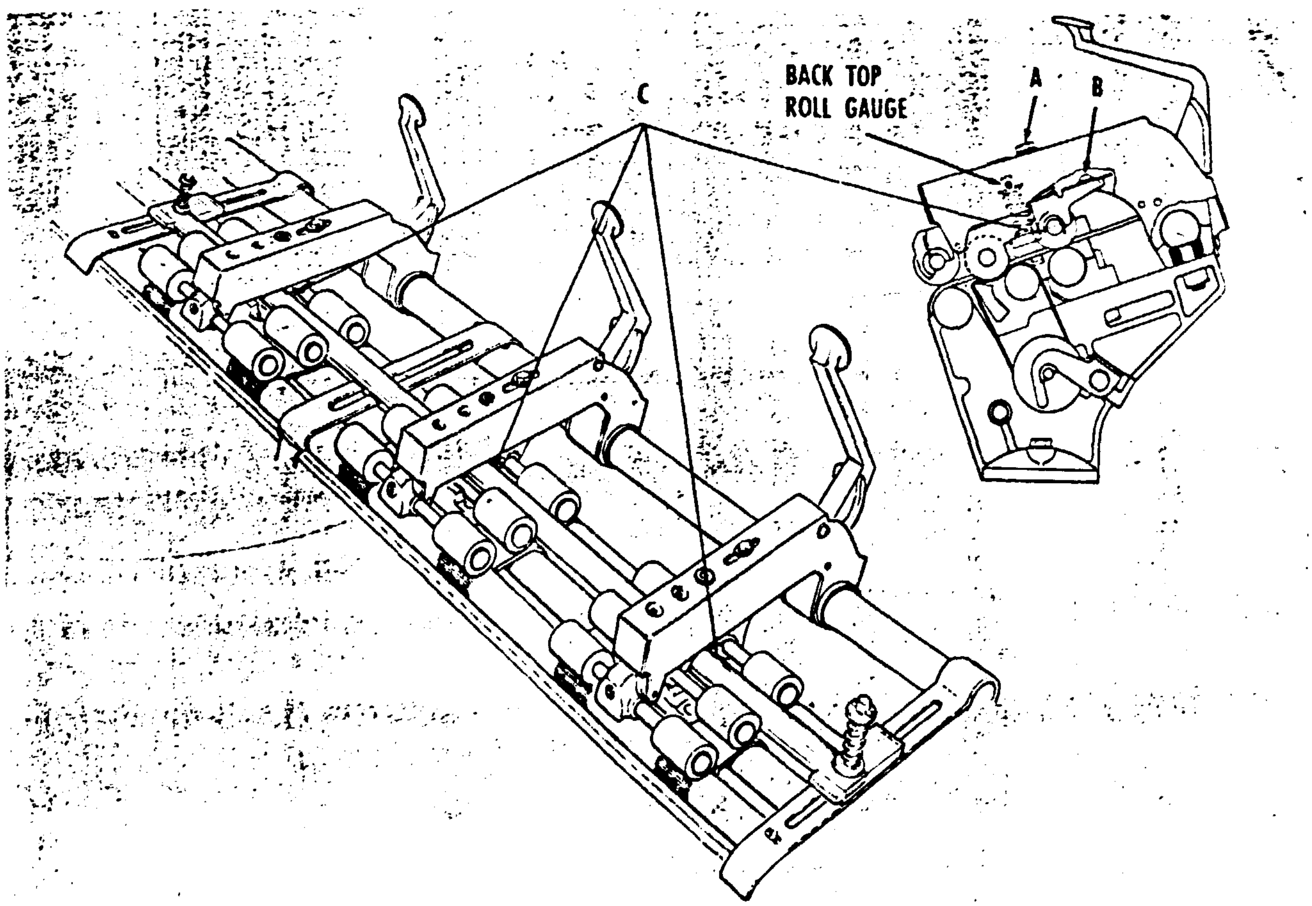


Figure 3A9 Back top roll gauge.

5B. DRAFT GEARING:

1. DESCRIPTION:

The Rovematic draft gearing is mounted in the top compartment of the head end cabinet. It is driven from the twist gearing through a roller chain. The total draft change gear, break draft change gear, and the constant change gears are easily accessible. These gears are interchangeable with the change gears of other Saco-Lowell machines.

2. PURPOSE:

The draft gears drive the bottom steel rolls. They regulate the speed of the different rolls to determine the draft, which is dependent upon the speed ratio of each roll to the preceding one.

3. PARTS:

See Figure 5B.1.

4. SETTINGS:

With the exception of the intermediate gears, and the total draft change gear of the 12F element all the draftgears are mounted on fixed centers. When the upper and lower draft constant gears are changed, both gears must be changed to maintain a combined total of 165 teeth and thus provide correct mesh. When the total draft or break draft gears are changed on the 1B, 1C and 1D elements, the intermediate gears, which are mounted on swing arms, must be adjusted to mesh correctly with the change gears.

The front jack shaft is mounted in an eccentric sleeve to provide adjustment between the drive gear and the front roll gear. To make this adjustment, disengage the total draft change gear and intermediate gear and loosen the two setscrews in the support brackets. Loosen the idler of the driving belt or chain to provide slack. Rotate the eccentric sleeve until the gears mesh correctly and tighten the setscrews. Adjust the intermediate gear chain idler. The driving chain should have enough slack so that it can be depressed slightly by hand between the sprockets.

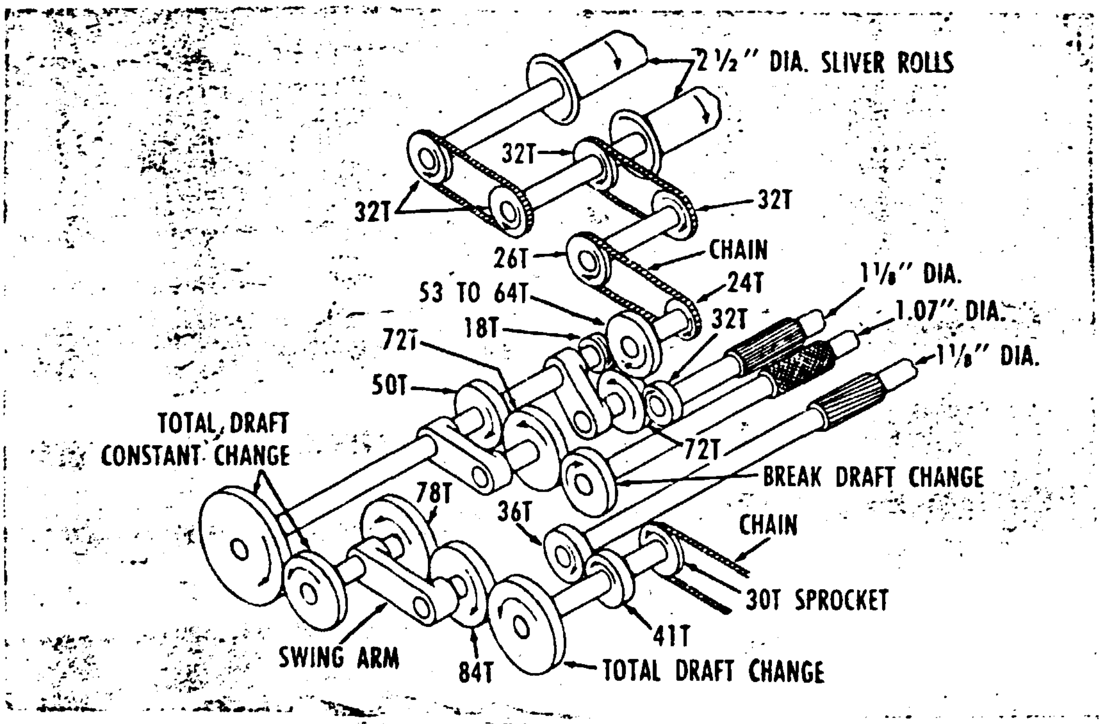


Figure 5B.1
Gearing diagram of the 1B, 1C and 1D drafting elements.

5C. THE TRAVERSE MOTION:

1. DESCRIPTION:

A bar mounted in sections in slots of the roll stand, supports a trumpet behind each back roll. The end of the back steel roll is threaded to form a worm. A worm gear is meshed with this worm and is attached to a small cam. The cam is attached to the end of the bar and provides a traversing motion.

2. PURPOSE:

The trumpets traverse back and forth so that the stock will not follow the same path and wear a groove in the rôll cots.

3. PARTS:

1. Trumpet Bar.
2. Trumpet.
3. Traversing Motion.
4. Slots.

4. SETTINGS:

Adjust the cam so that at the mid-point of the stroke the trumpet will center the top roll cot. Check both limits of the traverse stroke to see that the stock travels an equal distance from the center of the cot with each full stroke. The traverse must be 18-20 m.m.

GROUP-6:

6A. SAFETY DEVICES:

1. PURPOSE:

To protect the operators from accidents and avoid damage to machine and material. There are various safety devices operated by and switches.

2. PARTS:

2.1 Circuit Switch.
2.2 Pushbotton.
2.3 Cams.
2.4 Indicator Lamps.

3. CONTROLS AND SWITCHES:

3.1 STOP-JOG - START CONTROLS:

There are three different types of these controls for the Rovematic.

a) The first is a manually operated shipper handle pivoted at the roller beam. Push this handle down to stop the machine, push it up to start. For jogging, the handle is alternately raised and lowered.

b) The second type of control has a bar that is elevated or depressed to stop the machine. The machine is started by depressing a pushbutton. For jogging, the pushbutton is depressed while the bar is held up or down. (See Figure 6A.2)

Figure 6A2 The control bar and pushbutton type of Rovematic control.

c) The third type of control is a panel containing stop, jog, and start pushbutton, which are activated when depressed. For all three types these operating controls are conveniently spaced at intervals the entire length of the machine.(See Fig.6A.

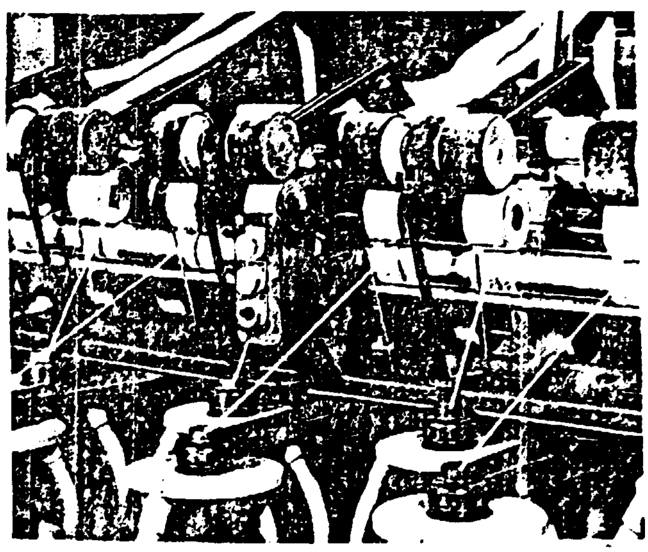


Figure 6A3 The three button type of Rovematic control.

3.2 MAIN DISCONNECT SWITCH: (Fig. 6A.4)

This switch is located inside the head end cabinet on the front cover of the electrical control box. Placing this switch in the OFF position removes all power to the frame.

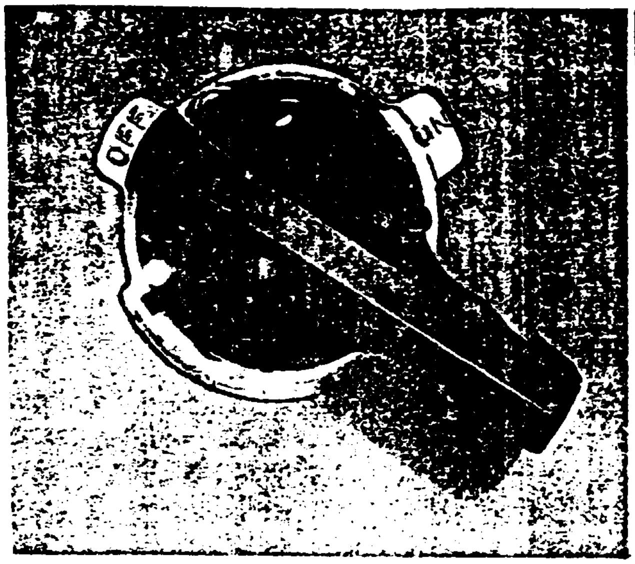


Figure 6A4 Main disconnect switch.

3.3 DRAFT GEAR INTERLOCK SWITCH: (Fig. 6A.5)

This switch located under the draft gear cover of the head end cabinet. Raising this cover will open the switch and prevent the frame from being started.

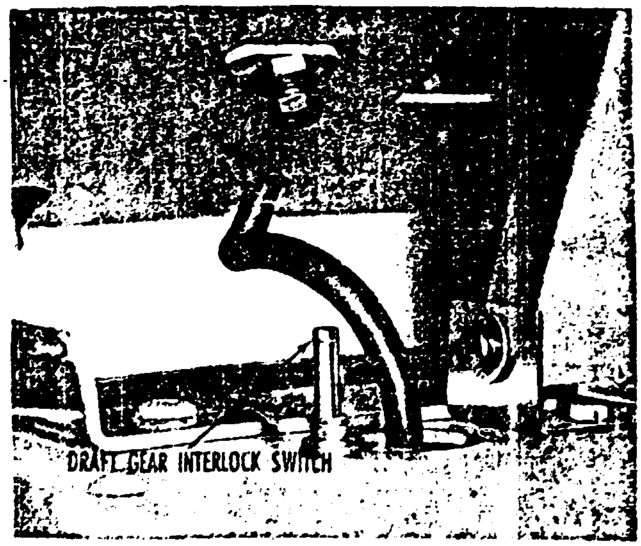


Figure 6A5 Interlock switch for draft gear cover.

3.49 STOP MOTION SWITCHES: (Fig. 6A.6)

A stop motion switch mounts on the roll beam, there being one switch for each delivery. Each switch contains a feeler rod which senses whether the end of roving is broken or too slack. The occurrence of either will allow the switch to close and stop the frame. As long as a switch is closed, the frame cannot be run except by holding the control in the jog position. There are also optional stop motions. A mechanical-electrical creel stop motion will stop the frame when a strand of sliver breaks or runs out between the creel and the back rolls. The Photostop stop motion is available for both front and back of the drafting element, or it can be used separately at either location. It uses a photoelectric cell and light to detect an end down or runout and will cause the frame to stop when either occurs.

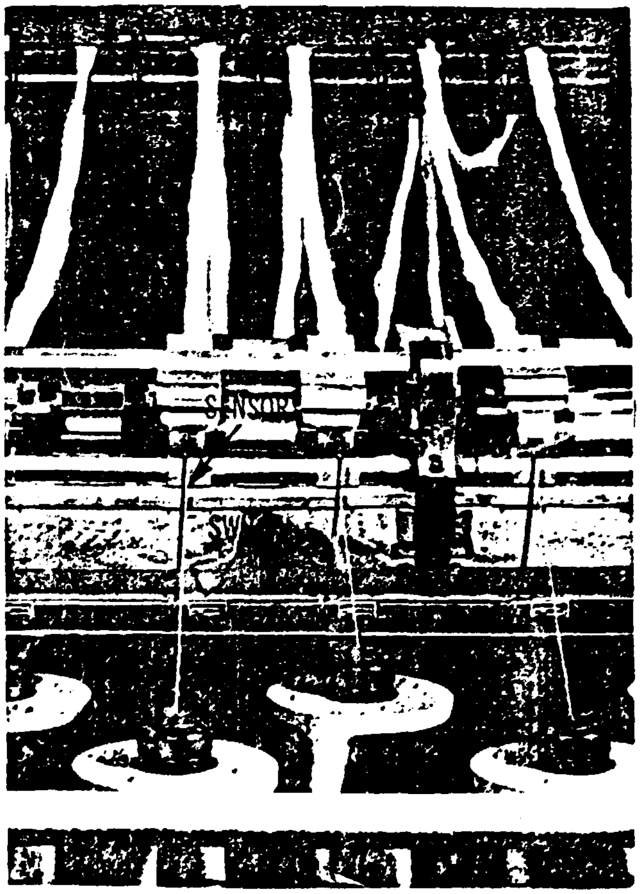


Figure 6A 6 Drafting element stop motion assembly.

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3.5 TRAVERSE LIMIT SWITCH:

See in Builder Motion 4.8.

3.6 INDICATOR LAMPS: (See Figure 6A.7)

The indicator lamps are green, yellow, and red. The red indicates that the frame is stopped - regardless of the reason. The yellow indicates low oil pressure and the green indicates that bobbins are full. Because the oil pump is driven by the head end gearing, the oil pressure will drop whenever the frame is stopped and when the the oil pressure at the filter drops below 6 pounds, the oil pressure switch closes and the yellow indicator lamp lights to indicate failure of oil pressure. Thus, it is normal for the red and yellow lamps to be on whenever the frame is stopped and for all three - green, red and yellow - to be on when the frame has stopped because of full bobbins.

CAUTION.
Should the yellow light come on by itself or stay on after the frame is up to full, stop the frame and call a fixer.

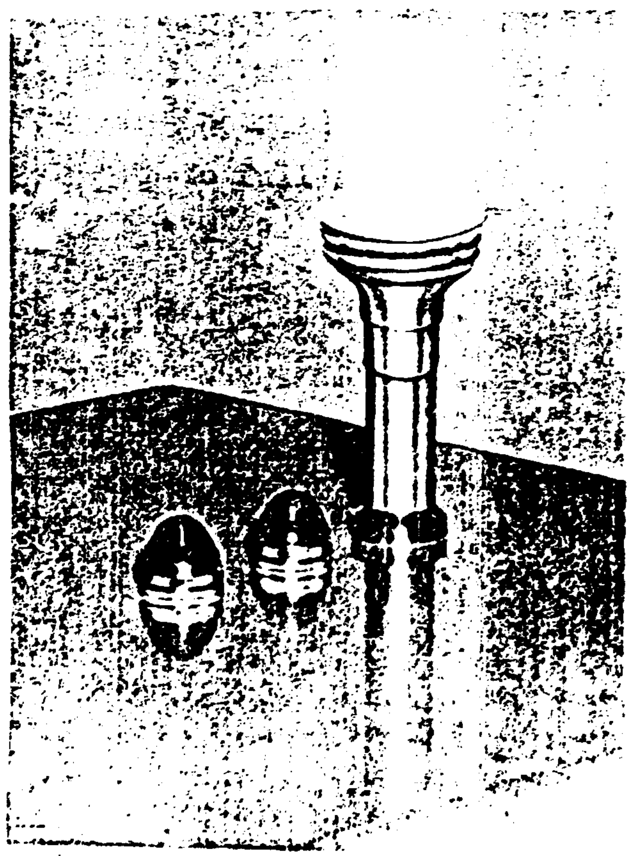


Figure 6A7 Signal lamps on head end cabinet.

3.7 THERMAL OVERLOAD RELAY :

A panel within a cabinet above the motor at the back of the frames houses the electric components of the Rovematic.

The Thermal Overload Relay is a safety device for electric motor, whenever electric motor is over-heated the thermal overload relay is tripped and stops the motor.

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING
3. TROUBLE SHOOTING
4. PREVENTIVE MAINTENANCE
5. FRAME INTERFERENCE
6. QUESTIONNAIRE
7. CHARTS AND GRAPHS

ROVING FRAMES

1. DIAGNOSTIC DEVELOPMENT:

a. Purpose:

To help the diagnostic and job planning abilities of the trainee.

b. Method:

The trainee is to walk the section of the preparation Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.

The suggested number of each defect is as follows:

-	Creel	2
-	Traverse motion	2
-	Flyers	5
-	Top rollers	5
-	Pressure Arms	5
-	Aprons	5
-	Trumpets, Condensers	5
-	Clearers	5
-	Building motion	2
-	Bobbin shape	2
-	Lift	5
-	Tension	5
-	P.I.V.	2
		50

SOME FREQUENT SOURCES OF UNEVEN AND FAULTY ROVING:

There should be sufficient twist in the roving to eliminate any danger of stretching as the bobbin unwinds. In general, where the overhead cleaning is used in the spinning room, additional twist may be quite desirable to prevent the disarray of the fibres in the strand by the air current.

INSUFFICIENT TWIST:

This is a condition which may have serious effects on the production in both the card room and spinning room. It may stretch the roving, excessive ends down in spinning, too much fly, and dirty frames. The apparent increase in production as a result of an increase in front-roll speed will probably be off-set by time lost in putting up ends, cleaning flyers and top rolls, and other incidental stoppages.

EXCESSIVE TWIST:

This condition will cause a loss of production as well as possible difficulties in the spinning room where undrafted roving will cause hard ends, grooved rolls, and needless waste and stoppages.

In case where the cotton is not up to standard or where there is an inherent fibre weakness, added twist may helpful in maintaining production in the card room.

Finally, the longer the staple, the less twist, coarser rovings require less than the finer counts.

LAY:

There have been a large number of mathematical computations concerning the proper lay. However, competent card-room technicians have found that, when the lay is regulated on the first layer to show plastic or paper equal to one-half the diameter of the roving between two successive layers, a well-built, solid, and satisfactory bobbin will be constructed.

TENSION:

The regularity and control of the tension has an important effect on the quality of the roving as well as the production and efficiency of the roving frame. Tension is affected by several factors temperature, humidity, the diameter of the strand, and variations therein. For many years, designers and technicians have been seeking a means or assembly for levelling off the effects of these variations to the greatest possible extent.

Since the diameter of the strand of roving of a given weight is affected by the twist, changes in the twist gear must generally be accompanied by a change in the tension gear, Low twist requires a "slacker" tension than normal or hard twist roving. Tight tensions should always be avoided because stretched and uneven roving will invariably be made. Furthermore, practical experience has shown that roving which has been stretched on the roving frame will also be stretched in the spinning frame creel.

While the first layer of roving is being placed on the bobbin, the tension must be tight enough to assure satisfactory winding on the bare bobbin at the second traverse where at least a portion of the winding will take place on a diameter smaller by the thickness of the half layer resulting from the start of the set. Tension is also affected by variations in bobbin diameter; therefore, bobbins should be systematically checked, at least once a year. Bobbins which are smaller in diameter than the standard will be soft at the start but, in general, will build up their diameter faster than normal until they reach the diameter of the remaining bobbins on the frame, after which tension will be equalized.

If the tension at the finish of the set is too tight, a larger tension gear should be used to eliminate this source of bad roving. The amplititude of vibration, from the nip of the front roll to the top of the front line of flyers, is about 1" to 1 1/2" wide when the tension is correct. If the tension at the start of the set is correct and undergoes a progressive slackening, the adjustment of P.I.V. unit or builder is improper.

EXCESSIVE ND BREAKAGE:

Cut drafting, improper tension, loose couplings on flyer gear or bobbin gear shafting, rolls not set properly or accurately; broken teeth in head-end gearing; loose gearing slipping on shafting, traverse motion badly set, roving running off top roll or apron, dirty gearing with roots of teeth with impacted waste; improper humidity. Builder improperly set (check starting point, starting tension, escapement setting, builder wight, builder gears), improper lay or tension gears, incorrect P.I.V. chain tension, P.I.V. dise clutch slipped, incorrect builder cam setting. Excessive breakage at single ends in generally caused by worn-out top roll, a care of faulty sliver, tangled or cut, worn bobbin gear, insufficient roll pressure, laps on middle or back rolls, worn, rough, or hollow top rolls, heavy sliver.

SLACK ENDS:

Faulty traverse motion, cil both dry or clogged with waste, under sized bobbins, presser not correctly shaped or wrapped, single in the sliver, stretched roving, tension too slack dur to improper tension gear, lay gear, builder setting, builder cam setting adjusting screw setting, incorrect P.I.V. chain tension P.I.V. dise clutch slipped, lighter sliver, plugged flyer tube, flyer grommet worn, glazed or slipping.

SLUBS:

These can be caused by bad piecing at the drawing; drawing frame waste worked into the sliver; an end breakings at front-roll delivery and attaching itself to the neighbouring ends; waste accumulating in the flyer eye and leg; dirty clearers; lack of pressure on top rolls, drafting rolls not set correctly, cots damaged, middle roll under-sized, top roll binding.

CUT ROVING:

Rolls set too close for staple; broken teeth in the various gear trains; gears improperly meshed, too deep, or the contrary; loose roll joints; excessive draft, worn top rolls, and lack of lubrication.

CARE OF BOBBINS:

This "wobbling" creates many unnoticeable but harmful linear irregularities in the roving. The same effects are the result of worn gear holes. Under no circumstances should roving be removed by cutting with a sharp knife. No matter how carefully the knife is handled, it will not belong before the surface of the bobbin is full of splinters and rough places. The layers of roving remaining on the bobbin, if any should be rolled off.

Finally, the full bobbin doffed from the frame should be carefully packed and arranged in the truck. Throwing bobbins around causes, in the course of time, a lot of tangled bobbins and expensive roving waste. The trucks should be cleaned out every time they are returned from the spinning room, and plainly marked so that they will be used for transporting roving and nothing else.

3. TROUBLE SHOOTING

The intent of this section is to aid in diagnosing and correcting trouble in the functioning of the Roving frame. To this end, trouble shooting tables have been developed which list trouble symptoms, possible causes, and suggested remedies. In the final analysis, however, the best trouble shooting aid is the thorough comprehension of the Roving frame and its principles of operation.

1. TROUBLE SHOOTING TABLES:

Should trouble occur, check first with the frame tender. His observations will usually aid in quickly diagnosing the source of trouble. If, however, the cause is still undetermined, reference to the following tables should, when coupled with the fixer's knowledge and logical analysis of the situation, result in localizing the source of trouble.

2. PRELIMINARY CHECK:

a) Visual inspection. Observe the three colored indicator lamps located on top of the head-end cabinet. Note which lamp or lamps are lit as an indication of the trouble. Observe the position of the top motion switches and the main power fuse disconnect switch. Check the roving on the bobbins.

b) Visually check for physical damage to such things as the flyers and the drafting system. The cover located on top of the head end cabinet must be down so that the draft gear interlock switch is closed.

If the visual check does not indicate the source of trouble, operate the controls to the jog position and then to the run position. If the frame will not run and the red and yellow indicator lamps light, turn the main disconnect switch to the OFF position, and remove the front cover from the electrical panel in the head end cabinet. Press and release the thermal overload relay reset pushbuttons. Replace the panel cover, turn the switch to the ON position and repeat operation of the shipper handle. If the frame runs normally the cause of the trouble was overheating of the motors.

CAUTION

Do not place jumper wires across the thermal overload relays as this will cause the motors to burn out.

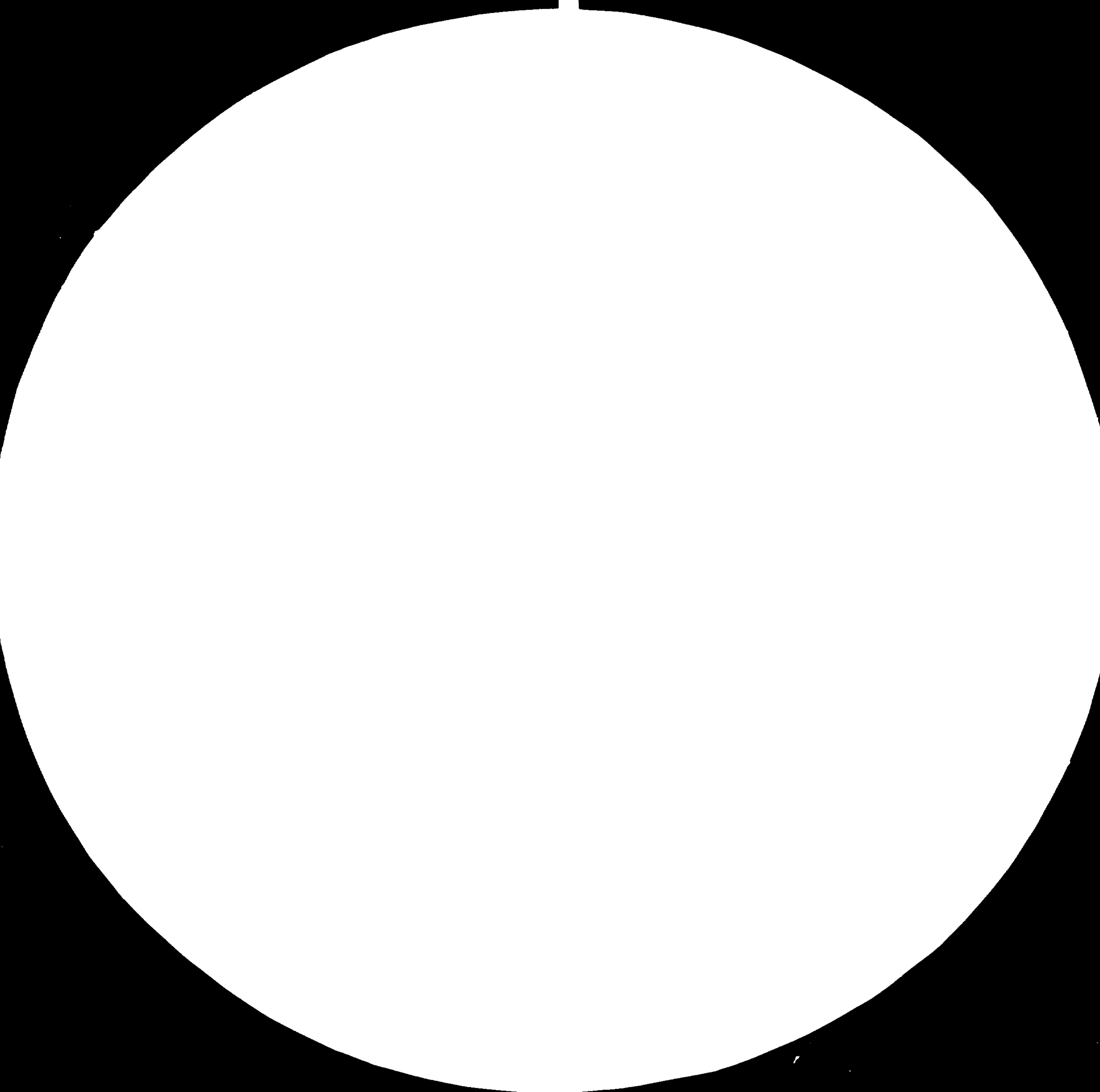
3. FUNCTIONAL ASSEMBLY TROUBLE SHOOTING:

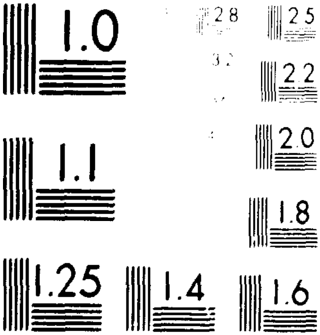
Preliminary check.

The following checks must be made before proceeding with the applicable trouble shooting chart. Failure to perform these checks can result in long periods of machine down-time and hours of unnecessary labour.

a) Temperature and Humidity.

Often the cause of troubles, which appears to be caused by frame malfunction, is in fact the result of external forces. Temperature and humidity, for example, are affected by the physical location of a frame with respect to windows and doors. A continous draft will effect the temperature and humidity in a given area, resulting in




1.0
2.8
2.5
3.2
2.2
2.0
1.1
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1.25
1.4
1.6

an abnormal number of ends down, because of the adverse effect on the sliver and roving.

b. Individual Slack Roving.

This would appear to be the result of not enough tension; however, often this is caused by incorrect sliver weight.

c. Lubrication:

Component failure and oil leaks often are caused by the use of inferior lubrication, not enough lubrication, or the use of the wrong type or weight lubricant which does not equal that recommend for prolonged trouble-free frame operation.

If the preliminary checks fail to indicate the source of trouble, refer to the Trouble Shooting Charts that follow.

ROVEMATIC TROUBLE SHOOTING CHECKLIST

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
*Frame does not start (Power on)	Draft gear cover raised.	Close cover
	Faulty draft gear cover interlock switch.	Adjust or replace.
	Thermal overload relays tripped.	(Reset overload relay.) Call Electrician.
	Main motor windings open, auxiliary contracts defective.	(Repair motor repair or replace auxiliary relay.) Call Electrician.
*Red indicator lamp fails to light when ON-OFF main disconnect switch is placed in ON position.	Red indicatorlamp or circuit defective.	(Operate controls to job position, if frame runs check lamp and circuit. Call Electrician.

*Services of a qualified electrician may be needed.

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
*Yellow light stays on when frame running.	Low oil pressure.	(Check oil level, oil line fittings, oil pump.)
	Broken pin in screw output shaft.	Replace pin.
	Open or incorrect size oil line.	Repair or Replace.
*Yellow indicator lamp fails to light when end comes down and frame stops.	Yellow indicator lamp defective.	Call Electrician.
*Green indicator lamp fails to light when bobbin is full and frame stops.	Green indicator lamp defective.	" "
*Frame fails to stop when end comes down.	Stop motion switch dirty or defective.	" "
	Switch Open.	" "
	Control Transformer open.	" "
	Overload relay defective.	" "
	Heater percentage value adjustment incorrectly set.	" "
	Defective line fuse or fuses.	" "
	Stop motion switch incorrectly set or defective.	" "
	Fuse, resistor, or relay open.	" "
*Fuses continue to blow when frame is operated	Short across one of the motor windings.	" "
	Shorted wiring.	" "
	Control transformer shorted.	" "
	Relay shorted.	" "
	Pneumafil motor starter shorted.	" "

*Fuses blow when direction of motor rotation is reversed.	Motor reversing Controllers defective or defective wiring.	Call Electrician
Frame fails to stop when roving package reaches desired size.	Full bobbin knock-off switch not correctly adjusted.	" "
	Full bobbin knock-off switch defective.	" "

* Services of a qualified electrician may be needed.

FAULT	PROBALE CAUSE	SUGGESTED REMEDY
Steel rolls fail to trun.	Timing belt or chain broken.	Replace belt or chain.
	Twist gear out of mesh.	Mesh twist gear.
	Defective cam clutch	Replace.
Steel rolls run backward when rewinding builder.	Cam clutch s sticking.	Remove clutch and clean. Replace collar and set with approximately 1/64-inch clearance to avoid binding. Lubricate. Replace clutch.
None of the bobbins rotate.	Defective middle universal joint.	Repair or replace universal joint.
	Defective compound	Replace compound.
	Defective key or gear on bobbin output shaft.	Replace defective item.
Individual bobbin fails to rotate.	Bobbin not seated on spindle.	Seat bobbin correctl
	Defective bobbin drive gear on bolster.	Replace spindle assembly.
	Drive shaft bobbin gear defective.	Replace gear.
	Defective gear spring pin on shaft.	Replace spring pin.
Individual spindle does not traverse.	Defective lead screw drive gear.	Replace gear.
	Drive shaft lead screw gear defective.	Replace gear.
	Defective gear spring pin on shaft.	Replace spring pin.
None of the spindles traverse.	Defective bottom universal joint.	Repair or replace universal joint.
	Defective compound	Repair or replace compound.

	Lead screw ring output shaft defective.	Replace gear.
	Gear or key on screw output shaft defective.	Replace defective ite
	Defective idler gear.	Replace gear.
Spindles fall or fail to traverse.	Builder is neutral.	Reset builder.
	Builder misfires.	Reset builder.
	Lay gear out of mesh.	Reset lay gear.
	Defective compound.	Repair or replace compound.
	Defective key or gear on screw drive shaft in main gear case	Replace key or gear.
	Defective key in lay gear.	Replace key.
Individual flyer does not rotate.	Pin on drive shaft sheared.	Replace pin.
	Drive gear damaged.	Replace gear.
None of the flyers rotate.	Defective top universal joint.	Repair or replace univeral joint.
	Defective main cam clutch.	Replace cam clutch.
	Defective gear or key on flyer output shaft.	Replace defective ite
Flyers run backward when rewinding builder.	Mainshaft cam clutch sticking.	Replace cam clutch. Replace shaft, if sc
Excessive flyer vibration.	Flyer out of balance or warped.	Replace flyer.
	Flyer misaligned.	Realign flyer.
	Damaged flyer gears.	Replace gears.
	Ball bearing around splined connection defective.	Replace bearing and/ or bearing housing ring.
Roving uneven(slubby)	Drafting rolls not set correctly.	Reset rolls.
	Cots damaged.	Re-cover.
	Middle roll undersized.	Replace.
	Top roll binding.	Lubricate or replace

Layers on bobbin not uniform.	Roving not properly thread on presser.	Rethread presser.
	Presser damaged.	Replace.
	Presser loose on hinge.	Replace or tighten.
Tension too tight on some ends.	Insufficient roll pressure.	Adjust spring tension.
	Heavy sliver.	Correct at drawing
Tension too loose on some ends.	Light sliver.	Correct at drawing.
	Plugged flyer tube.	Remove plug.
	Flyer grommet worn, glazed or slipping.	Replace grommet.

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
Improper tension-general.	Builder improperly set.	Check starting point, starting tension, escapement setting, builder weight, builder gears.
	Improper lay or tension gears for size roving.	Change lay and/or tension gears.
	Incorrect P.I.V. chain tension.	Check and adjust.
	P.I.V. disc clutch slipped.	Check and adjust.
	Incorrect builder cam setting.	Reset cam.
	Starting tension incorrectly set.	Check adjusting screw
End ribboning.	Flyer grommet not turning.	Replace.
	Package diameter too small.	Break back end and doff package.
Excessive sliver breaks.	Creel rolls not turning.	Check creel drive.
	Creel rolls turing too slowly.	Change creel gear.
	Defective sliver.	Check at drawing.
Excessive number of surface breaks.	Tension too tight or too slack.	Change tension gear or builder settings.
	Improper lay.	Change lay and/or tension gear.
	Insufficient twist.	Change twist gear.
	Plugged flyer tubes.	Remove plugs.
	Presser improperly threaded, worn or sticking.	Check and correct or replace.
	Defective sliver.	Check at drawing.
	Sliver too tight.	Check at drawing.
	Bent presser.	Replace presser.

Cutting ends on start-up.	Lost motion in flyer drive system.	Check top universal joint, top drive shaft coupling, gear key in head and drive gear.
	Starting too fast.	Adjust drive for slower start with clutch, add leaf springs under weight or change to lighter weights; if reactor, change air gap of reactor coils.
	Defective clutch.	Replace.

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
Ends fail to slacken when clutch handle operated.	Clutch discs sticking.	Clean and adjust.
Ends slacken at start-up.	Builder not wound back to proper starting point.	Check and, if necessary, adjust.
	Disc clutch not engaged or slipping.	Check engagement. Adjust if necessary.
	Bobbin tension incorrectly set.	Adjust starting tensi screws.
Run-over or loop-over.	Builder gears packed with lint or set too deeply.	Clean and adjust setting.
	Builder weight obstructed.	Check and correct cause.
	Builder triggers or escapement improperly set.	Check and adjust.
	Frame stopped on change.	If by stop motion, reset traverse switch
	Defective presser.	Replace.
Incorrect full package diameter.	Full bobbin limit switch improperly set or defective.	Adjust or replace.
Excessive presser wear.	Presser run against bare spindle.	Never run frame without bobbins on spindles.
Taper of package incorrect.	Taper gear wrong size.	Replace gear.
Portion of creel fails to feed sliver.	Creel coupling loose or defective.	Repair or replace coupling.
Entire creel drive fails to operate.	Drive chain defective.	Repair or replace defective chain.
	Hi-pro key missing or defective.	Replace key.
	Change gear for creel drive out of mesh.	Mesh gears.
	Drive shaft or needle bearing defective.	Replace defective shaft or bearing.

Creel rolls do not turn smoothly.	Loose chain.	Reset chain tension.
Ends too tight.	Bobbin tension incorrectly set.	Check setting of cam.
	Cam stop slipped.	Reset cam stop.
Ends slacken while frame is running.	Spring pin sheared in compound.	Repair or replace compound.

4. PREVENTIVE MAINTENANCE:

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance, the form shown on page 126 has been designed.

It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.

The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.

Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passess by between a check of a particular frame.

During the Training Courses the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame, the Instructor checks his performance by using the form "Evaluation of Preventive Maintenance", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF ROVEMATIC (SIMPLEX) PREVENTIVE MAINTENANCE.

FRAME No..................FIXER...................DATE...............

Standard	Points	
5		A. Creel
10		B. Front condensors and back trumpet
10		C. Top rollers
10		D. Pressure arms
5		E. Bottom roller settings
5		F. Clearers
5		G. Pneumafil pipe/Stop motions
5		H. Lift
5		I. Traverse motion
10		J. Builder motion setting
5		K. Shape of roving bobbin
2		L. Condition of V-belts
3		M. Condition of P.I.V. chain
5		N. Starting position of cam and cam follower
5		O. Tension
5		P. Spindles
5		Q. Grommets
100		TOTAL

MILL	MAINTENANCE WORK REPORT 119.

WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE:

Department: Preparation	Type of machine: ROVEMATIC SACO-LOWELL	Machine No.	Type of maintenance:
Persons per crew:	Expected time:		

CYCLE

2. MONTHS (8Wks)										Yearly (48 weeks)			
No.	Machine Part	G	A	R	No	Machine Part	G	A	R	No	Machine Part	G	A	R
											8 Week maintenance + the following:			
1.	Top rollers.									1.	Top rollers.			
2.	Pendulum arm.									2.	Pendulum.arm.			
3.	Top Middle roll support.									7.	Bottom rollers.			
4.	Bottom Aprons.									12.	Builder.			
5.	Clearers top+b.									14.	Flyers & Grommet.			
6.	Guide bar.									16.	Electr.apparatus			
7.	Bottom Rollers.									18.	Lubrication.			
8.	Condenser.									19.	Spindles.			
9.	Traverse bar.									20.	Flyer+Bobbin Gear			
10.	Covers.									21.	Head Stock.			
11.	P.I.V. unit.									22.	Motors.			
12.	Builder motion.									23.	Bearings.			
13.	Brake.									24.	Traverse Drive.			
14.	Flyers & Grommet.									25.	Levelling.			
15.	Drafting Gears.													
16.	Electr.apparatus.													
17.	Creel.													
18.	Lubrication.													

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MILL	DESCRIPTION OF THE WORK TO BE DONE 120.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Rovematic Saco-Lowell	Type of maintenance: 2 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

1. Pressure Top Rolls

   It is necessary to buff the top rolls after 3-4 months in order to have a perfect surface which is very important. In case that the top rolls are still in good condition we recommend to clean them in order to remove the grease and cotton wax and avoid lap ups.
   Remove the accumulation of fibres on the roller shafts.
   Never buff the second roller.

2. Pendulum Arms

   Clean only the pendulum arms.
   The setting of them is done yearly.

3. Top Middle Roll Support

   Repair damages and if necessary replace them.

4. Bottom Aprons

   Check the condition of the aprons and clean them.
   Replace the damaged, cut or worn out.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVEMATIC SACO-LOWELL	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

5. Top and Bottom clearers

Check the condition and operation of them.
Replace the damaged or defective ones.

6. Apron Guide bar

Remove and clean the apron guide bar.
Check the condition of the support if necessary center them, in order to have the apron at the center of the fluted part of the second roll.

7. Bottom Rollers

Clean with a stiff brush the fluted rollers.
Remove all dirt from the flutes.

8. Condensers

Check the condensers and inlet condensers.
Replace the defective ones. Check if they are of the proper size and if properly tighted.

MILL	DESCRIPTION OF THE WORK TO BE DONE 122.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVEMATIC SACO-LOWELL	Type of maintenance: 2 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

9. Traverse

Clean the guiding rails of the traverse and lubricate with Molycote.
Check functioning condition.
The traverse movement must be 18 - 20 m/m

10. Draft Roller Gearing Covers

Clean and adjust if necessary.

11. P.I.V. Unit

Check condition of the P.I.V. unit adjust if necessary the chain.

12. Builder Motion

Clean without dismantling the builder motion.
Check the starting position and adjust if necessary.

MILL	DESCRIPTION OF THE WORK TO BE DONE		123.
PREVENTIVE MAINTENANCE	FORM M - 101	Page :	
Type of machine and make: ROVEMATIC SACO-LOWELL	Type of maintenance: 2 months		
Working minutes:	Persons per crew: 4 Persons	Down time in hours 6 hours	

13. Brake

Check and adjust the brake (if existing)

14. Flyers and Grommet

Clean thoroughly the flyers and check the condition of the grommet.

15. Drafting Gears

Clean all gears without dismantle them.
Replace the defective ones.
Grease them afterwards.

16. Electrical Apparatus

An electricain must check the electrical apparatus.
He must also clean with compressed air the electrical panel.
and check all contracts.
Chech the functioning of the photo-cell.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page:
Type of machine and make: ROVEMATIC SACO-LOWELL	Type of maintenance: 2 months	
Working minutes:	Persons per crew 4 persons	Down time in hours: 6 hours

17. Creel Drive

Dismantle the covers of the creel drive and clean the gears. Check condition of the creel rollers.

18. Lubrication

Make a general lubrication after the maintenance, and also see the lubrication chart.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVEMATIC	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

GENERAL

Repeat all the elements of the 12 week maintenance and also the following:

1. Top Rollers

Buff the rollers and grease the top roller bearings. Every 2 years clean the bearings with a mixture of 90% gasline and 10% spindle oil. Grease them again once the bearings and clean and dry. Never buff the middle roller.

2. Pendulum Arms (Pressure)

Set as desired in the setting (4.4) of Group-5.

7. Bottom Fluted Rollers

Check and eventually reset the settings of the bottom rollers. Check also the distance between the front roller and pendulum arm shaft.

12. Builder

Check the conditions of the Builder . Clean and grease the Tension Gear Stud and cam shaft after every six months.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVEMATIC	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

14. Flyers

Clean the inside of the hollow arm and nose (where the [illegible] the sliver)
Repair or replace the damaged flyers and presser.

16. Electrical apparatus

To be revisioned.

18. Lubrication

Make a general lubrication after the maintenance, and also see the lubrication chart.

19. Spindles

Change the spindle base oil after every six months.
Check the height of the spindles and adjust if necessary.

MILL	DESCRIPTION OF THE WORK TO BE DONE 127.	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: ROVEMATIC	Type of maintenance: YEARLY

W Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

20. Driving Gears

Check the align ent of bobbin and flyer driving gears, and set properly the meshing.

21. Head Stock

Dismantle all gear and clean all elements.
Replace the defective ones.
When re-assembling check and set the meshing.

22. Motors

The electrician will make the yearly revision of the motor.
He will clean the inside of the motor and check, rotor, stater and bearings.
Grease the motor bearings.

23. Bearings

Check all bearings as per instructions of the manufacturer (SACO-LOWELL)
Replace the worn out bearings.
Grease afterwards.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: ROVEMATIC SACO-LOWELL	Type of maintenance: YEARLY	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

24. Traverse Drive

Dismantle the drive, clean and check the parts.
Grease afterwards.

25. Oil Level

Check the oil level.

FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.

for case b. 10 min.

for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

6. QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and help the trainee to understand his job.

QUESTIONS :

1. What type of working uniform, suits a mechanic?
   Short sleeve shirt.
   Tight trousers, with leather shoes.

2. What tools will be required for the mechanic?
   Set of : Tool box
   Metric Allen keys
   Screw drivers star and flat
   Spanners (open and close)
   Hammer (soft and hard)
   Pliers
   Wrenches
   Leaf gauges/Block
   Chisels
   Centre punch
   Meter
   Torch
   Gauges
   Spirit level

3. How a mechanic should file?
   1. Part to be files should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applies to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.
   5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the thumb being parallel on the top of the handle.
   6. Some soft metal pieces should be used in between the jaws of the vise.

4. What are the specifications of the machines?

Rovematic Fc-1B 1970.

1. Drafting system : 1B Single Aprong.
2. Drive : V-Belt.
3. Lift : 2"
4. Number of spindles : 80 and 64.
5. Flyer type : FB-1C ROVEMATIC.
6. Builder motion : mechanical.
7. Type of suction : Pneumatic.
8. Clearer rollers : yes.
9. Bobbin size : Ø 23/8". Length 13 3/4".
10. Hank roving running on the roving frames 0.95
11. Hank sliver on various frames : 0.150

5. How to stock the lubricants?

Different colours should be used for different lubricants.

6. What are the functions of Roving frame?

To convert sliver into a soft twisted strand, wound on package, for easier handling at ring creel.

1. Drafting.
2. Twisting.
3. Winding.
4. Building.

7. How you classify the lubricants according to use?

Recommended lubricants should be used.

8. What should be the criteria for break down maintenance?

Mechanic should first handle the machine which requires least time, so that, down time is reduced.

9. What are the basic Roving adjustments of Frame?

1. Level and alignment of machine.
2. Motor alignment and belts.
3. Spindle alignment.
4. Bottom roll setting and alignment Front 52-5 mm. Back 35 mm.
5. Top Roll/Settings : Front + 3/32 - Back + 3/32
6. Top arm pressure adjustment .. 3" - 1/4".

7. Adjustment of gearing head.
8. Building motion adjustment.
9. Traverse motion adjustment 18-20 mm.
10. Creel tension : 1
11. Flyers and pressor alignment and balancing.
12. Adjustment of top and bottom clearers.
13. Flyer and bobbin driving gears alignment.

10. What are normal changes required at Roving frame?

1. Total draft change wheel.
2. Break draft change wheel.
3. Creel tension change wheel.
4. Twist and twist carrier wheel.
5. Lay gear.
6. Tension gear.
7. Top and bottom roller settings.
8. Top roller pressure.

11. What the following expressions means?

a. Draft ?

b. Twist ?

c. Hank Roving ?

a. The amount of stretching applies to the thick sliver to produce a roving.

b. The twist means: one inch length of rove is twisted as many times as indicated, e.g. 0.5 per inch.

c. The count of sliver.

12. What is draft and where does it occur?

The draft is the drawing out of the fibres and it takes place in the drafting zone (between back and front rollers).

13. How many spindles per machine?

Depending on machine 64 and 80.

14. What is the weight of a bobbin?

2.2 lbs. approx. should be 3,5 lbs.

15. What is the size of a can and how many yards of sliver are in it?

    18" x 42", 3.000 yds.

16. How many doffs per can?

    Approx.: 11

17. How many R.P.M. does the flyer do?

    Approximately 1335 revolutions per minute.

7. CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 137) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 139) for recording the performance of the trainee on Preventive Maintenance.

   c. The Management Control Chart (see page 141) for recording the progress of the trainee on the exercises of Phase I and Phase II.

a. <u>The Complete Defect - recognition Schedule</u>.

As explained in the chapter on "Diagnostic Development" (page 99 of Phase II), the trainee has to repair at least 2 to 5 defects, of a particular type of frame.
The total number of the different reason for defects are 13, which means that the total number of flags to repair is:
13 reasons x 2 to 5 defects.
Per reason = 50 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 137) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day.
That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 50 defects within 18 days.

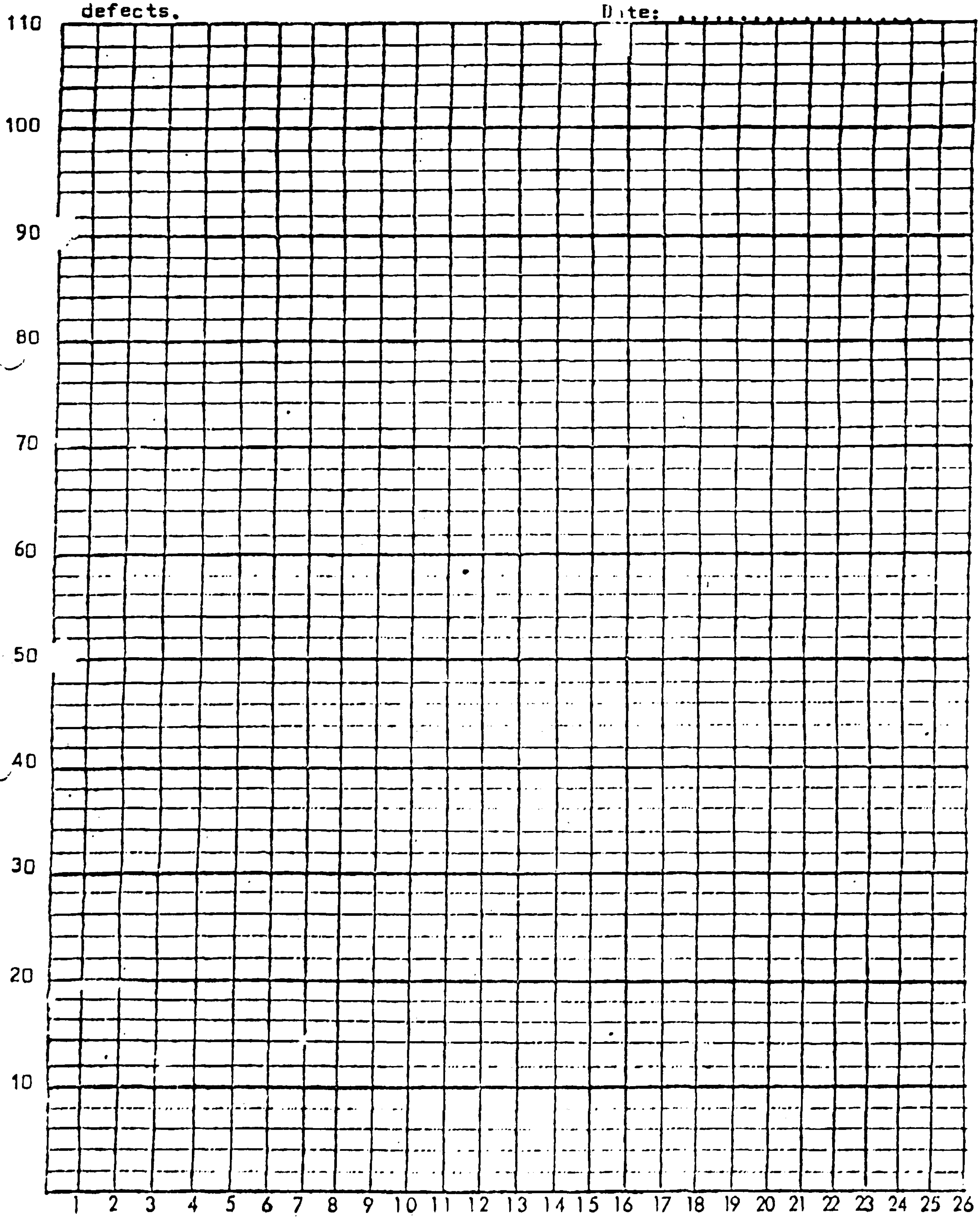
As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

COMPLETED DEFECT RECOGNITION :: :EDULE

Number of defects.

N :me: ....

D :te: ....



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b. <u>The Preventive Maintenance Results :ficiency</u>.

In the chapter on "Preventive Main· ·nance (see page 117) of Phase II) we mentioned that the :nstructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evaluation on Preventive Maintenance" as shown on page 98 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor hecks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

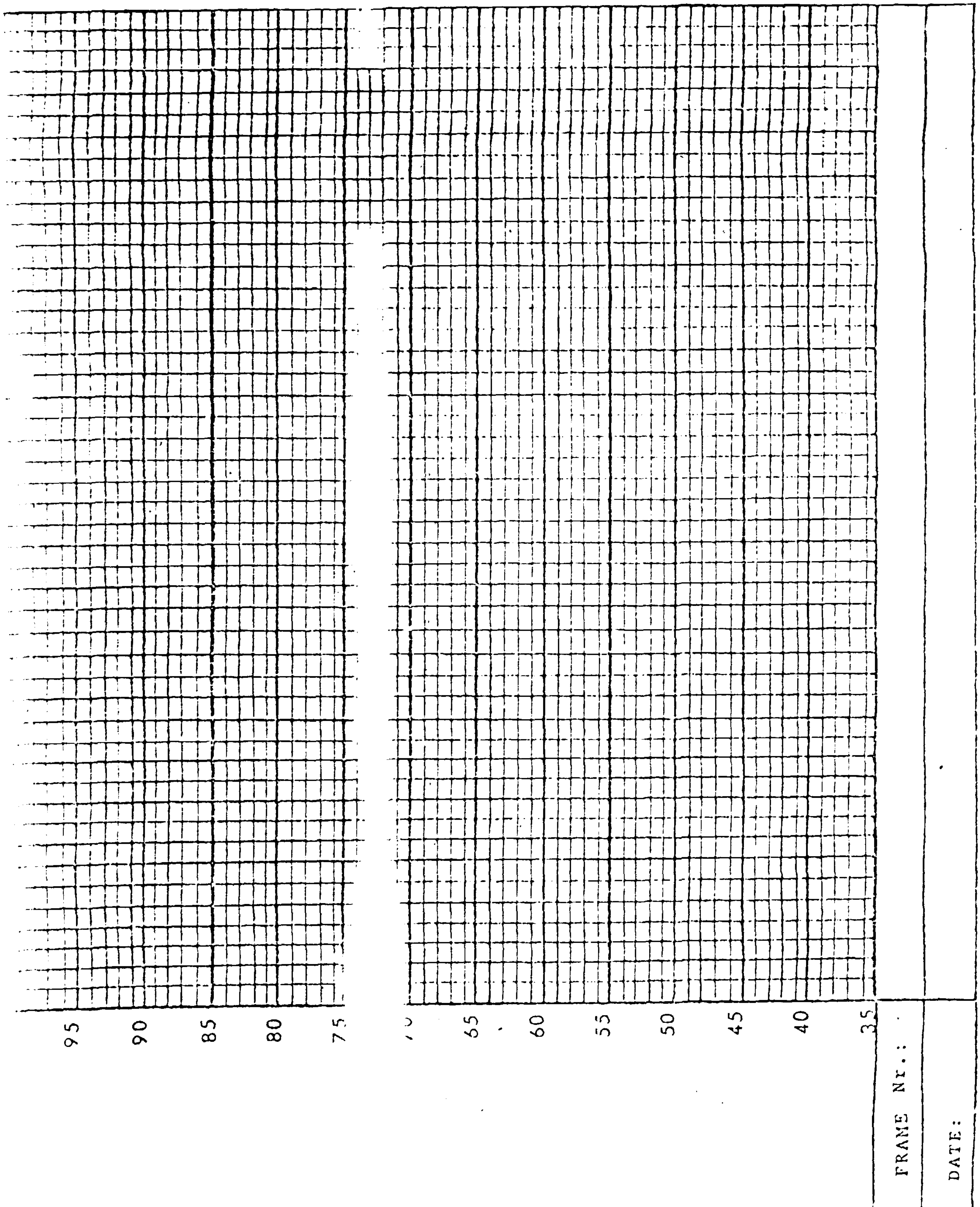
The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

Name:..............................



c. Management Conti· ' Chart.

The Management C· ·trol Chart, as shown on next page is the "log-book" of the course.

The chart is divided in two main parts, namely Phase I and Phase II.

PHASE I.

The number of days has been already inscribed on the chart, but the Instructor has to inscribe the dates, every day at the end of that day. All the six groups of exercises in Phase I are shown on the chart. When one group of exercises has been terminated by the trainee, the Instructor inscribes the frame number (s), on which the exercises were carried out, in the square, provided for it, under the group of exercises concerned and the date when the exercises were terminated.

Also he fills in the time spent on that particular group of exercises in the Training Centre (behind TC) and in the Spinning Room (behind SR).

PHASE II.

Here again the Instructor has to inscribe the dates under the number of days at the bottom of the part.

This part of the chart is divided into two sections:

a. Preventive Maintenance.

When the trainee has carried out preventive maintenance on a frame, the Instructor fils in the number of the frame, the score - the percentage of the evaluation - and the date when it was carried out.

b. Diagnostic Development.

For each type of defects recording columns appear on the chart. At the end of the day, the Instructor fills in the frame number and date, on which the particular defect-repair has been carried out by the trainee. At the end of the course each type of defect has to be tackled as per schedule (see Diagnostic Development on page 129 of Phase II).

WERNER AMPS ROVEMATIC FRAMES MANAGEMENT CONTROL CHART NAME........................

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

PHASE : 1

1	2	3	4	5	6
A : The Drive	A : The Builder	A : Spindles B : Flyers	A:Main Gear Case B:The Compound C:The P.I.V.	A:Drafting System B:Draft Gearing C:The Traverse	A:Safety Devices
FRAME / DATE	FRAME / DATE	FRAME / DATE	FRAME / DATE	FRAME / DATE	FRAME / DATE
HOURS TC :...... R :......	TC :...... R :......	TC :...... R :......	TC :...... R :......	TC :...... R :......	TC :...... R :......

PHASE : 2 PREVENTIVE MAINTENANCE

DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE

DIAGNOSTIC DEVELOPMENT

APRONS	TOP ROLLS	TRAVERSE	PR.AR.	BUILDING	TRUMPETS	CREEL	FLYERS	CLEARER	B.SHAPE	LIFT	TENSION	P.I.V.

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

10622
(9 of 10)

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME IX OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

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UNIDO CONTRACT No. 80/84

PROJECT No. DP/PAK/78/055

ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

M A N U A L VIII

W E R N E R A M P S

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

S P I N N I N G F R A M E S F I X E R'S

M A N U A L

I N G O L S T A D T

Prepared for:

T.I.R.D.C. (UNIDO)
KARACHI.

Prepared at:

JUBILEE SPIN. & WEAVING
KARACHI - PAKISTAN.

Prepared by :

WERNER INTERNATIONAL
BRUSSELS - BELGIUM
NEW YORK - U.S.A.

MARCH 1981.

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

I N D E X

PERSONNEL SPECIFICATION

Job:	SPINNER FIXER.
Sex:	M Age: 20 - 35
Experience:	Minimum 6 months good spinner or oil man.
Physique:	Capable of working in cramped positions 8 hours per day, in humid, noisy department.
Hands:	No disabilities or missing joints, no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

WERNER AMPS

SPINNING FIXER'S MANUAL

1.0 <u>OUTLINE</u>.

1.1 <u>OBJECT</u>.

The object of this training course is to prepare spinning fixers as quickly as possible.

1.2 <u>SELECTION</u>.

Prospective fixers are best chosen from spinning/roving tenders with at least 6 months <u>GOOD</u> spinning/roving experience. The recommended test results are shown in the personnel specification.

1.3 <u>TRAINING COURSE</u>.

The course covers the following aspects:

1. Knowledge in general.
2. Manual Skills
3. Basic of Engineering.
4. Mechanics tasks and responsibilities.

1.4 <u>INSTRUCTOR</u>.

The instructor has 2 trainees at a time and should be with them full time until approximately the end of the training course (6 weeks).

1.5 <u>GENERAL</u>.

The most important benefit of the training is improved quality. This will largely be achieved by better understanding of how the frames works and by the use of the standard settings and methods.

2.0 INTRODUCTION TO FIXING.

2.1 PURPOSE.

To help you become a good mechanic as quickly as possible, if this is your ambition, follow the advice of your instructor and you will attain this goal quickly. If this is not your aim, decide quickly what else you wish to do.

The main object of this course is to help the apprentice

to learn quickly and correctly the following:

1. The parts and motions of the frames.
2. The standard settings.
3. The correct method to make these settings.
4. The regular greasing and oiling of the frames.
5. The machine maintenance procedures.
6. Trouble shooting and quaility requirements.
7. Safety hazards.
8. Start of shift patrol and check.

2.2 INSTRUCTOR.

The instructor is here to help you, not to chase you. Any questions of discipline will be taken up with the training supervisor of the Dept.Foreman.

2.3 METHODS.

The methods taught you, are those we believe best at the mill. If you can improve on them, your suggestions will be welcome.

Discuss your suggestions with the instructor so that everyone can benefit from improved methods.

Please don't adopt new settings without asking; two other shifts have to work on your set.

2.4 TOOLS.

The tools recommended to you will make your work easier. Get the right ones and look after them.

2.5 SAFETY.

Yours is a responsible job. Whenever possible stop the frame. Before adjusting, cleaning or lubricating it. Follow these rules:

1. Wear clothes with short sleeves, no loose clothing.
2. Wear non-slip safety shoes.
3. Keep sharp tools into a sheathe.
4. Use the safety switch.
5. Follow also the other safety rules as prescribed further on.

2.6 QUALITY.

The quality of the sliver/yarn depends primarily on the adjustment of the frames. Therefore there is little which can be done to correct it.

2.7 WORKMANSHIP.

Frames should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

2.8 TRAINING COURSE.

During your training, you will pass through the following parts:

1. Machine knowledge - principles and settings.
2. Quality recognition.
3. Preventive maintenance and lubrication of the frames.
4. Tasks and responsibilities.
5. General knowledge.
6. Production fixing.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each learner fixer will do every exercise under the instructor's supervision.

3.0 FILING.

3.1 PRINCIPLE.

The part to be filed should be held at right angle in the vise and at a proper height, e.g. height of the elbow.
The operator should stand squarely in front of the parts to be filed.

3.2 WEIGHT.

Weight should be applied to the file only on the forward motion. No pressure should be applied on the backward cutting edge sharp.

3.3 FILE.

File should have a good handle and always be held level with work (horizontally). The operator should hold the slightly to the left. (diagonally).

3.4 Any part calling for a light filing - this should be done preferably at eye level.

3.5 To remove marks off a shaft made by set screw, the operator should file slightly in a circular motion and finish off with emery cloth.

3.6 So as not to mark the parts to be filed with the jaws of the vise, pieces of soft metal should be placed in the vise; it may be either copper, lead of zinc.

3.7 Way to hold file and handle.

a) The end of the file is held by the T/1,2 of LH
b) The RH should hold the handle in such a way that the tip rests on the flesh above small finger, the thumb being parallel on the top of the handle.

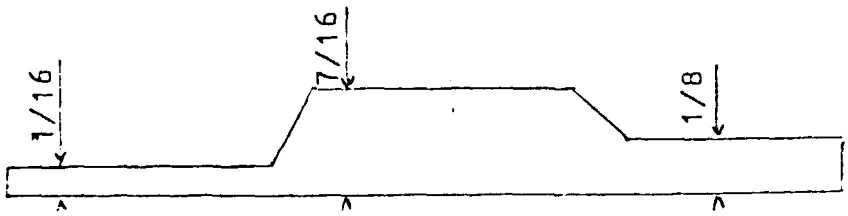
3.8 MANNER TO PROTECT FILES.

No pressure on file on its return specially on very soft metals; in suchcase, pressure should never be more than weight of file.

Clean teeth often with a metal brush, to prevent loading of file. File is a cutting tool, never leave in contact with other metal pieces in tool box.

EXERCISE.

Each trainee should make a front box plate gauge as described below from 7/16" shaft key.



4. USE OF STANDARD SETTINGS.

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made.

A fixed position or datum is used, e.g. the position of the top rollers.

Tolerances: It will be found that variations in the setting have different points on the frame. The allowable tolerance at each setting should be thoroughly understood to prevent wasted time and work.

5. BASIC MECHANICAL PRINCIPLES.

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern.

When adjustment is incorrect, then the fixer must track down the error and re-set the loom.

1. SOURCE OF POWER.

The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. TRANSMISSION OF POWER.

The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

Shafts:

Each frame has a main shaft on which are fixed the drums or spindle pulleys.

Supporting shafts are:

Bearings:

plan or roller

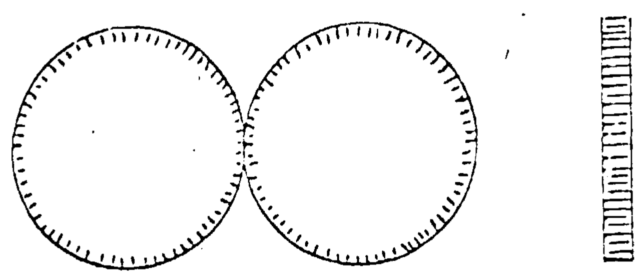
without adequate lubrication, the bearing will break down. Whenever possible, check, clean and renew the lubricant in the bearings.

Gears:

Note the following types of gears and find examples on the frames.

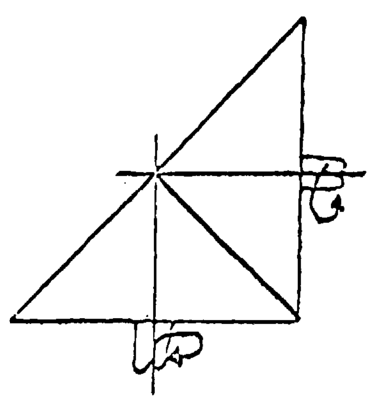
Spur gears:

Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



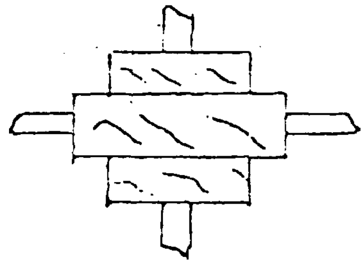
Bevel gears:

Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



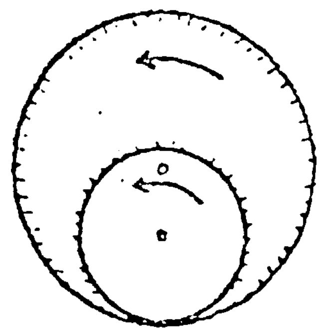
Worm gears:

Worm gears transmit power between shafts at 90 degrees. Usually, there is a large reduction in speed between the 2 shafts.



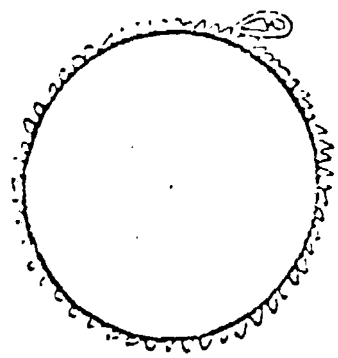
Internal gears:

Internal gears are used to give speed reduction on the same frames.



Ratchet gears:

Ratchet gears change a reciprocal motion to a circular motion.



Cams:

Cams are used to convert a rotary motion to a lifting motion.

Levers:

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force and the point. This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. 120 Kg.

4 m. 6 m.

180 Kg. 90 Kg.

4 m. ? m.

180 Kg. ? Kg.

4 m. 5 m.

CONTROL OF POWER.

Power in the frames is controles by:

1. Brakes.
2. Air Pressure.
3. Springs.

SPINNING FRAMES

PART 1 PHASE 1

A. PURPOSE.

To give the trainee the technical knowledge of the frame and to give experience in making the various frame adjustments.

B. METHOD.

Major frame adjustments are divided in 6 groups:

1. A. DRIVE
   B. DRIVE BELTS
   C. BRAKE
2. A. CABINETS CHASSIS
   B. ROLLER BEAM
   C. CREEL
3. A. ROLL STANDS AND ROLLS
   B. PRESSURE ARM
   C. TRUMPET
4. A. RINGS
   B. SPINDLES
   C. THREAD GUIDE
   D. SPINDLE DRIVE
5. A. LAY-TWIST GEARING
   B. DRAFT GEARING
   C. BUILDING MOTION
6. A. WASTE COLLECTION SYSTEM

Trainee to go through first group of adjustments in Training-Centre.
The instructor dismantles the frame part involved and re-assemble it, thereby naming the parts.
Then the trainee dismantles the part and re-assembles it under the guidance of the instructor, and applies the agreed adjustments.

When the trainee thoroughly understands the first group of adjustments, he is to go to the spinning room and make these adjustments on one frame.
Then he is to return to the training centre and go through the second group of adjustments.

When the trainee thoroughly understands the second group of adjustments, (as shown as for the first group), he is to go to the spinning room and make these adjustments on the frame which was set up on the first group plus one additional frame, and making both the first and the second group of settings.

This procedure will be followed through all six (6) groups of adjustments so that when complete, the trainee has completely set up six (6) frames.

Key points.

1. Problem frames have been selected for trainee to work on. They have been mechanically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands adjustments and performs with quality.

PHASE 1 OF THE TRAINING

GROUP 1 : A THE DRIVE
B DRIVE BELTS
C BRAKE

1.A THE DRIVE.

DESCRIPTION.

Power for the spinning frame is provided by a totally enclosed, fan-cooled motor that is floor-mounted to the head end cabinet. Transmission from the motor to the spindle drive shaft is by the constant speed conventional V-belt drive.
Drum on the shaft drive the spindles through tapes, and all other mechamisms (with the exception of the waste collector system) are driven from the shaft in the head end cabinet.

PURPOSE.

The drive transmits power to the various mechanisms of the frame. Through its pulleys, belts, chains, gears, and rolls the movement is imparted to perform all of the synchronized functions necessary to spin the yarn and wind it upon the bobbins. The drive also powers other auxiliary and necessary mechanisms such as the hank counter and the revolving clearers.

CONSTRUCTION.

The spinning frame has individual motor drive and the horse-power and voltage are determined by the number of spindles and mill specifications.
On the constant speed drive both pulleys are the plain V-belt type. The spindle drive shaft extends, in joined sections, the full length of the frame and into the head end cabinet. It is mounted upon ball bearings that rest upon, and are pinned to, each samson.
The abutting sections of shaft are joined by keys and held in place by a tapered collar and bolted coupling.

SETTING.

The motor is rigidly mounted to the head end cabinet and is adjustable. A change of speed through the drive is accomplished by changing to different size pulleys on the constant speed drive.

18. DRIVE BELTS.

Operating conditions for V-belts.

To ensure good operation, the following points concerning V-belts should be watched:

1. The belts should not be taut like violin strings. Proper belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 cm. and over.

2. Never use any adhesives. The V-belts should be kept clean and dry, and should be protected from oil and grease. V-belts do not require any maintenance.

3. Forcing the belts over the grooves will damage the pull cord and reduce belt life. For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.

4. Belts and pulleys should not heat up. Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.

5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.

6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.

7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only. The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

1.C. THE BRAKE.

1. DESCRIPTION.

The tin drum brake is accomodated in the inner part of the head stock.

2. PURPOSE.

It is the function of the automatic magnetic brake (drum brake or disc brake) to reduce the slowing time when the machine is turned off, thus preventing the formation of loops at the travellers and ensuing thread breakages when the machine is restarted.

3. PARTS.

3.1.	M 12,	securing bolt
3.2.	B,	fork holding bolt
3.3.	R,	set screw
3.4.	-	brake drum
3.5.	-	brake lining
3.6.	-	lever
3.7.	-	Magnet
3.8.	-	Fork
3.9.	-	Weight
3.10.	-	Armature

4. SETTINGS. (FIG. 1C.1)

4.1. Drum Brake.

The brake shoes must not contact the brake drum at any spot when the armature is applied. Brake lining and brake drum should be free from any trace of grease. The armature should freely move up and down and should be fully retracted during operation, otherwise restricted magnetic flux might result in overheating and coil blow-out.

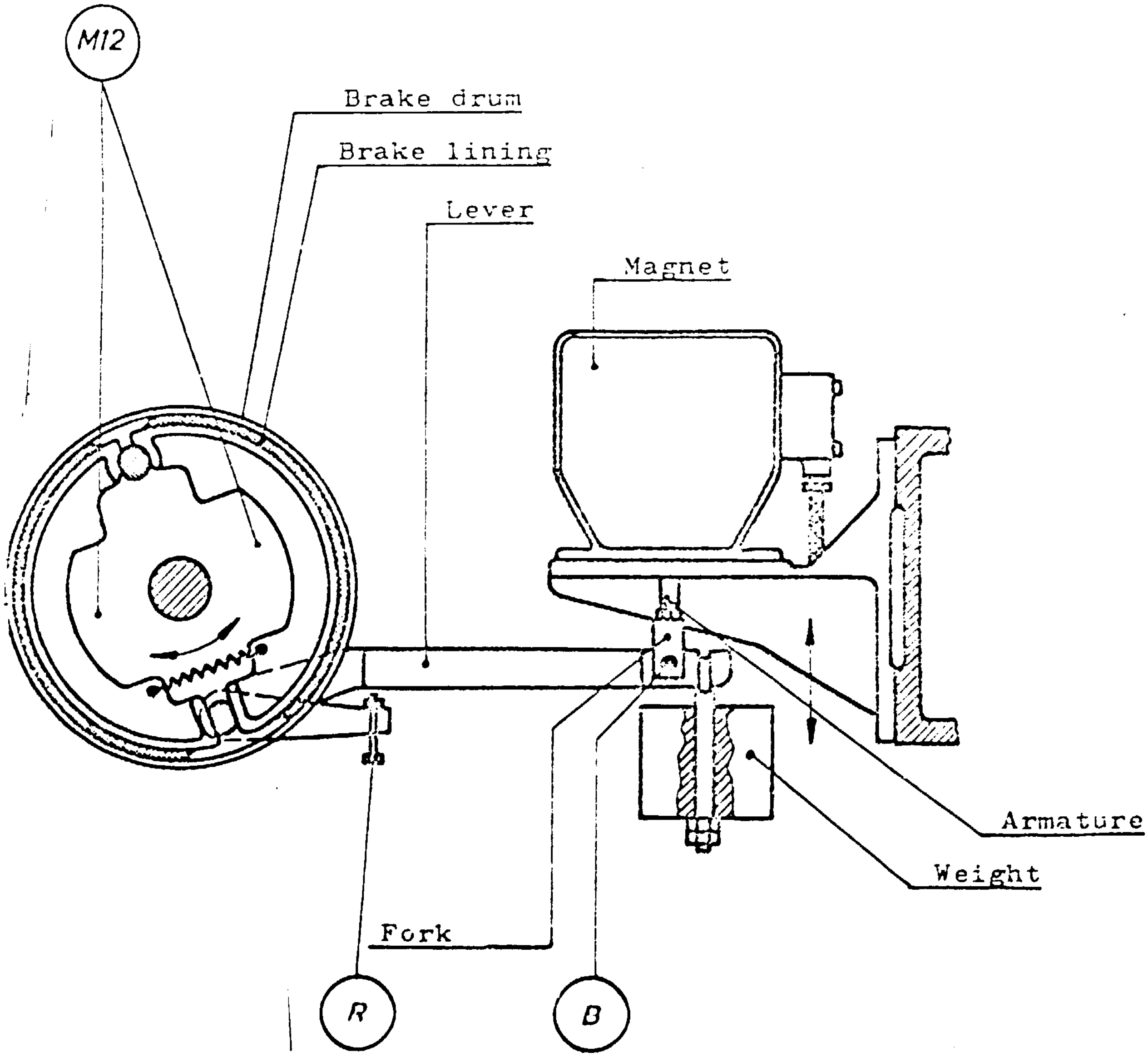
Centring the brake disc

Tighten securing bolts M 12 by hand only. Remove bolts B from the fork and force weighting lever sturdily downwards while at the same time tightening the bolts M 12.

Insert bolt B again. Lift the armature of the magnet as far as it will go and turn setscrew R until the brake resistance will be felt when moving the drum. Then slacken the setscrew R until the brake lining has just been separated from the brake drum. The brake should now properly act when dropping the armature.

Make sure to adjust the setscrew R in such a way that the machine is slowed down uniformly. Yerking of the brake indicates excessive engagement. To correct this, slightly slacken the setscrew R.

FIG. 1C.1



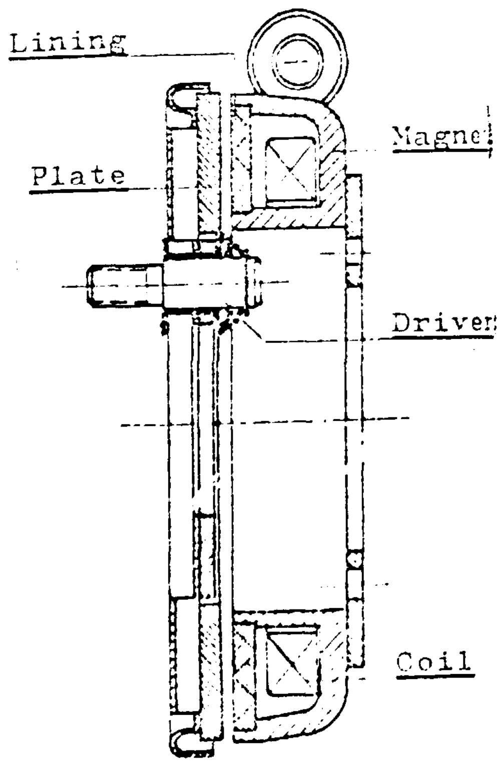
4.2. Disc Brake.(fig. 1C.2)

The electric disc brake consists mainly of a fixed housing (magnetic field) and the plate compounded to the tin roller shaft (armature). When the field bobbin is energized with direct current, a magnetic force originates pressing the plate against the lining of the housing.

The disc brake operates maintenance-free; the gap between field and plate is kept automatically at a distance of 1 mm by a resetting appliance.

When the main motor is stopped, the brake is automatically energized and remains in loaded condition for a period set at a time-relay. The time of inertia can be altered by raising or lowering the voltage by means of a resistance. Time-relay, resistance, transformer, rectifier & switch gear are located in a switch-box. The direct-current voltage is 24 volts.

FIG. 1C.2.



GROUP 2 : A THE CABINETS - CHASSIS
B ROLLER BEAM
C CREEL

2.A CABINETS.

1. DESCRIPTION.

The head end and foot end cabinets are similar in construction and contour. The lines are clean and simple, with no dirt-catching or hard-to-clean areas. They have tight-fitting access dcors that make it easy to reach all mechanisms.

2. PURPOSE.

The head end cabinet contains the draft gearing, twist and lay gearing, builder, windlass and wind down mechanism, and the drive. In the foot end cabinet is housed the waste collector unit.

3. CONSTRUCTION.

The cabinets are made of cast iron and finished with baked-on enamel. Each cabinet is designed to house the components in the most efficient arrangement for operation and ease of accessability.

4. PARTS.

4.1 DRAFT GEARING
4.2 TWIST GEARING
4.3 LAY GEARING
4.4 BUILDER
4.5 CAM
4.6 PITMAN ROLL
4.7 WASTE COLLECTOR UNIT
4.8 ELECTRIC CABINET

THE CHASSIS.

5. DESCRIPTION.

The spinning frame chassis is strong, clean and simple. There are no unnecessary parts and the entire assembly is designed and constructed to maximize production and minimize cleaning and maintenance.

The chassis is composed of the samsons, roller beams, and spindle rails.

6. PURPOSE.

The Chassis is the framework or skeleton of the spinning frame and holds all the component parts in their respective positions. In order to perform this function efficiently, the chassis must be made and assembled to close tolerances and must have great stability.

7. CONSTRUCTION.

The chassis parts are made of materials best suited to the individual requirements. The samsons are heavy iron castings, with all contact surfaces milled to close tolerances. Ring rails are made of stamped steel. The roller beams are made of cast iron.

8. PARTS.

8.1 SAMSONS

8.2 ROLLER BEAMS

8.3 SPINDLE RAILS

9. SETTING.

The sections have two samsons, one at the end and one in the centre. They are placed end to end so that the end of the section that does not have a supporting samson butts onto the samson end of the next section. In this way the sections are joined to form a very strong and stable chassis.

When the sections are all joined - but before the connections are tightened - the reel and wire are used to align them. A wire is stretched the full length of the frame along the right hand roller beam and spindle rail. Gauge blocks are used to align and level each section to the others. Vertical adjustments are made by loosening the holding nut on the adjusting screw of the samson foot and running the screw up or down as needed. When an adjustment is made to raise or lower a roller beam, the opposite beam must be checked to see if it has been affected.

After the assembled sections have been aligned , all the connections should be tightly secured. Again check with the gauge blocks to see that no part has been pulled out of alignment as the connections were tightened.

2.B THE ROLLER BEAM.

1. DESCRIPTION.

The roller beam, one on each side of the spinning frame, are special formed channel beams and extend in joined sections the full length of the frame.

2. PURPOSE.

The roller beam serves as a support for the drafting element, its components and accessories. It also forms a part of the framework of the spinning frame and adds strength and rigidity to the upper part of the frame.

3. CONSTRUCTION.

The roller beam is made of cast iron. The individual sections of the beam are accurately sized and drilled for precise fitting to the samson post brackets and for the accomodation of the roll stands.

4. PARTS.

4.1 ROLLER BEAM
4.2 SAMSONS
4.3 ADJUSTING SCREWS.

5. SETTING.

Each section of the roller beam is bolted to three samson posts, one at each end and one in the middle, with the exception of the head end and foot end section, which are bolted to two samson parts and to the cabinet plate. When the roller beam is installed, place an 18-inch level across the two beams at, and parallel to, the cabinet and level them by adjusting the cabinet feet.

Stretch the aligning wire from the reel the full length of the frame. With the aligning block check the alignment of the beam lengthwise from one samson to the next.
make any needed vertical adjustments by means of the adjustable feet of the individual samsons.

When adjustments are made to alter the height of a roller beam, the opposite beam will also be affected. To save unnecessary steps, the level should be used to keep both beams at the same height. Raise or lower both feet of the samson to level it before proceeding to the next one.

The roller beams should be level when the right hand spindle rail is correctly aligned lengthwise, but it is best to double check each of these settings and then securely tighten the holding screws. Whenever adjustments are made to the cabinet or samson feet, be sure to tighten the lock nuts of the adjusting screws.

2.C THE CREEL.

1. DESCRIPTION.

The spinning frame creel is the umbrella type in which the roving bobbins are suspended above the drafting element. It is three-way adjustable, has self-locking holders and weighted brakes.

2. PURPOSE.

The creel holds the packages of roving so that the stock is fed into the drafting element smoothly and consistently. The package revolves as the roving is pulled over the roving rods, which minimizes strain, stretch, and breakage.

3. CONSTRUCTION.

The bobbin holders are mounted in slats attached to cross arms. These holders are so constructed that by placing a bobbin on the holder and pushing upward, cams on each side of the holder turn and grip the bobbin firmly. Pushing upward on the bobbin a second time retracts the cams amd the bobbin is released.

The arms are mounted to collars attached to the creel posts. Chrome plated roving rods are optionally attached to split collars on the creel posts or to rods suspended from the cross arms.

4. PARTS.

4.1 BOBBIN HOLDERS
4.2 SKEWERS
4.3 THREAD GUIDE RODS
4.4 SLATS
4.5 CROSS ARMS
4.6 COLLARS
4.7 CREEL POSTS

5. SETTING.

The cross collars are held in place on the posts by socket head set screws. Loosen these set screws & move the collar up or down to get correct vertical position.
The lowest setting consistent with proper operation is best because it makes the creeling chore easier. Each cross arm is attanced to the collar by two bolts. A clamp arrangement, locked in place by a socket head cap screw, hold the slats in position on the cross arms. The slats can be moved in or out by loosening these cap screws at each cross arm.

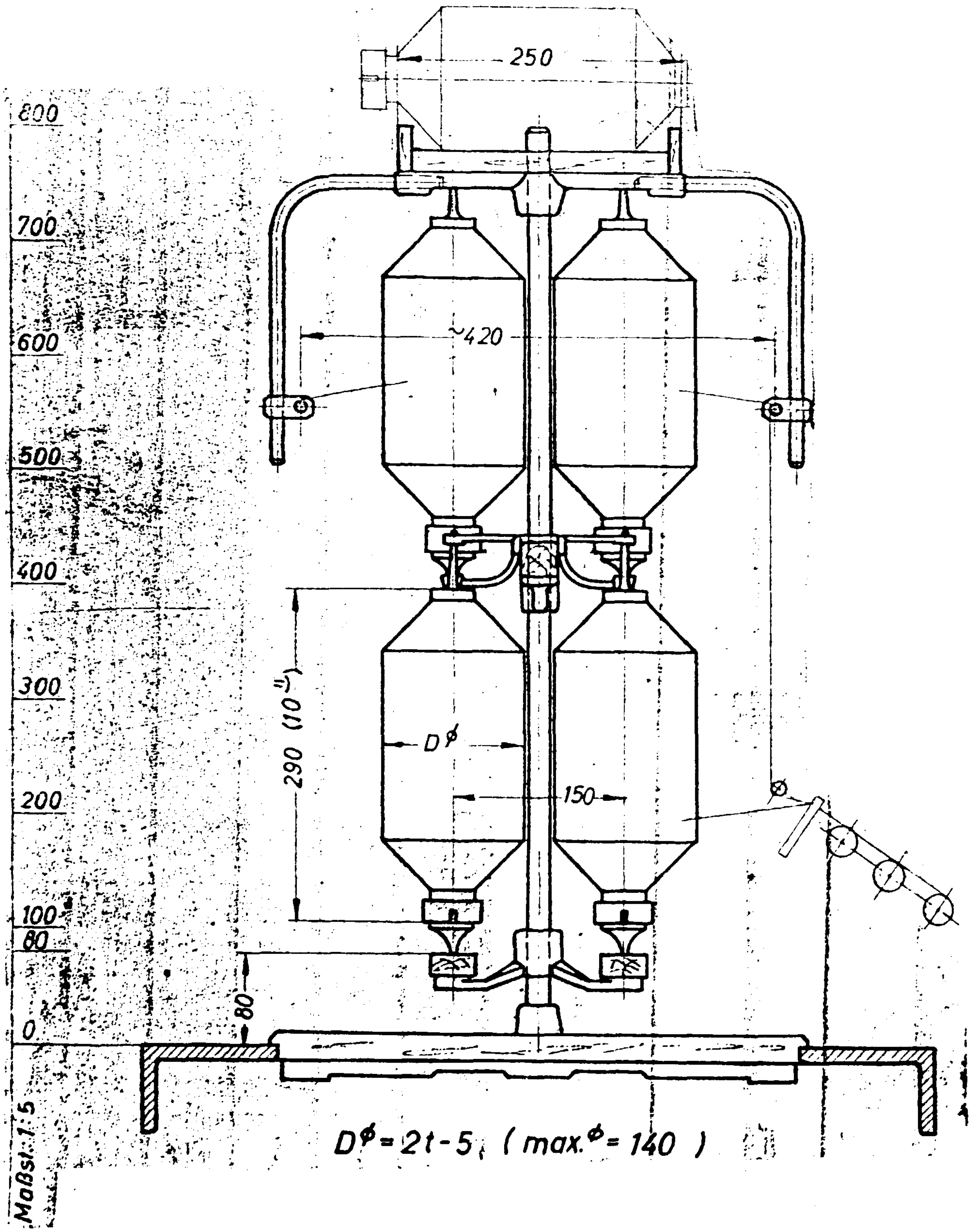
The roving bobbin holders are held in place on the creel slats by lock nuts. The holder can be moved parallel to the frame by loosening the lock nut and sliding the holder in the slat.

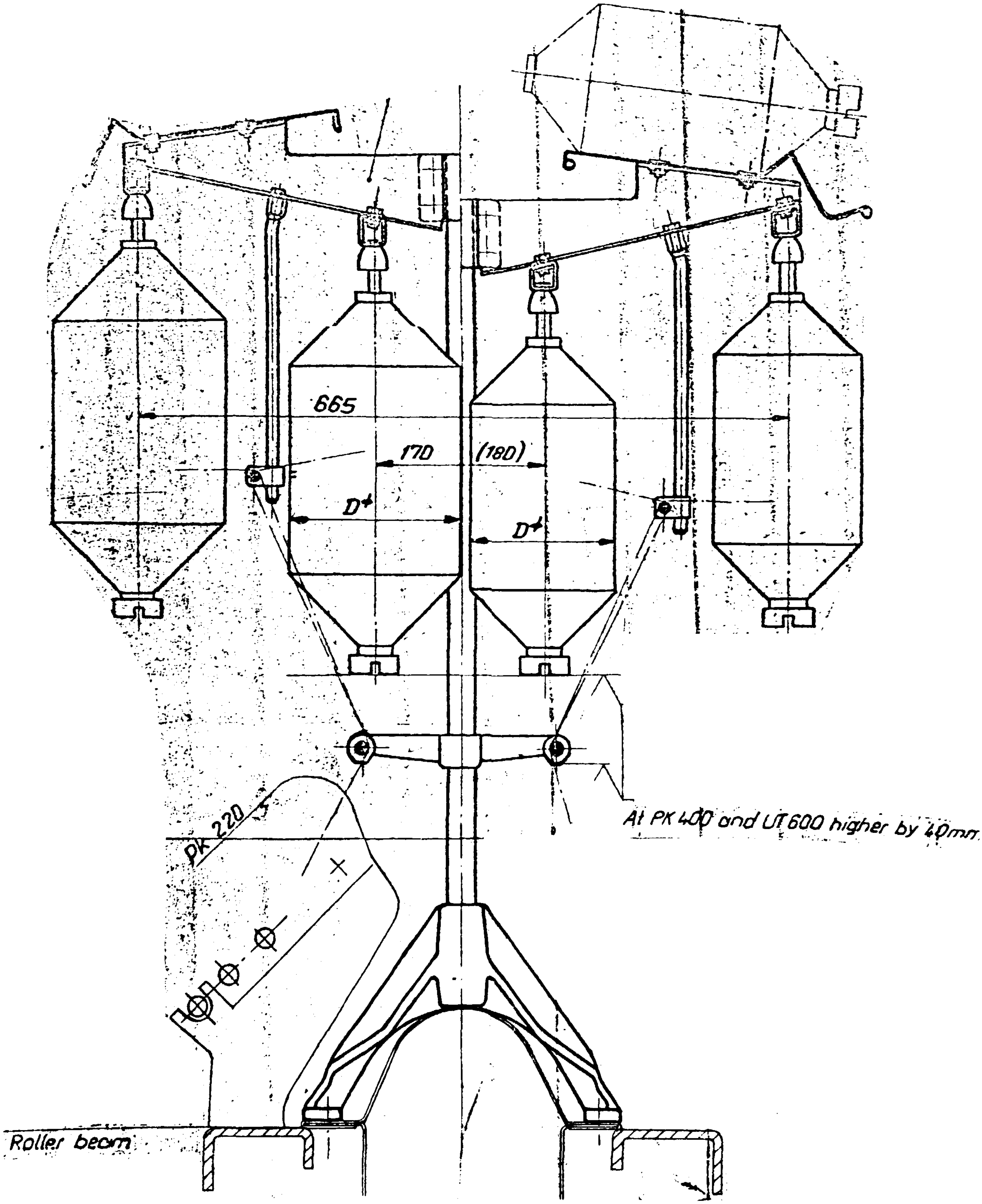
The exact position of each holder and its bobbin of roving is dependent upon the gauge of the frame, the size of the roving package, and other local factors. The roving rods can be positioned to guide the roving from the bobbin to the trumpet with the least possible stress and strain. (At the centre of the lift)

The centre to centre distance between the two hangers
= spindle gauge x No. of rows per side
= 70 mm x 2 = 140 mm

5.1 THE CREEL FOR SKEWERS IS MOUNTED AS FOLLOWS. (FIG.2.C.1.)

- Bolt the brackets for vertical rods to the frame, Insert the vertical rods and tighten them in the foot.
- Insert the bottom slotted bar brackets on the vertical rods. Fix the bottom slotted bar on the brackets. Fix the bottom skewer holders on the slotted bar with the screws. Lift the slotted bar bracket on the vertical rod & tighten it at the height of 80 mm as shown in Fig.2C.1.


250
800
700
600
~420
500
400
300
290 (10")
D ϕ
150
200
100
80
80
0
Maßst. 1:5
Dϕ = 2t-5, (max.ϕ = 140)



WERNER INTERNATIONAL

GROUP 3 : A ROLL STANDS AND ROLLS
B PRESSURE ARMS
C TRUMPET

3.A-ROLL STANDS AND ROLLS.

1. DESCRIPTION.

The roll stands are simple and functional. The smooth surface of the stand is easy to clean. The roll blocks are precision made and the middle and back blocks are fully adjustable in the stand. Roll stands are located at each joint of the bottom roll, the length of which varies according to the gauge of the frame. The stands hold the rolls parallel on a plane of 45 degrees inclined from front to back.
The bottom steel rolls of the spinning frame are 25 mm. diameter. Front and back rolls have straight fluting and the middle, or approop roll is knurled.

2. PURPOSE.

The roll stands support the drafting assembly and the waste removal flutes. The blocks provide a bearing, with a replacable needle bearing, for the bottom steel rolls. The bottom rolls transport the stock and, through progressively higher surface speeds, draw the fibres out and draft them into yarn.

3. CONSTRUCTION.

The roll stands are made of die cast aluminium with contact surfaces milled to exact specifications for the particular application. Roll blocks fit into the slots of the roll stands with space for adjustment of the middle and back roll blocks. The stands are securely attached to the roller beam with cap screws. The blocks are attached to the stands, which are slotted for block adjustments. The bottom rolls are made of steel, induction hardened for service and long life. They will withstand constant pressure without warping. The grooves of the flutes are rolled into the metal under tremendous pressure. The rolls are connected with the threaded end of one roll being screwed into the end of the adjoining roll. The rolls have tapered shoulders which maintain a firm bond.

All bottom steel rolls are ground and polished which leaves smooth, uniform lands.

4. PARTS.

4.1 ROLL STANDS

4.2 BLOCKS

4.3 FLUTED ROLLS

4.4 BEARINGS

5. SETTING.

The roll blocks must be set for the length of staple to be run. If the rolls are spaced too close together fibres will be gripped by the forward rolls before being released by the preceding ones, which will break some of the fibres and cause cockled yarn. On the other hand, when rolls are spaced too far apart the shorter fibres will have a tendency to stray, resulting in uneven yarn.

The roll blocks can be moved backward and forward in the stand by loosening the socket head cap screws and sliding the blocks to the desired position. Use appropriate gauge to space the blocks. Tighten the set screws securely and recheck when the rolls are installed to be sure there is no misalignment that could cause bind and eccentric motion.

With the front and back bottom steel rolls in position the roll stands are aligned with the reel, wire, and appropriate gauges. First, position the head and foot end stands the correct distance from the front of the roller beam. This setting can be quickly located with a small combination square. Remove the middle bottom roll bearings and stretch the wire the length of the frame along the bearing slots. Aling the roll stands both vertically and horizontally. If a roll stand is too high it must be removed and the bottom contact surface filed to lower it. A stand that is too low can be raised by loosening the screw and inserting a special shim between the roller beam and the bottom of the stand.

Mount the rolls in the bearings of the roll blocks. Join each section and securely tighten with the special wrenches. Assemble correct roll necks at each end of assembled rolls. Place bearings in place and tighten holding screws. Check to see that rolls do not bind at any position. Install appropriate gears to head end.

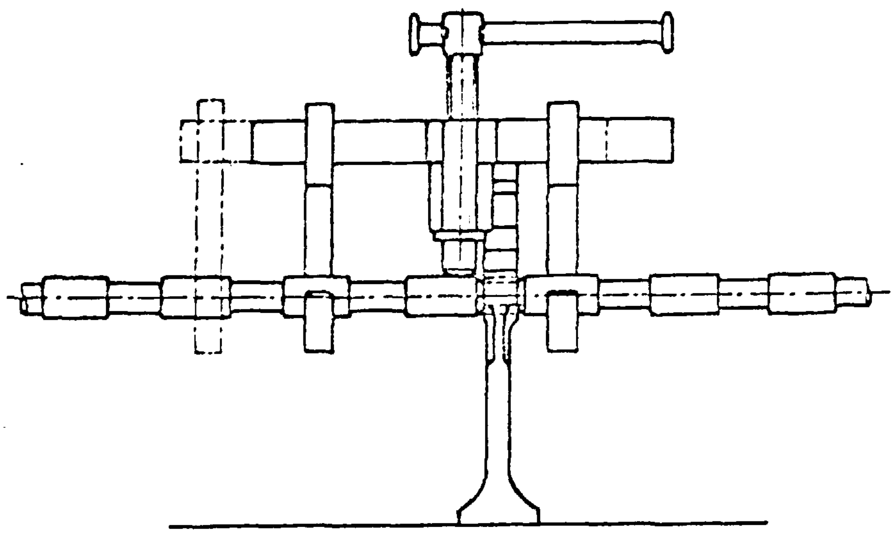
Aligning the delivery rollers.

Every roller fluting is tested under load with a dial-gauge. Care should be taken that the adjacent systems are loaded with at least one weighting arm. Both weighting arms should be closed to check the alignment of flutes in between the weighting arms.

In no case the eccentricity of the rollers at any point should exceed 3/100 mm. If necessary you should align the fluted rollers with the help of the press shown in figure below.

When it is necessary to true up above the bearing the straightening press with movabel hooks is used and the press (the central screw) is set close to the bearing either to the left or right, depending where the greatest deflection is.

The play for the back drafting roller should not exceed 5/100 mm.



GROUP 3B DRAFTING SYSTEM UT 620.:

1. DESCRIPTION.

The roller stands are simple and functional. The roller blocks are precision made and the middle and back blocks are fully adjustable in the stand. Roller stands are located at each joint of the bottom roller. The stands holds the rolls parallel on a plain 45 degrees inclined front to back. Top arm is spring loaded.
The front and back rollers are flunted, the middle or apron roll is Knurled.

2. PURPOSE.

The drafting system transport the stock and through progressive higher surface speeds, draw the fibers out and draft them into sliver roving.

3. PARTS.

See figures and Text.

4. SETTINGS.

1. MOUNTING.

a) The top arms and clamp brackets are slid onto the support bar, which is then mounted in the support slides as shown in Fig 1 ready to be fixed in the stands. The distance from the centre of the support bar to the centre of the delivery roller is 205 mm.

The top rollers and cradle units are mounted in the top roller retainers and each top arm is located correctly between two fluted sections in accordance with the gauge. All the top arms are then weighted and the clamp brackets are tightened with a torque of 2.5 mkp by means of a torque spanner. A higher torque is unnecessary, the form-fit between the clamp bracket and support bar guaranteeing an adequate grip.

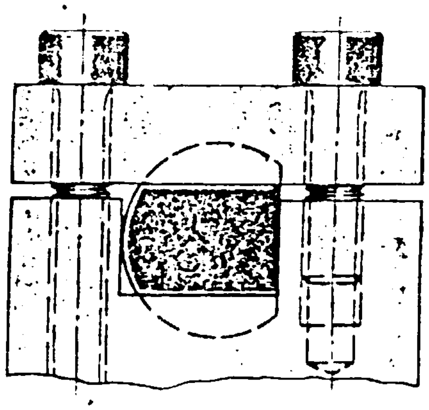


Fig. 1

2. HEIGHT SETTING OF TOP ARMS.

The No.620-1117 height setting gauge, which is intended for both the UT 600 and UT 620 top arms, must, before use, be adjusted according to the arm design. Proceed as follows:

Set the gauge (Fig.2 and 3) at the diameter (1) of the front top roller used with the arm by turning the block (2), which is provided on each side with one of the numbers 27, 28, 31 or 35, until the number corresponding to the front roller diameter, as seen from above, is adjacent to the adjustable front slide (3) of the gauge. Then adjust the block (2) in its slot (4) so that the notch (5) is adjacent to the notch (6) in the front slide (3) designating the arm and cradle type. To facilitate this the three notches in the slide (3) are provided with the type references of the arm and cradle on the side of the slide next to the arm.

In order to locate the lug (7) of the pointer (8) under the arm body without interfering with the top roller retainer, the gauge is adjustable by means of the two slides (3 & 9).

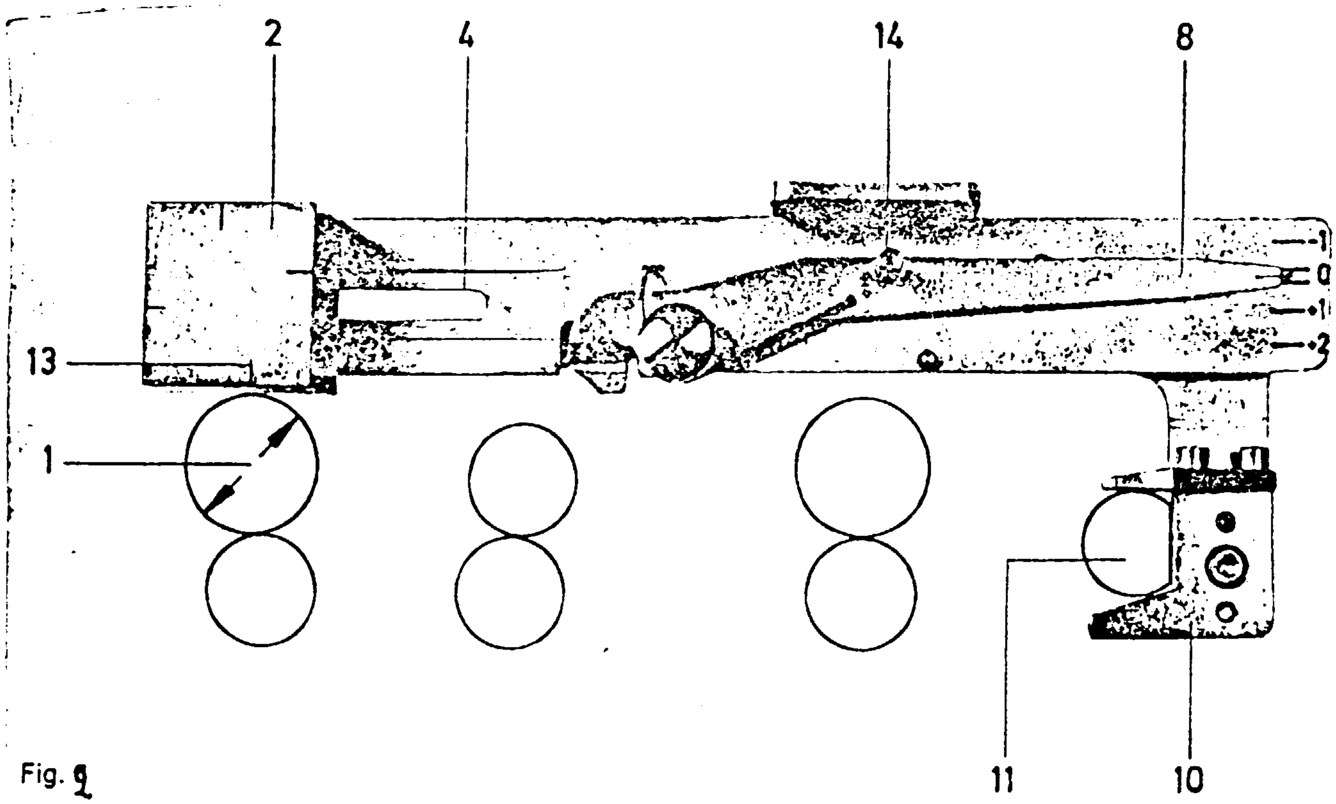


Fig. 2

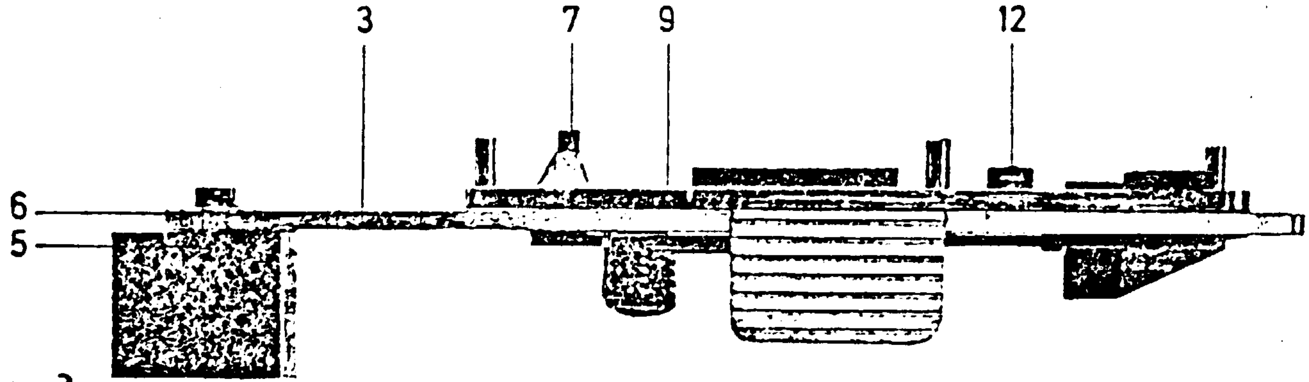


Fig. 3

Apply the gauge to the right of the arm, as viewed from the spindle, so that the support bar(11) is located in the bracket (10) of the gauge. After loosening the hexagon screw (12), adjust the front slide (3) until the block (2) is in the correct position in relation to the front roller, viz. when the mark (13) on the side of the block is aligned with the center of the top roller, When making this adjustment, ensure that the slide (9) of the gauge rests firmly on the support bar.

To apply the gauge, raise the pointer (8) at the stud (14) until the lug (7) is located under the arm body. Push the gauge in the direction of the arm until the location studs rest against the arm body. Lower the pointer to bring the lug into contact with the underside of the arm.

Turn the height setting screw on the clamp bracket until the pointer attains approximately a mid position between the two longer graduations at 0 on the scale. The arm is thus set parallel to the drafting field (Fig·4).

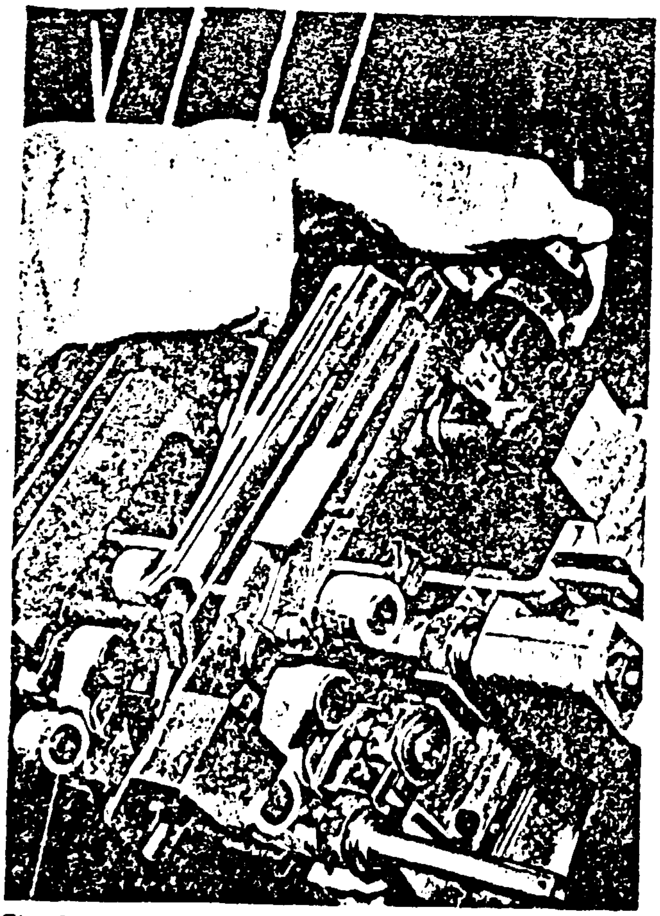


Fig. 4

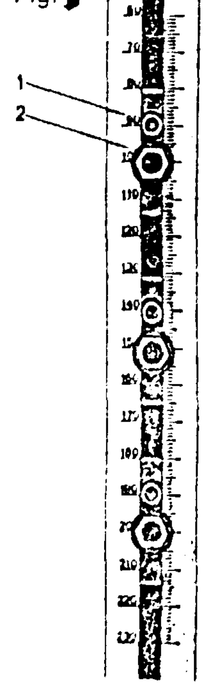
Release and weight the arm two or three times to check the position of the pointer, which should automatically take up its position between the two graduations at 0. When this mid position has been attained, the height setting of the arm is correct. If not, the arm must be reset. Ensure that the locking nut of the height setting screw is tightened properly after each setting.

Set all the arms in the frame in the same way and then make a second check.

3. <u>TOP ROLLERS SETTING.</u>

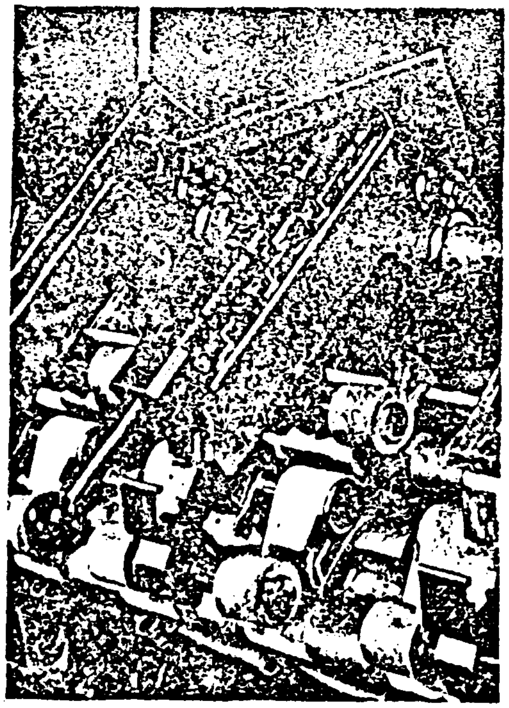
Tables are available showing the settings of the top roller retainers for each drafting design. These settings are determined on the basis of the centre line of the support bar. The top roller retainers are set with the arm released and are fixed by means of hexagonal screws (2) according to the settings recommended in the tables for the scale (1) on the arm body (Fig.5). The edges of the retainer surface serve to mark the correct division, the front edge indicating the settings for the back roller and the rear edge, the settings for the middle and front rollers.

Fig. 5



For settings on a large scale the top roller setting gauge 4.629-1022-1 can also be used (Fig.6)

Fig. 6



For adjusting the top roller settings by means of this setting gauge the required top roller settings are first to be made on one arm in accordance with the values given on the setting chart. The setting gauge is then adjusted to the settings on the pilot arm.

For setting the gauge (Fig.7) and also the top roller retainers the top arm must be in the relaesed position. Hold the gauge by its ball knob (10) and place it on the top arm body in such a way that the location (3) with its hook-shaped nose locks behind the arm body. The little pegs on the setting rings (9) reach through the longitudinal slot of the arm body until they touch the top roller retainer in which position they are tightened.

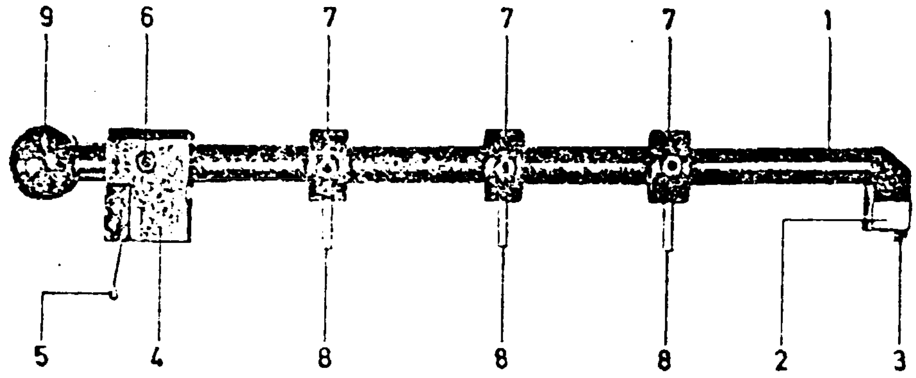


Fig. 7

In order to prevent the gauge from shifting on the arm body, a fixing device (4) has been provided in front of the ball knob; the tensioning spring (5) of this device grips under the front end of the arm body. Location (3), the tensioning spring (5) and the U-shaped support of this fixing device ensure the correct and safe position of the gauge on the arm body, nevertheless the gauge can be easily removed and fitted to another top arm.

When the threaded pin (6) is loosened, the fixing device (4) can be shifted on guiding rod (1); this is essential for the use of the gauge on the UT 600 and UT 620 top arms, which have arm bodies of different length.

In order to set push the fixing device (4) in the direction of the support bar until the tensioning spring (5) acts with sufficient pressure to enable the gauge to rest firmly on the arm body.

When the setting gauge has been adjusted the real setting of the top arms can be made. To this effect the gauge must be put into the top arms; the hexagonal bolts on the top roller retainers are loosened so that the top roller retainers can be shifted to the little pegs of the setting rings (3); in this position they are tightened again.

4. SETTING OF THE APRON NIP.

The apron nip "m" refers to the distance between the bottom apron guide bar and the front edge of the cradle. It is primarily the choice of cradle spacer which determines the quality of the yarn. Nine cradle spacers in different colours are available for various fibre types and qualities.

No.of Cradle Spacer	Colour	Count No.	Apron nip "m" Bottom Apron Leather 0.7/0.8	Bottom Apron Synthetic 0.9/1
2.5	red	below 12	3.5- 5	4 - 6
3.0	yellow	12 - 20	3 - 4	3.5 - 4.5
3.5	green	20 - 36	2.5- 3.5	3.0 - 4
4.0	blue	over 36	2.5- 3.0	3.0 - 3.5
5.0	white			
6.0	grey			
7.0	black			
9.0	brown			
11.0	colourless			

After removing the top apron unit from the top roller retainer, the spacer between the cardle and holding spring can be removed or fitted with a handy lever, without disassembling the complete unit.

5. CHECKING OF THE WEIGHTING PRESSURE.

The pressure of the weighting springs in the top roller retainers can be adjusted with infinite variation by means of screws. The standard weighting pressure is set on the arms before they leave the factory of the drafting manufacturers.

With the help of a device for checking nipping pressures (Fig.16) the pressure on each top roller can be increased when adjustments are made to cater for different type of fibre, e.g. when change is made from cotton to chemical fibres.

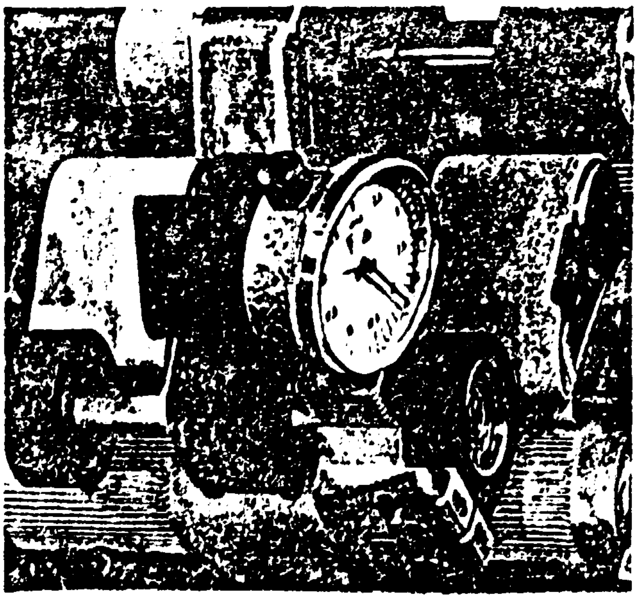
Standard weighting in Kp:

Cotton		Synthetics
1	10	13
2	10	12
3	10	13

Fit measuring head, the arbor and the boss wheel. Place the apparatus on a plane surface and set the dial indicator at zero.

Fit the apparatus into the top roller retainer instead of the top roller.

Read the values in Kp on the dial only with the machine running and all top arms weighted.



6. SOME IMPORTANT ASPECTS.

6.1 Fluff and fly.

On all double-apron drafting equipment a certain amount of fly will collect inside the mechanism in the course of time when processing low-grade cottons, causing additional tensioning of the apron and even slowing it down. It therefore requires cleaning from time to time. Even with good material the cage units should be dismantled and cleaned occasionally, especially in spinning mills for fine counts. The inside of the apron should be sprinkled with a little powder when assembled though not whilst running.

6.2 Inserting the cradles on UT drafting arrangements.

We are always coming across badly fitted cages, in which the top roller shafts have not been pushed all the way into the cage. As a result the apron is under excessive tension and runs badly, leading to faulty yarn, thread breakages and other troubles.

6.3 Inserting the top rollers.

While inserting the top rollers the guide arm should not be pressed upwards as otherwise the danger of deformation exists.

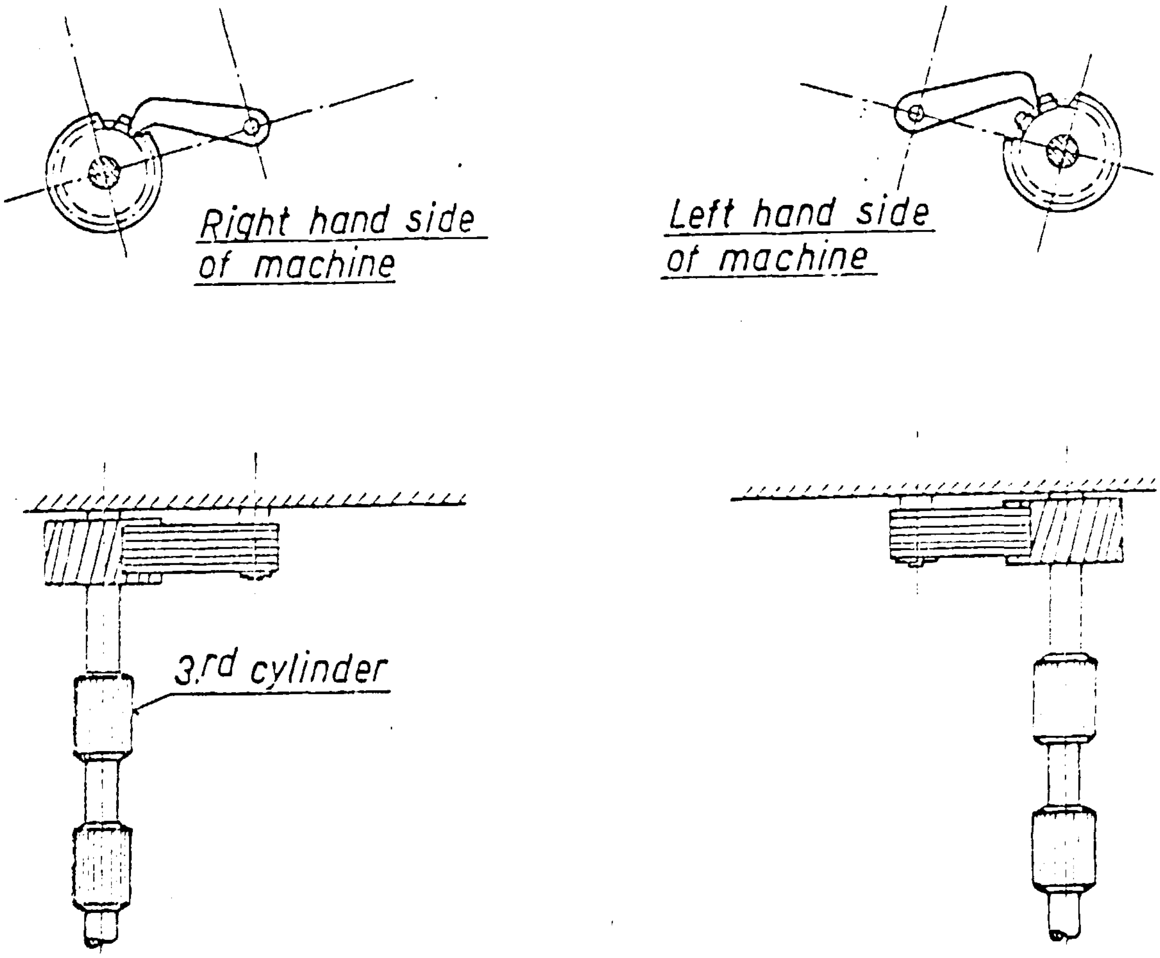
6.4 Grinding of top roller cots.

For achieving good running conditions (elimination slubs) and high quality of yarn periodic grinding of the top rollers cots is very important. The grinding may be advantageously done with the cots on the axle.

IMPORTANT: To remove laps from top rollers do not use knife or a sharp edged hook.

Fitting & adjusting of the holding pawl on the UT-620 gearing.

At stoppage, it is necessary to reduce to a minimum the reverse motion of the back cylinder on the UT-620 gearing.For this they exist 3 fixed pawls (not adjustable) each of 2 mm thickness. It should be checked that while the machine is running the pawls should actuate one after the other i.e. one holding pawls holds the wheel at a time.



30. THE TRUMPET.

1. DESCRIPTION.

The Spinning frame trumpet is a funnel-shaped roving guide, attached to a traversing bar, and located just back of the back rolls of the drafting element.

2. PURPOSE.

The trumpets guide the stock into the drafting element. The traversing motion of the trumpets move the stock back and forth so that a groove will not be worn in the cots and aprons, as would be the case if the stock maintained a constant, direct path through the drafting element.

3. CONSTRUCTION.

The trumpet is a one-piece component of molded plastic. Mounted on a traversing bar, it has a slot for longitudinal adjustment. Each trumpet is attached to the trumpet bar with a screw or clip. The trumpet bar is mounted in slots in the roll blocks and extends, in joined sections, the full length of the frame. The traverse motion consists of a gear, with eccentric pin, operating from a worm on the back roll and located at the foot end of the frame. An arm attached to the pin and to the trumpet bar imparts longitudinal movement to the trumpets.

4. PARTS.

4.1 TRUMPET
4.2 TRAVERSING MOTION
4.3 TRUMPET BAR
4.4 SLOTS

5. SETTING.

Adjust the trumpet so that the stock will traverse the same distance from each edge of the roll cot. With the bar either the inner or outward limit of its traverse, set the trumpet from the centre of the top roll cot so that on the opposite stroke it will carry the stock the same distance past centre on that side of the cot. Check the trumpet bar and arm to see that there is no bind or lost motion. See that all connections are tight. The traverse must be 12-13 mm.

GROUP 4 : A. RINGS
B. SPINDLES
C. THREAD GUIDE
D. SPINDLE DRIVE

4.A. RINGS.

1. DESCRIPTION.

The ring is mounted in the ring rail. An adjustable traveller cleaner is attached to the ring rail by a single screw, plastic separators are mounted on a bar, which rests in brackets attached to the ring rail. (the old model has Aluminum plate separators).

2. PURPOSE.

The ring provides a track for the traveller, which guides the yarn as it is wound onto the bobbin. The ring rail traverses vertically to place the yarn in predetermined lays as dictated by the builder and lay gearing. Separators prevent the yarn from ballooning into an adjacent end and also confine wild yarn when an end breaks. Due to higher lift or the 1964 model, balloon control rings are fixed to control the ballooning and reduce the end breakages.

3. CONSTRUCTION.

The ring rail is made of stamped steel and the ring is adjustable and hold in position by 2 screws (new frames). On the old frames the ring rail is of cast iron (the ring is not adjustable), and is hold in position by a screw. The separator are made of opaque, semirigid plastics mounted on a bar. The separator bar extends and is supported in open brackets attached to the ring rail.

4. PARTS.

4.1. RING
4.2. RING RAIL
4.3. TRAVELLERS
4.4. TRAVELLER CLEARERS
4.5. SEPARATORS

5. SETTINGS.

5.1. ALIGNMENT OF THE RING RAIL.

The ring rail is attached to the lifter bracket at each samson by a guide bracket.The height of the ring rail above the spindle rail for this adjustment is immaterial and can be at any convenient point of the traverse.However, the height at all sections of the ring rail must be exactly the same as gauged with the steel square.Vertical adjustment of the ring rail is made by means of the adjusting nuts under the lifter or poker rods.Adjust the traveller clearers so that it just clears the travellers. The size, shape and weight of the traveller that is used is governed by local conditions such as yarn count, twist, ring diameter, and spindle speed.

5.2. POSITION OF THE RING RAIL AT THE START OF THE DOFF.

a) Mark few tubes at 10 mm. from the base & put them on the spindles.

b) Unwind completely the winding chain.

c) Turn the cam at the smaller radius in order to have the ring rail at the lowest position.

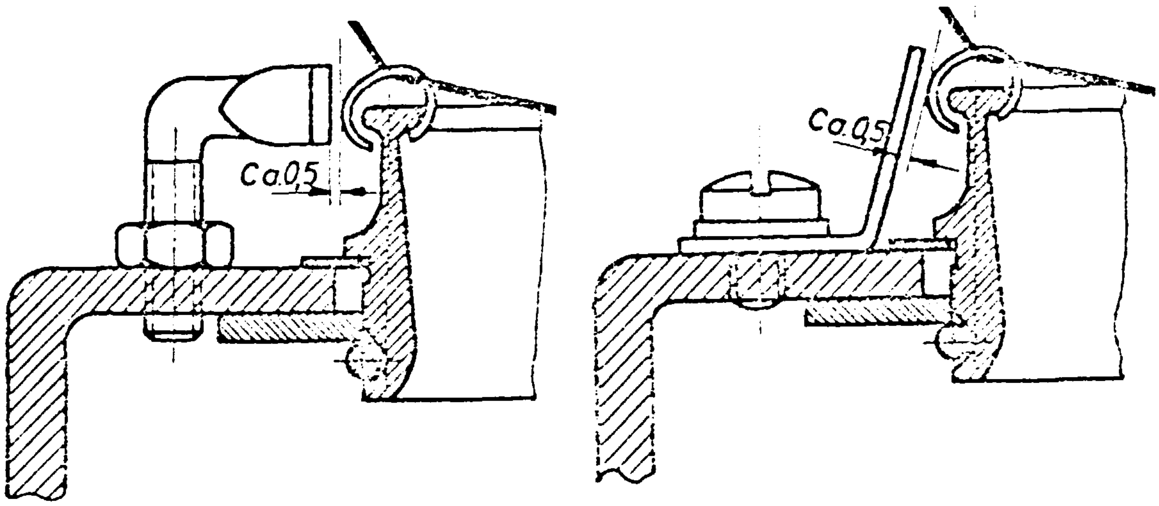
d) Adjust from the setting screw bolt the ring rail in order to have the top part of the ring at the same level with the mark on the tube.

5.3. <u>POSITION OF THE TRAVELLER CLEARERS.</u>

a) Determine the heaviest traveller to be used.

b) Push the traveller to the outside. The traveller clearer must be set at 0.3 - 0.5 mm. farther than the traveller as shown in fig.4.A.1 (a) & (b).

c) Measure the distance between the ring and the traveller clearer and make a gauge of the same thichness in order to adjust all other traveller clearers of the frame.



5.3.1. <u>Spacing plate B for flange No.1-Rings & R+F or Braecker-Travellers L1 and LS1.</u>

Use <u>2 mm. spacers</u> for <u>travellers No.8 to 1 to 9/0.</u>

Use <u>1.7 mm. spacers</u> for <u>travellers No.10/0 to 26/0.</u>

5.3.2. <u>Spacing plates B for flange No2 Rings & R+F or Braecker-Travellers M2 and MS2.</u>

Use 2.3 mm. spacers for travellers No.16 to 11

Use 2.0 mm. spacers for travellers No.10 to 8/0

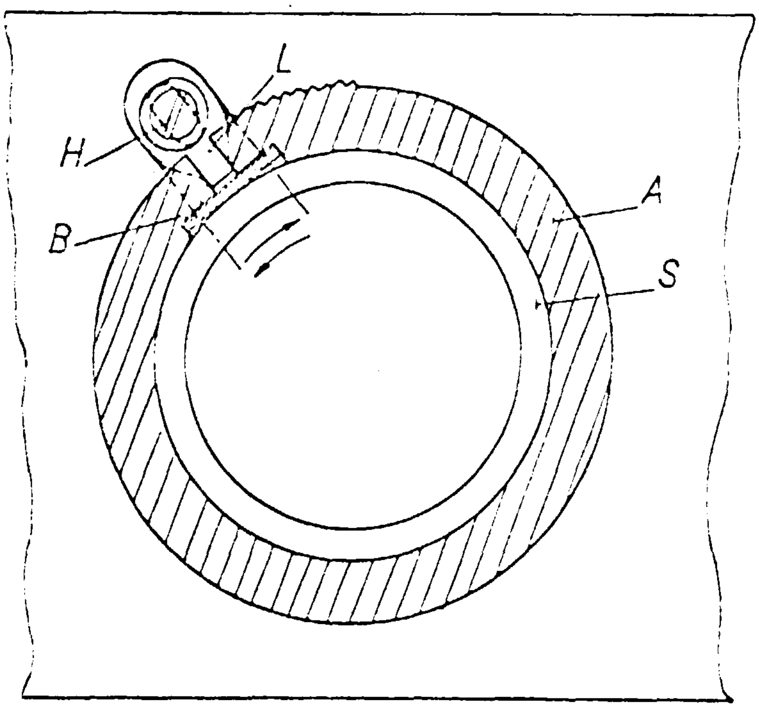
Use 1.7 mm. spacers for travellers No.9/0 to 20/0

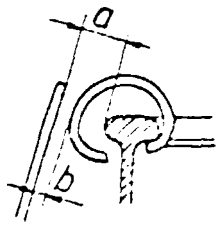
5.3.3. <u>General.</u>

5.3.4. <u>Fixing the traveller clearers.</u>

The traveller clearer "L" is pressed on to spacer B and screw H is tightened. Check whether the traveller clearer L remains in the proper position after tightening screw H.

5.3.5. In case the yarn count is changed considerably to coarser or finer, the traveller clearers have to be reset according to the respective traveller counts. Negligence results in excessive fluff on the traveller and consequently increases the ends down.





4.B. THE SPINDLES.

1. DESCRIPTION.

The spindles are composed of two parts:

- the mount which is filled with the spindle oil and
- the spindle blade.

The bottom part or mount is fixed with a nut on the spindle rail.

2. PURPOSE.

The spindle holds the bobbin and revolves it to not only wind the yarn on the bobbin, but also to insert twist in the yarn between the bobbin and the front rolls of the drafting element.

3. CONSTRUCTION.

The bottom part or mount has a reservoir oil, a ball bearing at the base and a roller bearing at the top.
The spindle blade can be removed from the base and replaced without distrubing the base or requiring replumbing after it has once been correctly installed.

4. PARTS.

4.1 SPINDLE BLADE
4.2 BOLSTER
4.3 BRAKE
4.4 RETAINING SPRING

5. SETTING.

Clean all contact surfaces of the mount and the spindle rail before installation. Place the mount in the hole in the spindle rail & put the large washer & nut on the threaded bottom part of the mount. With the mount approximately in the centre of the hole, run the nut up by hand until tight. When sleeve mounts are used they are installed directly in the spindle rail and do not require a torque wrench to tighten the nut. Before plumbing the spindles in this mount it is necessary to install the tapes and operate the spindles for 2 hours. The spindles should be reasonably plumb during this breaking-in-period to minimize to the tapes.

On new modelframes the spindle is equipped with a brake, place this assembly over the tube and against the lower flange of the whorl. With the brake lever in the off position, turn the assembly until the pin fits into the hole in the centre shaft. Push the lever to the on position to lock the brake in place. Insert the assembled spindle into the mount. Place the washer, beveled side down, on the base of the centre shaft & run the nut hand-tight to hold the spindle in place.

Lower the ring rail and set the top of the ring at the centre of the tube. Put the plumbing disc on the spindle and disc in the ring by moving the mount. Hold the top nut of the mount with open end wrench and tighten the bottom nut securely with torque wrench. Have the top nut of all the mounts turned the same way on the rail.

On the new model, the spindle mounts are fixed. To Plump the spindle, the ring is adjusted by the two adjustable screws. Loosen the screws & plumb the ring with the plumbing disc (made of aluminum). Tighten the ring screws after plumbing the rings.

The ballon control rings, when the frame is so equipped, should be aligned when the spindles are plumbed. A special disc fits the top of the plumbing gauge and the ring should be adjusted so that the disc is exactly centered in it. The ballon control ring is attached with one allen & one hexagonal screws and is fully adjustable.

Before starting the frame, check spindles to see that there is no bind and that all the locking caps are in position.

The spindles should be maintained and lubricated as prescribed in the maintenance section.

4.C. THREAD GUIDES.

1. DESCRIPTION.
Pigtail type with slub catcher slots.
Traverse in conjunction with the ring rail and balloon control rings. Tilts individually for piecing or collectively for doffing.

2. PURPOSE.
Holds the yarn in a direct line with the bobbin and helps control the ballooning action of the yarn as it passes from the front roll to the bobbin.

3. PARTS.
3.1 Lappets.
3.2 Thread guide.
3.3 Draw rods.
3.4 Supports.
3.5 Chains.
3.6 Lifter rolls.

4. CONSTRUCTION.
The lappet guide rail is mounted on the lifter rods fixed to the lifting bracket at each samson. As the ring rail lift ascends and descends, the lappet rail also follows the same.

5. SETTINGS.
The thread guide rail can be adjusted at each lifter lever by loosening the Allen key screw on the lifter rod bracket and adjusting it in the lifter rod.
The distance between the lifter roll "R" and the fulcrum at the lifter lever "H" must be adjusted to 66 mm. as shown on Fig. (4C.1).

For making the level of the thread guide rail, bring the ring rail at lowest position (i.e. the cam follower should be in the cam heart). Take an angle wooden gauge of 88mm. and check the level of the thread guide rail through out the machine at every lifter rod bracket. If the level is not good, adjust the lifter rod bracket as explained above.

With a plumb bob, the lappet should be adjusted in such a way that the axis of the spindle at the same time constitutes the axis of symmetry of the balloon of yarn being produced. The axis of the spindle then is approx. 1 mm. (.04") in front of therearmost point of the lappet Fig.4C.2

The correct distance from the lappet to the spindle and bobbin top edge, respectively is given in FIG. 5C.8. If despite proper Setting of the lappet on the position for commencing spinning the checking measurement specified is not obtained in top-most position, there is the possibility of moving the lifter roll R at the lifter lever towards or away from the fulcrum.
If the distance is not enough, the balloon is too close to the upper part of the tube and it can cause a break, especially when the edge of the tube is damaged. On the other side, if the thread guides are too high, they increase the tension of the yarn.

FIG. 4C.1

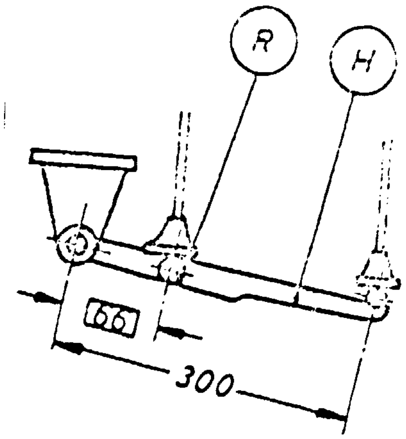
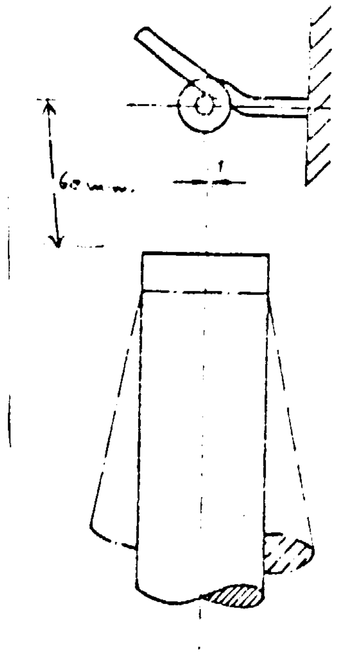


FIG. 4C.2



4.D. SPINDLE DRIVE.

1. DESCRIPTION.

Drive is through tape from a 10" drum mounted on the spindle drive shaft. Four spindles (two on each side of the frame) are driven from each pulley by a single tape. Tape tension maintained by pulleys mounted on reciprocating arms controlled by coil springs or weight.

2. PURPOSE.

The spindles are driven at high speed through this tape drive. One or more of the spindles can be stopped without materially affecting the speed of the other spindles that are pulled by the same tape. The tension pulleys keep the tape under constant, uniform tension so that the speed will be consistently the same for all the spindles.

3. CONSTRUCTION.

The tape jockey apparatus are always arranged on the right-hand side of the frame and the tin rollers, without exception, on the left.

4. PARTS.

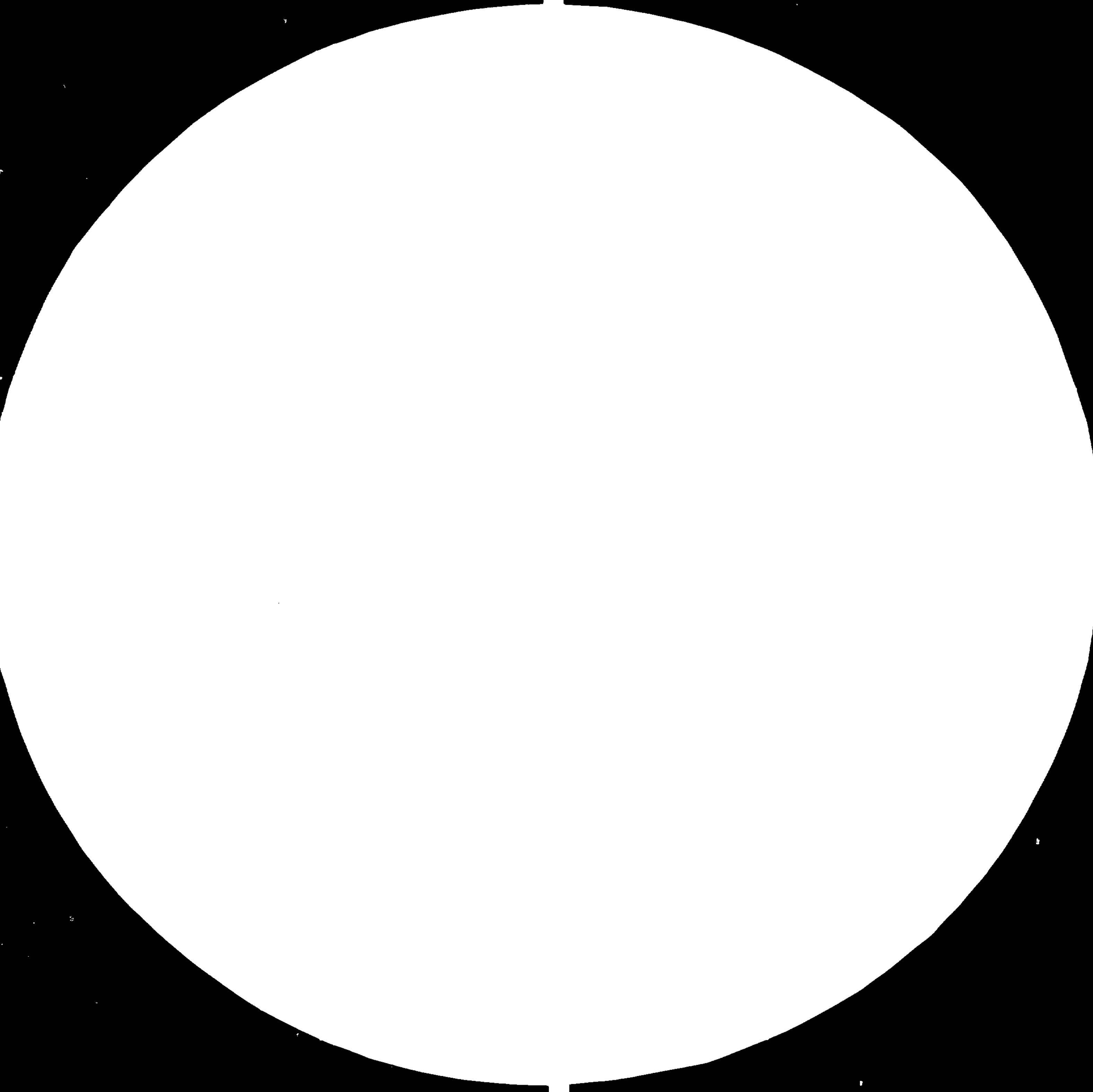
4.1 Jockey apparatus

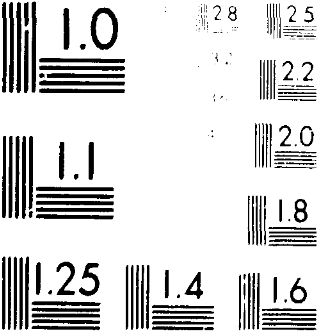
4.2 Tape

4.3 Tension pulleys

5. SETTINGS.

5.1.1 The principal requirement in a tape drive arrangement is to ensure that the tape runs on to the pulley at right angles to the pulley axis. A fairly wide deviation from that angle is permitted for the run-off. The particular conditions appertaining in a frame must be carefully considered when the pulley and bracket are adjusted so that the pulley is placed in the proper position to ensure a correct run-on of the tape.




1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

In a four-spindle tape drive arrangement, it is advisable to set the tape tension pulley close to the point where the tape runs on to the driving drum as shown in Fig. 4D.1

With this setting, the plane of run-on of the tape to the tension pulley varies only slightly from the plane of the deflective movement to which the pulley is subject when the tape is lengthened or shortened. This will assure positive run-on of the tape to the tension pulley even if it is a little too long or too short when fitted or is considerably stretched during operation.

5.1.2 Adjustment and Installation of the Tape Tension Pulley and Bracket.

It is recommended that template 6 (Fig.4D.3) be used so that the adjustment of the bracket and pulley to the correct position relatively to the spindles can easily be repeated from spindle group to spindle group. The process of adjustment is described hereunder for a four-spindle tape drive arrangement as shown in Figs. 4D.1 and 4D.2.

a) The correct position of the tape tension pulley and bracket is carefully determined in one spindle group by trial and error, care being taken to ensure correct tape drive conditions as described in paragraph 5.1

b) The position relatively to the spindles thus determined for the bracket and pulley is marked on support rod 8 by means of set collar 7 (Fig. 4D.3). The set collars for the other spindle groups are fitted accordingly, template 6 being used to determine the correct position for each collar on the support rod.

c) To adjust all the pulleys to the correct height and angle of inclination, a setting gauge as shown in Fig. 4D.4 is used. This ensures that the adjustment of the trial pulley is accurately copied for the other pulleys (Fig. 4D.5). Stop ring 9 of the gauge can be turned and adjusted vertically (screw 10, Fig. 4D.4). After slackening screw 12, rod 11 of the gauge can be moved laterally.

5.1.3 Fitting of the Tapes.

All pulleys having been adjusted, the tapes are fitted, after which the driving drum is slowly turned by hand to see whether any of the pulleys require further adjustment. The tapes must not be fitted too tightly. The length of a tape when fitted should be sufficient to allow the bracket and pulley adequate play on either side of the stop 13 of set collar 7 (Fig.4D.6). This can be tested - with the machine at rest - by pulling the tape and observing whether or not the bracket and pulley are free to swing. In the rest position the pulley must be exactly perpendicular to supporting rod 8 (Fig.4D.7). With the pulley fitted in this way, the pull exerted will not vary between the two extreme positions to which the pulley may be brought when the tape is too short or too long:
Z = Z1 = Z2 (Fig. 4D.7).

FIG. 4D.1

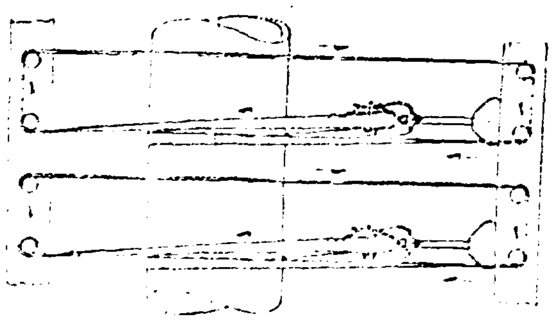


FIG. 4D.2

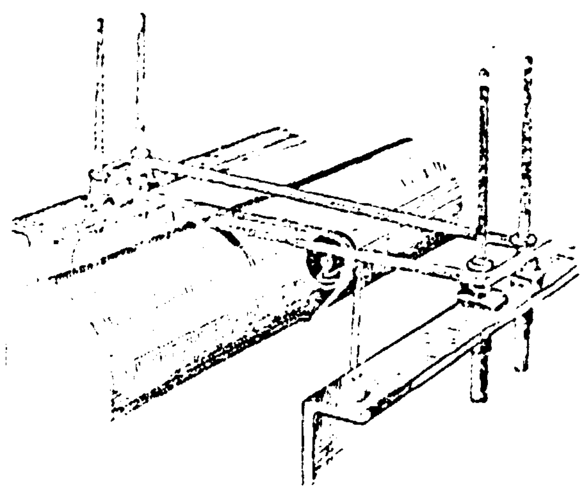
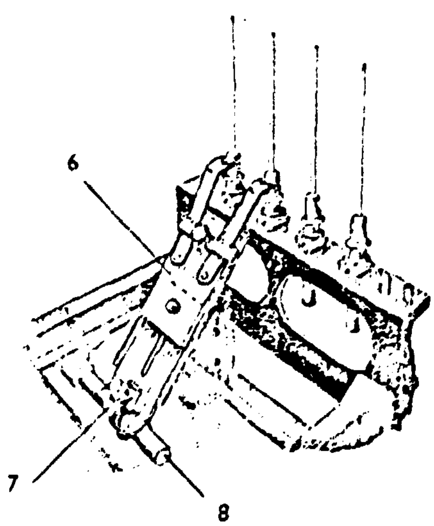
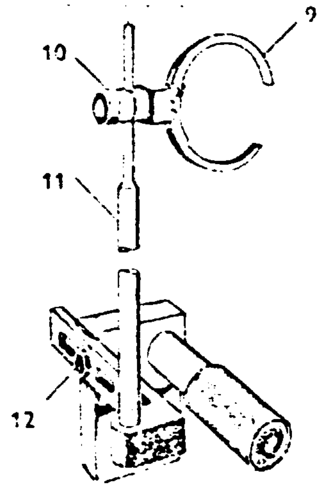


FIG. 4D.3



Correct position for set collars is determined with the aid of template

FIG.4D.4



Setting gauge

FIG. 4D.5

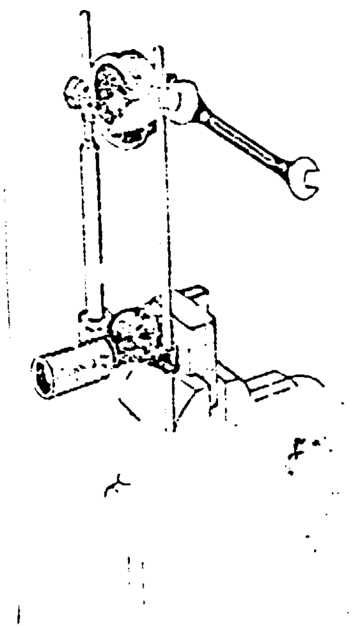
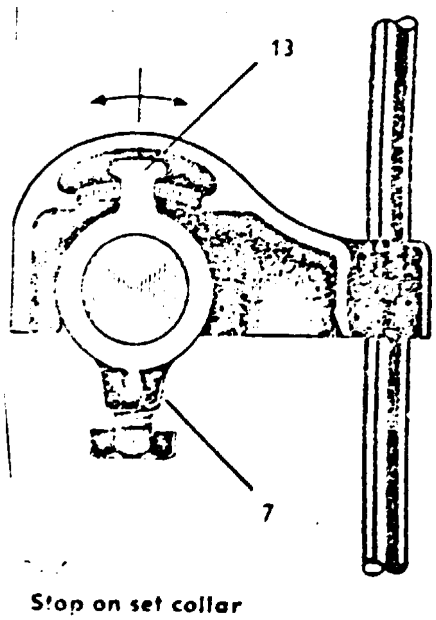
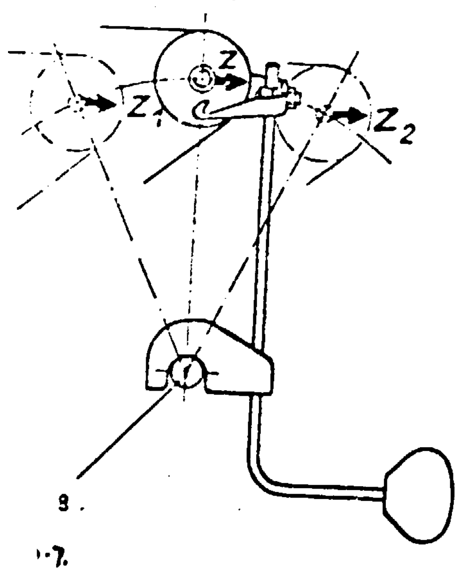


FIG. 4D.6



Stop on set collar

FIG. 4D.7

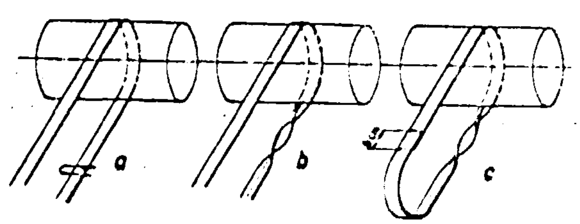


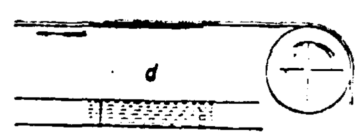
Pull diagram

5.2 Spindle driving tapes.

The fitted and sewn tape is in the correct position when the vertical rod of the normally loaded tape jockey apparatus is exactly perpendicular. In this position ascertain the exact tape length, allowing for an overlap of 6 cm. Transfer the measurement from this trial tape to a board. Cut all the tapes to this measurement, applying the same amount of tension (about 0,5 kg.).
The tapes are drawn in and sewn as follows (see diagram) :

1. Lay the tape round the tin roller like an open belt from the left-hand side of the frame (position a).
2. Turn the bottom end one whole revolution (360 degr.) in a clockwise direction (pos.b).
3. Lay the two tape ends parallel on top of each other for a length of 6 cm. (position c) and allow at the same time for the tape's direction of running (position d).
4. Sew the tape ends together with a special sewing machine, drawing the thread well into the tape. Use strong cotton twist, about No. 7 engl., for top and bottom sewing thread.





The spindle drive tape is a small but important part of the spinning frame. Much of the power necessary to operate the frame is used to drive the spindles. The wrong tapes, or tapes that are incorrectly installed, can cause abnormal consumption of power that will affect all the frames mechanisms. For this reason, a tape should be selected that is the correct weight, width, length, and thickness for the particular installation.

Always use the same kind of tape for all the spindles of the frame.

<u>A tape that is too wide will</u> :

1. Curl at the selvages.
2. Place additional load on the drive.
3. Have a short service life.

<u>A tape that is too narrow will</u> :

1. Not have sufficient traction.
2. Cause erratic spindle rotation.
3. Wear out or break prematurely.

<u>A tape that is too long will</u> :

1. Slip on the pulley and whorl.
2. Cause loss of output.
3. Adversely affect yarn quality.

<u>A too-short tape will</u> :

1. Cause undue wear to spindle bearings and tape tension assembly.
2. Prevent effective control by the tension pulley assembly.
3. Have a high rate of tape failure.

In addition to having the correct tape, it is equally important to have each tape correctly installed. There are two generally used methods of making the tapes endless.

One is by sewing the splice with a portable sewing machine especially made for this purpose.
The other is by bonding a special tape by inserting a thermoesetting strip between the tape overlap at the joint hand heating it with a portable pre-heated unit.

For a bonded joint, have the therm setting strip the exact width of the tape and longer than the splice. If the strip projects about 1/8" beyond the ends of the tape a full length bond is assured.

For either type joint, be sure the trailing end of the splice follows the direction of spindle rotation Fig. d.

Arrange the splice so that the trailing edge of the joint will travel away from the whorl.

One side of the tape contacts the drive pulley and the other side contacts the surface of the tension pulleys and spindle whorls. After running a few hours any new tape will have a tendency to stretch. This stretch should be taken into consideration when figuring the length of tape that is needed. However, once the exact length of tape - with allowance for stretch - with a given spindle whorl diameter has been determined, all the tapes can be pre-cut.

SPECIFICATIONS	M/C MODEL	
	OLD	NEW
Frame width	922 mm.	750 mm.
Spindle wharve diameter	25 mm.	28 mm.
Spindle gauge	70 mm.	75 mm.
Tin roller diameter	254 mm.	280 mm.
Dimensions "C"	2.870 mm.	2.460 mm.
Wharve width	20 mm.	20 mm.
Max. tape width	16 mm.	16 mm.

For the Ingolstadt frames, the approximate tape length is calculated as follows :

$$l = c + (2 \times \text{spd. gauge}) + (\text{spd.wharve dia.} \times \pi)$$

(including 60 mm. of overlapping for the tapes to be sewn).

For New Model :

$$l = 2.460 + (2 \times 75) + (28 \times 3.14) = 2.700 \text{ mm. or } 270 \text{ cm.}$$

For old Model :

$$l = 2.870 + (2 \times 70) + (25 \times 3.14) = 3.088 \text{ mm. or } 309 \text{ cm.}$$

Length of tape required for a frame:

$$L = \frac{l \times \text{No. of spindles/frame}}{4}$$

GROUP 5 : A. LAY-TWIST GEARING
B. DRAFT GEARING
C. BUILDING MOTION

A: LAY-TWIST GEARING

1. DESCRIPTION.

The twist gearing is composed of a train of gears that controls the speed of the front rolls of the drafting system in a predetermined ratio to speed of the spindles.

2. PURPOSE.

2.A. The lay change wheel (WW) determines the length of yarn delivered per cam revolution and consequently per ring rail chase. This means that the lay change wheel is capable of regulating the pitch of the windings on the cops to best suit the subsequent rewinding conditions. The bigger the lay change wheel, the closer the windings. For a high rewinding speed the windings should not be placed very closely to each other, in other words a smaller lay change wheel should be used.

The bobbin rail change wheel is available from t = 26 to t=58.

2.B. The ratio of the speed of the front rolls to the speed of the spindles determines the number of turns of twist that are inserted in each inch of yarn as it leaves the drafting element and is wound upon the bobbin.
Actually, the speed of the traveller as it travels around the ring should be used as the dividend in twist calculations. However, the spindle speed is constant, is easier to figure, and the difference between the two methods amounts to only a fraction of a turn per inch.
Therefore, the spindle speed, rather than the traveller speed, is generally used in these calcuations.

3. PARTS.

3.1. LAY GEAR

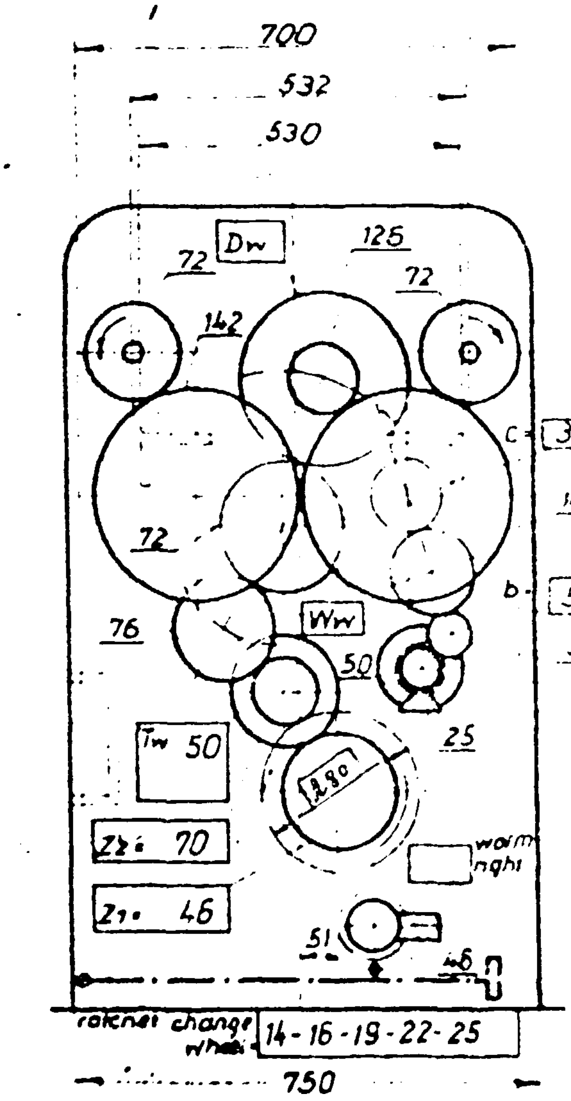
3.2. TWIST GEAR

3.3. INTERMEDIATE GEARS

3.4. SHAFTS

3.5. KEYS

LAY-TWIST GEARING



ratchet change wheel = 8-90 teeth

top twist change (Dw) can be chosen from 32 to 70 teeth

bottom twist change (Tw) can be chosen from 25 to 75 teeth

front roller dia.	df =	25
tin roller wheel	Z_1 =	46
counter wheel	Z_2 =	70
top twist change	Dw	
bottom twist change	Tw	

wharve dia. (dw) = 28 mm

tin-roller dia. 280 mm

twist per inch (T):

~~twist per meter (T)~~

$$T = \frac{\text{dia. of tin roller} \cdot Z_2 \cdot 126 \cdot 72 \cdot 25{,}4 \ (1000)}{(dw+1) \cdot Z_1 \cdot Tw \cdot Dw \cdot df \cdot \pi}$$

$$= \frac{20\,547\,791 \cdot Z_2}{(dw+1) \cdot Tw \cdot Dw \cdot Z_1 \cdot df}$$

$$= \frac{20\,547\,791 \cdot \boxed{70}}{\boxed{29} \cdot Tw \cdot Dw \cdot \boxed{46} \cdot \boxed{25}}$$

$$= \frac{\boxed{43\,129}}{Tw \cdot Dw}$$

constant of twist:

$Tw\,1$ $\boxed{50}$ $= \frac{862}{Dw}$

$Tw\,2$ $\boxed{}$ $= \frac{}{Dw}$

$Tw\,3$ $\boxed{}$ $= \frac{}{Dw}$

4. SETTING.

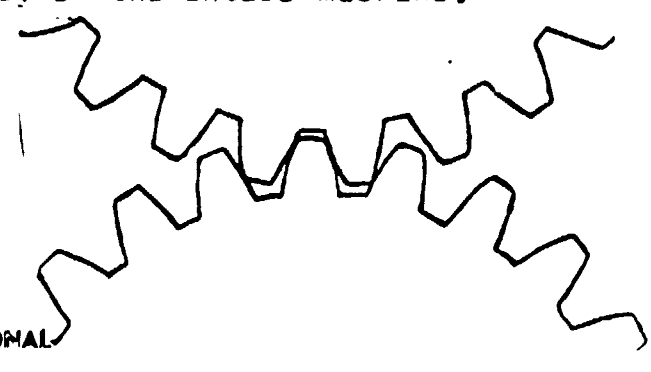
The gears are keyed to the shafts and are held in place by nuts and lock washers. When installing the gears, be sure they are straight, seated firmly on the shafts & that the nuts are securely tightened.

The change gears determine the twist by regulating the ratio or the surface speed of the front rolls to the R.P.M. of the spindles. Provision is made for easy twist reversel. To change direction of twist, the upper, or driven, change gear is meshed to the opposite gear & the frame motor is reversed. An optional reversing switch is available sometimes or the electrician can reverse the motor by changing the lead wires.
When changing the direction of twist, the ballon control rings (when used) must be turned over, unless the frame is equipped with optional reversible rings.

Never turn a gear in mesh with another gear, even by hand, before lubricant is applied to gear teeth. Use only the lubricant that is recommend by the manufacturer & follow the lubrication schedule for all gears ofthe machine. One of the most frequent faults of gear installation is improper mesh. If the gears are too lightly meshed, lost motion or excessive backlash will be present when the machine is started or stopped. The opposing teeth will make contact at only a part of their working surface. This will cause abnormal wear, chatter, vibration, and possible chipping or breaking of the teeth.

If the gears are meshed too deeply, the teeth will bind. This condition will cause overheating of the gears and bearings,breakdown of the lubricant, drain on the power source, and general inefficiency of the entire machine.

The correct way to mesh the teeth of conneceting gears.



5.B : DRAFT GEARING.

1. DESCRIPTION.

The precision cut draft gears are located in the head end cabinet. Drive and change gears are keyed to revolving shafts and intermediate gears are mounted on anti-friction bearings on adjustable swing arm.

2. PURPOSE.

The draft gears drive and control the bottom rolls of the drafting system. By means of different size change gears, the ratio of speeds of various rolls can be changed to give different drafts.

3. CONSTRUCTION.

The draft gears are made with care and precision. The gears fitted to rolls and shafts are spaced for exact meshing. Gears mounted on studs and swing arms have antifriction bearings.

4. PARTS.

4.1 DRAFT GEAR (Nw)
4.2 BACK DRAFT GEAR (Vvw)
4.3 SWING ARM
4.4 STUD

5. SETTING.

To thoroughly understand the settings for the various draft gears, a knowledge of the location and function of each gear must be known.
The gearing arrangement is the same for both sides of the frame, so for these instructions we will use one set of gears only, bearing in mind that these gears are duplicated for the other side of the frame. In actual practice the draft gears for both sides of the frame do not have to contain the same number of teeth. That is, the change gears can be different and one side of the frame can have different drafts and thus produce a different yarn than the other side. However, the twist will be the same for both sides. Referring to the gearing diagram, we see that the entire train of draft gears is driven through a train of gears from the spindle drive shaft.

Do not mesh the teeth of the gears so deeply that they bind nor so shallow that excessive backlash will be present.

Mounted on the back roller is another gear that transmits drive to the middle bottom roll. Through roll is the back draft change gear and an intermediate gear, mounted on antifriction bearings to a swing arm stud,connects it to the driver on the upper back jack shaft.

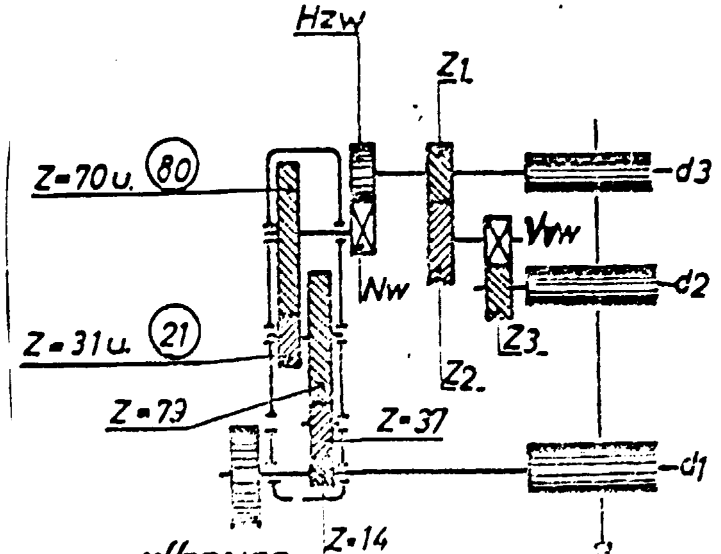
An intermediate gear, mounted on antifriction bearings to a swing arm stud, connects the drive gear and the back roll gear, A swing arm permits adjustment to compensate for various spreads between the back and middle rolls.

Whenever a gear is change, double check to see that it has the correct number of teeth.

NOTE:

If a gear must be forced from the shaft, do not strike it to drive it off. Use a gear puller.

The gears should fit the shafts, studs, or rolls snugly with no play or looseness.
See that keys and keyways are not worn and that appropriate nuts and washers are securely fastened. Clean the teeth of all gears before installation and lubricate them according to lubrication instructions, before the frame is started.



WERNER INTERNATIONAL

5.C BUILDING MOTION.

1. DESCRIPTION.

The building motion is located towards the end of the cabinet under the roller stand beam. The builder cam is the filling wind cam for placing the yarn directly upon the warp bobbins or paper tubes. The ratchet motion controls lift of the ring rail, anti-balloon rings and thread guide rail by shortening the ratchet chain at every stroke of the builder cam.

2. PURPOSE.

It is the function of the builder motion to transmit to the the ring rail, to the anti-balloon rings, and to the thread guides the motion necessary for winding the cops, the motion being composed of the following individual motions:

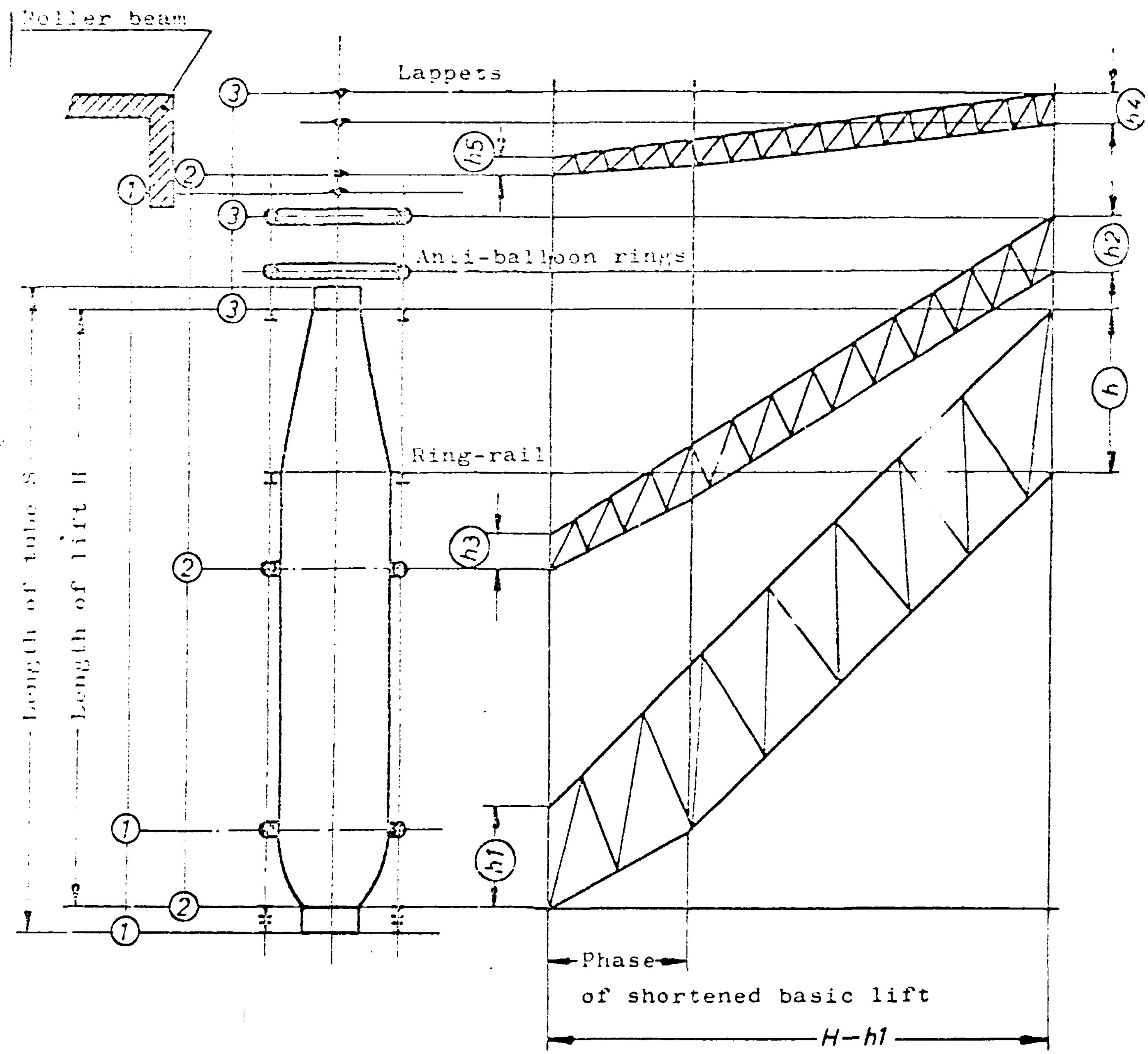
a. The basic chase - the cam-controlled lift of ring rail, anti-balloon rings, and thread guides.

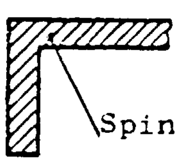
b. Ratchet lift - the raising of those parts to be moved with each chase, by shortening the ratchet chain controlled by the ratchet motion.

c. Bottom formation - the chain is reduced by the chain lug thereby forming the bottom of the cop (see motion diagram Fig. (5C.1).

The pickmotion regulates the traversing members so that the succesive layers of yarn are played on the bobbin in uniform fashion. For filling wind or combination wind the traverse is raised in increments propotional to the diameter of the yarn, which is placed conically on the bobbin.
The builder cam determines the build or shape of the package of yarn on the bobbin by controlling the position of the rings rail to the spindle for each lay of yarn. The long side of the lobe of the cam causes the ring rail to rise slowly placing the wraps of yarn side by side on the bobbin. The short side of the lobe of the cam permits the rail to descend more swiftly and the wraps of yarn are more widely spaced. Thus the descending wraps have a tendency to tie down the preceding wraps, and prevent sloughing.

FIG. 5C.1





1) Underwinding position
2) Commencing of spinning cam follower at heart of cam
3) Top position, cam follower at point of cam.

h	lift of ring-rail.
h_1	shortening of lift of ring rail.
h_2	lift of anti-balloon rings.
h_3	shortening of lift of anti-balloon rings.
h_4	lift of lappets.
h_5	shortening of lift of lappets.

3. CONSTRUCTION.

(Fig. 5C.2 to 5C.7)

The ring rail cam E (fig. 5C.2 and 5C.3) is driven from the main drive through the carriage change wheel Ww. This change wheel is capable of varying the length of thread to be wound onto the cop per ringrail chase within wide limits. Consequently the cop can be formed in adaptation to the doffing conditions in subsequent rewinding.

The arm SA transmits the lifting action of the cam E through the chain K1 to the double chain pulley D and from there through the chain K2 to the quadrant Q1. The quadrant Q2 controls the movement of the ring rail and the thread guide lappet rails, whereas the quadrant Q3 controls the movement of the anti-balloon rings.

The quadrants Q1, Q2 and Q3 are combined and fixed in a triple-type quadrant for different but positive amounts of movement, of the ring rails and the anti-balloon rings.

The movement derived from the quadrant Q2 is transmitted through the chain K3 and the lifter rod to the lifter levers moving the ring rail and the thread guide lappets.

As concerns the anti-balloon rings, the chain K4, the double chain pulley DK, the chain K5 and the guide pulley U transmit the movement from the quadrant Q3 to the lifter rod Z from which the anti-balloon rings are suspended by means of the Gall's chain K6.

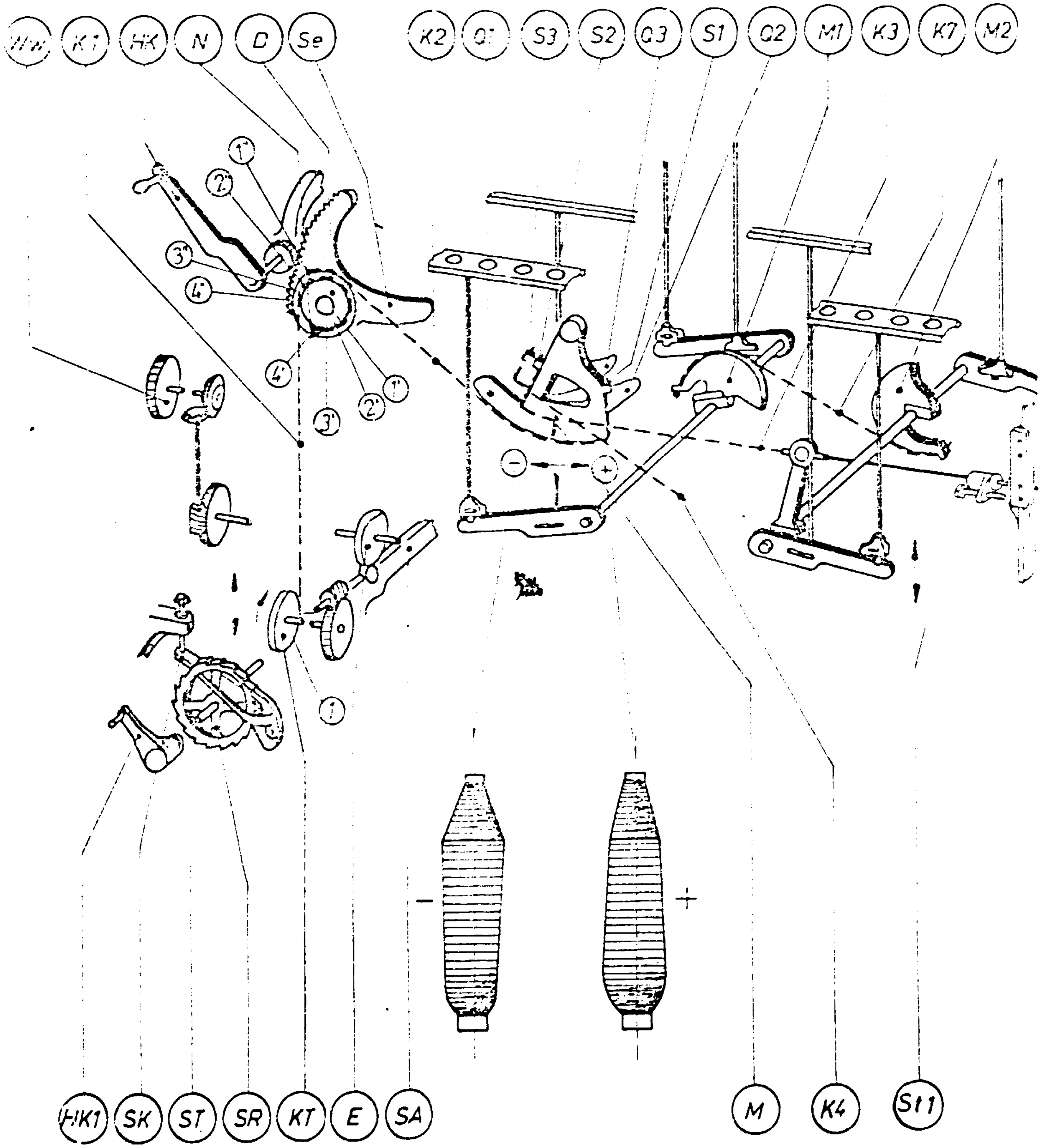
At each basic chase ring-rail, lappets and anti-balloon rings are lifted for a certain amount. This so-called ratchet-lift is derived from the lifting of arm SA which causes pawl SK to engage with set-screw ST thus causing the ratchet wheel SR to be moved one or several teeth depending on the setting of the setscrew and the number of teeth of the ratchet wheel. The revolution of the ratchet wheel is communicated through a worm gearing to the chain drum KT pulling in the chain K1 correspondingly. The number of teeth of the ratchet wheel SR, and the number of teeth the ratchet wheel is moved determine the cop diameter and should be selected in such a way that the cop diameter is approx. 4 to 5 mm. (5/32 to 3/16 in) less than the inside diam. of the spinning

For moving the builder motion by hand, hold the hand crank HK while at the same time unlocking the ratchet (Fig. 5C.7). This will free the segment Se and the ring rail may be lowered to underwinding position by means of hand crank HK. The hand crank HK1 serves for reversing the builder motion, i.e. for unwinding the fully wound chain K1 as far as it will go when the cop is finished. Then the builder motion is ready for commencing spinning.

4. PARTS.

D, Dk	=	Double chain pulley or chain roll.
E	=	Ring rail cam.
HK, HK1	=	Hand crank.
K1, K2, K3, K4, K5, K7,	=	Chains.
K6	=	Gall's chain.
KT	=	Chain drum.
M	=	Notch.
N, & N2	=	Half moons.
N	=	Lug.
NR	=	Chain lug.
Q, Q2, Q3	=	Quadrant.
S,S2,S3,S4,S5,S6	=	Bolt.
SA	=	Arm.
Se	=	Segment.
S, ST, St	=	Set screws.
SR	=	Ratchet wheels
Ww	=	Carriage change wheel.
U	=	Guide pulley.
Z	=	Lifter rod.

FIG. 5C.2

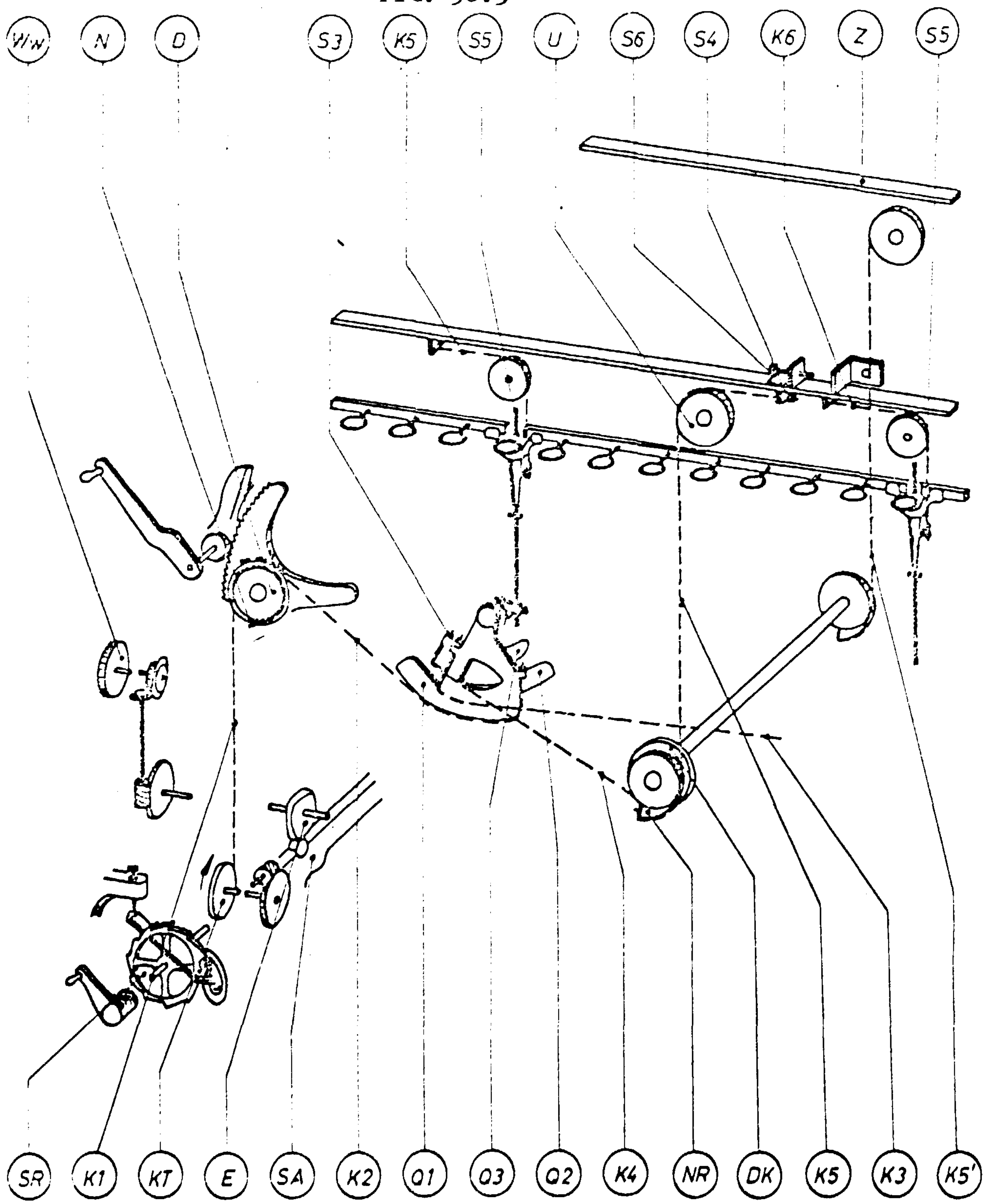

Ww
K1
HK
N
D
Se
K2
Q1
S3
S2
Q3
S1
Q2
M1
K3
K7
M2
1'
2'
3'
4'
1
HK1
SK
ST
SR
KT
E
SA
M
K4
S11

5. SETTINGS.

5.1 Setting of quadrants Q1 and Q2.

a. First install the chains K1 and K2. For this purpose make use of the threaded holes 1, 1' to 4' and 1" to 4" provided on the chain drums and of the tension bolt S1 at the quadrant Q1 (see also fig. 5C.5 and 5C.7).

FIG. 5C.3



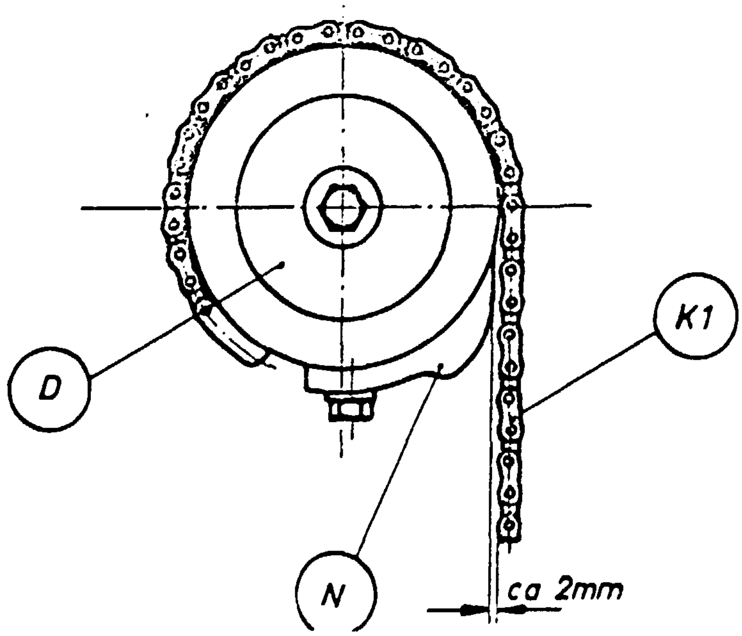
b. The cam follower should be on the cam point (Attention : where two-pointed cams are provided, the position of the cam follower in the heart always refers to the nearest distance from the cam shaft, whereas position of the cam follower on the point means the longest distance from the cam shaft). Support builder arm correspondingly.

c. The chain drum KT should be turned back as far as it will go (in a direction opposite to that indicated by the narrow) by means of hand crank HK1.

d. The chains K1 and K2 are set properly if on having proceeded according to para 2 and 3 (segment Se has been put into spinning position by means of hand crank HK) the notch M on the quadrant Q1 is a vertical below the centre of the quadrant shaft when the chains are tightened. For accurate adjustment the tension bolt S1 is provided. If there should be a more substantial variation, the chains must be bolted to different threaded holes on the chain drums.

e. In this position, the distance between chain K1 and lug N should approximate 2 mm. (5/64 in.) (see fig. 5C.4).
In commencing spinning the lug shortens the ring rail chase to produce the cop bottom.
When the cop diameter desired is obtained, the lug must no longer bear against the chain K1; otherwise increase the spacing between chain and lug.

FIG. 5C.4



f. To provide a connection between ring rail and builder motion, the chain K3 should be secured to the quadrant Q2 with the tension bolt S2. Move cam follower into the heart of the cam.

It is most practicable to loosely secure the chain K3 to the quadrant Q2 while the underwinding device (roll D) is lowered, and to tighten it when the underwinding device is wound up, by means of bolt S2 until the desired position for commencing spinning (10 to 12 mm. or 25/64 to 15/32 in. above the bottom edge of the tube) is obtained. In order to secure a maximum clearance to either side the fixing nut should as far as possible be on the centre of the thread of bolt S2. Otherwise lenghten or shorten the chain accordingly.

The flattened portion on the quadrant Q2 shortens the individual ring rail lift thereby producing a thickening of the cop on one end. When the thickening should be on the top end of the top, slightly slacken the bolt S2 and tighten the bolt S1 to swivel the quadrant several degrees in direction (-). The notch M then is no longer vertically under the shaft centre. If the cop diameter is desired to increase towards its bottom end, reverse the above procedure and swivel the quadrant in direction (+).

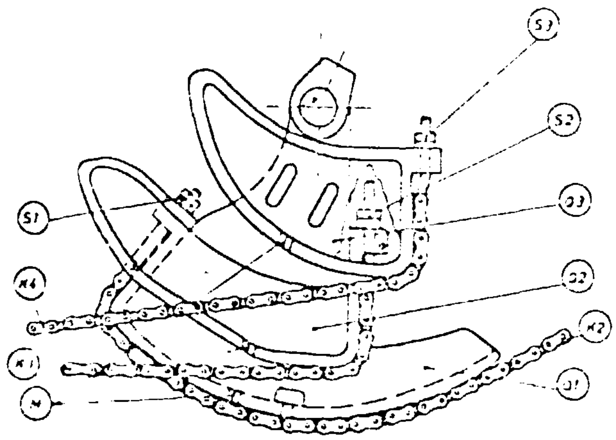
g. When the ring rail is lowered to underwinding position by operating the crank HK, the setscrew ST 1 engages a stop at the spring piece. This setscrew should be adjusted in such a way that the top edge of the spinning ring will be positioned approx. 10 mm. below the bottom edge of the tube.

When setting the half-moons M1 and M2 on the first and second cam shaft, care should be taken that the first ring rail leg performs the same lifting motion as the rest of them. If necessary, adjust the half-moons by moving them along their screw-on surfaces. The half-moons are adjustably interconnected by means of the chain K7. Together with the pokers the cam shafts move the rising and falling lappets. The distance between lappet and top edge of the spindle increases as the spinning process advances thereby providing for a substantial compensation of the balloon of yarn.

5.2 Setting of the quadrant Q3 and the anti-ballooning rings.

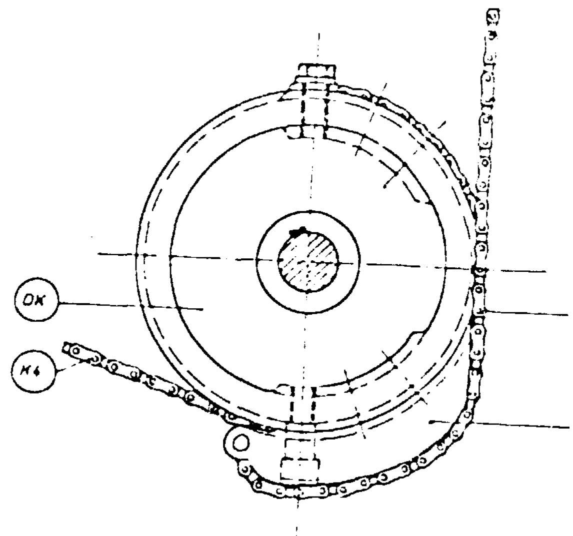
a. Move the ring rail to position for commencing spinning (cam follower in the cam heart).

FIG. 5C.5



viewed from centre of frame

FIG. 5C.6



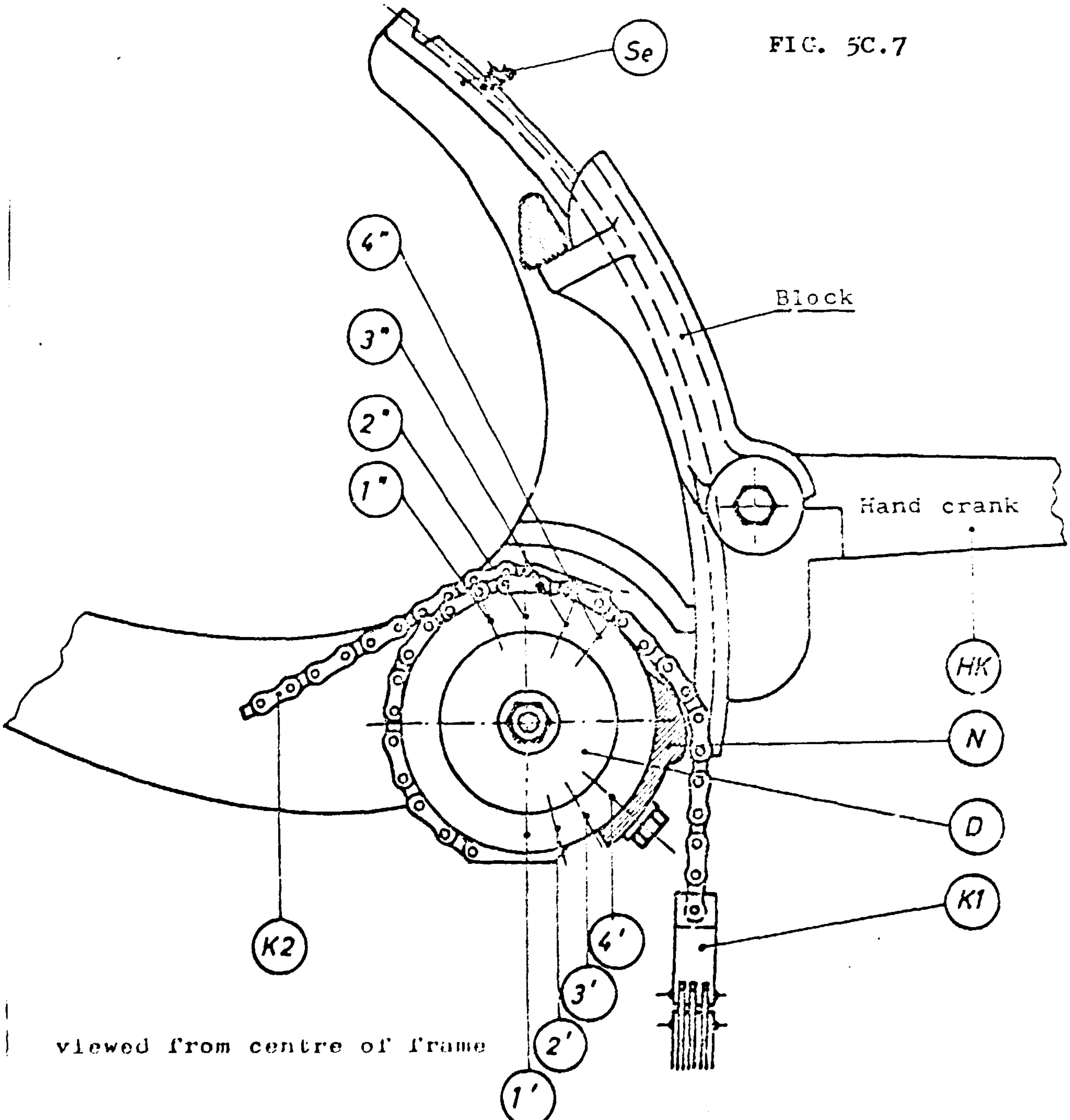
b. Attach chain K4 with tension bolt S3 to the quadrant Q3 and the chain roll DK. When the chains are tensioned the chain lug NR should be in a position coinciding with Fig. 5C.6. This implies that the chain K5 must be installed simultaneously.

c. The anti-balloon rings should be moved in a position for commencing spinning according to fig. 5C.8 first on one side of the machine by means of the setscrew S4. Then install the chain K5' on the opposite side of the machine and set the anti-balloon rings in the same way as on the first side. The chains K6 were already installed when the unit was assembled and the anti-balloon ring holders were fixed at about the same level by means of the bolts S5. The bolts S5 should be screwed in place as deep as possible so that in top-most position they will not touch the supporting rolls and are prevented from jamming.

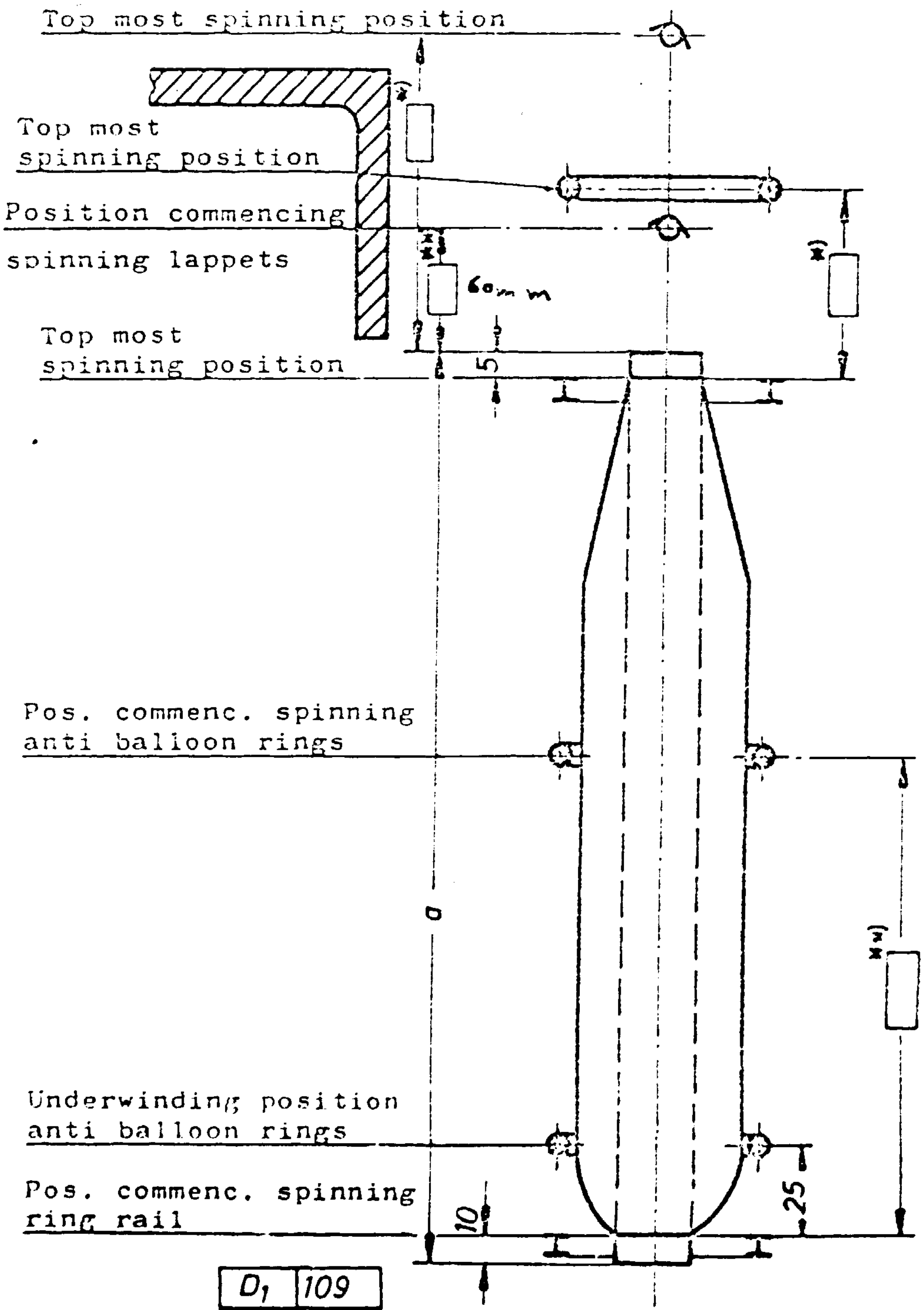
d. On having fastened all chains check the anti-balloon rings for uniform level and correct with the bolts S4 and S5 if necessary.

e. To check the topmost position of the anti-balloon rings according to fig 5C.8, move the ring rail into top-most position (cam on point). If despite correct setting in the position for commencing spinning the checking measurement specified (fig. 5C.8) is not obtained in top-most spinning position, there is the possibility of moving the quadrant Q3 slightly to the left or right relative to the two other quadrants, on unscrewing the two securing bolts.

FIG. 5C.7

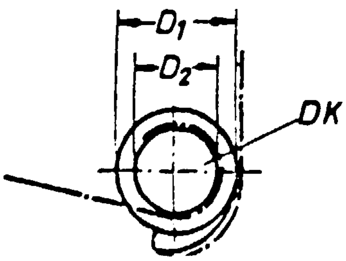


f. For fixing the anti-balloon rings in unwinding position there is a bolt S6 on either side of the machine. For setting, move the ring rail into underwinding position. The stop bolts S6 then should be set in such a way that the anti-balloon rings are approx.25 mm. above the top edge of the spinning ring.



a = length of tube
d = 10 - 12 mm
*) = check. measurem.
**) = setting measurem.

D_1	109
D_2	109



GROUP 6 : THE WASTE COLLECTOR SYSTEM.

1. DESCRIPTION.

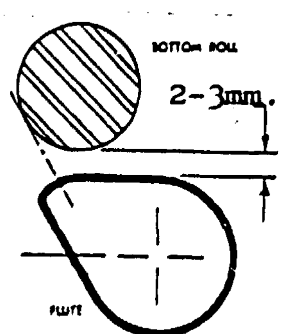
The vacuum system consists of a collector box, a back plate assembly consisting of the screen, fan, fan housing, and motor, an accumulating header or main duct, and a series of flutes. In operation the fibres from a broken end are sucked into the flute through the orifice, pass on into the main duct and through it to the collector unit where they lodge against the screen to await removal for reprocessing.

2. PARTS.

2.1 FLUTES
2.2 DUCT
2.3 FAN
2.4 SCREEN

3. SETTINGS.

After extended frame stoppage, such as the weekend shutdown, the vacuum system should be started about five minutes before the frame is started to clean all dust and lint from around the orifices.
Both the vertical and horizontal setting of the flute to the bottom steel roll should be precise for maximum efficiency. Set the top of the flute 2-3mm below the bottom of the roll and far enough back so that the fibres will enter the centre of the orifice without touching either side (see drawing below). The flutes are made to fit the specific gauge of the frame which they are installed and no longitudinal adjustment is necessary.



Note: On the old machines with round flutes, the distance must be: 1-2 mm.

4. MAINTENACE AND CLEANING.

4.1 Check the flutes often for nicks,cuts or burrs around the orifices that can catch and retain fibres. Small burrs or rough edges can be smoothed with steel wool. For larger nicks and cuts, sand with 00 sand paper and then apply Pneumafil flute repair solution 103 or equivalent, which will dissolve the plastic. This solution can be applied with a small brush, such as artists use, until the roughness disappears from the surface of the flute. If the roughness is inside the flute, it can be removed by swabbing with a special mop saturated with 103 solution or equivalent.

4.2 To clean the flutes, remove them from the frame. Remove the end plugs, clean with a dry rag, and leave at the roll stand so that each plug will be replaced in the same suspension spring from which it was removed. Soak dirty flutes in lukewarm water to which has been added about one cup a good liquid detergent to 15 gallons of water. After soaking for about two hours, swab each flute with special flute brush and allow to drain dry. Do not dry with compressed air. The cleaning schedule for the flutes will vary due to many factors, among them being the kind of stock run. As a general guide, the cleaning schedule should be:

- Cotton ....Every Year.
- Synthetics ....Every 6 months.

This schedule is, of course, dependent upon mill conditions and if oil; dyestuff, or other solution is added to the fibres it may be necessary to clean the flutes more often.

4.3 The accumulating header it main duct seldom needs maintenance or cleaning. However, it should be inspected every six months for any accumulation that might obstruct the flow of air. Place a flashlight where the header enters the collector unit and then go to the opposite end of the frame and remove the end cap from the header. It may be necessary to use a mirror to get a clear view down in the interior of the duct.

If it is neceaary to clean the duct, turn the unit on and feed a strong cord or spindle tape into the end opposite the collector unit. The suction will pull the loose end to the collector unit and a clean rag saturated with a good solvent tied to the opposite end can be pulled through to swab out the interior of the duct.

4.4 The screen should be cleaned with a special screen brush every week. The screens should be washed at least one a year in luke-warm water with about a cup of good liquid detergent added to 15 gallons of water. Let the screen drain dry. Inspect the screen for damage every month and replace immediately if cut or torn.

Whenever the screen or back plate aeembly is removed, be careful not to tear or damage the neoprere sponge that is attached to the screen frame and around the collector unit housing. Use a good solvent to clean out tne collector unit - do not use water. Keep the inside of the collector unit free of nicks and burrs.

Remove any roughness by sanding with light sandpaper or emery cloth and polish with steel wool.

4.5 The motor is totally enclosed, fan cooled, and has sealed bearings. It requires no maintenance or lubricant. The motor is protected from overload or abnormal voltage by a heater and has a switch interlocked with that of frame motor so that in the event one motor overheats both will stop.

If the motor stops, check the following for possible cause:

- Low voltage
- High voltage
- Loose switch box connection
- Bad bearings
- Worn insulation
- Excessive vibration
- Clogged ducts or flutes.

The fan should be inspected every six months to one year, dependent upon stock that is being run. If there is an accumulation on the fan blades, it should be removed with a good solvent. Remove the fan from the motor shaft for cleaning to prevent solvent seeping into the motor bearings and dissolving the lubricant.

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. THEORY OF SPINNING
3. DEFINITION OF SPINNING TERMS
4. TEMPERATURE AND HUMIDITY
5. TRAVELLERS
6. TWIST CONTRACTION
7. TROUBLE SHOOTING
8. PREVENTIVE MAINTENANCE
9. FRAME INTERFERENCE
10. QUESTIONNAIRE
11. CHARTS AND GRAPHS

1. DIAGNOSTIC DEVELOPMENT.

a. Purpose.

To help the diagnostic and job planning abilities of the trainee.

b. Method.

The trainee is to walk the section of the Spinning Room, each day looking for and fixing a particular type of defects. The trainee's diagnostic and corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common defects. The defects can also be created by the Instructor to supplement those who are missing.

The suggested number of each defect is as follows:

- Spindles plumbing.	7
- Thread guides plumbing.	7
- Aprons.	7
- Top rollers.	7
- Pressure arms.	7
- Pneumafil tubes.	7
- Trumpets.	7
- Traverse motion.	4
- Building motion.	4
- Separators	7
- Jockey pulleys.	7
- Bobbin holders.	7
- Brakes.	7
- Ring rail level.	7
	92

THE THEORY OF SPINNING

The spinning operation consists of taking one or more strands of fibre, drawing these individual fibres out, twisting the resulting yarn, and placing it upon a bobbin. The spinning frame contains all the necessary mechanisms to perform these basic operations as well as auxiliary motions to perform various supplemental functions.

A creel holds the bobbins of roving, which are strands of fibres with just enough twist to hold them together. (In some spinning systems such as the Saco-Lowell Spinnster the roving process is omitted and sliver is pulled over similar creels from cans.)
The stock passes through guides and into the back rolls of the drafting element. The bottom rolls of the spinning frame are made of steel and have helical flutes and the top rolls have contact surfaces covered with cots of rubber or of a resilient synthetic material. The middle rolls have aprons to better transport and control the stock.
The bottom rolls are positively driven by suitable gearing, with change gears to vary the speed for different kinds or counts of yarn. The top rolls are hold by a pressure arm (spring or air pressure) and are pushed against the steel bottom rolls. Thus, as the bottom rolls revolve, the top rolls cling to them and are also rotated while exerting a constant pressure on the yarn that is passing between the rolls.

The stock enters between the back top and bottom rolls, passes through a drafting zone, and is gripped by a second pair of rolls. These latter rolls are revolving faster than the former ones, which tends to partially rearrange the formation of the fibres. The individual fibres that have been released by the back pair of rolls are pulled forward and, since they are now moving at a faster pace, they slide forward in the strand. The fibres that are still gripped by the slower moving back pair of rolls are straightened by the action of the fibres moving past them and they are in turn fed into the middle rolls when released by the back ones.

An apron passes over the second, or middle, bottom roll and over a bar near the front roll. A similar apron and bar, mounted in a cage, operates with the top roll. These aprons serve to transport the fibres evenly between the rolls and hold them in orderly arrangement for the final drafting, which takes place between the middle and front pair of rolls.
The front pair of rolls is revolving much faster than the preceding pair and the fibres are drawn out to their final form. So you can see that the size of the spun yarn is determined by the size of the fed stock and by the speeds of the various rolls. In the first drafting zone (between the back and middle rolls) it is possible to draw the stock out 1.19 to 1.6 times its original length. In the final drafting zone (between the middle and front rolls) this elongation is greatly extended and it is possible to have a total draft of from 9.9 to 40.
Draft is defined as the proportion of the stock delivered to stock fed. For instance, if the total draft is 20 it simply means that for every one inch of stock fed into the back rolls there will be 20 inches of drafted stock delivered by the front rolls.

The ring rail traverses vertically in a predetermined pattern so that the wraps of yarn are placed upon the bobbin in a symetrical fashion.
To bind the fibres together and strengthen the yarn, the strand must be twisted after it leaves the front rolls and before it is placed upon the bobbin. This twisting is accomplished by having the spirdle, which supports the bobbin, revolve at a high rate of speed.
Since one end of the strand is held by the front rolls and the other end is attached to (and is a part of) the package on the bobbin, each revolution of the bobbin would insert one turn of twist to the yarn if the yarn remained stationary.
If the bobbin only revolved fast enough to wind the yarn as it came from the front rolls, no twist would be inserted. In order to twist the yarn the bobbin must revolve much faster than the yarn is wound upon it. This is where the traveller plays such an important part in the spinning process.
The traveller is pulled by the strand of yarn that passes through its loop and it is free to revolve around the ring. Therefore, it follows the revolutions of the bobbin whe there is enough tension on the yarn to overcome the weight of the traveller and its friction with the ring. But as yarn is fed from the front rolls, sleck is created and when the drag of the traveller overcomes the tension of the yarn the traveller overcomes the tension of the yarn the traveller lags behind the bobbin. If the traveller were to rotate at the same speed as the bobbin there would be no yarn wound on the bobbin and each revolution would insert one turn of twist.
As the yarn that is fed from the front rolls slips through the loop of the traveller it is wound upon the bobbin and twist is still inserted to the yarn at the rate of one turn per revolution of the traveller. For a clearer picture of just what happens, here is a hypothetical example: A 16s yarn is being produced through a drafting element that has a 1" dia. front bottom roll operating at 163 rpm and the yarn is wound upon a 9/16" dia. bobbin to form a 1 1/4" dia. package when full. The bobbin is mounted upon a spindle that operates at 9,000 rpm and the traveller is mounted upon a 1 1/2" dia.ring.

Roll dia. x pi x rpm = 512" yarn delivered per minute.

$$\frac{512}{\text{Dia.bobbin x pi}} = 289 \text{ (Wraps/min. 1st wrap and laps traveller lags behind bobbin)}$$

$$\frac{512}{\text{Dia.package x pi}} = 130 \text{ (Wraps/min. last wrap and laps traveller lags behind bobbin)}$$

9,000 - 289 = 8,711 (RPM of traveller, 1st wrap)

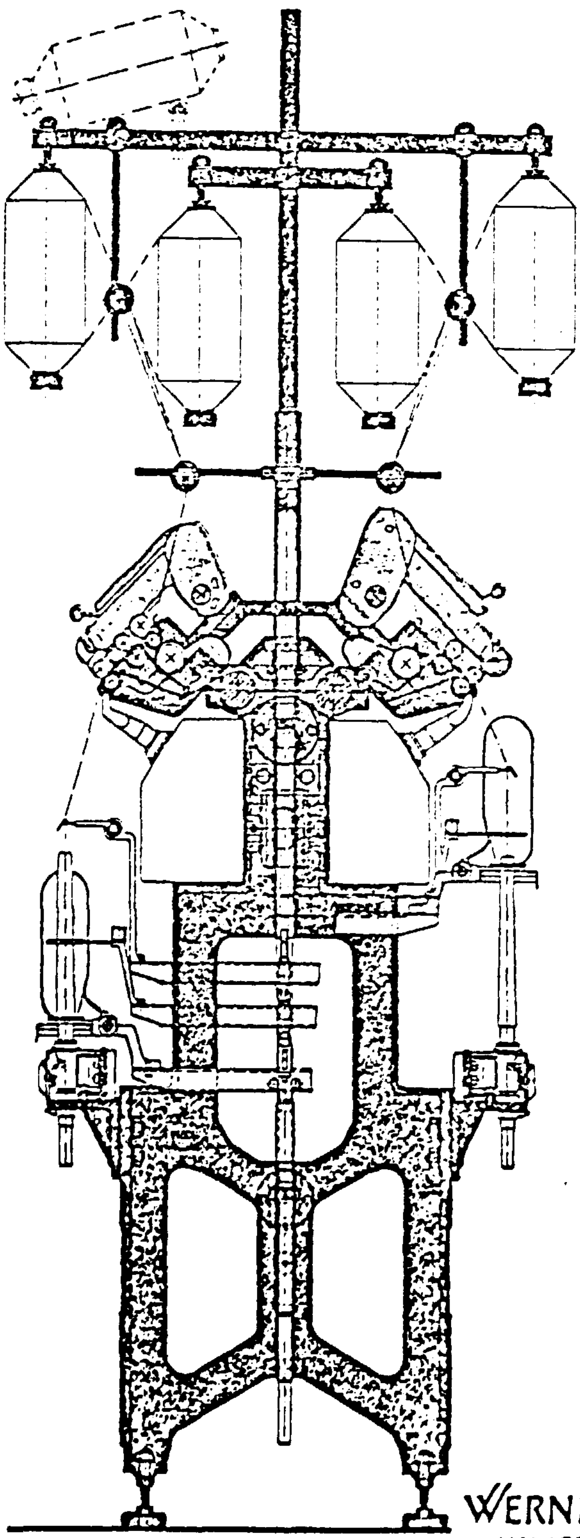
9,000 - 130 = 8,980 (RPM of traveller, last wrap)

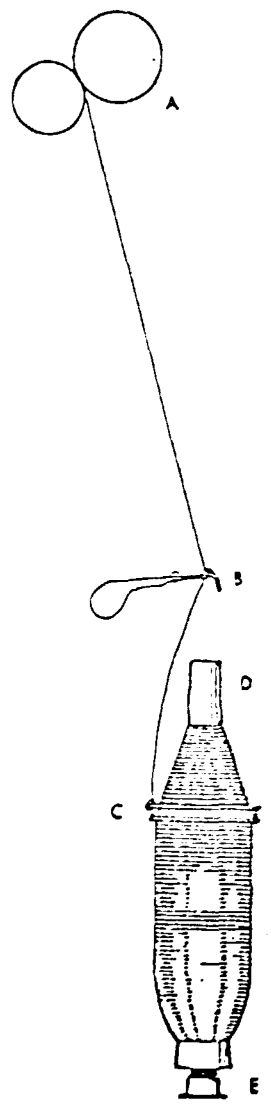
$\frac{8,711}{512}$ = 17 (Turns per inch, 1st wrap) $\frac{8,870}{512}$ = 17.3 (Turns per inch, last wrap)

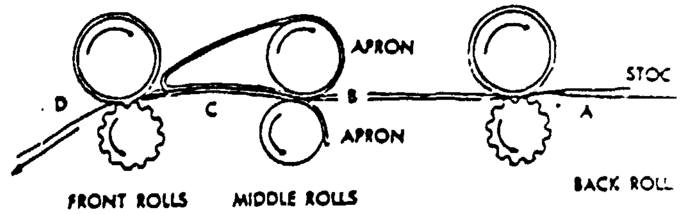
1 1/2" x pi x 8,711 = 41,028" (Minimum distance traveller orbits to wind 512" yarn on bobbin)

As can be seen from the foregoing figures, there is a variation in the rpm of the traveller from empty to full bobbin and a corresponding variation in the turns per inch (TPI). However, this variation is so slight that it is not discernible in the finished yarn.

There is another factor connected with twist that materially affects the yarn. As the yarn is twisted it contracts, the amount of contraction increasing proportionately to the TPI and the counts of the yarn. In the preceding example the contraction would amount to about 2.98 %. See contraction table on next page .
The amount of twist that can be inserted in the yarn ranges from 7.3 to 52.5 Turns per Inch (TPI). The amount of twist is controlled by a pair of twist change gears located in the head end cabinet, which regulate the speed of the front rolls in relation to the speed of the spindles.
Basically, this covers the theory of spinning.
However, there are other parts of the frame that are necessary for the doffing, cleaning, lubrication, and other functions incidental to this final process of converting raw material into spun yarn.







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DEFINITION OF SPINNING TERMS

ACTUAL DRAFT

Draft based upon the ration of weight delivered to weight fed, or length delivered to length fed.

ANGLE OF YARN PULL

The angle of the yarn from the traveller to the surface of the bobbin on the spindle.

BOBBIN WIND

The arrangement of the yarn on the bobbin.

BREAKING STRENGTH

The number of pounds of pull required to break a skein of yarn (120-yard skein wound on reel with 1 1/2 yard circumference equals 80 ends of yarn).

COEFFICIENT OF VARIATION - CV %) -

A value obtained by use of the Uster CV Integrator to denote the variation in the evenness of a test sample of sliver, roving, or yarn. It is also used for other tests such as breaking strength of yarn.

CONSTANT

A figure evolved from a number of factors, such as train of gears, that can be used to shorten the mathematical calculations needed when changing output, twist, draft, and other variables.

COT

Covering of rubber or other resilient material on the bosses of the top roll that compress and hold the stock during drafting.

COUNTS (Cotton)

A method of numbering roving or yarn based on weight in pounds per hank of 840 yards, in which one hank of 1s yarn or roving weighs one pound.

FORMULA: $\dfrac{\text{Number of Hanks in Quantity}}{\text{Weight in Pounds of Quantity}}$ = Counts.

CREEL

Rack-like device for holding bobbins of roving and for feeding the strands of stock evenly to the back rolls.

DOUBLE ROVING YARN

Yarn composed of two strands of roving.

DRAFT CONSTANT

A number derived from a number of factors, such as gears and rolls, that is used as a short-cut to figure needed draft change gear.

EFFICIENCY

The actual production of the machine expressed as a percentage and based on continuous (100 %) production.

EQUIVALENT COUNTS

The single equivalent of a ply yarn; the counts of a yarn in one numbering system as expressed in the equivalent of another system.

FILLING YARN

Yarn, usually of lower twist than the warp, that is placed on bobbins or quills for insertion in the loom shuttles.

GOUT

Foreing matter in yarn that usually causes an enlarged or undrafted section.

HANK (Cotton)

840 Yard length of roving or yarn.

HANK ROVING (HR)

Designation of the size of roving and based on the weight in pounds of one hank (see COUNTS)

LAY

The number of strands of yarn or roving that will lay side by side in an inch. Usually referred to as lays per inch or coils per inch.

LEFT-HAND SIDE OF FRAME

The side to your left as you face the end of the frame, from the head end.

MECHANICAL DRAFT

Draft based upon the ratio of the surface speed of the delivery roll to the surface speed of the feed roll.

NEPS

Small knotted or tangled clumps of cotton fibres.

PLUMB THE SPINDLE

Align the spindle to the ring rail.

PRODUCTION CONSTANT

A standard number for each yarn count, which can be multiplied by the diameter of the front roll times the RPM of the front roll to give the 100 % production in pounds per spindle hour.

RELATIVE HUMIDITY

Expressed as a percentage, it is the ratio of the actual presence of existing water vapor to the maximum possible presence of water vapor in the atmosphere at the same temperature.

RKM

Strength of yarn expressed in Kms.

FORMULA: $$\frac{\text{Ne x Avg. Breaking strength of 50 cm. in gr.}}{1.000 \times .59} = \text{RKM.}$$

RIGHT-HAND SIDE OF FRAME

The side to your right as you face the end of the frame, from the head end.

ROVING

Strand of slightly twisted fibres prepared for the drafting element of the spinning frame.

S-TWIST

A direction of twist in yarn that coincides with the middle portion of the letter S. Also called left-hand or reverse twist.

SETTING

The location and proper setting of the vital parts of a machine with their relation to each other.

SINGLING

A section of yarn with one or more strands of roving or sliver missing.

SLUB

A soft, thick, uneven place in the yarn that forms a defect but is sometimes purposely made to produce novelty yarn.

SOFT TWIST

A twist below the standard required turns per inch for a given yarn.

SPINDLE TWIST

The actual turns made by the spindle while the front rolls are delivering one inch of stock.

STANDARD ATMOSPHERE

Air that is maintained at a relative humidity of 64 % and at 70 degrees C)

STAPLE

The average length of the fibres in a given quantity. As a general classification, short staple fibres range from the shortest spinnable length to 1 1/2" and fibres longer than 1 1/2" are classed as long staple.

STOCK

Material in process.

TRAVERSE

The lateral distance between reversal points in the building of a package of yarn or roving; the maximum lateral distance that the traversing members will move; the traversing mechanism.

TWIST OR TURNS PER INCH (TPI)

The number of turns of twist inserted in one inch of yarn or roving.

TWIST CONSTANT

A constant based on cylinder, or spindle pulley speed, front roll speed, and the gearing arrangement of the spinning frame that can be devided by the desired turns per inch to give the size twist change gear that is needed for a given yarn.

TWIST MULTIPLIER

A constant number, which can be multiplied by the square root of the counts or hank roving to obtain the required twists per inch of yarn or roving.

WARP YARN

High-twist yarn that is to be placed on beams and threaded through the drop wires, heddle eyes, and reeds of the looms in the weaving process.

WHORL

The spindle pulley

WRAPS

The number of lays of yarn placed on the bobbin during each stroke of the traverse.

Z-TWIST

A direction of twist in yarn that coincides with the middle part of the letter Z. Also known as right-hand twist or regular twist.

TEMPERATURE AND HUMIDITY

Atmospheric conditions have a decided effect on textile materials, especially during processing. For this reason it is essential that the temperature and moisture content of the air within the mill be controlled. The exact degree of temperature and percent relative humidity that is best will vary, but for most spinning installations air temperatures ranging from 78 to 84 degrees F and relative humidities between 45 and 55 percent will give satisfactory results.

Temperature alone - unless in extremes of hot or cold - does not have a great effect on the fibres. However the temperature dictates the amount of moisure the air will hold in suspension and, therefore, temperature and humidity must be considered together.

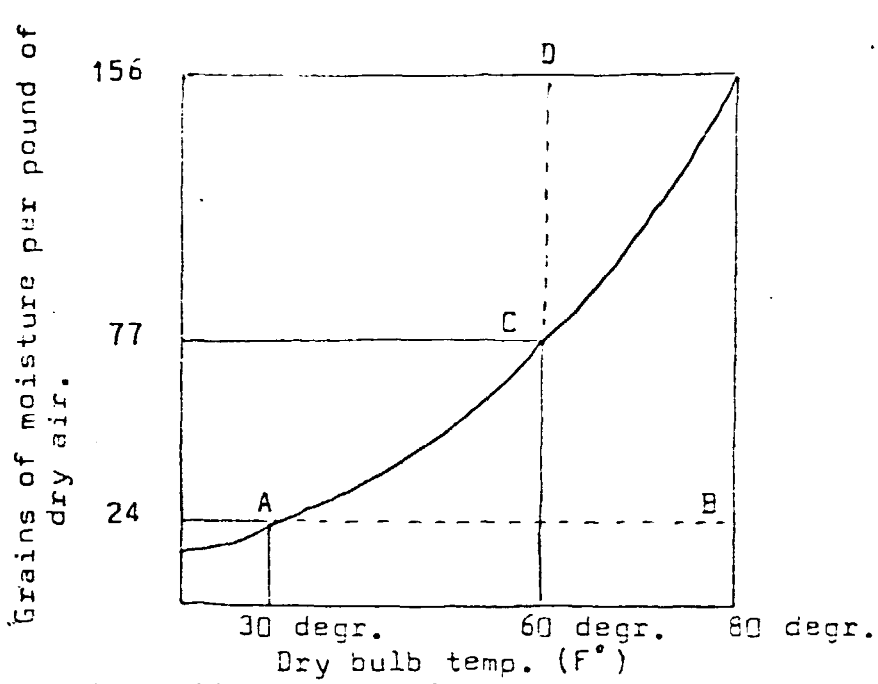
Fibres, especially cotton, are very sensitive to moisture. If the air is dry, the fibres quickly lose their natural moisture. They become brittle, have a tendency to curl, lose cohesiveness, and become hard to control in the drafting process.
On the other hand, they quickly absorb moisture from the surrounding air and if there is an excess of moisture, the fibres become limp, cling together, and make drafting difficult.

Moisture content of the air also has other effects. When the air is extremely dry, frictional surfaces of the machines discharge static electricity, which adversely affects the spinnability of the fibres. Too much moisture in the air causes condensation and the damp surfaces of rolls and guides cause lap-ups and chokes.

In the mill, moisture content of the air is usually expressed in percent relative humidity. This term denotes the amount of moisture actually present in the air as compared to the amount of moisture the air would contain if thoroughly saturated at the same temperature. Air has measurable weight, which varies according to temperature and moisture content. At 70° F. 13.34 cubic feet of dry air weighs one pound.

Moisture content of the air is in vapor form and is invisible until it condenses. The warmer the air, the more moisture it will keep in suspension. Air becomes thoroughly saturated and the moisture begins to condense when the moisture content reaches the dew point.

For a better understanding of this subject, consider the accompanying chart. (see next page).



At 30° F the air is thoroughly saturated when it contains 24 grains of moisture per pound of dry air (A).

The relative humidity is 100 %. If we heat this air to 80° without losing any of the moisture, we will have the conditions shown at B. Since the dew point of the air at 80° permits a moisture content of 156 grains per pound of dry air, we have 24/156 or 15 % relative humidity.

If we saturate this air at 80° F. by adding the additional 132 grains of moisture per pound of air, we will again have 100 % RH and a much greater amount of moisture. Suppose we now cool this air to 60°, which has a moisture content at dew point of 77 grains per pound of air. All the moisture betweens points C and D, or 79 grains per pound of air will be removed from the air through condensation.

For optimum running conditions in the spinning room, the best relationship between temperature and moisture content of the air should be determined for the particular application and then controlled within as narrow limits as possible.

TRAVELLERS

The selection of the correct traveller for a particular installation is made difficult by the many variable factors involved. Here are just a few of the factors that must be considered.

The count of the yarn is a major factor because the weight of the traveller must be compatible with the weight of the yarn.

The twist inserted in the yarn can offset some of the weight difference because a high-twist yarn has less bulk and, therefore, less air resistance than a low-twist yarn.

The type of fibre must be considered because different fibres react in different ways while passing from the drafting element to the bobbin.

The spindle speed affects the action of the traveller - an increase in spindle speed will have the same effect, within certain limits, as adding a heavier traveller.

There are actually two kinds of forces acting on the traveller; they are:

1. Tangential Forces, which are (a) tangential component of yarn pull caused by the bobbin as its pulls the traveller around the ring, (b) backward pull of yarn due to air resistance, and (c) frictional resistance between traveller and ring.

2. Radial Forces, defined as (a) centrifugal force acting radially outward (b) weight of the traveller acting downward, (c) radial component of the yarn pull caused by the bobbin, acting radially inward, and (d) radial component in the balloon force, acting upward.

It can be seen that with all these forces acting on the traveller a slight variation in some controlling factor such as change in yarn count or spindle speed may cause one force to complement the effect of another force or it may cause them to become the very antithesis of each other.

Local conditions such as humidity, the condition and contour of the ring flange, the shape of the traveller and its position in relation to the ring, all have a definite effect on the traveler's behaviour.

Although it is hard to arbitrarily pick a traveller for a particular installation (there are 28,000 different sizes and types) the requirement for a suitable traveller are easily definable.

1. The traveller must exert enough braking force on the yarn to cause it to wind smoothly and firmly on the bobbin.

2. The traveller must not place enough strain on the yarn to cause end breakage or to stretch it beyond its elasticity regain.

3. The circle of the traveller must be large enough to accommodate the yarn and not become loaded with fly.

4. The traveller must not be so large or unbalanced that it rides the ring flange unevenly or skips against the side of the ring.

5. The traveller must be of a size and shape that will not generate excessive frictional heat and thus shorten the service life of traveller and ring.

A handy formula to help select the correct weight traveller when changing yarn count is:

Multiply the weight of 10 of the travellers presently used by the yarn count and divide by the count of the yarn to be spun, which will give the correct weight of 10 travellers recommended for the change.

Example:

30s yarn is being spun with a 6/0 traveller and change is to 20s yarn.
From the table on next page 74 we see that 10 No. 6/0 travellers weigh 30 mg. therefore

$$\frac{30 \times 30}{20} = 45$$

Referring again to the table we find that 10 travellers weighing 45 mg. are designated as 2/0 and so we change to this size traveller for the 20s yarn.

However, it must be remembered that many variable factors must be considered in addition to yarn weight. Tests should be made after any change to see if the traveller that is selected is actually the best one in practice as well as in theory.

SIZES OF RING FLANGES		
FLANGE	WIDTH	OUTSIDE DIAMETER OF RING
No. 0	3/32"	3/16" Larger than I.D.
No. 1	1/8"	1/4" Larger than I.D.
No. 2	5/32"	5/16" Larger than I.D.

TABLE OF NUMBER AND WEIGHTS OF REINERS FURST C AND EL SPINNING TRAVELLERS FLANGE 1 AND 2

WEIGHT OF ONE TRAVELLER IN Mg.

No.Size	Weight in mg.	No.Size	Weight in mg.	No.Size	Weight in mg.
20/0	9	5/0	32.5	11	185
19/0	10	4/0	35	12	205
18/0	11	3/0	40	13	220
17/0	12	2/0	45	14	235
16/0	13	1/0	50	15	250
15/0	14	1	60	16	265
14/0	15.3	2	70	17	280
13/0	16.5	3	78	18	295
12/0	17.5	4	85	19	310
11/0	18.8	5	95	20	325
10/0	20	6	105	21	340
9/0	22	7	115	22	355
8/0	24	8	130	23	370
7/0	27	9	145	24	385
6/0	30	10	165	25	400

TWIST CONTRACTION

In order to produce the most accurate computations with reference to the production of spinning frames, the effects of contraction on the strand of fibres delivered by the front roll should not be overlooked. It is also well to consider the effect of this contraction on the draft.

For instance, if the contraction is 5 % and a draft of 20 is required to produce a give yarn from a given hank roving, the actual draft will be 21.0527 if the yarn on the spindle is to be spun true to count. This means that the actual poundage passing through the nip of the front roll is 5 % less than calculated. In other words, if the contraction is 5 %, the strand of yarn passing through the front roll is not 20's but is 21.0527's. Assuming that at the end of the day the hank clock read 8 hanks, you would actually be producing on 480 spindles 182 pounds, whereas if you figured on No. 20's yarn, the corresponding figure would be 192 pounds. In other words, there is a difference between the theoretical and the actual of 10 pounds per frame for an 8-hour shift.

Finally, the practice of neglecting the effect of contraction on the inserted twist leads to another error.
Assume that the mill wishes to produce a yarn with the final twist on the basis of a certain twist multiplier TM. If they do not increase the front roll speed in the same ratio as the contraction in the final yarn, the twist in the yarn on the bobbin will be T X C, where T equals the calculated twist and C is the percentage of contraction.

TWIST CONTRACTION TABLE

Showing Percent of Yarn Contraction for Twist Multipliers from 3 to 5

Twist Multiplier	Percent of Contraction	Twist Multiplier	Percent of Contraction	Twist Multiplier	Percent of Contraction
3.00	3.10	3.70	4.95	4.40	6.80
3.05	3.25	3.75	5.08	4.45	6.93
3.10	3.40	3.80	5.20	4.50	7.05
3.15	3.53	3.85	5.35	4.55	7.20
3.20	3.65	3.90	5.50	4.60	7.35
3.25	3.78	3.95	5.60	4.65	7.48
3.30	3.90	4.00	5.70	4.70	7.60
3.35	4.03	4.05	5.85	4.75	7.73
3.40	4.15	4.10	6.00	4.80	7.85
3.45	4.28	4.15	6.15	4.85	8.00
3.50	4.40	4.20	6.30	4.90	8.15
3.55	4.55	4.25	6.43	4.95	8.28
3.60	4.70	4.30	6.55	5.00	8.40
3.65	4.83	4.35	6.68		

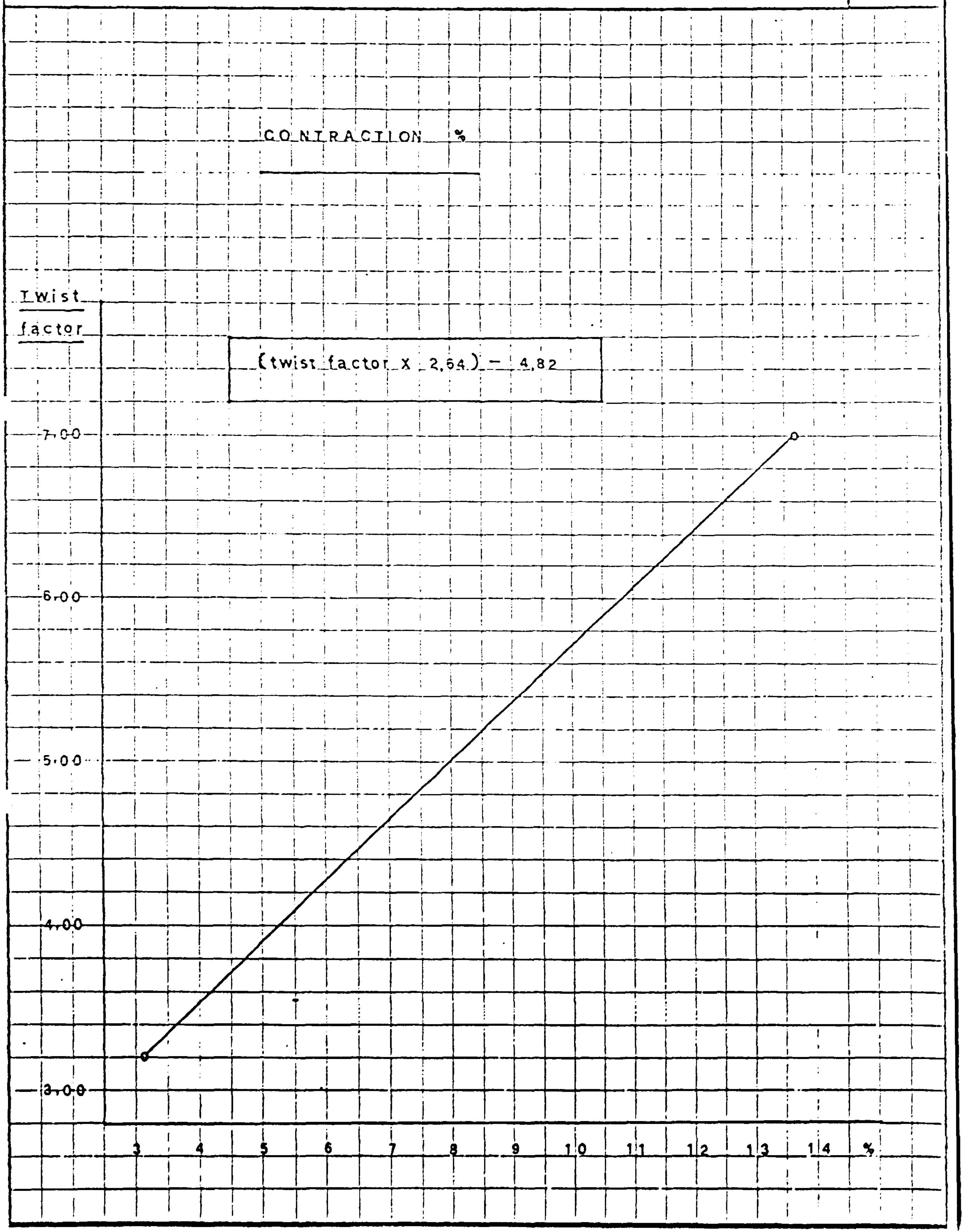
The above table is very useful when making calculations to determine the correct draft gear to use when it is necessary to control accurately the number of yarn on the bobbin. To do this there are two simple calculations involved as follows:

$$1.\ \text{Total Draft} = \frac{\text{Yarn Count X (1.00 + Contraction)}}{\text{Hank Roving at Back}}$$

$$2.\ \text{Actual Draft Gear} = \frac{\text{Draft Constant}}{\text{Total Draft}}$$

By using the following formula it is possible to determine the contraction quickly and accurately. The results obtained by using this formula agree closely with those shown in the table.

$$\text{Percent contraction} = (2.64 \text{ X Twist Multiplier}) - 4.82$$


CONTRACTION %
Twist factor
(twist factor x 2,64) - 4,82
7.00
6.00
5.00
4.00
3.00
3
4
5
6
7
8
9
10
11
12
13
14
%

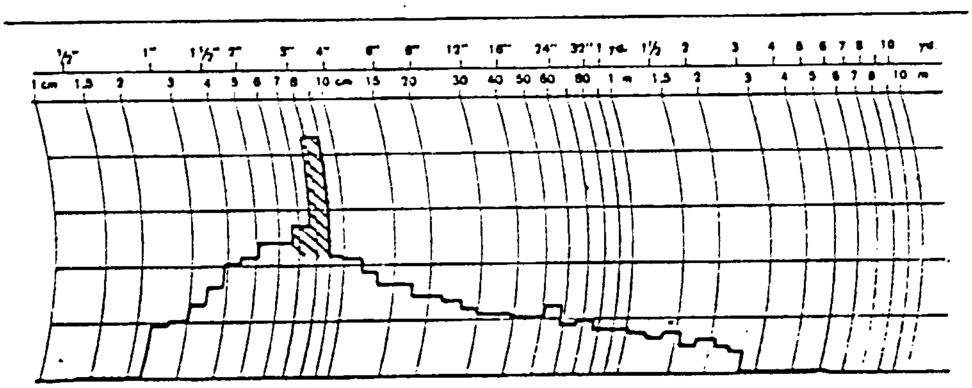
TROUBLE SHOOTING WITH THE SPECTROGRAPH

Most mills are equipped with - or have the services of - a testing laboratory. When this laboratory contains a Spectrograph, its charts, known as Spectrograms, can be a very useful tool for tracing the cause of yarn faults to their source. To understand how the Spectrograph works, we'll use an example of mechanical screening.

To sort similar objects of a different size such as apples, oranges, or lumps of coal, the aggregate is moved over screens that have different size openings or mesh. The objects first pass over the fine mesh, which permits the smallest particles to fall through and into bins. As the remaining objects move along, they pass over increasingly larger openings and they fall into bins as they come to openings that will admit them until the largest objects fall through the largest holes in the screen.

The Spectrograph operates on the same principal except that it uses wave lengths instead of concrete objects and electronic "memory" bins in which to store them. When yarn has been run through the Evenness Tester, a button is pushed and all the signals caused by yarn variation at each weave length fall into their respective bins and are recorded on the Spectrogram. An examination of the Spectrogram will then show the pattern and magnitude of any repetitive variations in the yarn.

Look at the Spectrogram below. It has steps known as drafting waves and peaks showing mechanical faults. The drafting waves can usually be levelled out to some extent by improving the the drafting to better control the fibres, but they cannot be completely eliminated. The peaks caused by mechanical faults can be eliminated by tracing these faults to their source and taking corrective action.



A mechanical fault will have a repetitive effect on the yarn at a specific wave length and thus will show as a well-defined peak or chimney on the Spectrogram. The chart shows the wave length of the fault and thus the machine part that is responsible for the yarn variation can be located.

For example, a fault shows on the Spectrogram at a point between the wave length of 3" and 3-1/2" on a sampling of yarn from a Spinomatic. The circumference of the front roll of this frame is 3.1416" and thus the fault is easily traceable to the front roll or its driven gear.

There are two methods that can be used to find the offending machine part after its wave length has been shown by the Spectrogram. One is by calculation and the other is by use of a tachometer. To use the calculation method, it is necessary to have an accurate gearing diagram of the machine showing the number of teeth in each gear and the roll diameters. A table can then be devised showing the wave length for each of these parts.

By the tachometer method, a direct check is made at the machine. The output speed of the front rolls is determined in inches per minute. The wave length of the fault, as shown on the Spectrogram, is then divided into this output rate to give the RPM of the offending part. The parts approximating the speed thus shown can be checked with the tachometer to pinpoint the source of the fault.

From these charts a table can be devised to show the wave length or frequency for each part of the drafting element of your spinning frame. Use the actual number of teeth in the change gears of your machines for T and B of the formulas.

From the table and the Twist multiplier you are using obtain the figure for twist contraction (C in the formulas).
For this purpose, use the figure in the right hand column, which is 100 % minus percent twist contraction.

No.1 - For 1" Bottom Front Roll

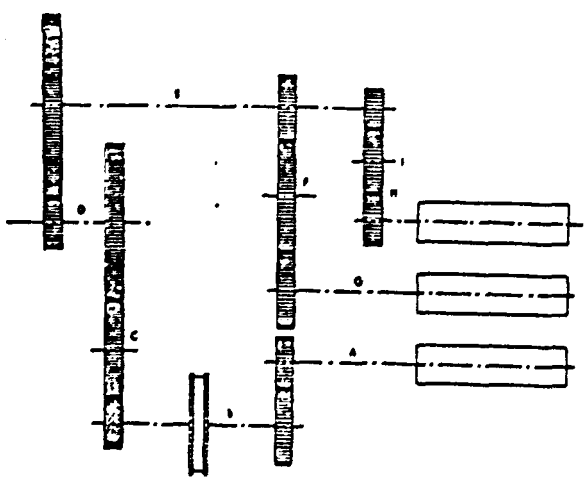
T = Total Draft Change Gear
B = Back Draft Change Gear
C = 100 % - Percent Twist Contraction

KEY	1450 Constant	791 Constant
A	$3.1416 \times C$	$3.1416 \times C$
I	$\frac{4555.3 \times C}{T}$	$\frac{2485 \times C}{T}$
G	$\frac{(1450)}{\frac{3.36 \times (T) \times C}{\frac{(105)}{(B)}}}$	$\frac{(791)}{\frac{3.36 \times (T) \times C}{\frac{(105)}{(B)}}}$
B	$\frac{4.8 \times C}{T}$	$\frac{4.8 \times C}{T}$
C	$\frac{312.4 \times C}{T}$	$\frac{312.4 \times C}{T}$
D	$\frac{471 \times C}{T}$	$\frac{471 \times C}{T}$
E	$\frac{2128.9 \times C}{T}$	$\frac{1161.1 \times C}{T}$
F	$\frac{1633.7 \times C}{T}$	$\frac{1320.5 \times C}{T}$
H	$\frac{6025.1 \times C}{T}$	$\frac{3288.6 \times C}{T}$

No.2 - For 1-3/8" Bottom Front Roll

T = Total Draft Change Gear
B = Back Draft Change Gear
C = 100 % - Percent Twist Contraction

KEY	1452 Constant	792 Constant
A	$4.32 \times C$	$4.32 \times C$
I	$\frac{4561.6 \times C}{T}$	$\frac{2488.1 \times C}{T}$
G	$\frac{(1452)}{\frac{3.36 \times (T) \times C}{\frac{(105)}{(B)}}}$	$\frac{(792)}{\frac{3.36c\ (T) \times C}{\frac{(105)}{(B)}}}$
B	$\frac{4.71 \times C}{T}$	$\frac{4.71 \times C}{T}$
C	$\frac{313.5 \times C}{T}$	$\frac{313.5 \times C}{T}$
D	$\frac{473.1 \times C}{T}$	$\frac{473.1 \times C}{T}$
E	$\frac{2136.3 \times C}{T}$	$\frac{1043.7 \times C}{T}$
F	$\frac{2371.8 \times C}{T}$	$\frac{1227.7 \times C}{T}$
H	$\frac{9682.2 \times C}{T}$	$\frac{4280.3 \times C}{T}$



TROUBLE SHOOTING CHECKLIST

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
1.0 DRIVE.		
1.1 Frame won't start	Interlock switch open	Check cabinet doors and close securely
	Motor overheated	Allow overload relays to cool. Reset.
	Main switch off	Turn switch on
	Waste collector motor overheated	Clean out waste collector ducts and screens. Reset overload relays.
1.2 Frame stops too slowly	Brake rheostat set too low	Set rheostat to next higher number
	Friction disc worn	Replace disc
	Oil or grease on brake friction surface	Clean with solvent
	Rheostat points corroded	Turn rheostat knob full cycle and back to original setting.
1.3 Frame stops too quickly	Brake rheostat set too high	Set rheostat to next lower number
	Foreign substance on friction surface	Clean with solvent
2.0 BOBBIN FORMATION		
2.1 Erratic Ring Rail Traverse	Broken lifter tape	Replace tape - find and remedy cause of breakage
	Not enough counter-balancing	Adjust torsion bar
	Uneven counter-balancing	Adjust compensating roll
	Bind between brackets and guide rods	Check eccentric bushings and adjust
		Clean out any lint accumulation between bushings and rods
2.2 Bottom too short and too full	The nose touches too much on the chain	Keep off the nose from the chain
2.3 Bottom too small in diameter and length	The nose works too little	Bring closer the nose
2.4 Cone too long	Traverse of the ring rail too big. The pitman roll is too small	Change the pitman roll with a bigger one
2.5 Cone too small	Traverse of the ring rail too small. The pitman roll is too big	Replace the pitman roll with a smaller one. $D = \frac{5198.4}{\text{Traverse}} - 8.5$

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
2.6 Sloughing-off bobbins	Too much yarn delivered for the traverse of the ring rail	Increase the speed of the ring rail
2.7 Rapid movement of the ring rail, not enough yarn on the bobbin	Not enough yarn delivered for the traverse of the ring rail	Decrease the speed of the ring rail
2.8 Low conicity of the bobbins and too empty bobbin at the bottom	At the start of the new doff the lever of the cam does not return till the block stop.	Adjust the lever of the cam till it reaches the bloc stop.
2.9 Too empty bobbin at the bottom	The doff starts too low	Adjust the beginning of the doff (10 mm.)
2.10 Certain bobbins are dirty and the yarn looks shafed	The traveller touchs on one side, the spirdle is off centre.	Plumbs the spindle
2.11 Soft Package	Traveller too light Tape slipping Bobbin turning on spindle	Change traveller Clean or replace tape Replace bobbin
2.12 Hard Package	Traveller too heavy Worn ring Foreing accumulation on ring	Change traveller Replace ring Clean ring with solvent
2.13 Oversize package	Heavy roving Incorrect picks Builder arm stroke too short Lay too close Soft twist	Replace roving Re-set ratchet shield on pick motion Check for slippage Lengthen stroke Change lay gears Change twist gears
2.14 Undersize package	Incorrect picks Light roving Lay too open Builder arm stroke too long	Re-set ratchet shield in pick motion Change roving Change lay gears Shorten stroke

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
3.0 TOP ROLLERS		
3.1 Uneven Yarn	Worn out cot	Buff or replace .
3.2 Embossed cots	Bushing not properly positioned on the arbor	Position properly the bushing and check also all the other ones .
3.3 Worn out points of the arbors	Badly positioned bushing on the arbor	Replace them.
4.0 THREAD GUIDES		
4.1 The balloon is not properly centered and is touching one side of the tube	The thread guide is not properly centered	Adjust the thread guide
4.2 The balloon is centered but is touching the top of the tube	Too close distance between thread guide and spindle	Adjust the distance
5.0 RESERVE		
5.1 The reserve is too high or too low	Bad adjustment of t' : mechanism	Adjust the mechanism
5.2 The reserve is too big or too small	The length of the yarn is too big or too small	Adjust the mechanism or the brake
5.3 Too many breaks during the winding of the reserve	Wrong move	The ring rail must come down smoothly
6.0 YARN BREAKS		
6.1 Single End down	Defective roving	Replace and return defective roving to card room
	Bad top roll cot	Buff or replace
	Bad middle apron	Replace
	Lint under apron	Clean out
	Thread guide out of line	Reset
	Spindle out of plumb	Plumb spindle
	Worn ring	Replace ring-check and remedy cause of wear
	Worn traveller	Replace traveller-check ring flange for roughness
	Rough or warped bobbin	Replace bobbin

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
6.1 (cont'd)	Trumpet out of line	Adjust trumpet
	Roving holder sticking	Clean out-check bearings and replace if needed
	Too much traverse end play	Eccentric bushings worn - replace or adjust
	Too much longitudinal end	Check eccentric bushings at 6th samson for longitudinal end play - adjust or replace
	Apron tension roll out of	Adjust roll
	Apron tension roll sticking	Clean out or replace
	Top roll bearing worn	Replace bearing insert -check roll gudgeon
	Spindle lagging	Check spindle brake-Check spindle bearings-Lubricate or replace
	Spindle tape slipping	Clean or replace tape-check tape tension roll
7.0 YARN DEFECTS		
7.1 Uneven yarn	Roll spread too wide for staple length	Re-set drafting rolls
	Erratic ring rail traverse	See item 2.1
	Wrong break draft	Change break draft gear
	Incorrect gap between top and bottom aprons	Change tensor spacer washers or studs
	Defective roll cot	Buff or replace
	Roll sticking	Check roll and bearings-clean or replace as needed
	Accumulation of lint under apron	Clean out
	Bad movement of the aprons and wrong splicing	Change aprons and glue them properly
	Vibration of bottom rollers and not set down properly	Check and adjust the bottom roller bearings
	Other causes	See item 6.0
7.2 Yarn too light	Wrong draft gear	Change draft gear
	Singling	(double roving only) piece-up roving
	Wrong hank roving	Replace roving
	Stretched roving	Check roving bobbin holder
7.3 Yarn too heavy	Draft too low	Adjust to higher draft -
	Doubling	Remove extra end of roving
	Wrong hank roving	Replace roving
	Bad quality of roving sliver. Bad piecings	Improve the quality of the roving sliver
	Wrong adjustment of the traverse	Adjust the traverse of the trumpets
	Dirty frame	Keep cleaner the frame.

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
7.4 Formation of loops at the start up.	Wrong move at the stop of the frame	The frame must be stopped when the ring rail comes down
7.5 Yarn with less twist on certain bobbins	Spindles without oil	Lubricate the spindles
	Tapes too big	Shorten the tapes
	Bad top rollers	Change the top rollers.
7.6 Hairy and rough	Humidity too low	Increase the humidity
	Wrong travellers	Change traveller size
	Very high draft	Change Hank roving
	Vibration of the spindles	Lubricate the spindles
7.7 Slubby yarn	Foreign matter	Check for fly Clean out waste collector orifice or duct
	Roving out of condenser	Replace roving in condenser
	Insufficient top roll pressure	Adjust the pressure arm
	Incorrect break draft	Change gears
	Incorrect roll settings	Re-set rolls
	Incorrect tensor spacer washers or studs	Change washers or studs
7.8 Uneven yarn count variation	Wrong stretch on the creel	Change bobbin holders
	Insufficient pressure on the back top roller	Check the pressure arms
	Blocked trumpets	Check the trumpets
	Dirty or bad lubrication of the drafting rollers	Clean and lubricate the rollers
	Variation of the humidity	Keep instant temperature and humidity
	Twist variation due to long tapes	Replace the tapes
	Bad top or bottom aprons	Replace the aprons
7.9 Oiled and dirty bobbins	Too much spindle oil	Lubricate the spindles as per instructions.
	Oiled rings	You must never oil the rings
7.10 Cockled yarn	Incorrect tensor washer or stud	Change washer or stud
	Drafting rolls set too close for staple length	Re-set rolls
	Break draft too low	Change gears

FAULT	PROBABLE CAUSE	POSSIBLE REMEDY
8.0 TRAVERSES		
8.1 Uneven tension of the yarn, too high end breaks	Fly on the travellers The traveller is set too far	Adjust closer the traveller clearer
8.2 The travellers are buzzing, too many end breaks of the yarn, worn out travellers, bright rings and traveller clearers	The traveller clearer is set too close	Adjust further on the traveller clearer
9.0 RINGS		
9.1 On certain rings the tension is too high. Too many yarn breaks.	Dirty rings Uneven surface of the ring	Clean the rings with Petrol and wipe them with a dry cloth. Replace the worn out ring
9.2 Too much tension of the yarn	Too high speed for new rings	Run with lower speed till the break-in of the rings, and coarser count if possible.
10.0 SPINDLES		
10.1 Top part of the spindle gets off the base.	Bad position of the retaining Hook	Clean or adjust the Hook
10.2 Tapes damaged on the edges	Tapes are touching the sides of the whorl	The tension pulley is adjusted too high or use more tight woven tapes
10.3 Tapes are damaged by the brake of the spindle	Bad position of the brake with regard to the bottom part of the whorl	Replace the brake
10.4 Spindles vibration	Oil level too low Worn out spindle blade Badly fixed spindle sleeve	Add oil Replace the blade Mount properly the sleeve.

8. PREVENTIVE MAINTENANCE.

To maintain quality and high production levels, the frames must be in good mechanical condition; proper setting on frames must be maintained at all times.

The inspection and control of frames has been scheduled on a 2 months basis.

In order to ensure that each frame is checked once per 2 months the fixer has to carry out preventive maintenance on 1 frame per day.

In order to help the fixer to keep a record of his progress in preventive maintenance,the form shown on page 106 has been designed.
It shows the checks to be carried out and has columns for ticking off the frames, that has been checked.
The normal procedure for filling out the form is that the fixer writes in the column "Frame No." the number of his frames in mathematical order (e.g. 1,2,3,4,5, etc.) and ticks off in the day-column the day he tackled a particular frame.
Although the fixer is not obliged to check the frames in the order as appear on the form, it is advisable to maintain that order as much possible, which will ensure that approx. a forthnight passes by between a check of a particular frame.

During the Training Course the trainee has to carry out preventive maintenance, as described before. When the trainee has carried out it on a frame,the Instructor checks his performance by using the form "Evaluation of Preventive Maintenace", shown in the last section, "Charts and Graphs" of this manual.

EVALUATION OF SPINNING PREVENTIVE MAINTENANCE

FRAME Nº .... FIBER .... DATE ....

STANDARD	POINTS	
5		A. Roving guide bar
10		B. Bobbin holders
4		C. Traverse motion
5		D. Trumpets
10		E. Pressure Arms
7		F. Top rollers
8		G. Aprons
5		H. Pneumafil pipes
5		I. Spindles plumbing
5		J. Thread guides plumbing
5		K. Traveller clearers
5		L. Jockey pulleys
5		M. Spindle tapes
5		N. Separators
3		O. Brake
6		P. Gearing
5		Q. Building motion
2		R Condition of V-Belts and Drive
100		TOTAL

MILL	MAINTENANCE WORK REPORT	
WERNER INTERNATIONAL N.Y.	FORM M-103	PAGE :

Department: SPINNING.	Type of machine: INGOLSTADT	Machine No.	Type of maintenance
Persons per crew:	Expected time:		

CYCLE

4 MONTHS										YEARLY				
No	Machine Part	G	A	R	No	Machine Part	G	A	R	No	Machine Part	G	A	R
1	Creel										All jobs listed under 3 months maintenance, and in addition:			
2	Creel(bob.hold.)													
3	Roving traverse													
4	Clearers													
5	Top rolls									1	Creel			
6	Top roll cots									5	Top rolls			
7	Craddle									6	Top roll cots			
8	Top aprons									10	Pendulum arms			
9	Spacers									11	Flut.bott.rolls			
10	Pendulum arms									14	Tension rollers			
11	Fluted bottom R.									15	Drafting gears			
12	Bott.roll bear.									16	Build.cam & gear			
13	Bottom aprons									17	Head stock gears			
14	Apron tens.pull.									19	Ring rail			
15	Drafting gears									21	Travell.clearers			
16	Build.cam & gear									22	Spindle rail			
17	Head stock gears									26	Spindles			
18	Separators									27	Cylinder			
19	Ring Rail									28	Tape tens.pull.			
20	Pokers									31	Filter screen			
21	Traveller Clear.									32	Flutes			
23	Thread guide bar									33	Duct			
25	Spindle breaks									38	Bearings			
	Spindles									39	Motors			
[illegible]	Tapes									40	Counter			
30	Suction									41	Doors and covers			
31	Filter screen									42	Machine levell.			
32	Flutes									43	Chains			
34	Rubb.flute conn.									44	General			
35	Central lubr.sys									45	Lubrication			
36	Coupling (clutch)													
37	Electrical app.													
38	Lubrication													

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

2. Creel

Clean all the bobbin holders.
Adjust them and replace them if necessary.
Clean the slots and treat them with Molykote or lead powder.

3. Roving Traverse

Check the roving guides and replace the damaged or missing ones.
Check the sliding and levelling of the bar.

4. Clearers

Remove and clean the clearers. Check condition of the felt and send the defective ones to the workshop for replacement.

5. Top Rolls

Remove all fly and waste from the shafts.
Eventually use a roller picker.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

6. Top Roll Cots

Check the condition of the top roll covers.
Clean or send to the worshop to check the wear down.
Buff eventually
Replace the cut or damaged cots.

7. Cradles (apron cages)

Remove and dismantle the cradles.
Clean the waste and remove with a cloth the wax from the nip of the cage.

8. Top Aprons

Clean the dismantled aprons (inside and outside). Wash them if necessary.
Replace the damaged ones, worn out or cut.

9. Spacers

Check and replace the missing and wrong ones.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

10. Pendulum Arms (Pressure Arms)

Clean only with a brush.
No need to adjust the arms during this maintenance.

11. Fluted Bottom Rolls

Clean the flutes with a stiff brush in order to remove all impurities from the flutes.

12. Bottom Roll Stand Bearings

Remove all fly from the bearings and check their condition.
Grease lightly the bearings before replacing them on the stands (only for plain bearings)

13. Bottom Aprons

Clean the inner part of the aprons and replace the damaged or cut ones.
Take out and clean the guide bars.

MILL	DESCRIPTION OF THE WORK TO BE DONE

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

14. Tension Pulleys for Aprons

Check the pulleys and hangers.
Clean and adjust them. Check condition.
The adjustment must be made in order to have the apron running in the middle of the fluted part of the second bottom roll.

15. Drafting Gears

Clean thoroughly without dismantling the gears.
Replace the damaged or worn out gears.
Check the meshing of the gears and grease afterwards.

16. Building Cam and Gearing

Same as Point 15.

17. Head Stock Gears

Same as Point 15.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

18. Separators

Check condition and if properly fixed.
Replace the damaged or missing ones.
Adjust them if not properly positioned.

19. Ring Rail

Clean the ring rail and rings.
Clean and check the driving chains.
CAUTION: The carrier tapes must be properly on the guide rollers.

20. Pokers

Clean with a roller picker all the pokers.
Remove dust, fly and accumulated waste.
Lubricate them with molykote or graphite.
The pokers must be always clean and slide without bumping.

21. **Traveller Clearers**

Check the traveller clearers and replace the damaged or missing ones. The setting of the clearers is done yearly, however the ones which are off position should be adjusted.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

23. <u>Thread Guide Bars</u>

Clean the bars and check the thread guides.
Replace the defective ones.
Clean and check the chains and drive.

25. <u>Spindle Breaks</u>

Check all breaks. Replace the missing ones and repair the ones which can be repaired.
Adjust those which are not in position.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

26. <u>Spindles</u>

Check the oil level on some spindles.
If the level is too low, refill the whole frame.

29. <u>Tapes</u>

Replace the damaged or missing ones.
Check whether positon of the tapes tension devices is correct.
Clean the tape tensioning devices and jockey pulleys.

30. <u>Suction</u>

Ask the Lab to check the depression.
The results must be as follow:

- near end : min. 80 mm of water
- far end : min. 50 mm of water

Advise the maintenance supervisor if these values are not obtained.

31. <u>Filter Screen</u>

Clean with a brush.
Check condition and replace if damaged.

./...

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: 3 months

Working minutes:	Persons per crew: 4 persons	Down time in hours: 6 hours

33. Flutes

Check condition of the flutes and clean them outside.
Fix or replace the damaged ones.
Check and if necessary set the off positioned flutes.

34. Rubber Connections of the Flutes

Check if they are properly fixed.
Replace the damaged, cut or missing ones.

35. Central Lubrication System

Check the system and replace the damaged pipes and connections.

36. Coupling (Clutch)

The coupling is a cluth disc type.
Check the clearance between discs it must be 8 mm. with new disc.

Type of machine and make:	Type of maintenance: 3 months
Spinning INGOLSTADT	

Working minutes:	Persons per crew:	Down time in hours:
	4 persons	6 hours

37. Electrical Apparatus

Ask an electrician to check the electric plant.

38. Lubrication

Make a general lubrication afterwards.

39. Motors.

Check condition of V-Belts. Replace if necessary (full set)
Check tension of V-Belts. Readjust the motor if necessary.
Check whether the belts run straight. Readjust if necessary.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

General:

Make the same as per the months maintenance and also the following:

1. Creel

Check settings and levelling.
Remove all fly from the guide bars and bobbin holders.
Check whether bobbin holders rotate easily

5. Top Rolls

The roller shop must grease the arbors.
The machine maker recommends every 18 months but due to the fact that the drafting 20 Ne is full of fly, we recommend to grease the arbors yearly.
Every two years wash the arbor bearings. For the purpose use a mixture of 90% clean benzine and 10% of spindle oil.

6. Top Roll Cots

Buff the rolls in the roller shop.
Important: The diameters must be exactly the same.
Eventual differences result into breaks and bad quality yarn.
Once in position, the top rolls must be completely parallel to the bottom rolls.

10. Pendulum Arms

Check the pressure and settings of the arms.
Follow Sussen instructions manual.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Spinning INGOLSTADT	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

11. Fluted Bottom Rolls

Rolls with Plain Bearings
Check also excentricity of front bottom bolls,tolerance 0.03-0.05 mm

Rolls with Needle Bearings

Do not remove the rolls from the stands to avoid bending.
Tight the rolls on the stands to prevent them to fall down.
Clean the rolls with a stiff brush and pomice stone and remove all impurities from the flutes and bearing sides.
Grease the bearings afterwards.
Check the excentricity of the front roll,tolerance 0.03-0.05 mm.

15. Drafting Gears

Dismantle all gears,clean and check all shafts,keys,screws,etc.
Check condition and replace damaged or worn out parts.
Put on again and check the meshing of the gears (a play of a few tenths of mm. between them is necessary).
Grease during and after putting them on the gears.

16. Building Cam and Gearing

Same as Point 15.

17. Head Stock Gears
Same as point 15.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :
Type of machine and make: Spinning INGOLSTADT	Type of maintenance: yearly	
Working minutes:	Persons per crew: 4 persons	Down time in hours: 8 hours

19. Ring Rail

Check and adjust if necessary the winding starting point.

21. Traveller Clearers

Check the settings.

22. Spindle Rail

Check and adjust if necessary:
beginning of winding

26. Spindles

Check oil level and add if necessary.
Every 2 years change oil completely.
Centre the rings with the spindles running.
Centre the threade guides and adjust the height.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

27. Cylinder

Clean, check and repair if necessary the cylinders.
Tighten all screws.

28. Tape Tension Pulleys

Clean thoroughly and check condition.
Grease every 2 years.
Replace missing or damaged parts.

31. Filter Screen

Remove the filter screen. Wash it in soapy warm water. Rinse it with cold water and dry it with compressed air.
Replace the screen only when it is dry.

32. Flutes

Wash the Flutes.
Check position of the flutes and adjust if necessary.
The flutes must be parallel to the front roll and the distance between them must not be over 3 mm.
Fix or replace the damaged ones.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

33. Duct

Clean the inside of the duct and check if the joints are hermetically closed.

38. Bearings

Check and grease all bearings.
Replace the damaged or worn out.

39. Motors

Job to be done by an electrician.
Clean with compressed air rotor and stator wash bearings and replace them if damaged or worn out.
Grease the bearings and check the motor running (rotation)

40. Counter

Clean and check condition of the counter.

PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: Yearly

Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

41. Doors and Covers

Check and adjust if necessary all doors and covers.
Safety depends, for the greatest part,of the good condition of them.

42. Machine Levelling

Check the levelling of the machine with a spirit level and adjust if necessary. Also check with a wire the lining.

43. Chains

Check the stretch of all suspension chains. Shorten them if necessary or replace the damaged ones. Lubricate with spray. Previously clean thoroughly the chains with a piece of cloth. Remove the impurities fly and fibres, and spray them especially on the inside part and pins.

44. General

Clean, fix, adjust or replace also the parts which are not described above.

MILL	DESCRIPTION OF THE WORK TO BE DONE	
PREVENTIVE MAINTENANCE	FORM M - 101	Page :

Type of machine and make: Spinning INGOLSTADT	Type of maintenance: Yearly	
Working minutes:	Persons per crew: 4 Persons	Down time in hours: 8 hours

[illegible]. <u>Lubrication</u>

Make a thoroughly lubrication after the yearly maintenance.

. <u>Tension rollers</u>

Clean and lubricate with graphite or Kluber paste Altemp Q.

FRAME INTERFERENCE.

The fixer normally tackles one frame at a time. When more than one frame are stopped for mechanical reason, the fixer obviously has to think on what frame he should tackle first with the aim to keep waiting time at a minimum. In general he shoul' start with the frame that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 frames are stopped for various mechanical reasons for which the spinner has told him. When the fixer comes to the frames and he estimates the times he will need for repairing the stops, for case a. 30 min.
for case b. 10 min.
for case c. 5 min.

We will show two methods of tackling these stops:

Method 1.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	3	30	5 + 10 = 15	45 min.
b	10	2	10	5	15 min.
c	5	1	5	0	5 min.
			Total lost time on 3 frames:		65 min.

Method 2.

Case	Time to repair	Repair priority	Lost time		
			Work	Waiting of frame	total
a	30	1	30	0	30 min.
b	10	2	10	30	40 min.
c	5	3	5	30 + 10 = 40	45 min.
			Total time lost on 3 frames:		115 min.

It is obviously that Method 1. is the better one of the two, since the total time lost by waiting of the frames is 65 min., whereas with Method 2 that time is 115 min.

Normally a fixer should never spend longer than approx. 45 min. on one job. If for one or another reason, the job will take much longer time, he should interrupt his work on that job and look if he has to repair other frames.
When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

10. QUESTIONNAIRE

PURPOSE : To enable the instructor to detect possible weaknesses and to help the trainee to understand his job.

QUESTIONS :

1. What type of working uniform, suits a mechanic?

   Short sleeve shirt.

   Tight trousers

   with leather shoes.

2. What tools will be required for the mechanic?

   Set of : Tool box
   - Metric allen keys
   - English allen keys
   - Screw drivers star and flat
   - Spanners (open & close)
   - Hammer(soft and hard)
   - Pliers
   - Wrenches
   - Leaf gauges/Block
   - Chisels
   - Centre punch
   - Meter
   - Torch
   - Callipers
   - Spirit level

3. How a mechanic should file?
   1. Part to be filed should be held at right angle in the vise at a height of the elbow.
   2. Weight should be applied to the file only on the forward motion.
   3. File should be held slightly to the left.
   4. End of the file is held by the T/1,2 of LH.

5. R.H. should hold the handle in such a way, that the tip first on the flesh above small finger, the tumb being parallel on the top of the handle.
6. Some soft metal pieces should be used in between the jaws of the vise.

4. What is the make and model of machine?

Make : INGOLSTADT
Model : RB 10 and RB x
1954 and 1970

5. What are the specifications of the machine?

Drafting system : UT620, UT3-G Sussen 3/3 double apron spring pressure.
Drive: V-belt
Spindle assembly : tube spindle
Lift : 180 mm. + 230 mm.
Ring Ø : 45 mm.
Flange : No. 2
No. of spindles: 428, 420. The new : 428, The old 420.
Spindle gauge: The new: 75 mm. The old: 70 mm.
Spindle per box : The new : 6 , The old : 8
Type of suction : Pneumatic.
Spindle tape & size : New 270 cm., Old 309 cm. - 16 mm. wide..
Bobbin size and type : New 245 mm., Old 205 mm.
Doffing system : Manual.
Traveller type : G & T-type.
Counts running on various frames : 16, 21, 35, 36, 50, 60 Cotton.
Creel: Skewer and bobbin holder.

6. What are the funtions of ring frame?

1. Drafting.
2. Twisting.
3. Winding.
4. Building.
5. Conversion of roving into the yarn.

7. What are the basic adjustments of ring frame?

Level and alignment of the machine.

1. Motor alignment/Belts.
2. Adjustment of jockey pulleys.
3. Meshing of gears.
4. Plumbing of creel : $\frac{\text{Spindle gauge x No. of bars}}{2}$
5. Roving guide bar adjustment : in centre.
6. Bottom roll setting : 44 mm. Front - 54 mm. Back.
7. Bottom roll alignment and pilishing.
8. Top roll/Settings: Front + 3; Back 0 ; Middle: - 2 mm.
9. Top arm pressure adjustment: 10 - 10 - 10 Kg.
10. Top arm settings : (centre)
11. Traverse motion adjustment: 12 - 15 mm.
12. Roving trumpets alignment.
13. Thread guide plimbing, and lappet distance 60 mm.
14. Spindle plumbing.
15. Traveller clearer adjustment 2 mm.
16. Ring rail levelling.
17. Lappet rail levelling.
18. Setting of builder motion.
19. Adjustment and cleaning of suction flutes, pneumafil box. and duct.
20. Brake adjustment.
21. Adjustment checking of Pneumatic pressure.
22. Anti-Balloon rings (125 - 148 mm.) at start.

8. What are the normal changes required at ring frame?

1. Total draft change wheel.
2. Spindles speed.
3. Twist wheel.
4. Ratchet wheel.
5. Lifting wheel
6. Traveller size.
7. Traveller cleaner.
8. Bottom roll settings.
9. Top roll settings.

How to stock the lubricant?

Different colours should be used for different lubricants.

How you classify the lubricants according to use?

Recommended lubricants should be used.

What should be the criteria for break down maintenance?

Mehcanic should first handle the machine which requires least time, so that, down time is reduced.

9. What is the drafting zone and its purpose?

The drafting zone enables us to draft or stretch the thick roving into a fine yarn.

10. What is: the yarn count, the twist?

The yarn count is a measure for the fineness of the yarn, that is to say: Yarn count of 1 means that 840 yds. weight 1 lb.or ar an example a 20,s means that 20 x 840 = 16'800 yds or 9.5 miles of that yarn weighs 1 lb.

The twist means that one inch length of yarn is twisted so many times as indicated. TPI 12 means 12 turns per inch. The higher the twist the stronger the yarn.

The lot indicated a certain quantity of a type of material, shade, count, twist.

11. What are the processes after spinning?

Winding, reeling or twisting.

12. How many spindles per machine?

On Model RB10, we have 428 spindles per machine.

On Model RBx, we have 420 spindles per machine.

13. What is the average weight per cop?

On Model RB10 : 85 gr.

On Model RBx : 55 gr.

14. What is the average weight per bobbin?
600 gr. and 1.000 gr.

15. How many cops per roving bobbin?
Around 12 and 14 cops per roving bobbin.

16. What is the average time to fill a cop?
It is around 2 1/2 and 3 1/2 hours for 21's count.

17. What is the average time to run off a roving bobbin?
It is around 35 and 48 hours.

18. What is the spindle speed in RPM?
Average 10,750

19. What is the traveller speed in meters sec.?
24,9 m./sec.

20. What are the particulars on the ticket?
Quality, date, count, machine number, twist, weight.

21. What is the function of Pneumafil?
When an end is broken, the Pneumafil sucks in the outcoming roving in order to prevent lap rolls, spinner's double and other anomalies.

22. Why must the spindle be clean before putting on a new tube?
In order to ensure the correct position of the tube.

23. Where to we get new travellers from?
From the boxes kept on the machines or the shift foreman.

24. In what way do you replace broken or damaged aprons?
There are spare aprons on the apron drive roller.

25. In what way do you dissemble and assemble the draft elements?
Demonstration.

11. CHARTS AND GRAPHS.

1. Purpose.

   Charts and graphs have been designed for:

   a. recording the progress of the trainees.

   b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

   a. The completed Defect - recognition Schedule (see page 134) for recording the progress in " Diagnostic Development".

   b. The Preventive Maintenance Results Efficiency (see page 136) for recording the performance of the trainee on Preventive Maintenance.

   c. The Management Control Chart (see page 138) for recording the progress of the trainee on the exercises of Phase I and Phase II.

a. The Complete Defect - recognition Schedule.

As explained in the chapter on "Diagnostic Development" (page 81 of Phase II), the trainee has to repair at least 4 to 7 defects, of a particular type of frame.
The total number of the different reason for defects are 14, which means that the total number of flags to repair is:
14 reasons x 4 - 7 defects.
Per reason = 92 defects.

The vertical axe of the graph "Completed defect recognition Schedule (see page 134) is divided into 110 parts and the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 92 defects, with the line, representing the 18th day. That line is called the "target-line".

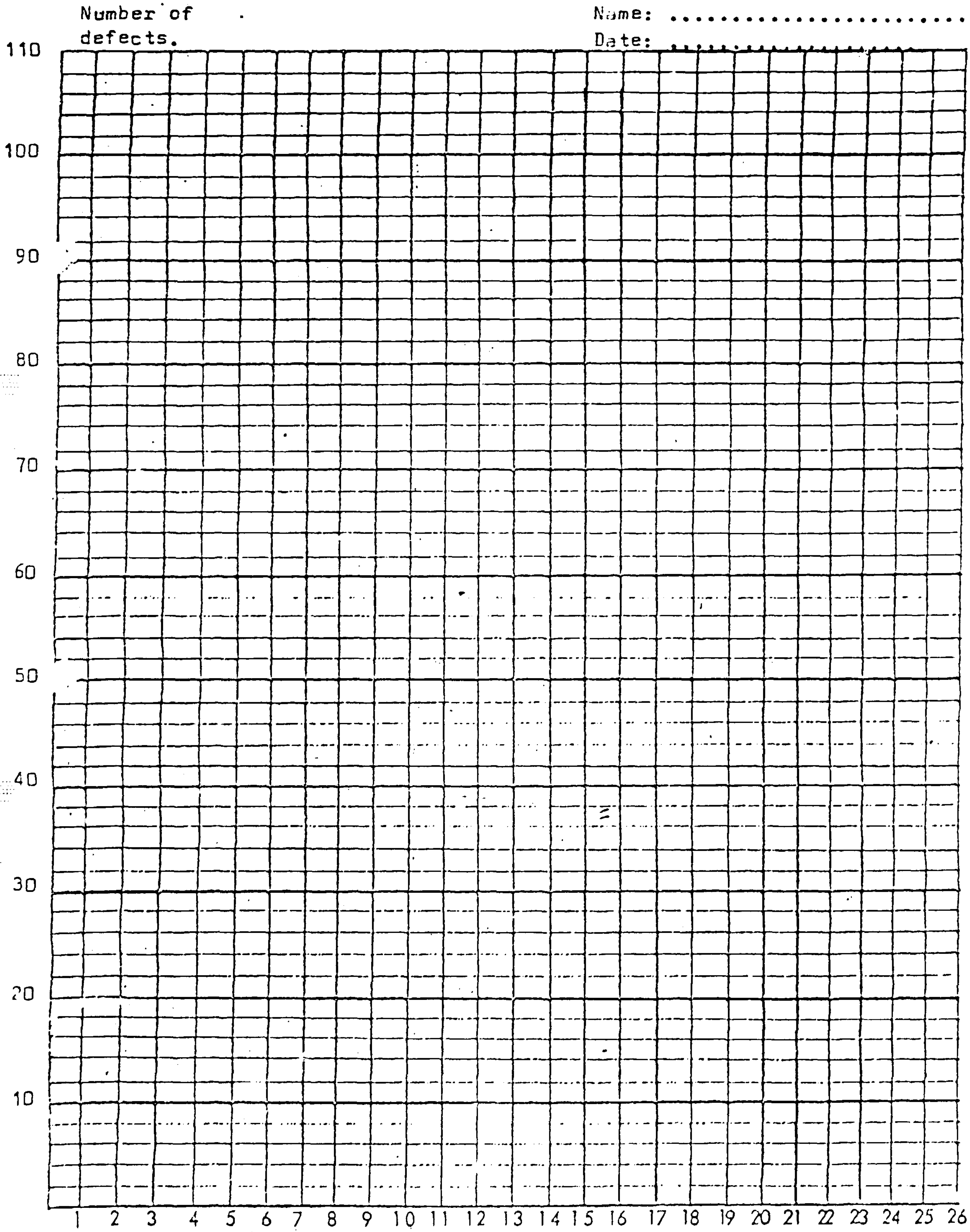
As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well and will terminate all the 92 defects within 18 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule and the Training Supervisor should investigate and discuss with the Instructor ways and means for getting the trainee back on the right track.

COMPLETED DEFECT RECOGNITION SCHEDULE

Name: ....

Date: ....



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b. <u>The Preventive Maintenance Results Efficiency</u>.

In the chapter on "Preventive Maintenance (see page 106 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evaluation on Preventive Maintenance" as shown on page 107 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances of preventive maintenance by skilled fixers.

The Preventive Maintenance Results Ef:

Name:..............................

95 90 85 80 75 70 65 60 55 50 45 40 35

FRAME Nr.:

DATE:

c. Management Contr.' Chart.

The Management Control Chart, as shown on next page is the "log-book" of the course.

The chart is divided in two main parts, namely Phase I and Phase II.

PHASE I.

The number of days has been already inscribed on the chart, but the Instructor has to inscribe the dates, every day at the end of that day. All the six groups of exercises in Phase I are shown on the chart. When one group of exercises has been terminated by the trainee, the Instructor inscribes the frame number (s), on which the exercises were carried out, in the square, provided for it, under the group of exercises concerned and the date when the exercises were terminated.

Also he fills in the time spent on that particular group of exercises in the Training Centre (behind TC) and in the Spinning Room (behind SR).

PHASE II.

Here again the Instructor has to inscribe the dates under the number of days at the bottom of the part.

This part of the chart is divided into two sections:

a. Preventive Maintenance.

When the trainee has carried out preventive maintenance on a frame, the Instructor fils in the number of the frame, the score - the percentage of the evaluation - and the date when it was carried out.

b. Diagnostic Development.

For each type of defects recording columns appear on the chart. At the end of the day, the Instructor fills in the loom, number and date, on which the particular defect-repair has been carried out by the trainee. At the end of the course each type of defect has to be tackled as per schedule (see Diagnostic Development on page 138 of Phase II).

WERNER AMPS ..SPINNING. FRAMES INGOLSTADT MANAGEMENT CONTROL CHART . NAME........................

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

PHASE : 1

1	2	3	4	5	6
A: DRIVE B: DRIVE BELTS C: BRAKE	A: CABINETS CHASSIS B: ROLLER BEAM C: CREEL	A:ROLL STANDS& ROLLS B:PRESSURE ARMS C:TRUMPET	A:RINGS B:SPINDLES C:THREAD GUIDE D:SPINDLE DRIVE	A:LAY-TWIST GEARING B:DRAFT GEARING C:BUILDING MOTION	A: WASTE COLLECTION SYSTEM

FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE	FRAME	DATE
HOURS											
TC :...... R :......		TC :..... R :......		TC :..... R :......		TC :..... R :......		TC :..... R :......		TC :..... R :......	

PHASE : 2 PREVENTIVE MAINTENANCE

DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE	DATE	FRAME	SCORE

DIAGNOSTIC DEVELOPMENT

APRONS	TOP ROLLS	TRAVERSE	PR.ARM	BUILDING	TRUMPETS	PNEUMAFIL	SEPARATOR	JOCKEY PULLEYS	BOBBIN HOLDERS	THREAD GUIDES	SPINDLES PLUMBING	RING RAIL LEVEL	BRAKES

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DATE																							

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(10 of

FINAL REPORT

ON

THE DEVELOPMENT OF A

TEXTILE TRAINING SYSTEM

IN PAKISTAN

VOLUME X OF TEN VOLUMES

WERNER INTERNATIONAL
MANAGEMENT CONSULTANTS

10622
(10 of 10)

FINAL REPORT
ON
THE DEVELOPMENT OF A
TEXTILE TRAINING SYSTEM
IN PAKISTAN
VOLUME X OF TEN VOLUMES

UNIDO CONTRACT No. 80/84
PROJECT No. DP/PAK/78/055
ACTIVITY CODE 10 22 31.5A

Submitted to:

PURCHASE AND CONTRACTS SERVICES SECTION
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

AUGUST 1981

WERNER ASSOCIATES INC. | 111 WEST 40th STREET NEW YORK, NEW YORK 10018 | TELEPHONE: (212) 730-1280 | TELEX 223399 CABLE: WERNERCONS

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WERNER AMPS

ANALYTICAL METHOD PRODUCTIVITY SYSTEM

LOOM FIXER'S MANUAL

SAKAMOTO LOOMS

Prepared for:
T.I.R.D.C. (UNIDO)
KARACHI.

Prepared at:
JUBILEE SPIN. & WEAVING
KARACHI - PAKISTAN.

Prepared by:
WERNER INTERNATIONAL
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NEW YORK - U.S.A.

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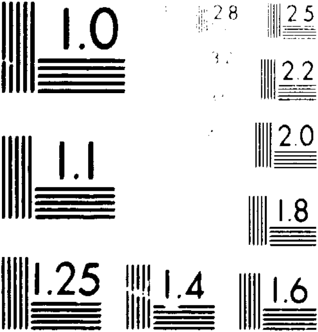

1.0
2.8
2.5
3.2
2.2
2.0
1.1
1.8
1.25
1.4
1.6

PERSONNEL SPECIFICATION

Job:	LOOM FIXER
Sex:	M Age: 20 - 35
Experience:	Minimum 6 months good weaving on full set.
Physique:	Capable of working in cramped positions 8 hours per day, in humid,noisy weaveroom.
Hands:	No disabilities or missing joints,no stiffness.
Feet:	No disabilities.
Eyesight:	Good near and distant vision.
Temperament:	Stable, conscientious, responsible.
Attitude:	Willing to learn.

	Recommended		Minimum
Dexterity:	B	7	6
Form-Boards:	B+	9	7
Perception:	B	6/22	4/17

GENERAL

A. OUTLINE :

1. OBJECT

The object of this training course is to prepare loom fixers as quickly as possible to run complete sections.

2. SELECTION

Prospective fixers are best chosen from weavers with at least six (6) months good weaving experience. The recommended test results are shown in the Personnel Specifications.

3. TRAINING COURSE

a) This course covers the following aspects:

1.Knowledge.
2.Manual Skills.
3.Diagnosis.
4.Production fixing-preventive maintenance.

b) The learner fixer course is divided into two (2) phases and is designed to accommodate two (2) fixers at a time.

4. INSTRUCTOR

The instructor should have two (2) trainees at a time and he will be with them full time until the end of the course.

5. GENERAL

The most important exercise is diagnosis. The most important benefit of training is improved quality. This will largely be achieved by the better understanding of how the loom works and by the use of standard settings and methods.

B. INTRODUCTION TO LOOM FIXING:

1. PURPOSE

To help you become a good fixer as quickly as possible, if this is your aim, follow the instructor's advice and you will get there quickly. If this is not your aim, decide quickly what it is you wish to do.

2. INSTRUCTION

The instructor is here to help you, not to chase you. Any question of discipline will be taken up with the Training Supervisor.

3. METHODS

The methods taught you, are those we believe, best at the mill. If you can improve on them, your suggestions will be welcomed. Discuss your proposals with the instructor so that everyone can benefit from improved methods. Please do not adopt new settings without asking. 2 other shifts have to work on your set. Always use gauges where possible since the settings by feel will vary from fixer to fixer and will have an adverse effect on the quality, product and efficiency.

4. TOOLS

The tools recommended to you will make the work easier.Get the right ones and look, after them.

5. SAFETY

Yours is a responsible job. Whenever possible, stop the loom before adjusting, cleaning and lubricating it.Follow these rules:

1. Short sleeves, no loose clothing.
2. Non-slip, safety shoes.
3. Sharp tools sheathed.

6. QUALITY

The quality of the cloth depends primarily on the adjustment of the loom. Once cloth of second quality has left the loom, there is little which can be done to correct it. 90% of seconds are caused by loom faults attributable to loom fixing.

7. WORKMANSHIP

Looms should be adjusted so that they will remain in adjustment. It should not be necessary to repeat the same repair or adjustment on the shifts following your own.

8. TRAINING COURSE

During the training you will pass through the following parts:

1. Machine knowledge, principles & settings.
2. Weaver's training exercises (if required).
3. Quality recognition.
4. Loom fault diagnosis.
5. Production fixing (flagged looms) & preventive maintenance.

Your instructor will demonstrate each adjustment or diagnosis and explain the key points. Each fixer will do every exercise under the instructor's supervision.

9. MEASUREMENT OF PROGRESS

Progress of the trainees through the various groups of loom settings and diagnostic skills will be plotted and charted. The instructor must be completely satisfied with the work performed by the trainees, before he considers any exercise or parts of any exercise completed.

C. DUTIES OF THE LOOM FIXER

The duties of the loom fixer are as follows:

1. Repair looms stopped for mechanical reasons.
2. Check, adjust and restart looms flagged by weaver for quality faults.
3. Check out and start all looms with new warps.
4. Check and adjust all looms for which red tickets have been issued by the Cloth Room.
5. Perform daily and weekly maintenance on his section of looms, as laid down.

D. FIXER'S TOOLS :

The following tools should be in the possession of the fixer:

-Screw driver - small 5/16"
-Screw driver - big 3/8"

-Pair plyers
-Hammer - ball-peen - small
-Hammer - ball-peen - 3 lbs.

-Centre punch
-Flat chisel

-Hacksaw
-Leather punch
-Pocket knife
-Gear puller
-Hand drill

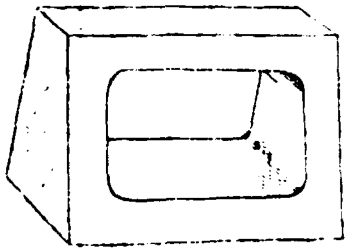
-Scissors
-Read hook
-Steel tape - 6ft.x1/16"

-Wrenches,open end:

1/4x5/16-	/16x19/32	- 7/8x13/16
3/8x13/32-	5/8x11/16	- 13/16x15/26
7/16x1/2-	3/4x25/32	- 1"5/8x1"1/4

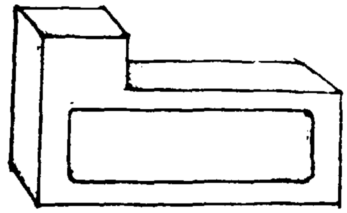
REQUIRED GAUGES:

FRONT CROSS RAIL GAUGE



1.

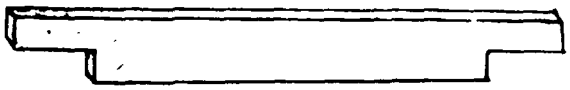
BACK CROSS RAIL GAUGE



2.

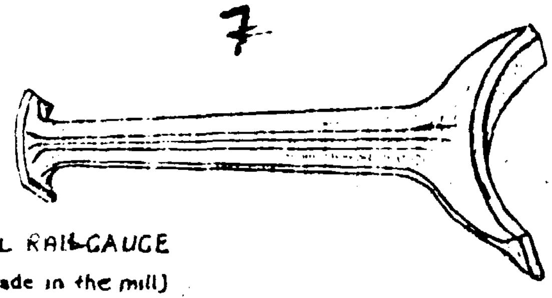
TRANSVERSE RAIL GAUGE made in the mill

3.



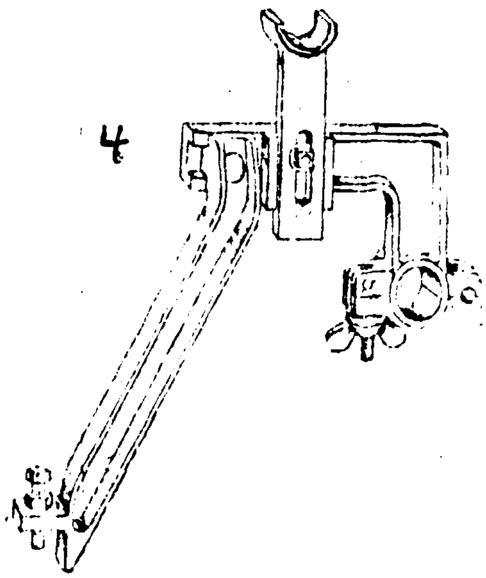
BEAM PRESSER GAUGE
(FOR POSITIVE LET-OFF)

7.



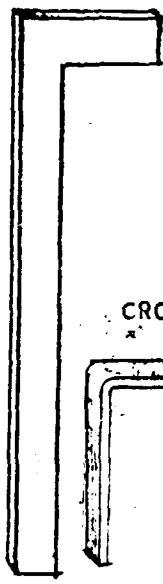
WEIGHT LEVER SHAFT GAUGE
(FOR POSITIVE LET OFF

4.



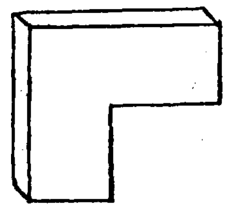
CRANK WHEEL RAIL GAUGE
(made in the mill)

5.

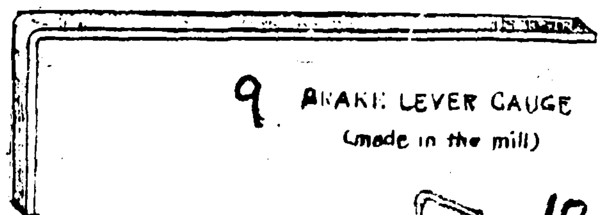


PARABOLA CURVE CAM GAUGE
(FOR POSITIVE LET OFF)

8



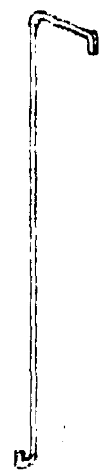
CROSS ROLLER LEVER BRACKET GAUGE



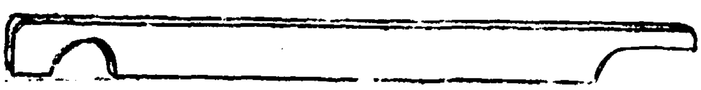
9

BRAKE LEVER GAUGE
(made in the mill)

10

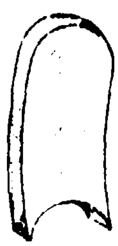


6 ROCKING SHAFT GAUGE



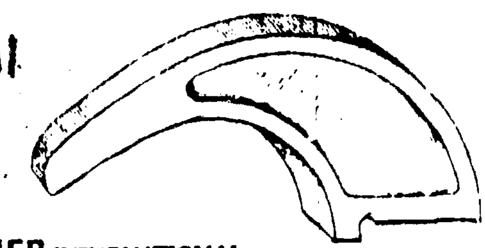
FEED REGULATOR GAUGE
(FOR POSITIVE LET-OFF)

12



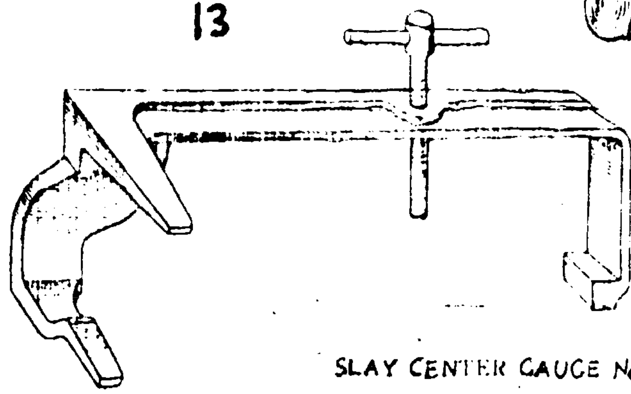
EASING ARM GAUGE (FOR POSITIVE LET OFF)

11



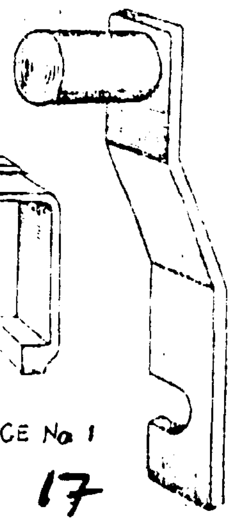
BUMPER SHIM AND TAKING UP LEVER GAUGE

13



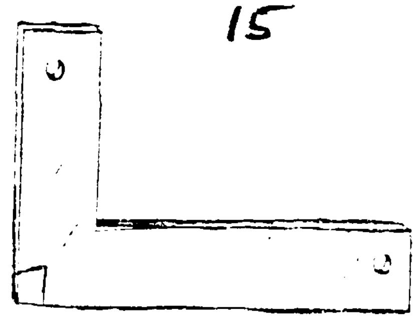
INTERMEDIATE WHEEL GAUGE

14



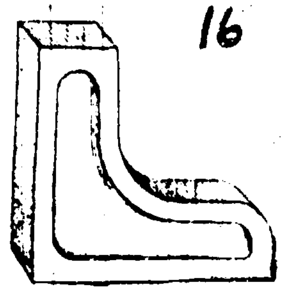
SLAY ANGLE GAUGE

15



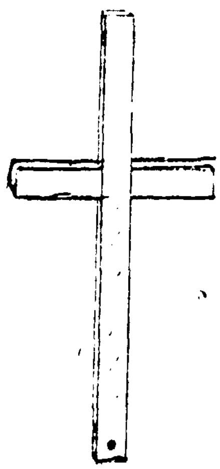
HOPPER STAND GAUGE

16



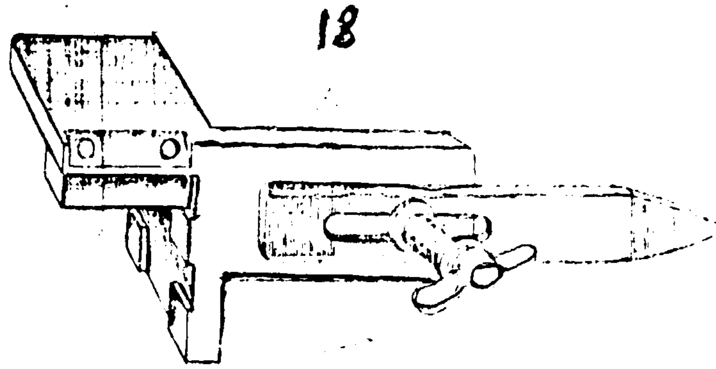
SLAY CENTER GAUGE No 1

17



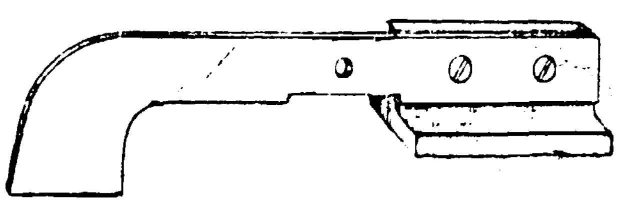
SLAY CENTER GAUGE No 2

18



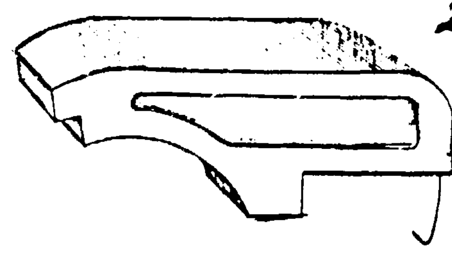
SLAY HEIGHT GAUGE

19



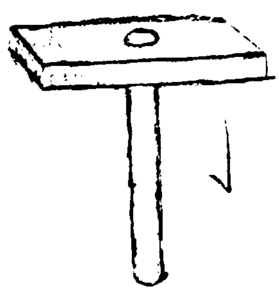
SPIDER STOP ROD SPRING SLOT GAUGE

20



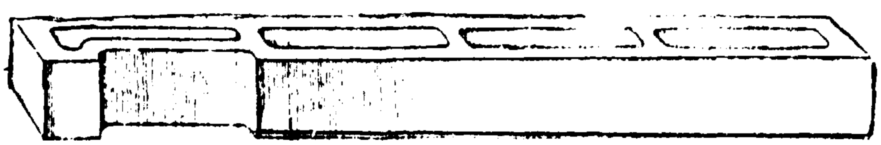
WEFT HAMMER GAUGE

21



BOX FRONT GAUGE

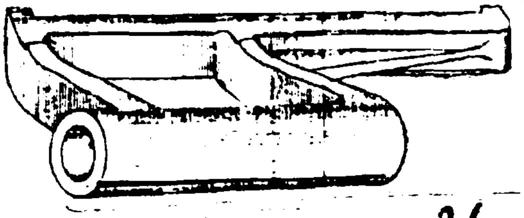
22

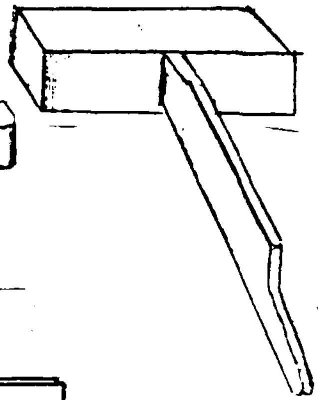


SHUTTLE FEELER GAUGE 24

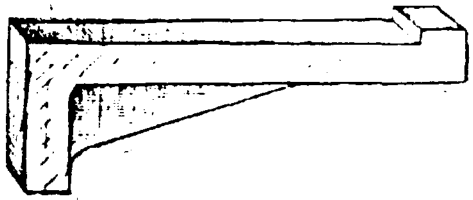
23

TRANSFERRER STUD CENTER GAUGE

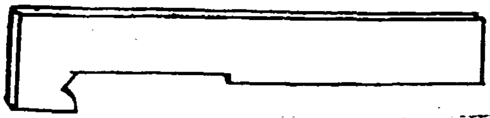




SHUTTLE FEELER DISTANCE GAUGE 25

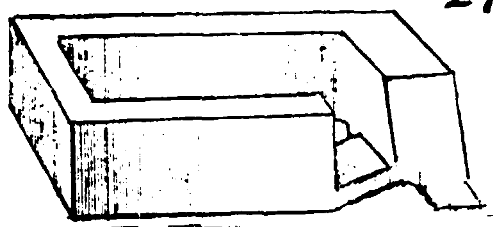


BUNTER GAUGE 26



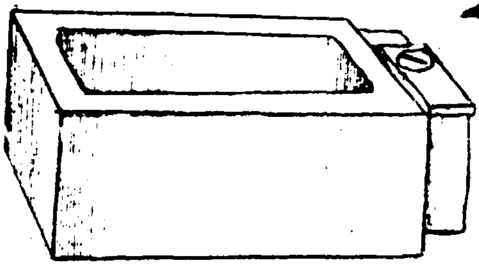
END CUTTER GAUGE (FOR SOC · D TYPE
FOR LOWER GROOVED SHUTTLE

27

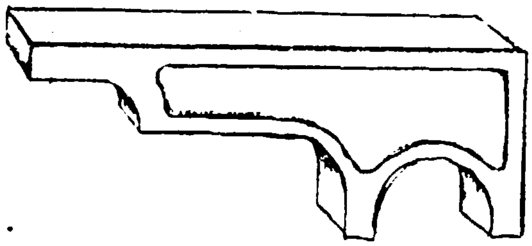


END CUTTER GAUGE FOR SOC · D TYPE
FOR UPPER GROOVED SHUTTLE

28

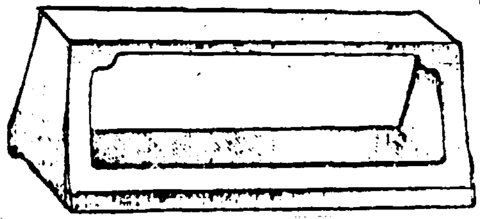


PRESS LEVER SHAFT GAUGE
FOR NEGATIVE LET OFF 29



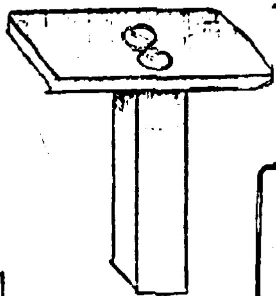
SHOE LEVER AND WEIGHT LEVER GAUGE
(FOR NEGATIVE LET-OFF)

30



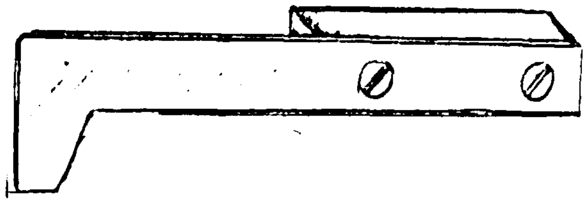
REED CAP GAUGE

33

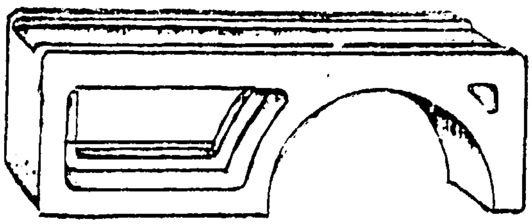


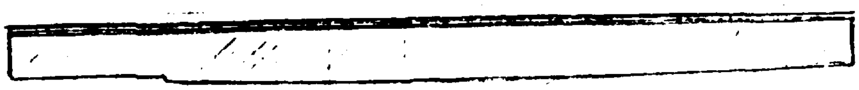
SHOE LEVER AND FOUNDATION GAUGE
(FOR NEGATIVE LET OFF)

31

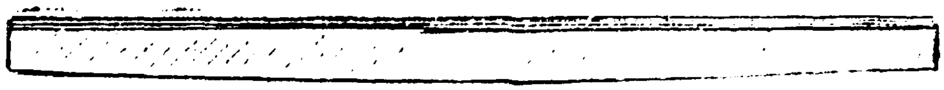


EASING ROLLER ARM GAUGE
32 (FOR NEGATIVE LET-OFF)





34 REED SWEEP GAUGE (made in the mill)



35 SLAY SWEEP GAUGE (made in the mill)

E. <u>BASIC MECHANICAL PRINCIPLES</u>

The fixer's job is to ensure that the correct amount of power reaches each part of the loom at the correct time so that the cloth is made evely and to the designer's pattern. When the adjustment is incorrect, then the fixer must track down the error and reset the loom.

1. <u>SOURCE OF POWER</u>

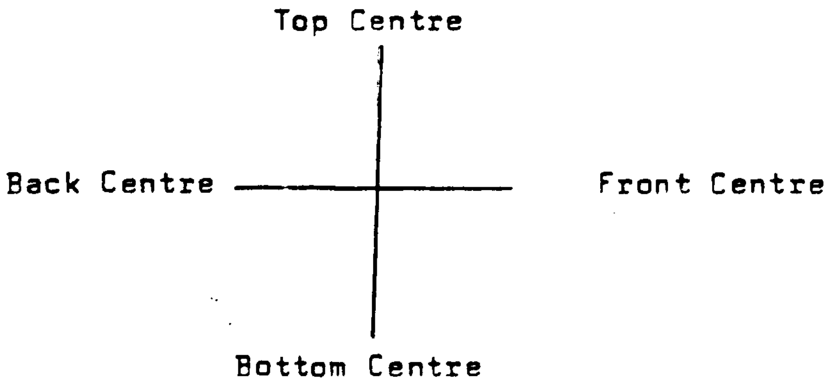
   The electric motor is the source of power. The fixer does not meddle with the motor, although he may be asked to assist in exchanging it.

2. <u>TRANSMISSION OF POWER</u>

   The power is transmitted through shafts, gears, levers, cams and belts. The following points should be noted:

<u>Shafts:</u>

Each loom has a crankshaft and a camshaft. Note the following positions:

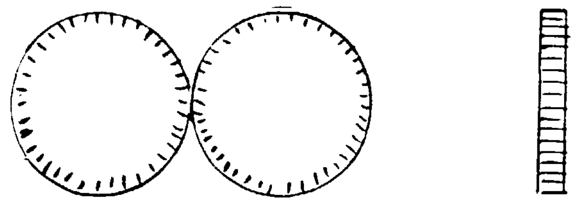


Supporting the shafts are:

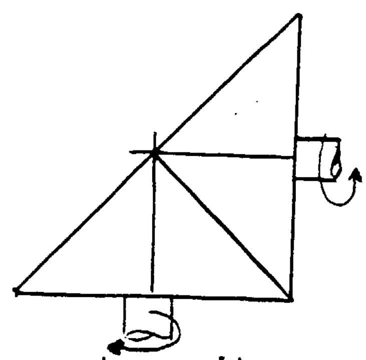
<u>Bearings:</u> plain or roller
without adequate lubrication, the bearings will break down. Whenever possible,check,clean and renew the lubricant in the bearings.

<u>Gears:</u> Note the following types of gears & find examples on the looms.

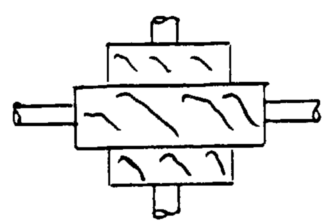
Spur gears : Spur gears transmit power between parallel shafts. The teeth must mesh properly and the edges of the gears should be aligned.



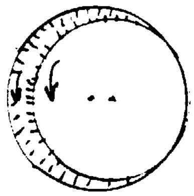
Bevel gears : Bevel gears transmit power between shafts at right angles. Again, the teeth must mesh and the edges be lined up.



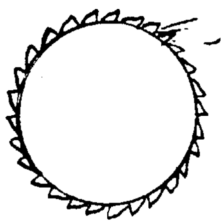
Worm gears : Worm gears transmit power between shafts at 90°. Usually, there is a large reduction in speed between the 2 shafts.



<u>Internal gears:</u> Internal gears are used to give speed reduction on the same frames.



<u>Ratchet gears:</u> Ratchet gears change a reciprocal motion to a circular motion.



Cams :

Cams are used to convert a rotary motion to a lifting motion.

Levers :

The motion of a force about a point is equal to the force multiplied by the perpendicular distance between the force & the point.

This is illustrated by the see-saw. The lighter the man, the further away from the point of balance he must sit to counter a heavier part.

180 Kg. ______________________ 120 Kg.
4m. 6m.

180 Kg. ______________________ 90 Kg.
4m. ?m.

180 Kg. ______________________ ? Kg.
4m. 5m.

Belts :

Power is transmitted through belts on a loom.

3. CONTROL OF POWER

Power in the looms is controlled by:

1. Brakes.
2. Clutch.
3. Straps and box leathers.
4. Springs.

4. USE OF STANDARD SETTINGS

The first setting to be learned is the standard setting. Two points of importance should be noted.

Fixed points: before setting an adjustment and measuring a distance, it must be clear from what starting place the measurement is to be made. Affixed position or datum is used, e.g. the position of the lay or reed.

Tolerances: It will be found that variations in the setting have different points on the loom. The allowable tolerances at each setting should be thoroughly understood to prevent wasted time and work.

Each fitter should have the maker's setting instructions for the looms he will be expected to fix.

After changing settings on a loom it is always a good rule to turn the loom 1-2 picks by hand to examine the function of the re-adjusted mechanism.

T R A I N I N G   S Y S T E M

1. THE INSTRUCTOR WILL SHOW HOW TO DISMANTLE AND REPLACE THE PARTS OF EACH GROUP.

2. THE TRAINEE AT HIS TURN WILL DISMANTLE AND REPLACE THE PARTS OF EACH GROUP.

3. THE INSTRUCTOR WILL CREATE INCORRECT SETTINGS AND THE TRAINEE MUST ADJUST THEM PROPERLY. ALWAY ONLY ONE SETTING AT A TIME.

4. THE TRAINEE LEARNS THE NAMES OF THE IMPORTANT PARTS OF EACH GROUP.

P H A S E 1
============

12 GROUPS OF SETTINGS.
======================

PART 1: PHASE 1.

(a) PURPOSE.

To give the trainee the technical knowledge of the loom & to give experience in making the various loom settings.

(b) METHOD.

Major loom settings are divided into 12 groups.

1A Motor
B Clutch

2 Brake

3A Beat up and protector motion
B Temple and temple cutter

4A Shuttle
B Picking motion

5 Weft stop

6 Take-up

7A Weft feeler
B Change control

8A Battery
B Pirn change

9 Shuttle eye cutter

10A Vibrator
B Let-off

11 Warp stop motion

12 Shedding motion

Trainee to go through first group of settings in training centre. The instructor dismantles the loom part involved and re-assembles it thereby naming the parts. Then the trainee dismantles the part and re-assembles it under the guidance of the instructor and applies the agreed settings.

When trainee thoroughly understands settings, he is to go to the weaving shed & make his first group of settings on one loom. If the instructor is satisfied with his performance,trainee is to go back to the training centre and go through the breakdown on the second group of settings.

When the trainee thoroughly understands the second group of settings (as shown as for the first group), he is to go to the weaving shed & make these settings on the loom which was set up on the first group plus one additional loom, and making the first & the second group of settings. This procedure will be followed through all 12 groups of settings so that when completed, the trainee has completely set up 12 looms.

KEY POINTS.

1. Problem looms have been selected for the trainee to work on. They have been mechnically rated.
2. Instructor should follow up very closely to see that trainee thoroughly understands settings & performs with quality.

TEMPO.

To complete phase-1, it should require 12-18 days in the training centre & 30-35 days in the weaving shed.

This of course, can vary depending upon the ability of the trainee, the condition of the looms & the quality & availability of spareparts.

NOTE.

This loom tuner manul has been specially prepared for:

TIRDC, Karachi.

The adjustments for the looms are those recommended by the loom maker:

Sakamoto, Japan (1967).

WEAVER AMPS LOOM RATING FORM TIRDC

TYPE OF LOOM: SAKAMOTO SO CHECKED BY: .... DATE: ....

	Control of loom parts	Loom No. / Points	Name of Fixer:											
1	Shuttle boxing	5												
2	Clutch	3												
3	Brake	2												
4	Protector motion	5												
5	Crank arm	5												
6	Reed and race board	5												
7	Harness setting/Timing	5												
8	Picking power	2												
9	Pick timing	2												
10	Take - up	5												
11	Fork	5												
12	Temple and cutter	5												
13	Transfer motion	5												
14	Mechanical feeler	5												
15	Hammer and Transfer	5												
16	Shuttle eye cutter + plate	5												
17	Pirn position in shuttle	3												
18	Shuttle eye (Thread guide)	2												
19	Wavy shuttle	3												
20	Cracked shuttle	3												
21	Nylon in shuttle	3												
22	Shuttle boxes	5												
23	Bunch on pirn	3												
24	Warp stop motion	3												
25	Let - off	4												
26	Warp tension	1												
27	Bumpers	1												

PHASE 1 OF THE TRAINING

GROUP 1: A. MOTOR
B. CLUTCH

1A : MOTOR.

A : FUNCTION. Power for the loom is provided by a totally enclosed motor.

B : PARTS.

- Motor
- Driving pulley
- Driven pulley
- Slides
- Base with swiveling shaft
- Adjusting nuts
- Tension springs
- V-Belts

C : ASSEMBLY.

1. Place motor on foundation belts
2. Put on fixing nuts on foundation bolts
3. Put cn V-belts

D : ADJUSTMENT

1. Slide the motor to ensure proper tension of the belts and tight the holding fixing nuts.
2. Adjust the motor spring adjusting nuts to have equal length.

DRIVE BELTS.

Operating conditions for V-belts.

To ensure good operation, the following points concerning V-belts should be watched:

1. The belts should not be taut like violin strings. Proper belt tension shows in the resilient vibration when the belt is slapped with the hand. In full-load operation, the belt may sag slightly at the slack end in the case of distances of 1 cm. and over.

2. Never use any adhesives. The V-belts should be kept clean and dry, and should be protected from oil and grease. V-belts do not require any maintenance.

3. Forcing the belts over the grooves will damage the pull cord and reduce belt life. For placing the belt, shift one of the two shafts with respect to the other. Afterwards, restore the adjustable shaft to its operative position, until the belts have their required tension as mentioned under point 1.

4. Belts and pulleys should not heat up. Hot pulleys indicate a slipping belt. In this case, the time relay in the switch box runs off before time, before the correct speed of the main shaft is attained.

5. If the bearings run hot, the V-belt is too taut. Unduly worn bearings are very often the result of excessive belt tension.

6. In the first weeks of operation, the belts settle into the grooves and relax. At the beginning, this causes some dust. If necessary, slightly re-tighten. Frequent re-tightening is not necessary.

7. Never use new belts in conjunction with settled belts on the same drive. Always replace the whole set, or replace broken belts with old ones only. The V-belts must be tensioned so that they can be pressed in 1 or 2 cm. with the thumb.

IB - CLUTCH

A - FUNCTION - To transmit driving power of motor to loom

B - PARTS
- Clutch lever bracket
- Cone clutch
- Spring handle & bottom bracket
- Clutch lever
- Shifter lever
- Clutch lever joint + spring
- Clutch lever joint rod
- Collar
- Driving pulley
- Driving pulley bush
- Shifter lever peg bracket

C-ASSEMBLY/2. Put driving pulley, with clutch cone on crank shaft

3. Tighten up stop ring holding cone and ballbearing - 3 screws

4. Put on bush

5. Put on shifter lever to starting handle and side frame bracket

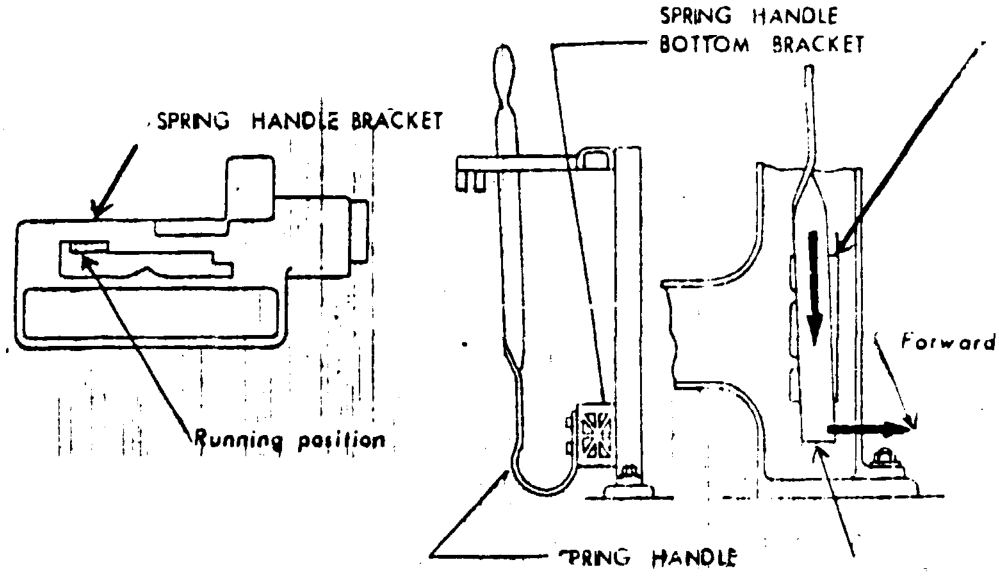
6. Put clutch lever and clutch lever joint rod on crank and connect to clutch lever bracket and shifter lever

/-1. Fix clutch cone on crank shaft taking care that its key should not remain outside.

D-ADJUSTMENTS

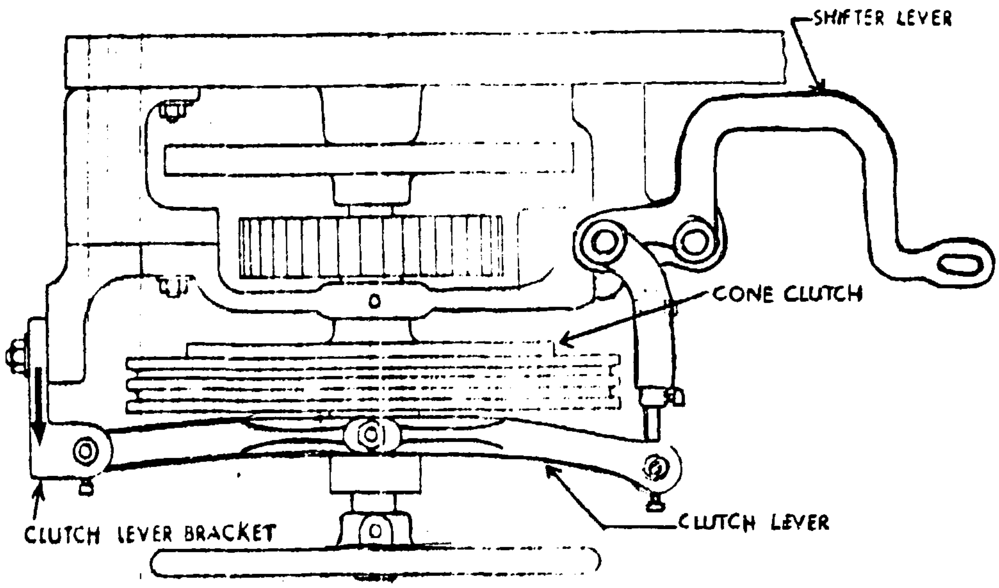
SETTINGS OF SPRING HANDLE

Spring handle at engaged Pos. and fit to bottom bracket by pushing downward. & forward.



Clutch lever bracket should be fitted as outwards as possible

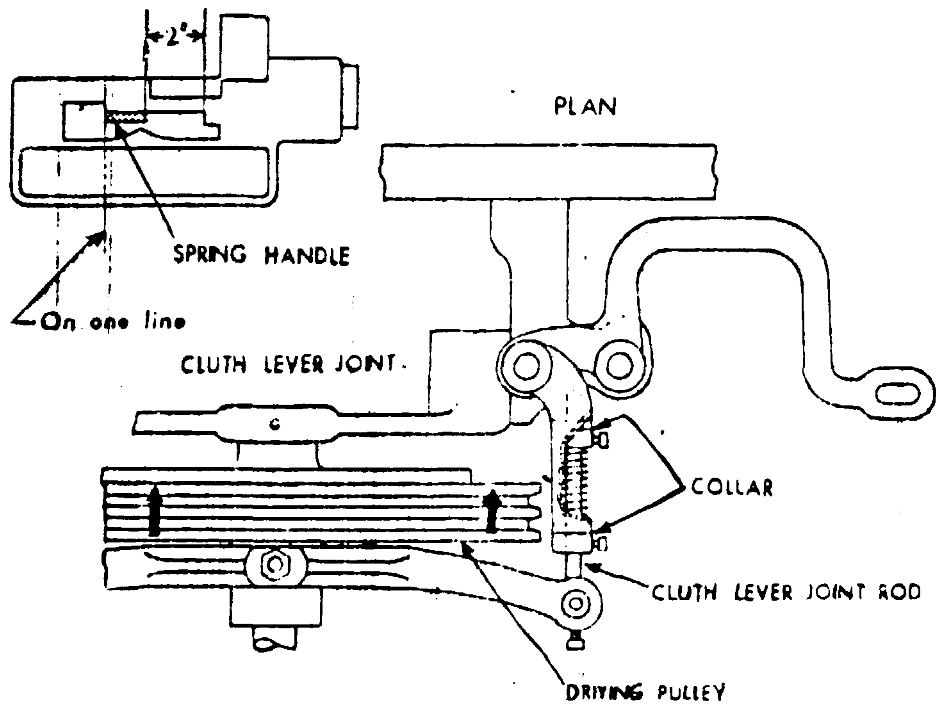
Clearance between clutch cone and clutch lever to be wide as possible



SETTING OF CLUTCH

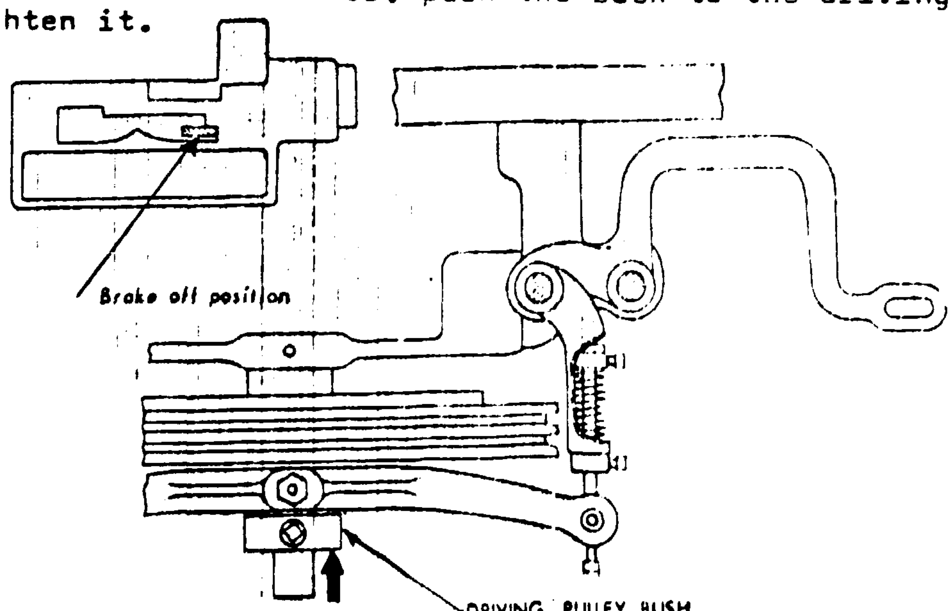
Spring handle 2"(50 mm) apart from resting point.

Clutch cone and driving pulley in fast contact and fix 2 Pieces of the collar on the clutch lever joint rod so as to be in contact with clutch lever joint.



SETTING OF THE BUSH

Put spring handle in brake off Pos. push the bush to the driving pulley and tighten it.



E - <u>LOOM PROBLEMS CREATED BY CLUTCH</u>

a- <u>NOT ENOUGH FRICTION</u>

- Bang off
- Low loom speed
- Clutch disc hot

b- <u>TOO MUCH FRICTION</u>

- Lever hard to pull
- Lever hard to knock off
- Trip motor
- Damage re-set switch

<u>GROUP 2</u> - BRAKE

A - <u>FUNCTION</u> - To ensure a gentle braking action when the brake is applied, so to avoid the shuttle leaving the box.

B - <u>PARTS</u>

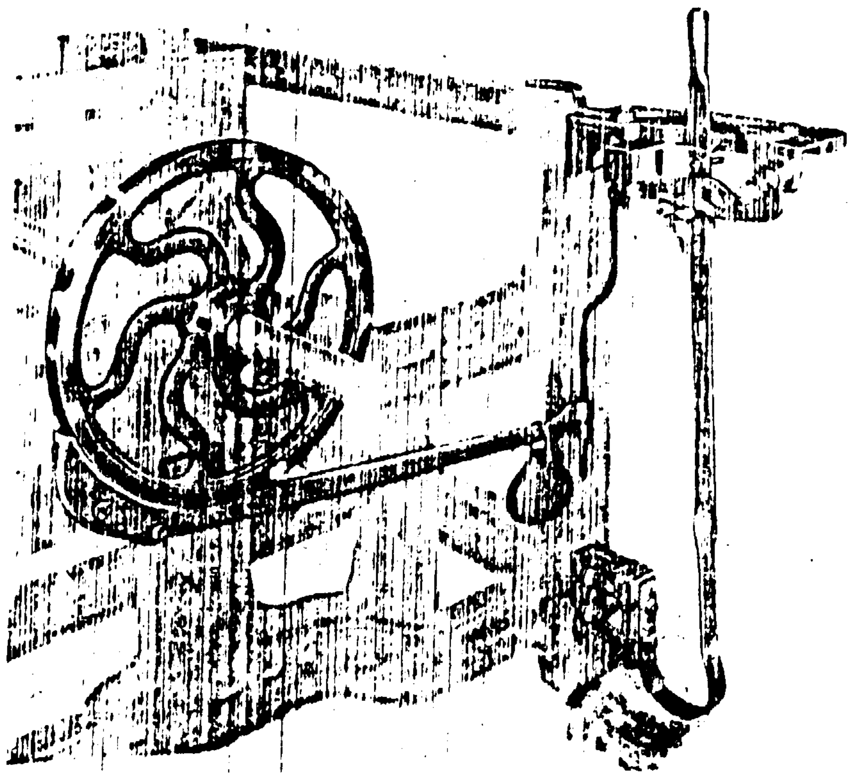
- Brake lever + axel
- Brake shoe
- Brake wheel
- Brake lever weight
- Connecting rod for inclined lever
- Brake lever bracket
- Inclined lever
- Brake hoop
- Brake off tongue

C - ASSEMBLY

1. Fix bracket to loom side frame
2. Put brake lever and axel on bracket
3. Put brake shoe on pin
4. Put wt. on brake lever
5. Put connecting rod to inclined lever pass end through brake lever and put on brake hoop
6. Put inclined lever resting on brake off tongue with bracket

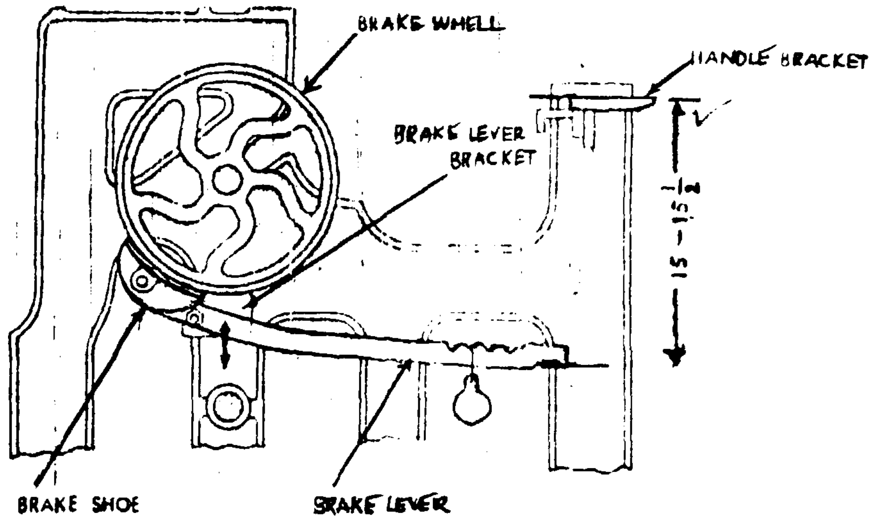
D - ADJUSTMENTS

Brake lever - length of connecting rod: Vertical adjustment 15-15¼" (380 - 387 mm) from upper face of handle bracket to the lower face of the end of brake lever.



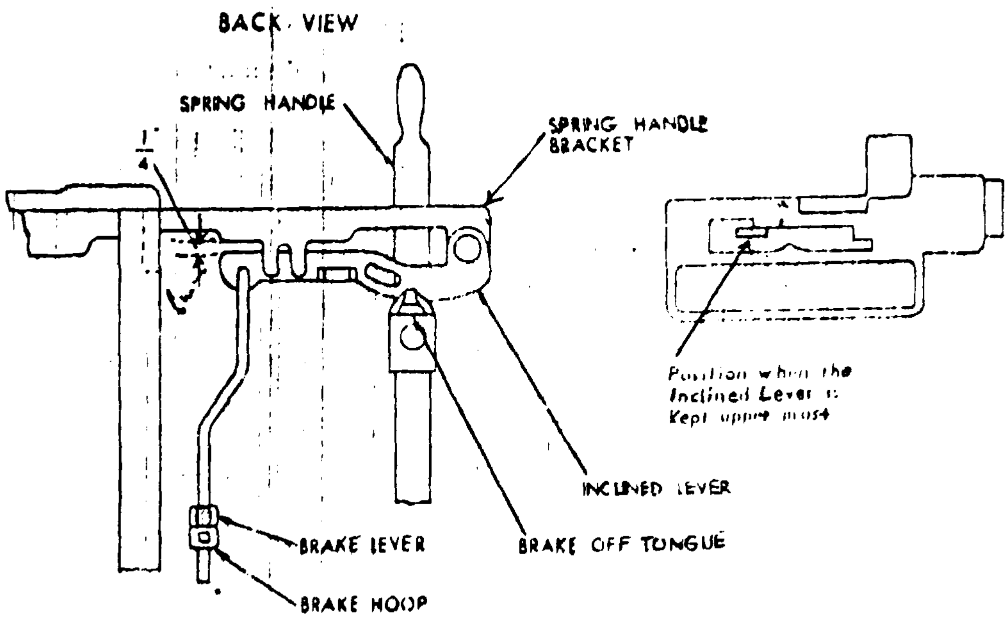
Brake shoe in contact with brake wheel.

Position of weight on brake lever: start in centre, move wt. to increase or decrease.

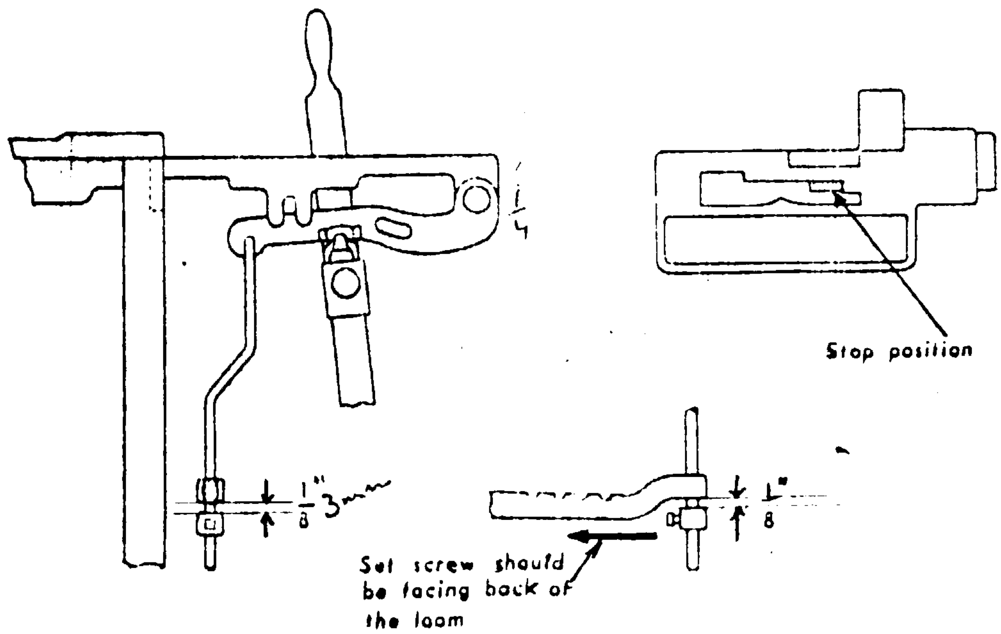


SETTING OF INCLINED LEVER AND BRAKE HOOP

Inclined lever uppermost and spring handle in centre (see fig. 69) set brake off tongue clearance of ¼" between underface of spring handle bracket and upperface of inclined level.



Spring handle in stop pos. fix brake hoop at 1/8" (3 mm) clearance between brake hoop and brake lever.



E - LOOM PROBLEMS CREATED BY BRAKE

a- TOO TIGHT

1 - Running hot, causing

- Excessive wear
- Fire hazard
- Hard to turn by hand
- Strain on friction
- Trip motor
- Low loom speed

b- TOO LOOSE

- Not stopping correctly
- Warp breaks
- Wrong weave (indexing for next pick)
- Mis-matched picks
- Bad start ups

GROUP 3: A : BEAT UP AND PROTECTOR MOTION

B : TEMPLE AND CUTTER

3A : BEAT UP AND PROTECTOR MOTION

A - FUNCTION - To bring the inserted pick to the fell of cloth and stop the loom in case that the shuttle arrives too late in one of the boxes or does not arrive at all in order to avoid warp ends brake or any part damaged.

B - PARTS

- Sley and sword
- Connecting rod
- Crank shaft
- Rocking shaft + brackets
- Reed and cap
- Sley sword bracket
- Breast beam
- Adjusting screw
- Hopper stay and stand
- Wood thrash
- Spider stop + rod + bush
- Duck bills
- Wings
- Suspenders
- Sley ply back
- Weft grate
- Suspender
- Spring hanger
- Stop rod spring
- Spider stop rod spring slot
- Knocking off lever + bolt
- Spider pulley + lever
- Spider pulley guide lever+holder+spring & Bracket
- Spider stop finger + bracket

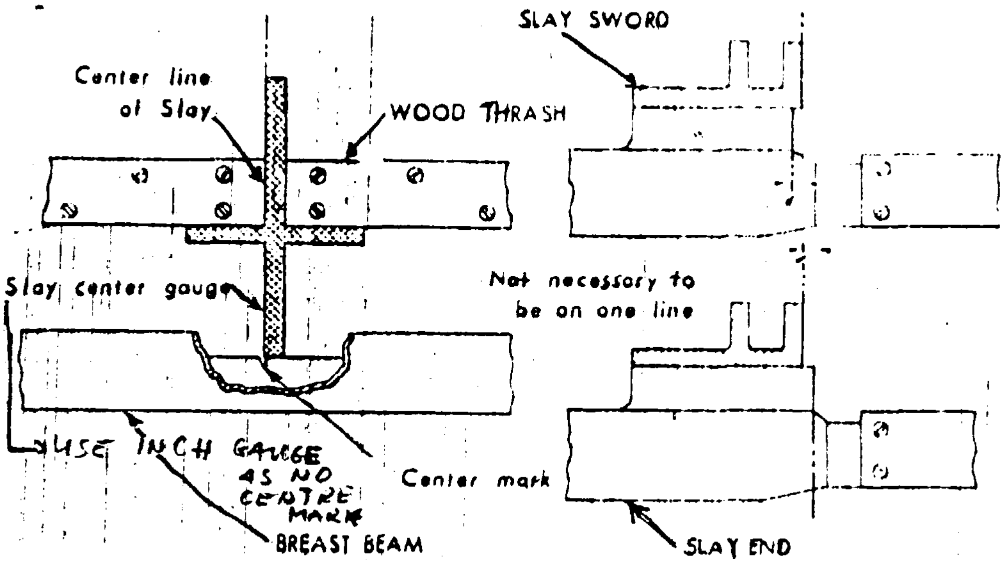
C - <u>ASSEMBLY</u>

1. Put sley sword bracketson rocking shaft, put on rocking shaft bush and bracket on both sides.
2. Put sley swords to the sley sword brackets.
3. Put completed connection rod to the sley.
4. Put sley to sley sword.
5. Put wings, stop rod spring bracket, stop rod bush on sides of stop rod
6. Put knocking off lever on handle side and spider ball bracket pulley lever on hopper (battery) side on stop rod.
7. Fix assembled stop rod on sley swords.
8. Put sley fly-back with the wings and put on stop rod spring on spring slot.
9. Slide reed in the reed cap.
10. Put duck bills with wings.
11. Fix spider stop fingers, brackets along with finger spring on the breast beam.
12. Assemble spider guide lever, holder and spring with bracket put it to the side frame (hopper side)

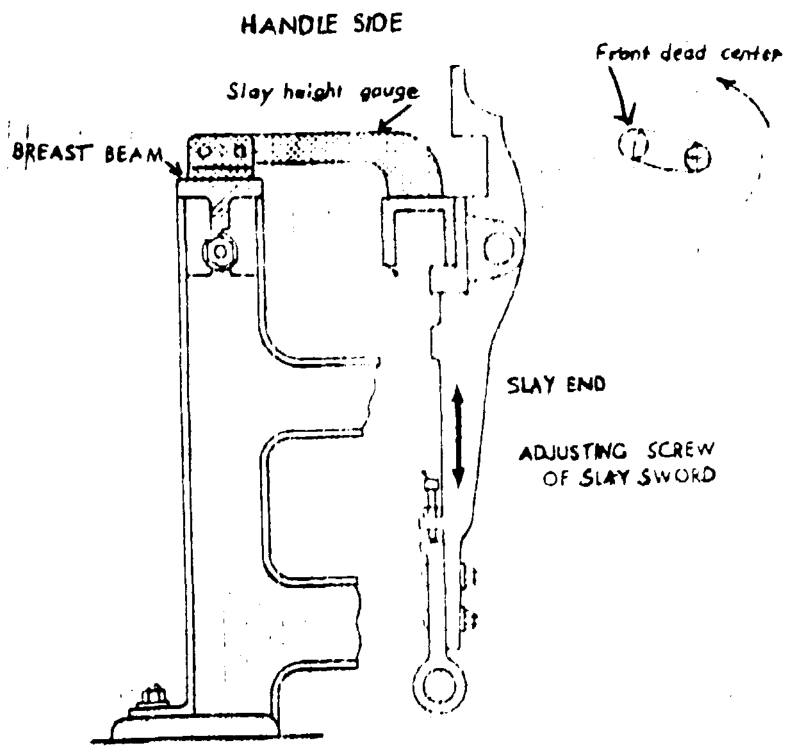
D - ADJUSTMENTS:

SETTING OF SLEY SWORD

Slight side ways play of crank side ways position of sley, using sley centre gauge (No. 17)

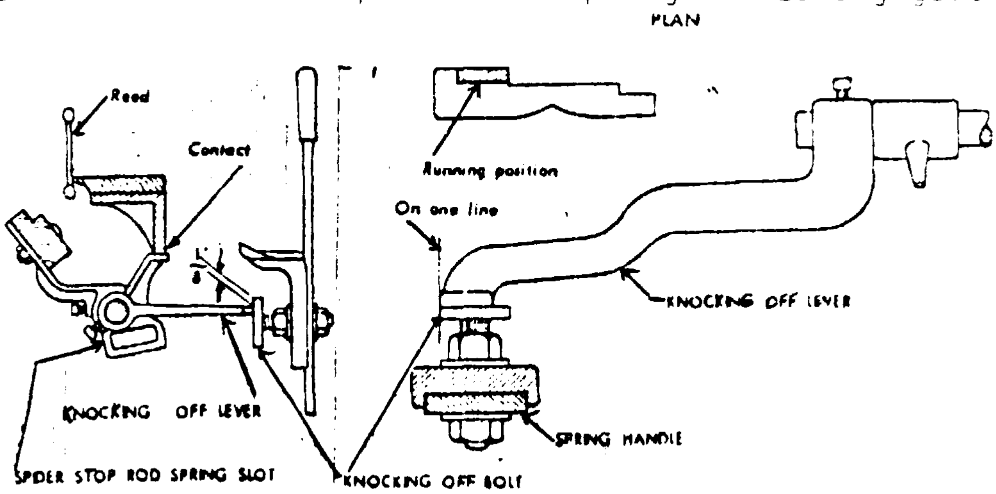


Height adjustment of sley is done by sley height gauge (No. 19)



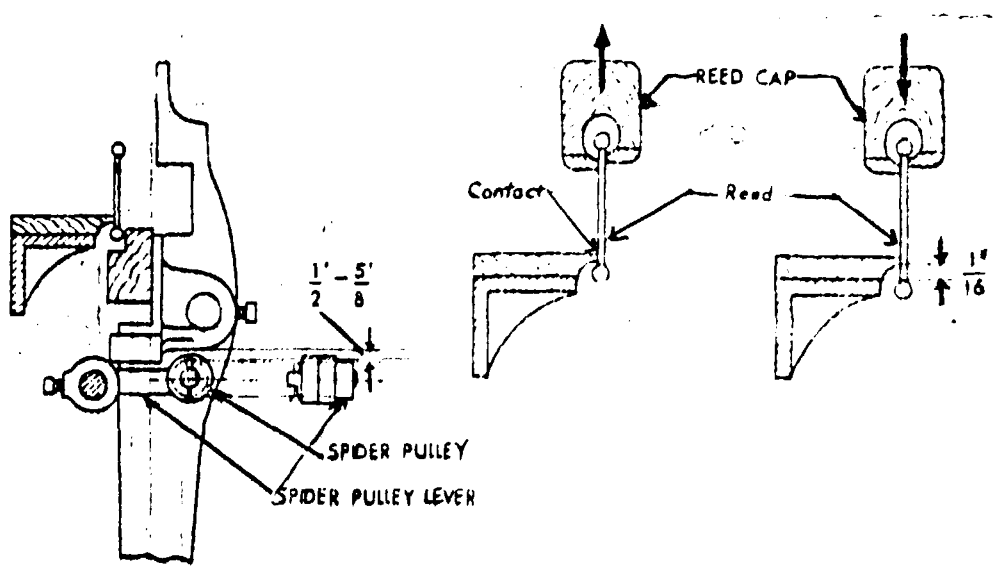
Knocking off lever setting to be 1/8" below upper face of knocking off bolt and the outer face should be in line with that of the bolt.

Sley fly back in backmost position & spring handle engaged.



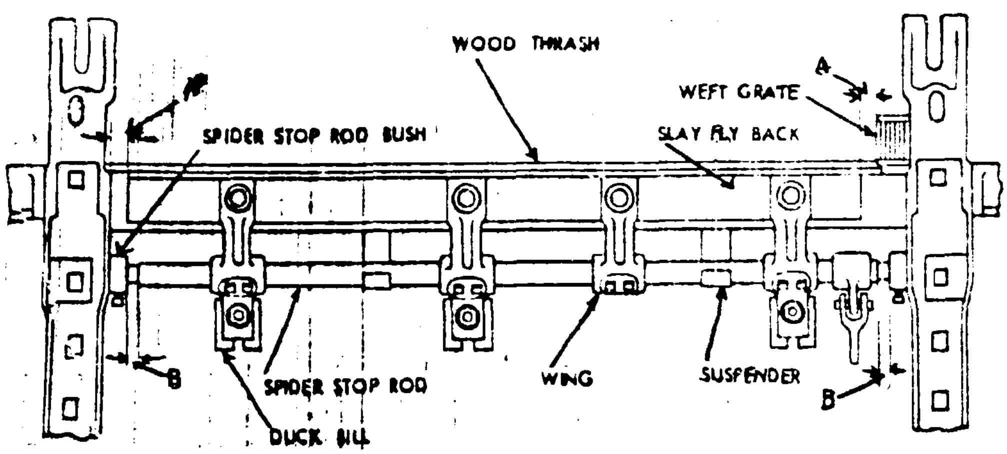
The spider pulley lever to be fixed up with clearance ½" - 5/8" between upper part of spider pulley lever & lower part of sley sword.

Fit reed cap with reed to give clearance of 1/16".

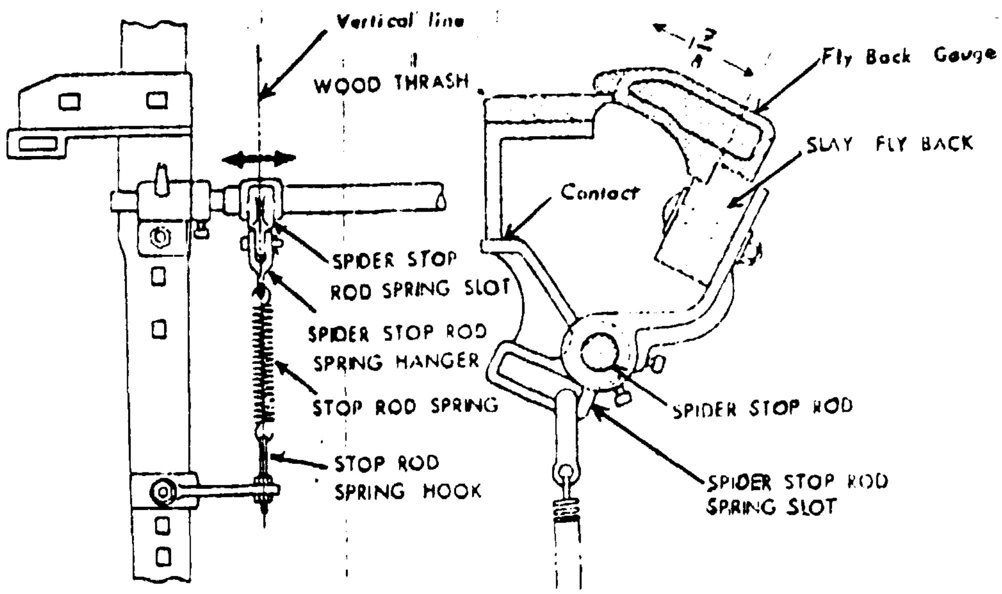


The sley fly back is fitted to the wings after the spider pulley lever and the knocking off lever has been put on the spider stop tod.

BACK VIEW

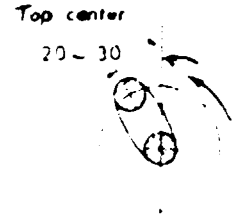


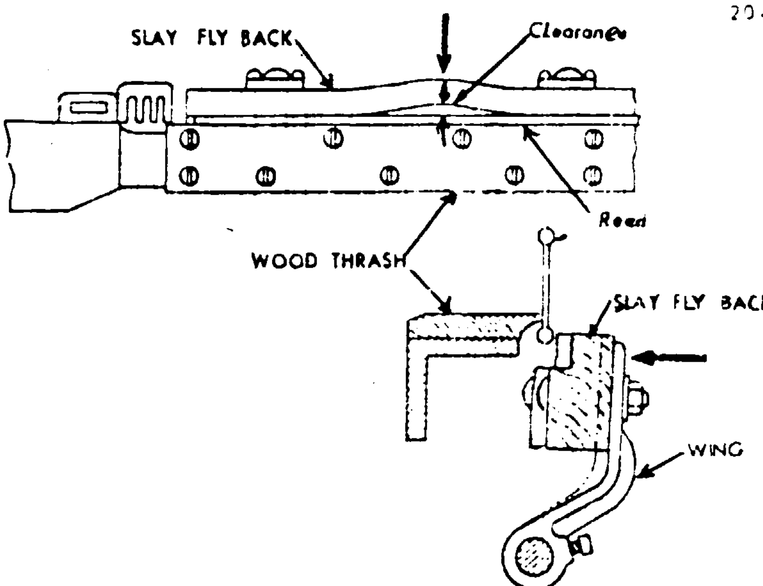
The spider rod spring slot to be set to give 1"7/8" between back part of wood thrash and sley fly back. While slot contacts with angl sley. Spring to be strong enough to prevent the reed from vibrating while running.



The sley fly back keeps the reed in contact with the wood thrash all the length of the reed.

To adjust loosen bolts of the wings, push sley fly back against reed and fasten bolts

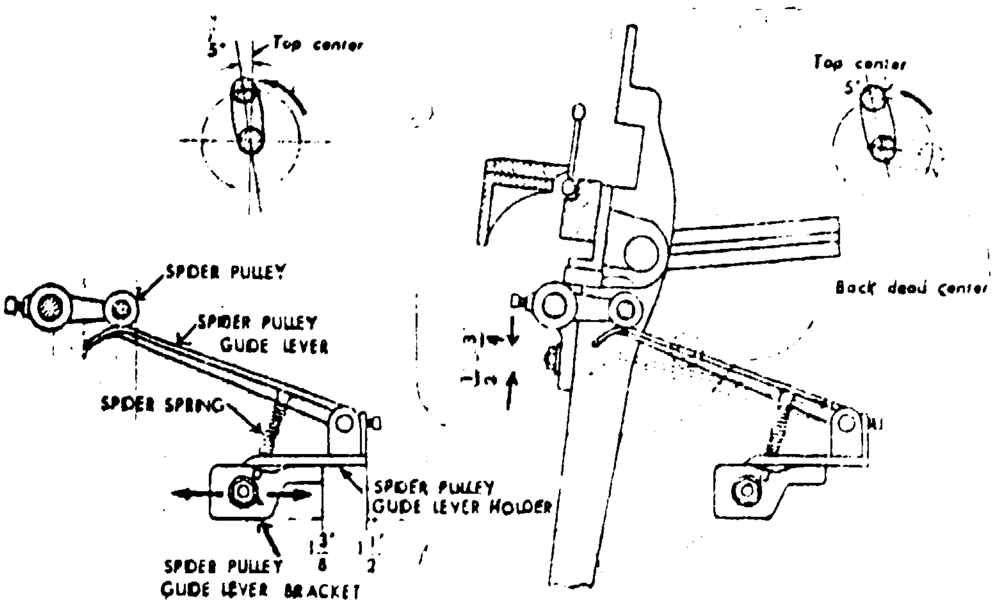




Spider pulley guide lever to be fitted with its bracket at a distance of 1" 3/8-1"$\frac{1}{2}$

Bracket to be fitted on side frame so tip of guide lever can move up and down by $\frac{1}{2}$" - $\frac{3}{4}$"

To increase movement move holder back and to decrease move forward. Spider pulley & guide should contact when loom pos. 5° after T.C.

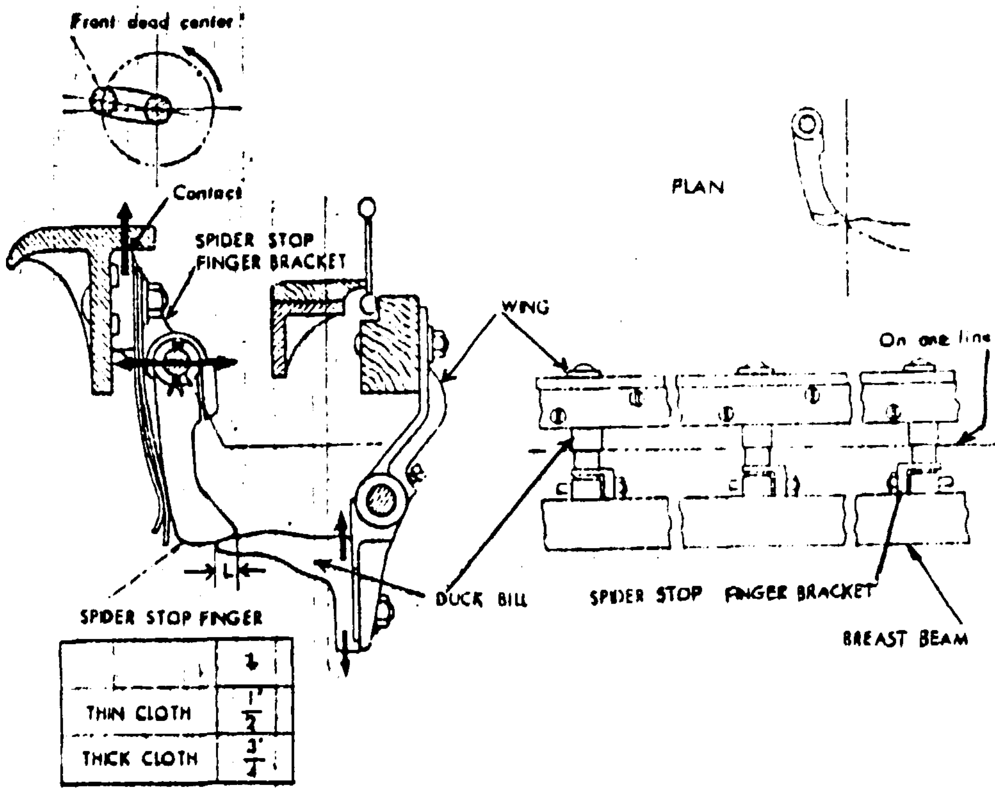


Spider stop finger bracket to be fitted on breast beam by keeping them uppermost within the bolt holes.

Each tip to contact duck bills at the same time. If not, move stop finger stud forward or backwards. At loom pos. fdc. the fingers and duck bills to overlap by:

- Thin cloth - $\frac{1}{2}$"
- Thick cloth - $\frac{3}{4}$"

Crank at fdc and reed is put in the duck bills to be fixed by moving up and down, so upper face of duck bills comes into light contact with lower face of spider stop fingers.



E - <u>LOOM PROBLEMS CREATED BY BEAT-UP</u>

<u>R E E D.</u>

1. Wear shuttle
2. Damage reed
3. Damage leather

<u>S L E Y.</u>

1- Improper transfer
2- Break on change
3- Broken picks
4- Lash-in
5- Empty pirns
6- Thin places
7- False change
3- Bend crank arms (wear crank arm)
9- Break sley and plate
10- Break pirns
11- Trip motor
12- Personal injury

3B : TEMPLE AND TEMPLE CUTTER

A - FUNCTION - To hold fabric in correct width while weaving and to cut the yarn of the ejected pirn held by the cloth and shuttle eye cutter after each change.

B - PARTS - Temple slide bracket
- Temple rod spring
- Temple rod slide
- Temple case
- Temple cap
- Temple cutter lever + roller + bracket
- Temple rings + washers + spindle
- Ratchet stop finger
- Ratchet wheel
- Feed pawl + lever
- Ratchet box + bracket + stud
- Starting arm + rod
- Connecting rod
- Starting finger
- Temple cutter cam
- Vertical lever
- Shifting rod + action lever + adjuster
- Moving blade
- Temple cutter blade + guide + action roller
- Limiting screw

C - ASSEMBLY

-1- Fit temple slide with beam breast

-2- Fit temple rod with temple rod slide on temple slide bracket

-3- Fix temple rod spring with temple rod slide

-4- Fix assembled temple boxes on temple rod

-5- Fix temple cutter lever bracket on cloth roller lever bracket.

-6- Fix temple cutter lever with its lever & vertical lever on temple cutter lever bracket

-7- Fix ratchet box bracket on its stud at side frame (B.S.)

-8- Fix ratchet box on its bracket

-9- Fit temple cutter cam on bottom shaft

-10- Fix starting arm on starting rod with connecting rod at its lower end.

-11- Fit starting finger with connecting rod

-12- Fix shifting rod with adjuster to vertical lever

-13- Fix shifting rod with adjuster and vertical lever

-14- Fix shifting rod action lever & spring on shifting rod

-15- Fix moving blade on temple cutter blade

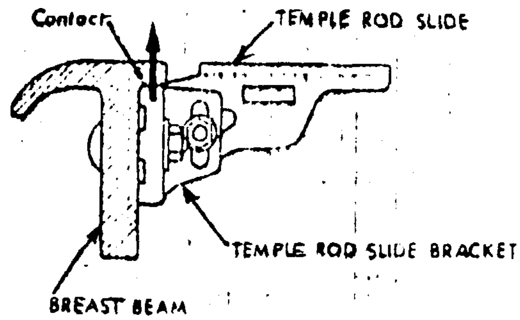
-16- Attach temple cutter blade along with temple cutter action roller through temple cutter blade guide

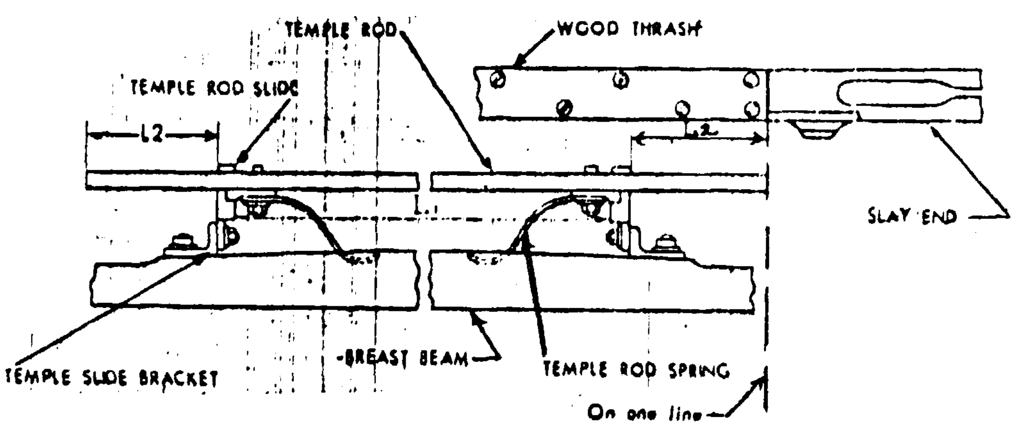
D - ADJUSTMENTS

SETTING OF TEMPLE SLIDE BRACKET AND TEMPLE ROD

Fix the templeslide bracket after fully lifting to the breast beam. Length of temple rod out of temple rod slide on both ends should be as equal as possible.

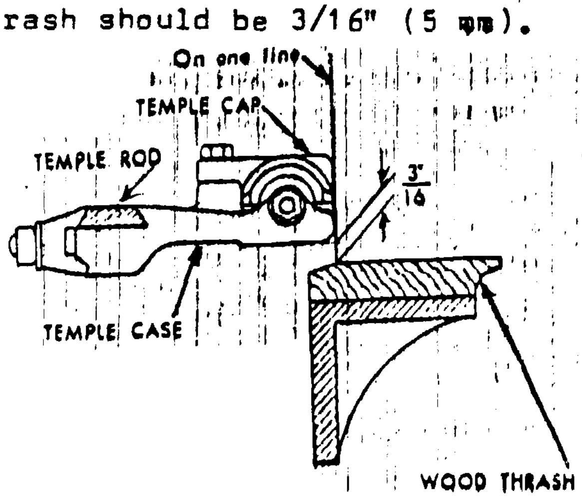
Fix the right hand side end of the temple rod in line with the border of the wood thrash and sley end.

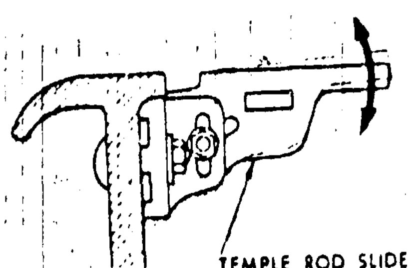




SETTING THE HEIGHT OF THE TEMPLE CASE

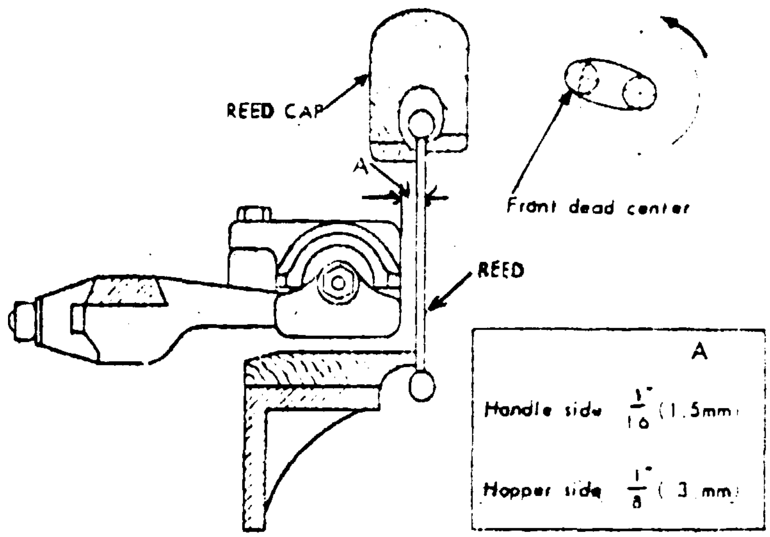
The clearance between the temple case and the wood thrash should be 3/16" (5 mm).





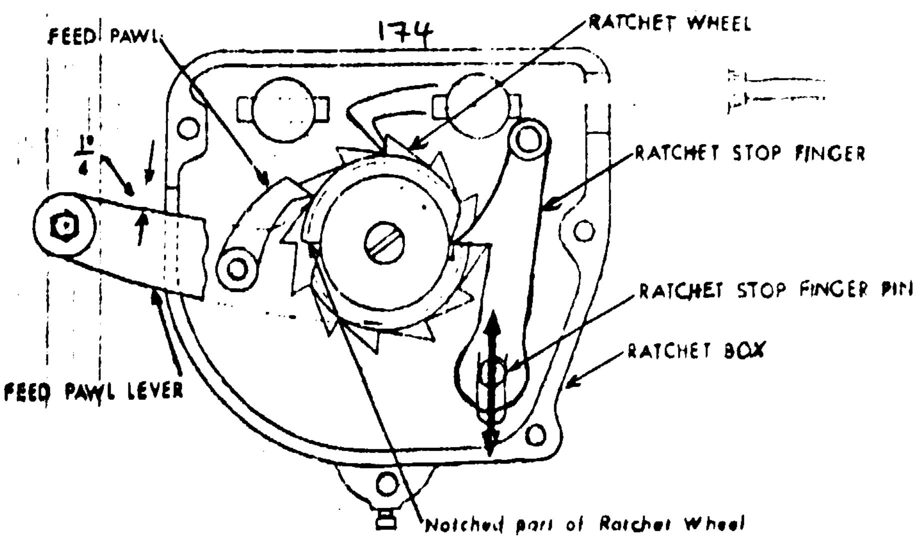
SETTING OF TEMPLE CASE AGAINST REED

The clearance between the temple case and the reed at fdc should be 1/16" (1.5 mm) on handleside and 1/8" (3 mm) on hopper side.



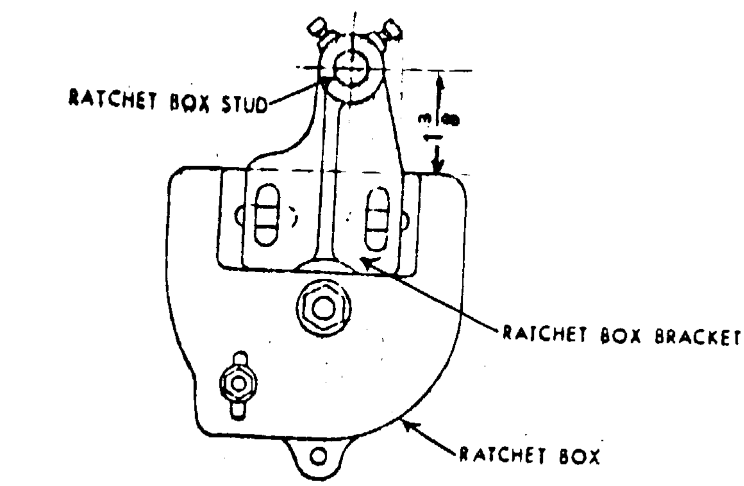
SETTING THE RATCHET STOP FINGER

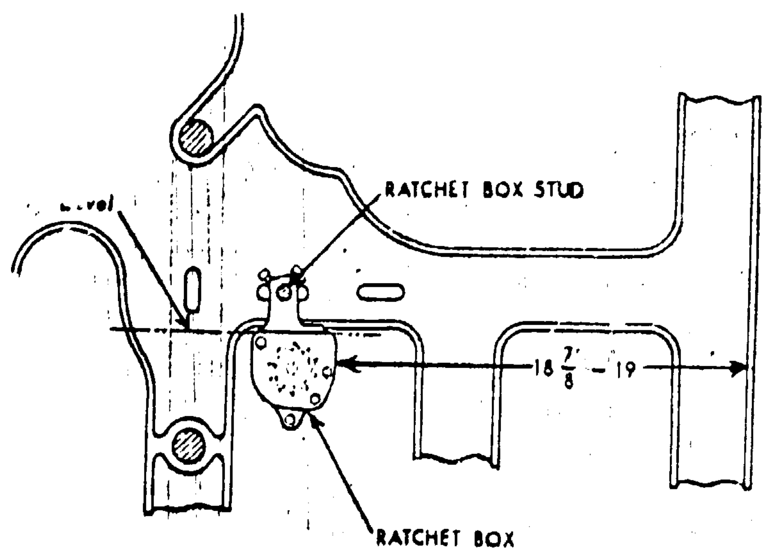
Fix the ratchet stop finger so that it should fall strictly into the recess on the ratchet wheel when the feed pawl lever is 1/4" (6 mm) from the end of the opening in the ratchet box.



SETTING THE RATCHET BOX STUD

Distance between the upper face of the ratchet box and the centre of the ratchet box stud be 1"3/8" (35 mm). Distance between the front faces of the side frame and the ratchet box be 1 7/8" - 19" (480 - 483 mm).



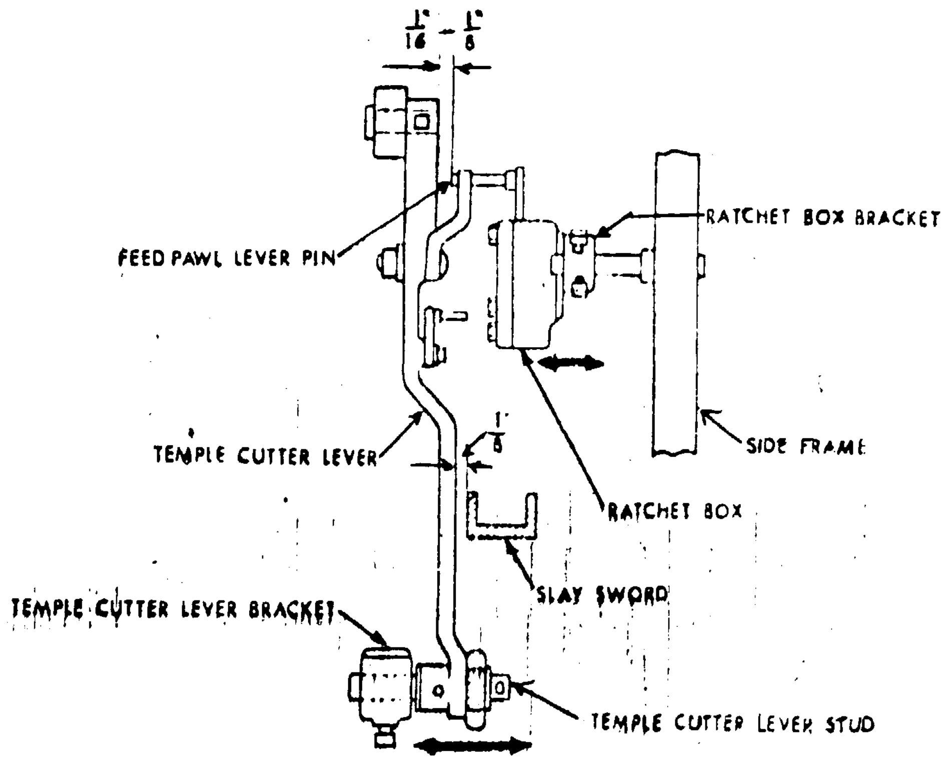


SETTING THE TEMPLE CUTTER LEVER & RATCHET BOX BRACKET

Fix the temple cutter lever bracket alongwith the lever on the cloth roll lever bracket.

Clearance between temple cutter lever and the sley sword be 1/8" (3 mm). The clearance between the tip of the feed pawl lever pin and the side face of the temple cutter lever should be 1/16" - 1/8" (1.5 - 3 mm)-

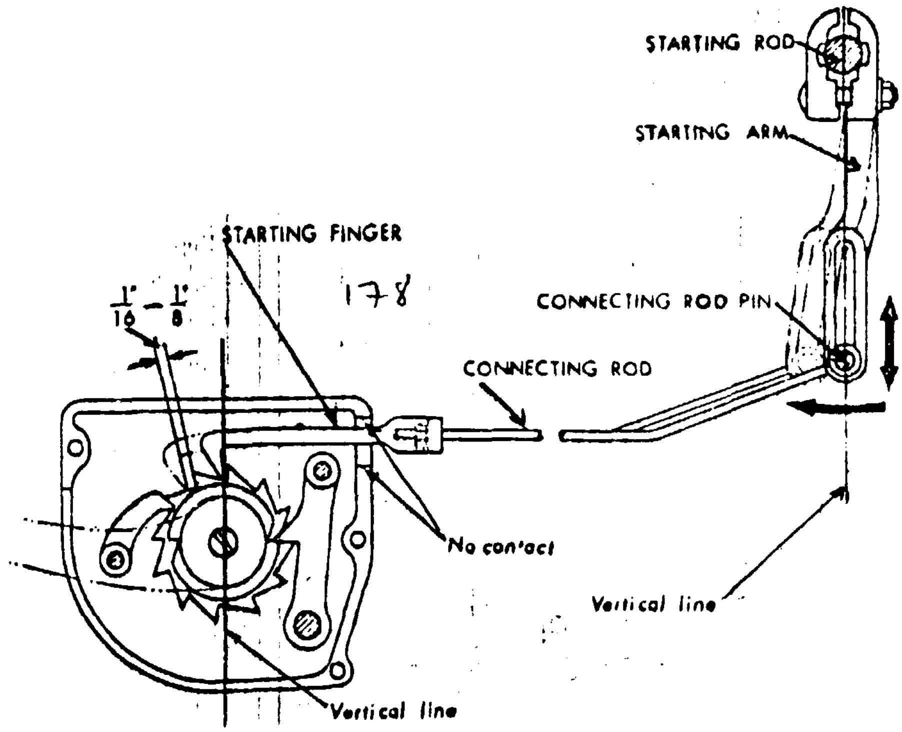
The upper face of the ratchet box should be kept in level before fixing to the stud by the set screw on the ratchet box bracket.



SETTING THE STARTING ARM AND CONNECTING ROD

Starting arm slot should be almost vertical when being fixed on the staring rod.

The connecting rod pin is set temporarily in the bottom of the slot. Adjust the length of the connecting rod so that when ratchet stop finger rests in the recess on the ratched wheel, the tip of the starting finger be in slight contact with the bottom of the tooth which is a little ahead of the vertical line extending through the centre of the ratchet wheel. Fine adjustment in this case is done by changing the slant of the starting arm.



SETTING THE STROKE OF STARING FINGER

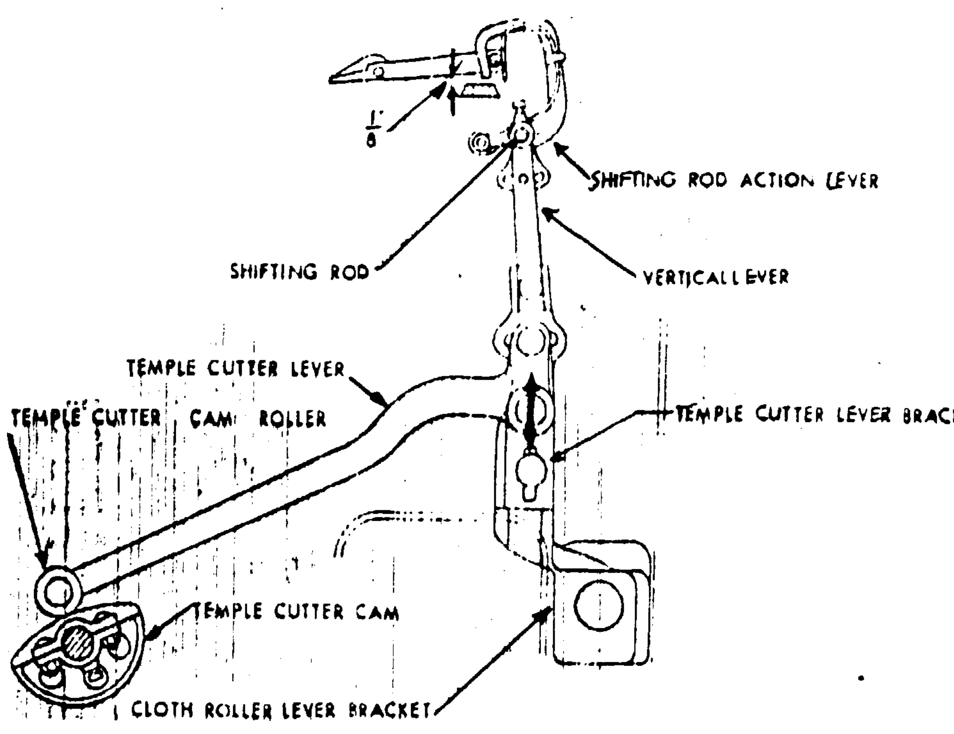
Move the connecting rod pin vertically in the starting arm slot so that the tip of the starting finger advances one pitch + 1/16" - 1/8" (1.5 - 3 mm) when the shuttle feeler has protruded to the utmost.

Modify the curve of the connecting rod when the ratchet wheel is not turned by the prevented free movement of the starting finger.

SETTING THE TEMPLE CUTTER LEVER BRACKET

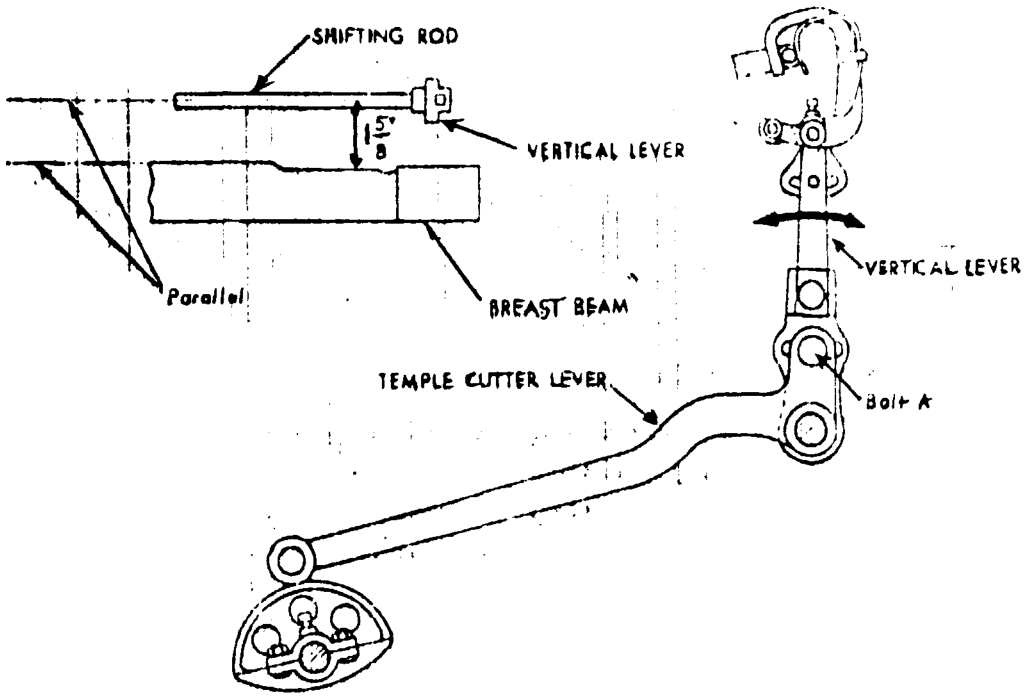
Set the shifting rod parallel to the breast beam.

The clearance between the lower tip of the shifting rod action lever and the upper face of the temple rod when the temple cutter cam roller is on the lowest position of the cam should be 1/8" (3 mm).



SETTING THE VERTICAL LEVER

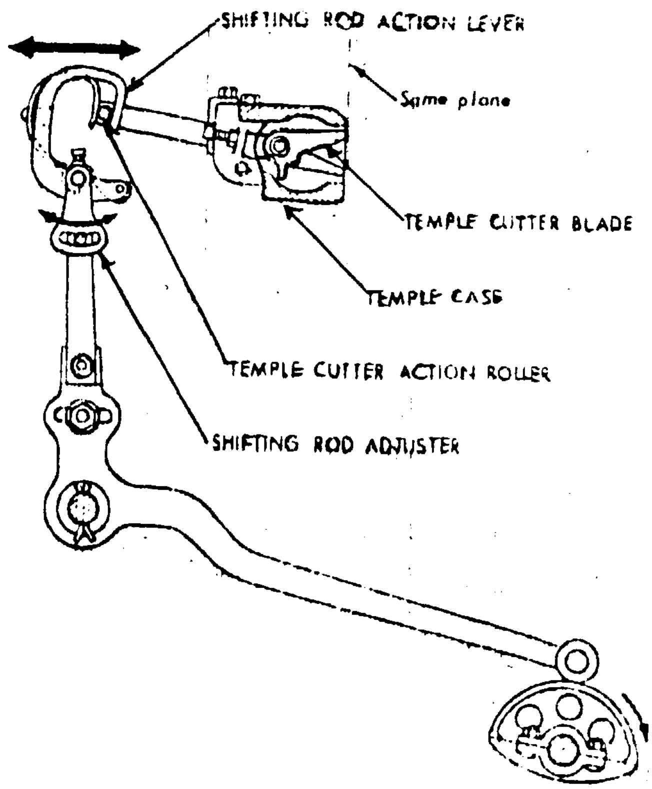
The clearance between the center line of the shifting rod and the breast beam when the temple cutter cam roller is on the top position of cam should be 1" 5/8" (41 mm).



SETTING THE S..IFTING ROD ADJUSTER

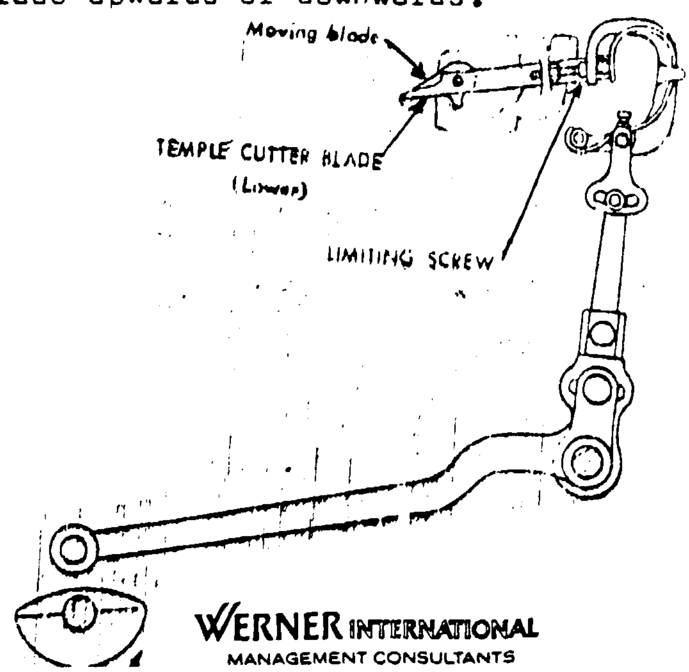
Put the temple cutter cam roller on the top position of the cam.

Change the position of the shifting rod adjuster so that the tips of the temple cutter blades are on the same plane with the front face of the temple case when the temple cutter action roller is in contact with the shifting rod action lever.



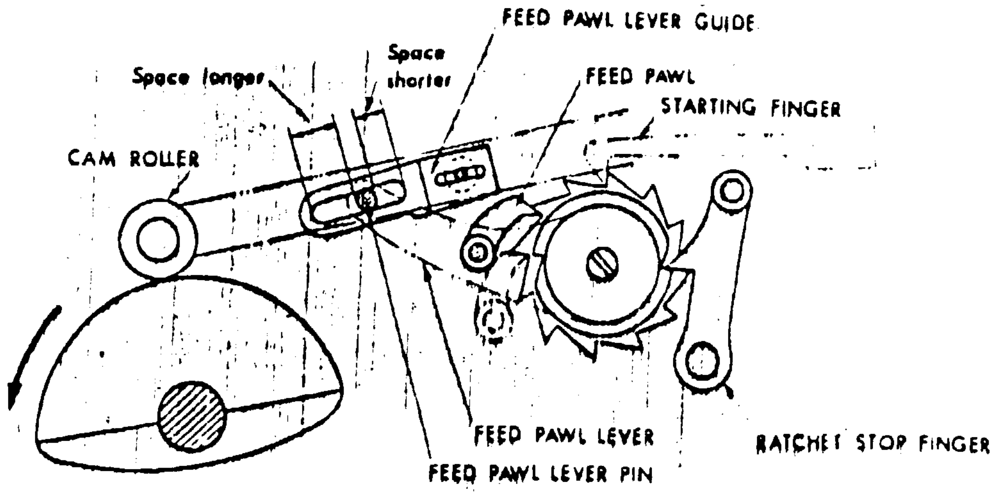
SETTING THE LIMITING SCREW

Put the temple cutter cam roller above the lowest portion of the cam (no contact of roller with the cam).Turn the limiting screw into contact with the shifting rod action lever. The movable blade and the lower fixed blade of the temple cutter at this time should overlap each other and the movable blade comes down a little beyond the dixed one. There should be further allowance for movement of the movable blade. That is, the limiting screw should be adjusted so that there may be some play when moving the movable blade upwards or downwards.



SETTING THE FEED PAWL LEVER GUIDE

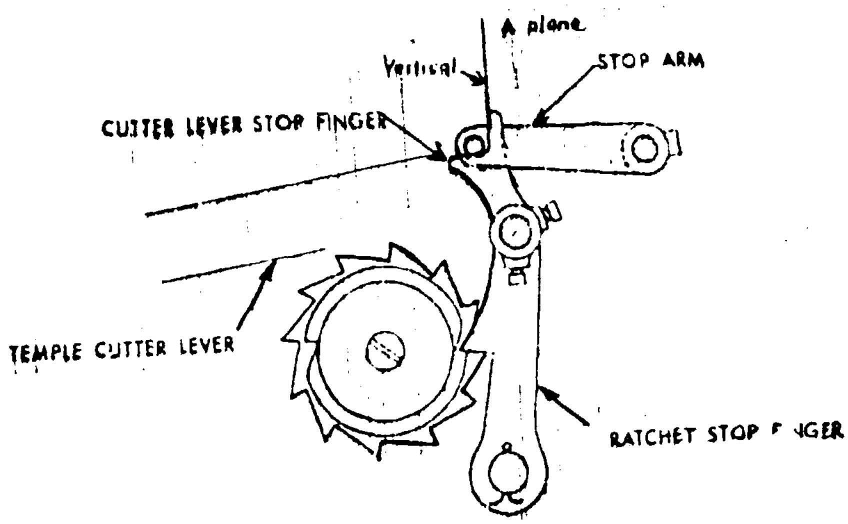
Place the cam roller on the top position of cam and the ratchet stop finger in the recess on ratchet wheel. Fix the feed pawl lever guide on the temple cutter lever so that the tip of the feed pawl contacts the bottom of the tooth which is by two teeth in the rear of the position where starting finger is waiting for action. Feed pawl lever pin should be set a little ahead of the center of the slot in the guide for smooth working.



SETTING THE RATCHET STOP FINGER AND STOP ARM

Fix the face A of the cutter lever stop finger in almost vertical position when cam roller is on top position of cam and the ratchet stop finger in the recess of the ratchet wheel. Fix the stop arm on the temple cutter lever so that its pin is in contact with the recess of the cutter lever stop finger. Turn the cam until the roller is over the lowest position of the cam.

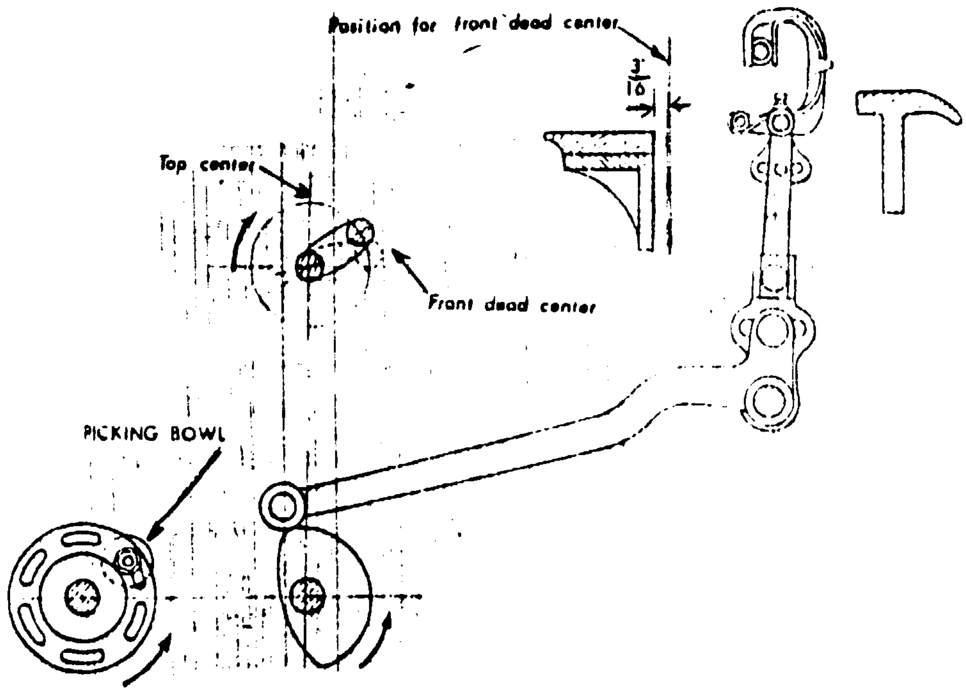
Turn the ratchet wheel to take the ratchet stop finger out of the engagement when the cutter lever stop finger swings out of the stop arm.



SETTING THE TEMPLE CUTTER CAM

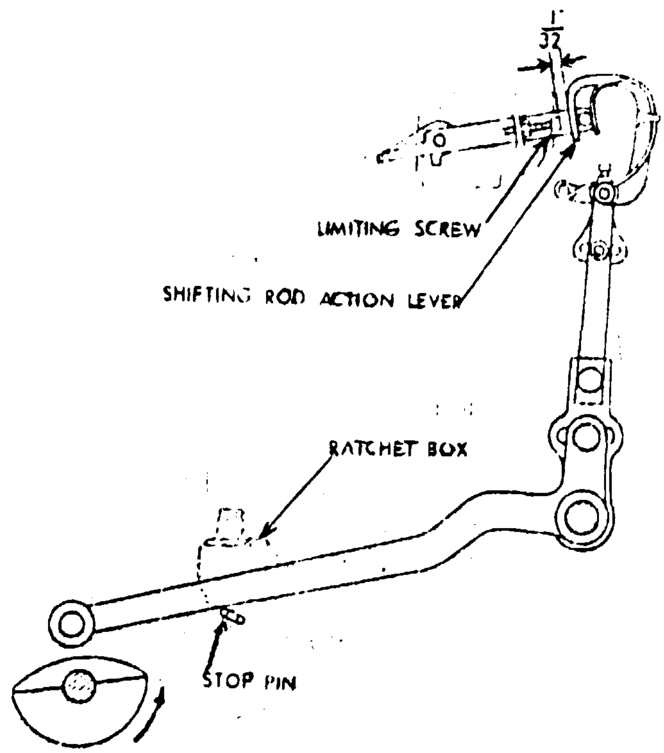
Turn the loom until handle side picking bowl comes to its front side.

Place the sley to a position 3/16" (5 mm) away from fdc towards top center. Fix the cam so that in this position roller should begin to run to the top position of the cam.



SETTING THE STOP PIN

Put the cam roller above the lowest part of the cam whille the temple cutter is under operating condition. Fix the crank shaped stop pin to support the temple cutter lever with a clearance of 1/32" (1 mm) between the shifting rod action lever and the limiting screw.



E - <u>PROBLEMS CREATED BY TEMPLE CUTTER</u>

- Lashing - in
- Long ends at cloth

<u>TEMPLE CLOSE TO SLEY</u>

- Damage reed
- Break ends
- Break selvedge
- Break weft

<u>TEMPLE FAR BACK TO SLEY</u>

- Break selvedge
- Narrow cloth
- Break weft

<u>TEMPLE TOO LOW</u>

- Damage race board
- Break out ends
- Damage spikes

<u>TEMPLE TOO HIGH</u>

- Overshots
- Throw shuttle
- Not boxing
- Wear shuttle

<u>SELVEDGE IN LINE (INSIDE OF LINE)</u>

- Narrow cloth
- Knock-out selvedge
- Break selvedge ends

<u>SELVEDGE IN LINE (OUTSIDE OF LINE)</u>

- Not holding properly
- Improper spread
- Knock-out selvedge
- Break ends

GROUP 4: A. SHUTTLES

B. PICKING MOTION

4.A. SHUTTLE.

1. FUNCTION:

To carry the weft pirn and insert the weft in the cloth.

2. PARTS:

2.1 Tip

2.2 Shuttle eye

2.3 Shuttle jaw

2.4 Nylon brake rings

3. CHECKING:

a) pirn position in the shuttle jaw

b) shuttle eye for cleanness

c) wavyness (wash board)

d) cracks

e) tension by nylon rings

f) smoothness of tip

g) clearance between pirn in the shuttle and inclination (1 mm)

4. LOOM PROBLEMS CREATED BY SHUTTLE:

a. Pirn alignment.

1. Break weft
2. Break on change
3. Cut warp ends
4. Knock out weft
5. Kinky weft
6. Bad change

b. <u>eye loose.</u>

1. Cut warp ends
2. Break weft
3. Broken picks

c) <u>Nicks on surface of shuttle.</u>

1. Cut warp ends
2. Weft breaks

d) <u>Nick near eye (groove).</u>

1. Broken picks
2. Thin places

e) <u>Loose screw.</u>

1. Break weft
2. Cut warp ends
3. Damage shuttle
4. Tear leather
5. Bad change
6. Damaged reed

f) <u>Loose nylon (tension)</u>

1. Kinky weft
2. Break weft
3. Loom stoppage
4. Improper working of shuttle eye & temple cutter
5. Lashing-in

4 B - PICKING MOTION

A - FUNCTION

To strike the shuttle from the handle side to the hopper side and from the hopper side to handle side.

The strength of picking is determined by the position of adjusting screw on the side lever bracket. When raised, the strength is increased whereas when lowered, it is decreased. The picking strength depends on a number of various factors, in particular:

- The cloth to be woven
- Start of the pick
- The loom speed
- The dimensions and weight of shuttle

As a general rule, from the mechanical point of view as well as from the weaving technique, picking should be as soft as possible.

B - PARTS

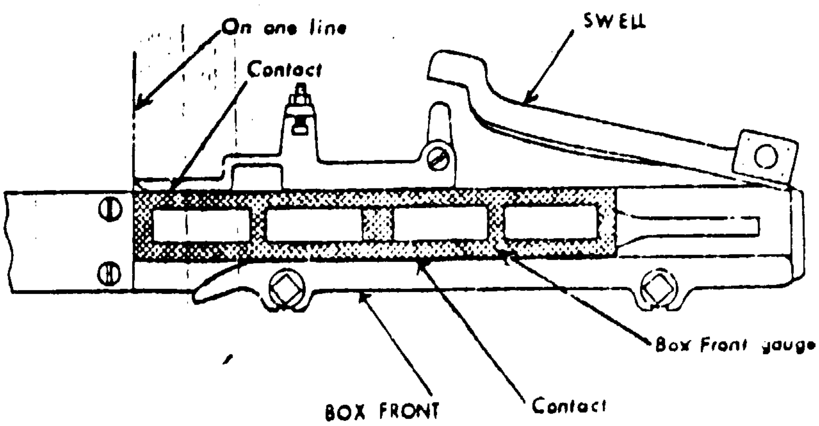
- Lower stick guide
- Picker
- Picking stick & cap & cros. cannon
- Sley and stay
- Buffer strap & holder + support
- Auxiliary buffer
- Bumper shim + bracket
- Side lever + guard
- Side lever cap
- Picking bowl + picking plate
- Picking nose
- Side lever spring + bracket
- Side lever bumber

C - ASSEMBLY

1. Fix the box front and swell
2. Fix the picking stick
3. Fix the guard plates
4. Fix cross cannon on rocking shaft
5. Fix race end stay, one end under shuttle box & other on cross cannon
6. Fix buffer holder support with race end stay
7. Fix buffer holder one end with support & other with sley end
8. Fix buffer sent on buffer holder
9. Fix oxillary buffer with buffer holder support
10. Fix picking stick with picker in its cap on cross cannon spring bolt
11. Fix side lever along with its bumper with side frame
12. Fix side lever bracket along with cap & spring in the side frame
13. Fix side lever along with picking nose in its cap
14. Fix picking plate with picking bawl on bottom shaft

D - ADJUSTMENTS

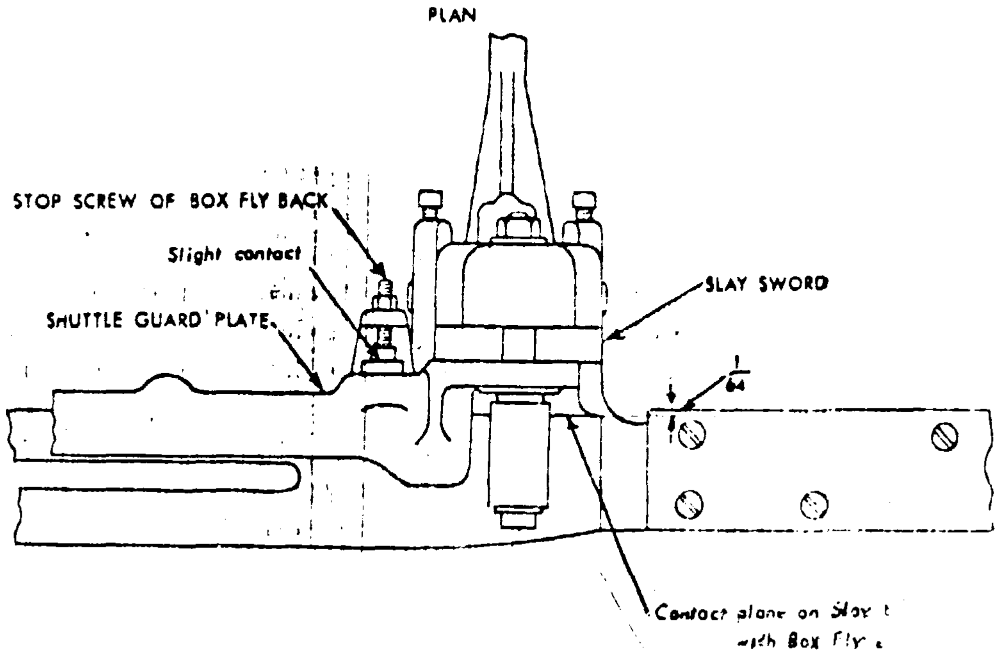
Setting of box front, take off swell spring & put box front gauge (No.22) in contact with box fly back & meet inside of gauge to sley end. Box front in contact with gauge & tighten up.



SETTING OF WOOD THRASH & STOP SCREW OF THE BOX FLY BACK

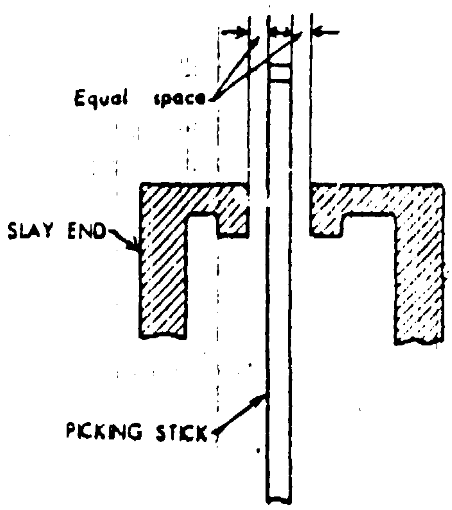
Back edge of the wood thrash be fitted 1/64" (o.4 mm) backward than the back edge of the sley end which contacts box fly back.

Stop screw of box fly back in this position should slightly contact shuttle guard plate.



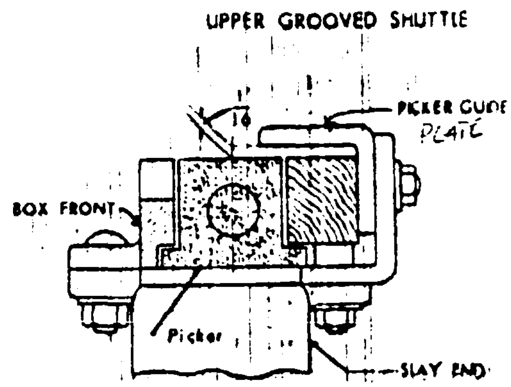
PICKING STICK AND SLEY END ADJUSTMENT

Picking stick should move in centre of groove on upper face of slay end.



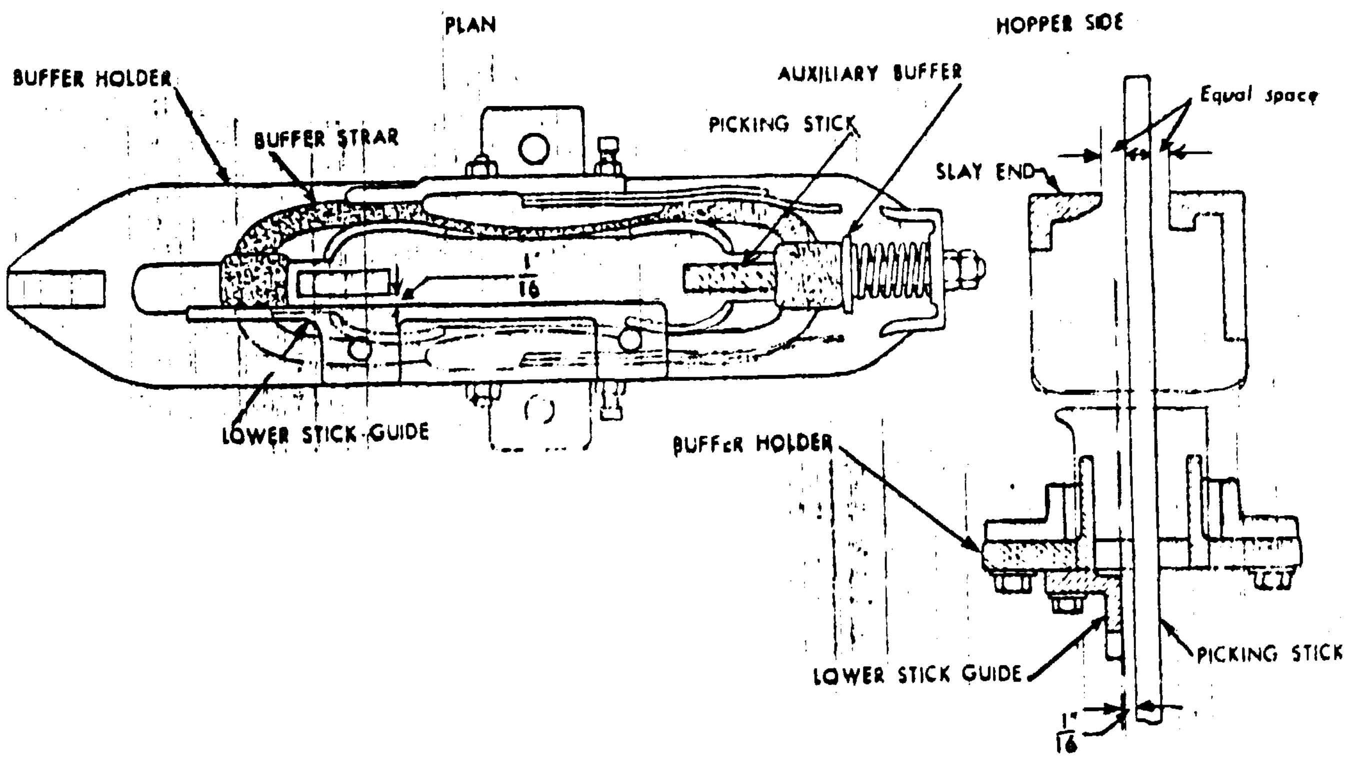
ADJUSTMENT OF SHUTTLE GUARD PLATE & PICKER GUIDE PLATE

Shuttle guard plate should have clearance of 1/16" measured outside end of shuttle box between upper face of picker and lower face of shuttle guard plate.



SETTING OF LOWER STICK GUIDE

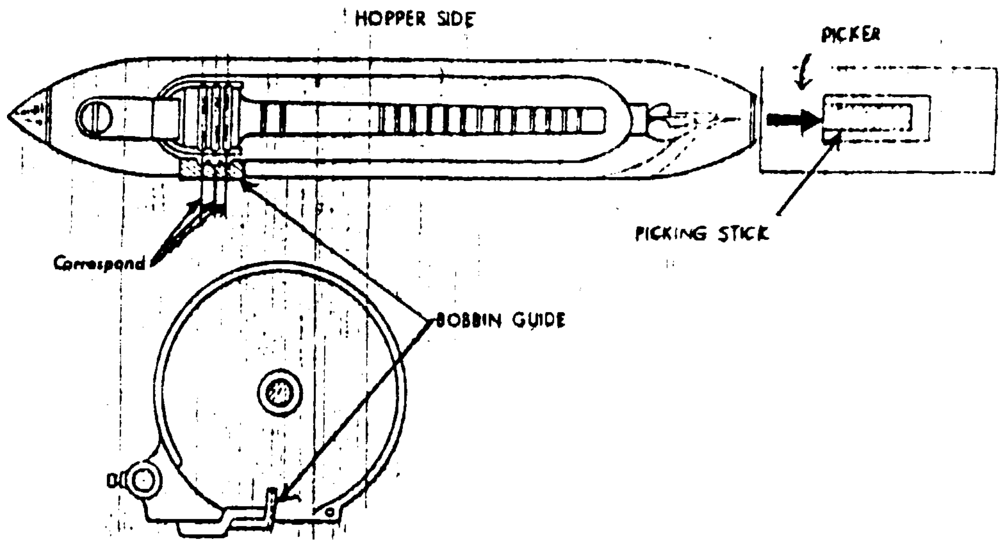
Clearance between lower stick guide and the picking stick on the hopper side when in the center of the slot in the sley end is 1/16" (1.5 mm)



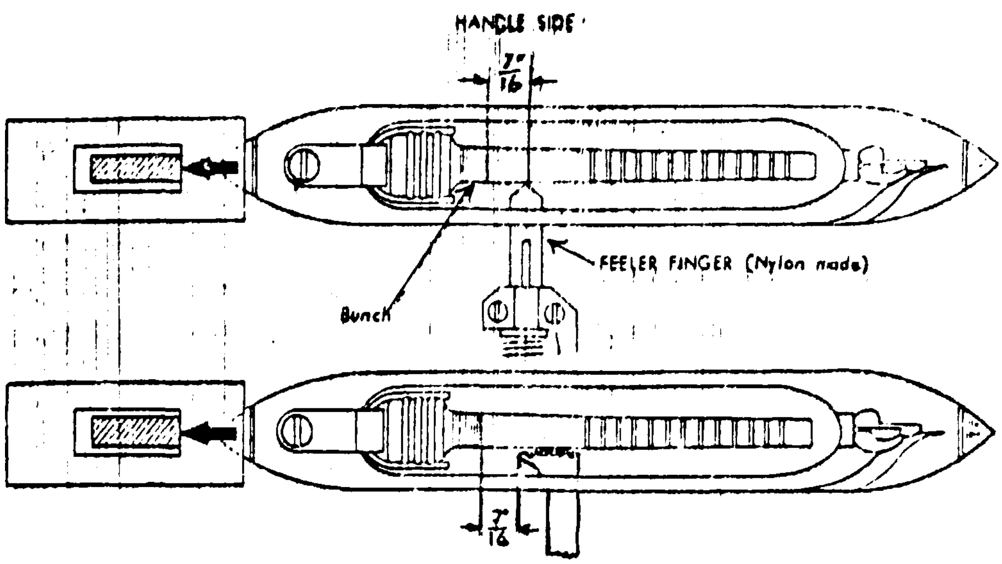
SETTING OF BUFFER HOLDER AND BUMPER

Insert a shuttle with bobbin fully into the shuttle box on hopper side.

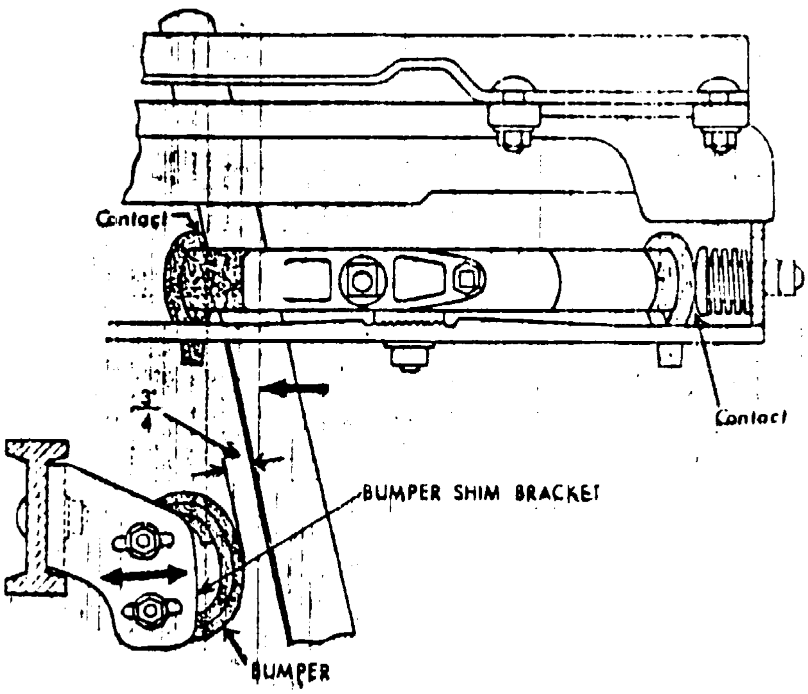
Make adjustment at this time by the buffer holder so that three rings of bobbin in the shuttle should correspond to the grooves of the bobbin guide on the hopper stand respectively.



On the handle side, buffer holder is set so that the feeler finger should contact the bobbin being 7/16" (12 mm) away from the right end of the bunch on bobbin of fully inserted shuttle in the box.

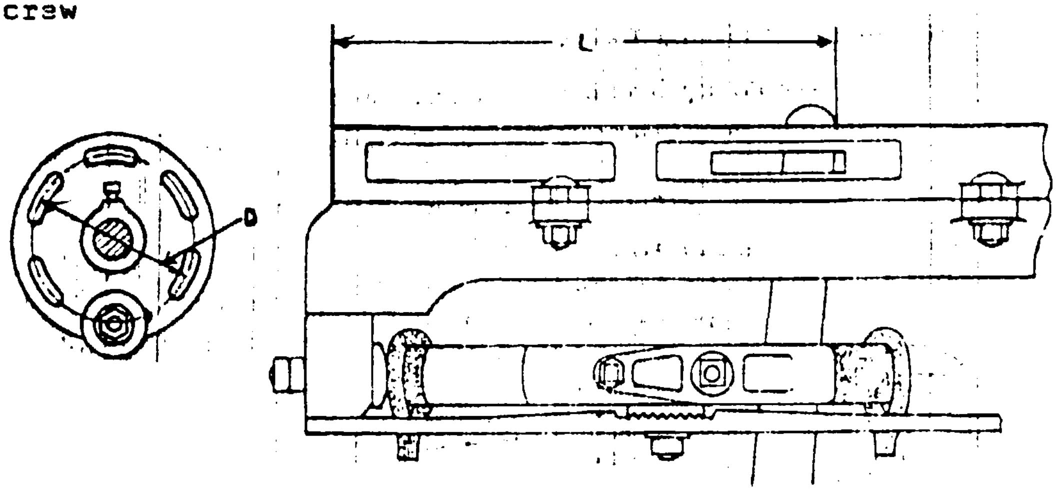


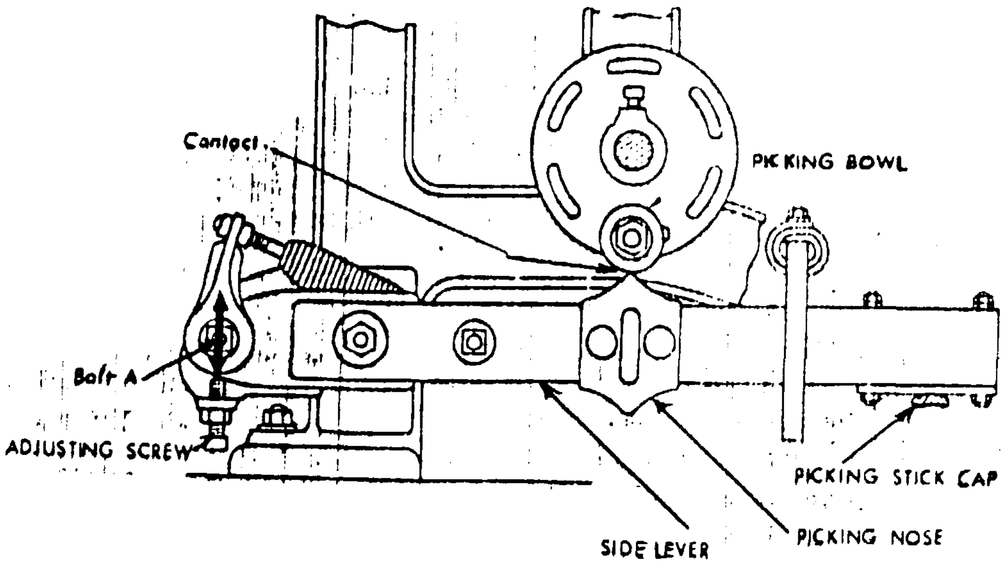
Fix the bumber shim on the bracket so that the distance betw-een the picking stick and the bumber is ¾" (19 mm).



ADJUSTMENT OF STRENGTH OF PICKING

Required strength of picking (distance L as shown in the following figure) is of side lever by means of adjusting screw





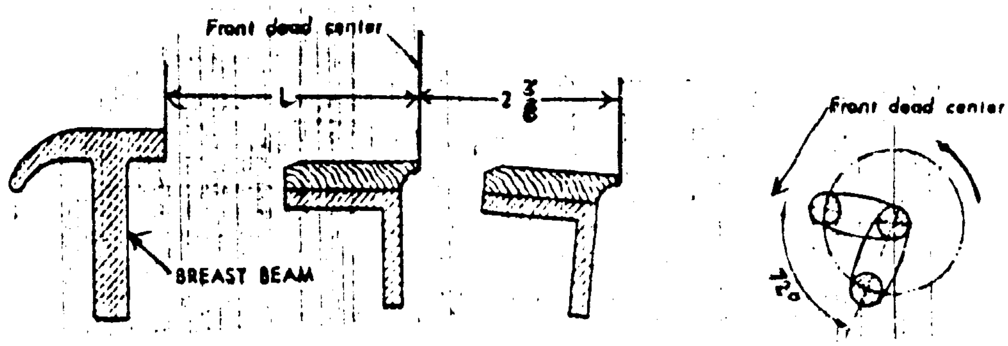
Practical standards of strength of picking for various loom reed space is given in the following table.

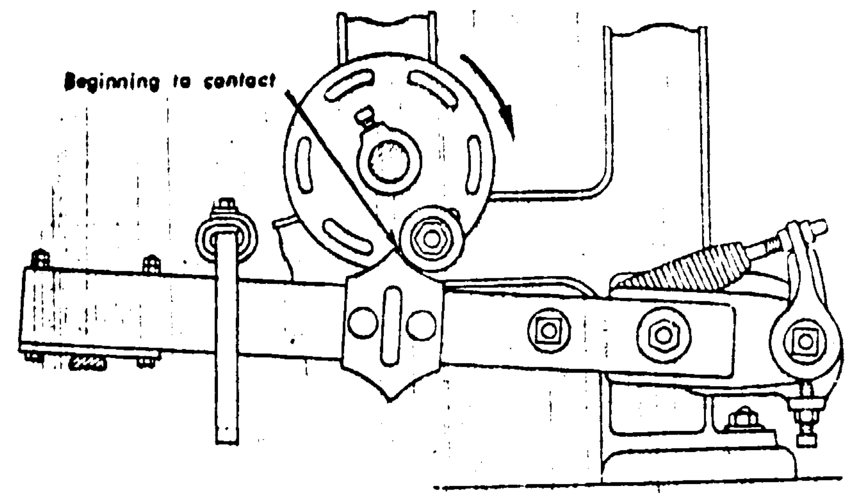
Inches

NORMAL REED SPACE			36	38	40	42	44	46	48	50	52	54	56	58	60	64	66	74
L	DIA OF PICK PLATE	$8\frac{1}{6}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{3}{4}$	$10\frac{3}{4}$	11	11	$11\frac{1}{4}$		$10\frac{1}{2}$	$10\frac{3}{4}$	$10\frac{7}{8}$	11	$11\frac{1}{4}$	$11\frac{1}{2}$		
		$8\frac{3}{4}$								$10\frac{1}{2}$							$11\frac{1}{2}$	$12\frac{1}{2}$

SETTING OF PICKING TIMING

The picking bowl should contact the picking nose when the sley has moved 2"3/8" (60 mm) + L (the distance between the breast beam and the reed at fdc) backwards.





E - LOOM PROBLEMS CREATED BY PICKING MOTION

PICKING EARLY OR LATE

- Overshots
- Kinky weft
- Throw shuttle
- Personal injury
- Knock out ends
- Break weft

- Knock out pirns
- Bang-off
- Empty pirns
- False change
- Damage shuttle
- Knock-off on change
- Damage straps

IMPROPER SHUTTLE BOXING

- Lashing-in
- Broken picks
- Kinky weft
- Break on change
- Break weft
- False change
- Knock out weft
- Laying-off
- Bang-off
- Empty pirns

GROUP 5 - WEFT STOP

A - FUNCTION - The weft fork activates the stop motion in the event of missing weft, thus stooping the loom

B - PARTS
- Filling motion box
- Fork wire and holder
- Weft grate
- Twitch roller bracket
- Fork holder slide
- Weft hammer
- Weft motion cam
- Weft hammer lever stud
- Tappet shaft
- Cloth roller lever bracket
- Starting rod & finger & collar
- Straddle bug & finger tip
- Shuttle feeler finger
- Lifting catch
- Filling motionknock
- Back wire
- Handle lever
- Shifting lever
- Adjustment screw

C - ASSEMBLY

1 - Assemble filling motion box & put it with Twitch Roller bracket on the breast beam

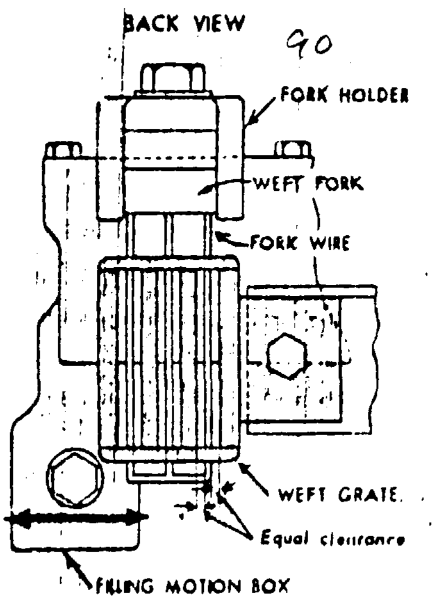
2 - Put fork holder and fork on slide

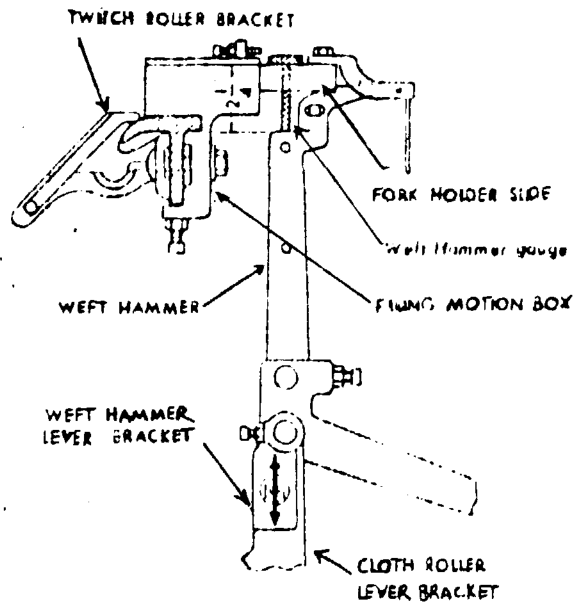
3 - Put weft grate to box fly back

4 - Put weft cam on tappet shaft
5 - Assemble weft hammer, hammer lever, hammer lever bracket, and put on cloth roll lever bracket
6 - Put shifting lever to filling motion box and handle lever to handle bracket

D - <u>ADJUSTMENTS</u>

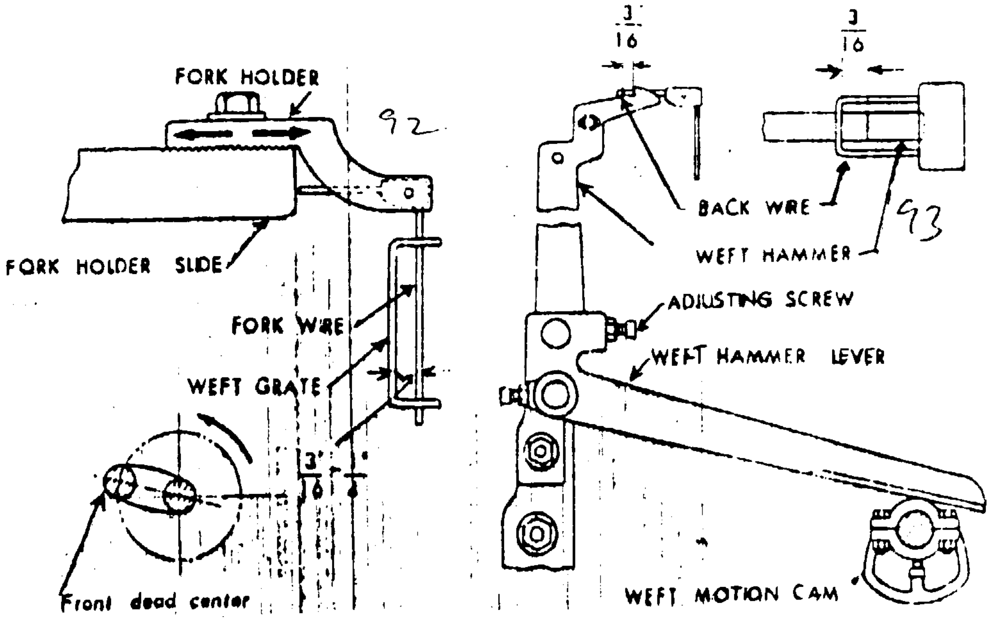
Filling motion box to be fitted so fork wire is at centre of opening of weft grate.
Twitch roller bracket not to slant against breast beam.
The height of weft hammer lever bracket should be fixed by weft hammer gauge (No.21) distance $2\frac{1}{2}$"





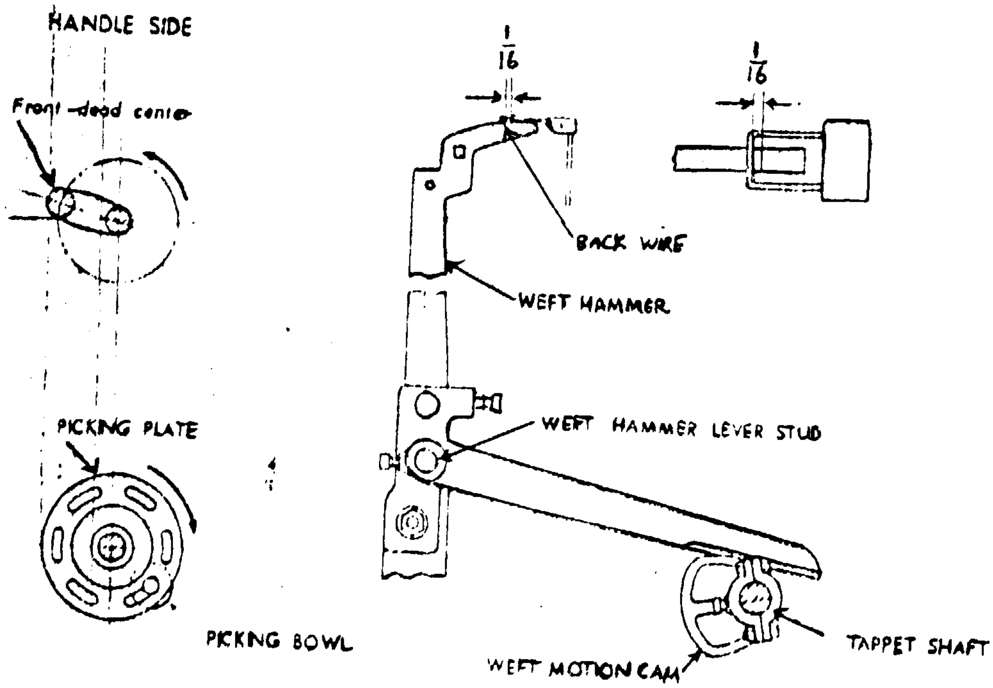
Fork holder to be adjusted on slide so fork wire engages with weft grate 3/16" - $\frac{1}{4}$"

Weft motion cam to be fixed to tappet shaft so a clearance of 3/16" between weft hammer and back wire. Shuttle in F.S.

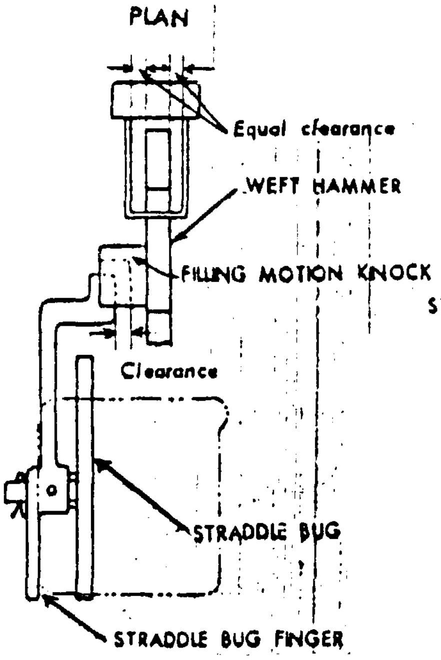


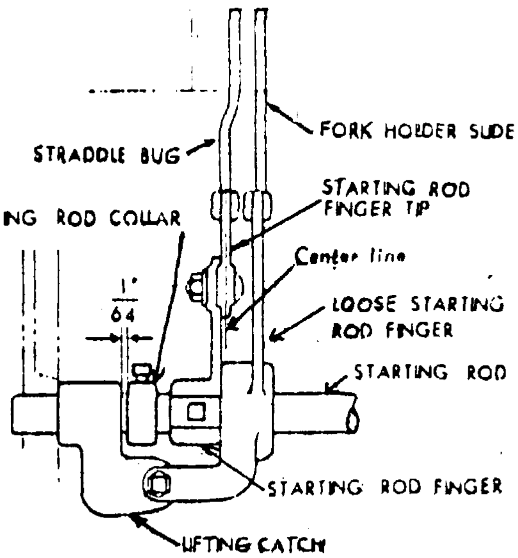
In case of weft fork with spring to prevent weft fork jumping the clearance should be changed according to loom speed.

Low speed = 1/16" - 3/32"
High speed = 3/32" - 1/8"

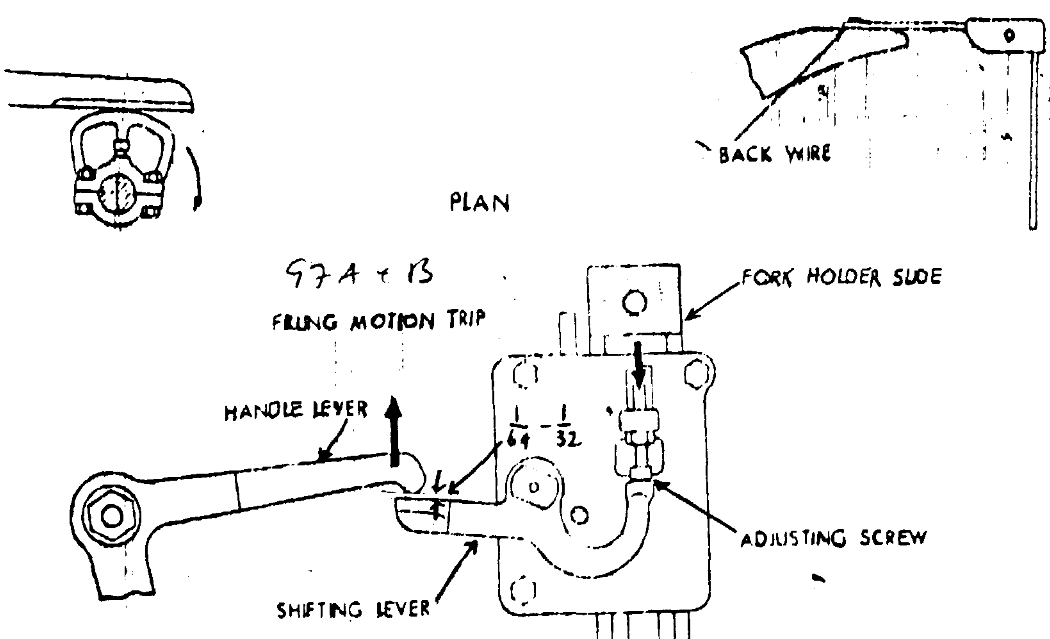


Sideways adjustment of weft hammer to centre back wire. Weft hammer must not be too near to straddle bug finger lifting catch to be fixed with starting rod collar, clearance 1/64"



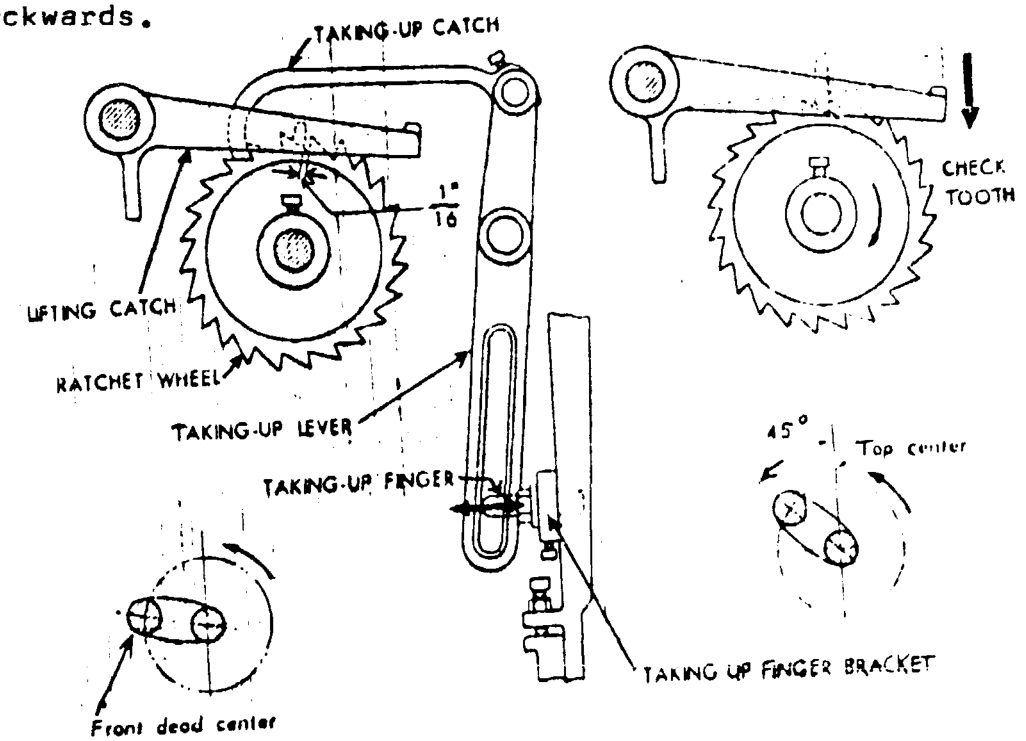


Hook back wire on weft hammer and turn loom until weft hammer lever is on top position of weft motion cam. Then adjust by filling motion trip adjustment screw so 1/64" - 1/32" cleara-nce between shifter lever & handle lever.



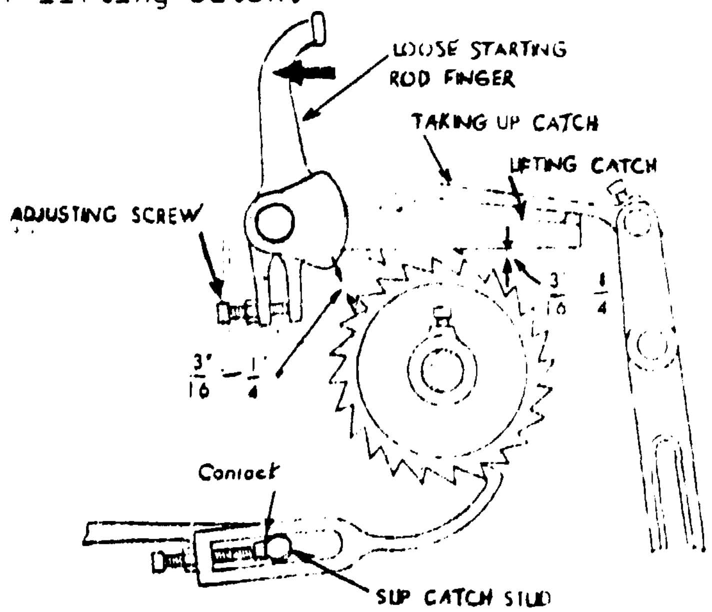
Adjust take-up finger with clearance of 3/16" between tooth of ratchet wheel & check tooth of lifting catch loom pos.Fdc.

Do not move take-up finger bracket, but move finger forwards or backwards.



Loom pos. back wire engaged on weft hammer. Weft hammer lever on top position of cam.

Adjust clearance of 3/16"-$\frac{1}{4}$" between tooth of ratchet wheel & check tooth of lifting catch.



E - LOOM PROBLEMS CREATED BY WEFT STOP

1 - Thin places

2 - Broken picks

3 - Missing picks

4 - Knock-off on change

GROUP 6 - TAKE-UP

A - FUNCTION - To roll the woven cloth into the cloth roll by rotating the sand roller and cloth roll to same degree as picks are inserted into the fabric.

Take-up motion is controlled by the slay movement.

B - PARTS

- Cloth roller lever bracket
- Side frame
- Slip catch lifting rod
- Cloth roller lever bracket stay
- Intermediate wheel stud & bracket
- Radial quadrant lever
- Int. wheel
- Surface (sand) roller + bracket
- Return motion lever and spring
- Return motion spring adjuster
- Cannon bracket
- Standard wheel
- Take-up lever & bush + take up finger + bracket
- Ratchet wh.
- Take-up catch (Pawl)
- Lifting catch (Pawl) + collar
- Take-up lever
- Slip catch lifting rod + adjusting collar + foot pedal + foot pedal bracket

C - ASSEMBLY

1. Put std.wheel axel in cannon bracket & fix on side frame
2. Fix ratchet wh. and std.wh to axel
3. Put cloth roller, lever bracket to side frame

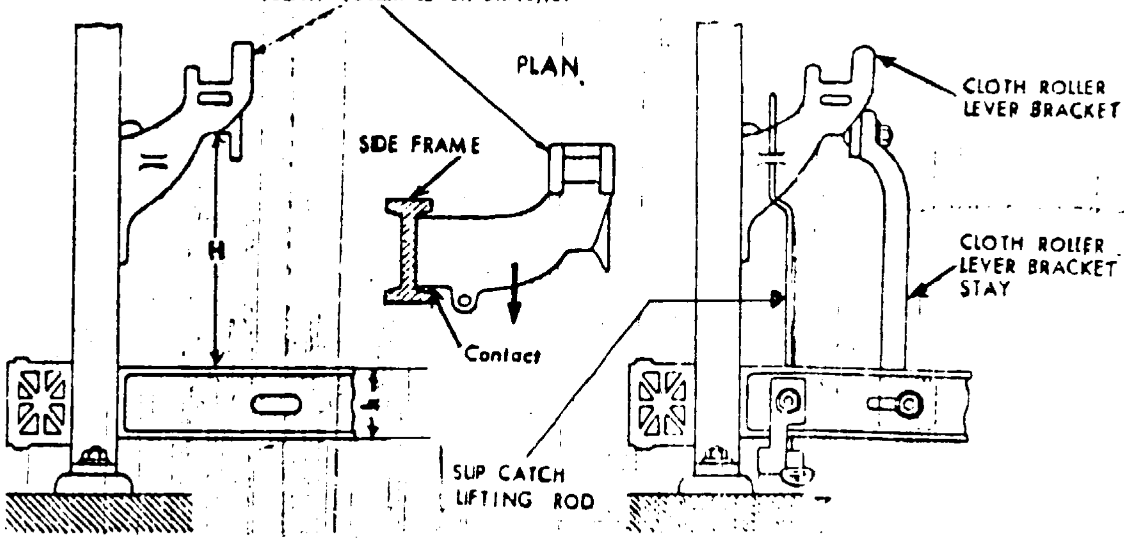
4. Fix stay with cloth roller lever bracket and front cross rail
5. Put cloth roller lever and attach spring fixed with loom front cross rail
6. Put trip lever and changing bracket on transmi-ssion shaft
7. Put adjusting collar and lifting catch on start-ing rod
8. Put take up pawl lever and bush on stud
9. Put take up finger in bracket
10. Put surface (sand) roller brackets to side frames and wheel to (F.S) surface roller
11. Put slip catch and bracket to side frame (F.S)
12. Put slip catch lifting rod in cloth roller brac-ket and fix adjusting collar on its upper end and foot pedal on other end
13. Fix foot-pedal bracket on front cross rail
14. Put int.wh. bracket on side frame and put axel on, and fix return motion lever, spring and tension collar
15. Fut radial quardrant lever on intermediate wheel
16. Put change wh. pinion and racket with the quard-rant lever
17. Put ch.wh. on stud and mesh the ch.wh.with std.wh.

D - ADJUSTMENTS

SETTING OF CLOTH ROLLER LEVER BRACKET

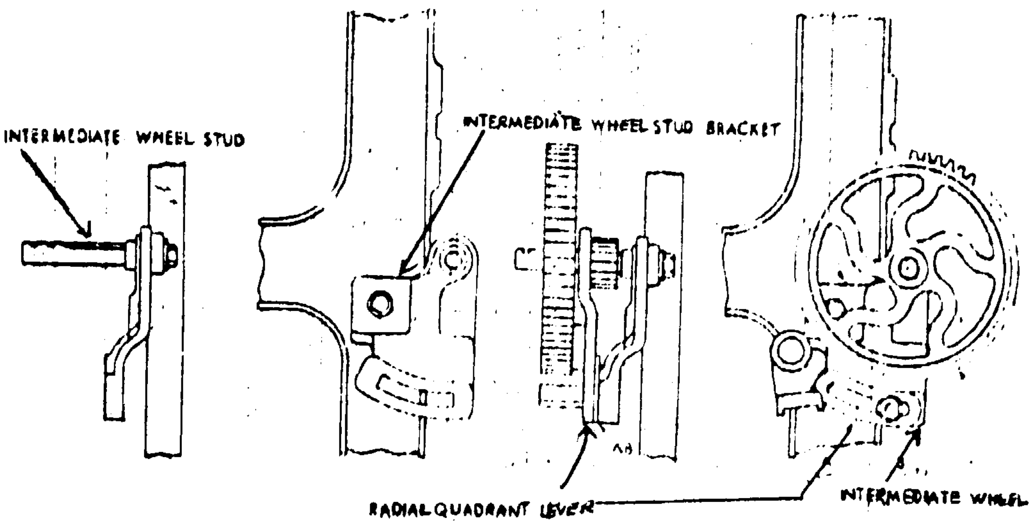
For Lh.Rh. fitted on side frame at height of 9"¾ for 10"cloth roll winding.

Slip catch lifting rod must be put into the cloth roll lever bracket previously.



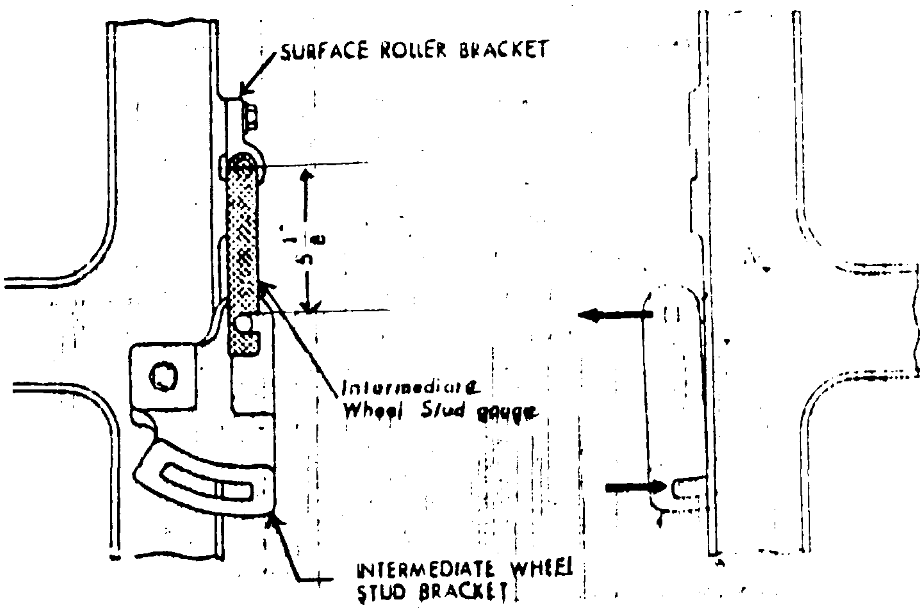
SETTING OF RETURN MOTION LEVER & INT.LEVER STUD BRACKET

Fitted on side frame with oil groove upwards. Radial quadrand lever with int.wh.on its stud. Lower face of quadrant in line with its bracket.



Set surface roller bracket on side frame. Engage the pos. of int. wh. stud gauge (No.14) should be inserted on one side of surface roller bracket and int. wh. stud bracket.

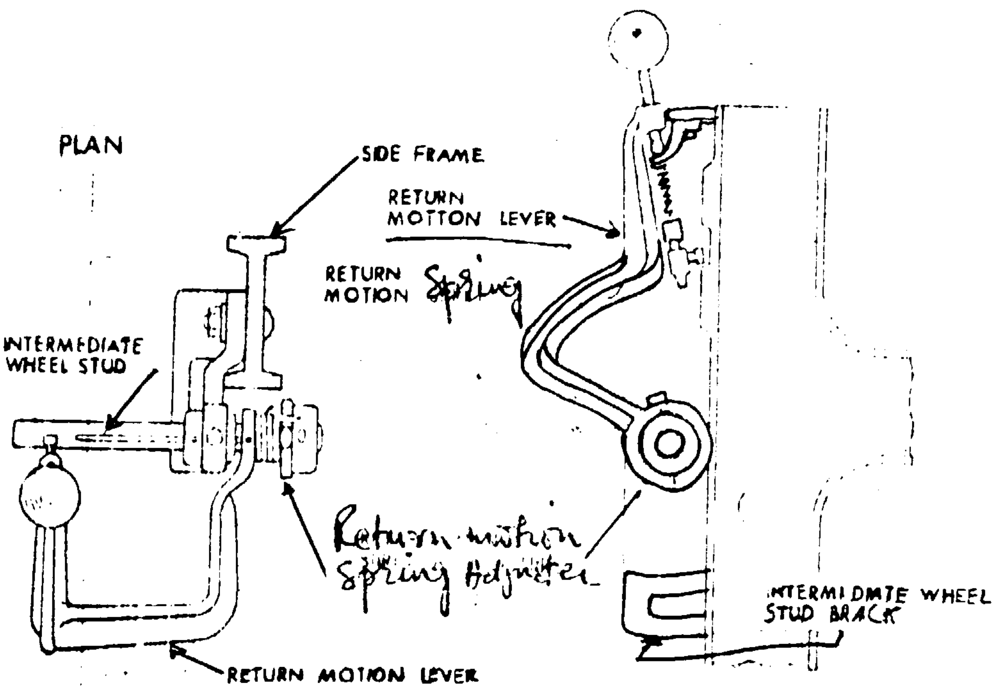
There should be some space between the upper part of the bracket and the side frames. The lower part of the bracket closely attached to side frame.



SETTING OF RETURN MOTION LEVER

No clearance should be allowed between return lever and adjuster by pushing the stud outwards.

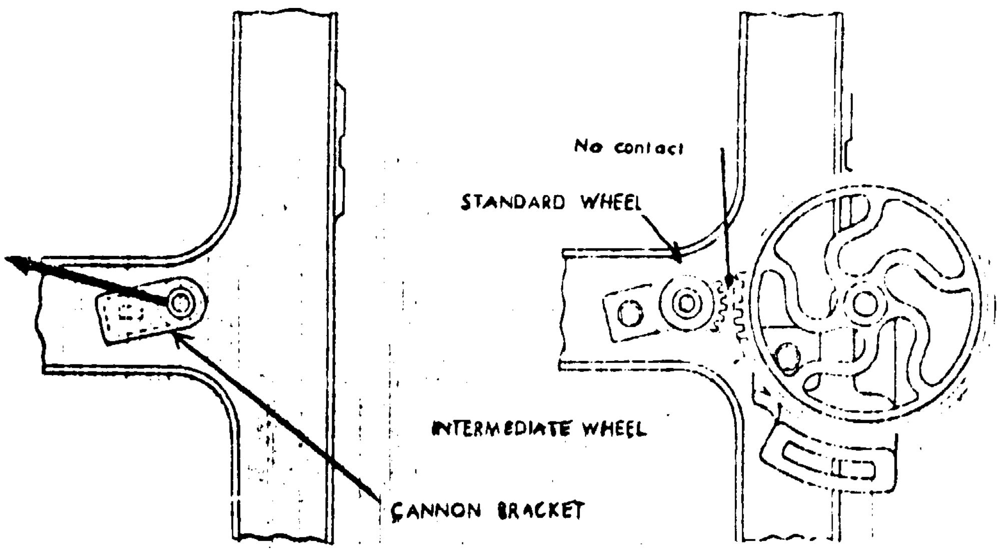
And also oil groove on stud should be in agreement with oil hole on its bracket by turning the stud upwards.



SETTING OF THE CANNON BRACKET

Cannon bracket should be fitted so that it may come into contact with upper backward part of the fitting hole in the side frame (As Fig. 62)

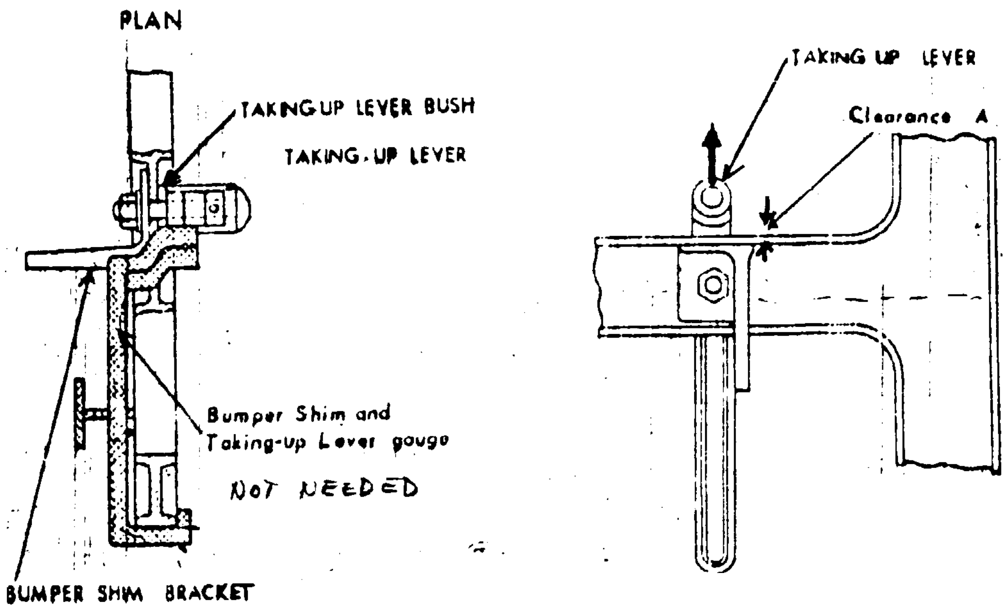
No contact between standard wheel and intermediate wheel



SETTING OF TAKE UP LEVER & BUMPER SHIM BRACKET

The take up lever together bumber shim bracket should be fixed up simultaniously on the side frame by using bumber shim & take up gauge (No. 13)

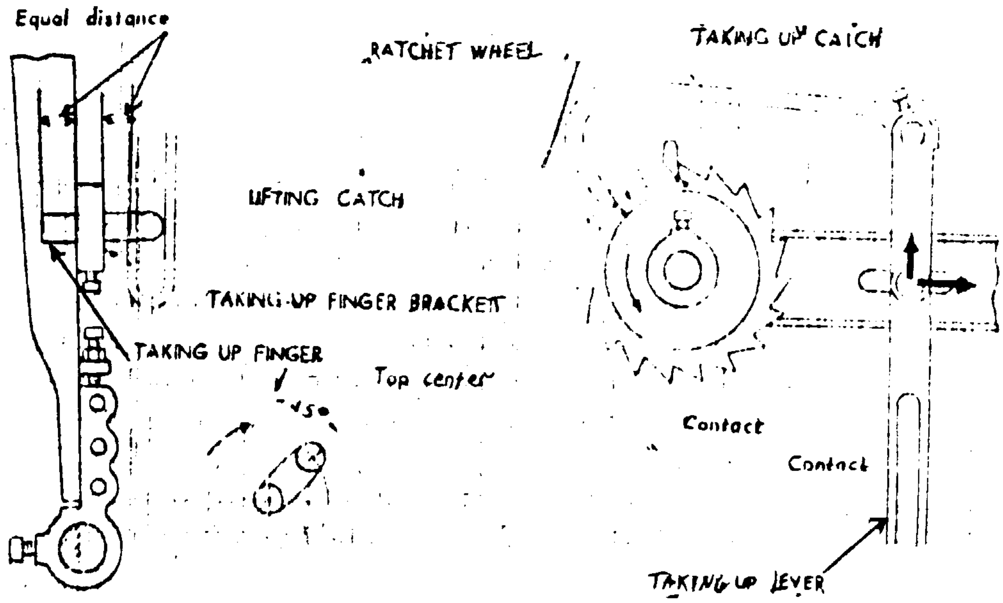
Clearance 'A' between takeup lever and the side frame to be uppermost.



SETTING OF TAKE UP LEVER AND RATCHET WHEEL

Loom pos. Past tc (45^0)

Take up finger in centre of bracket. Adjust lifting catch with tooth of ratch wheel by turning st. wh. towards front of loom. And at same time take up catch should come into contact with ratchet wh. tooth. One tooth behind lifting catch.



NOTE:

The let back mechanism, which is assembled alsongwith the take up, will be adjusted during weft stop motion (W. FORK MOTION) adjustment.

E - LOOM PROBLEMS CREATED BY TAKE-UP

1. BINDING IN IMPROPER MESH

- Wavy cloth
- Break ends
- Slack selvedge
- Over shots
- Excessive wear

2. PICK WHEEL

- Wavy cloth
- Incoreect picks per inch
- Excessive wear

GROUP 7 : A WEFT FEELER
B CHANGE CONTROL

7A WEFT FEELER

A - FUNCTION - The feeler has a sliding motion as the loom begins to use the reserve on pirn. This sliding movement releases the pirn change mechanism & a full pirn is transfered to the shuttle.

B - PARTS
- Weft feeler finger swell box front.
- Weft feeler box and bracket handle bracket.
- Weft feeler adjustable stud.
- Weft feeler connecting rod filling motion box.

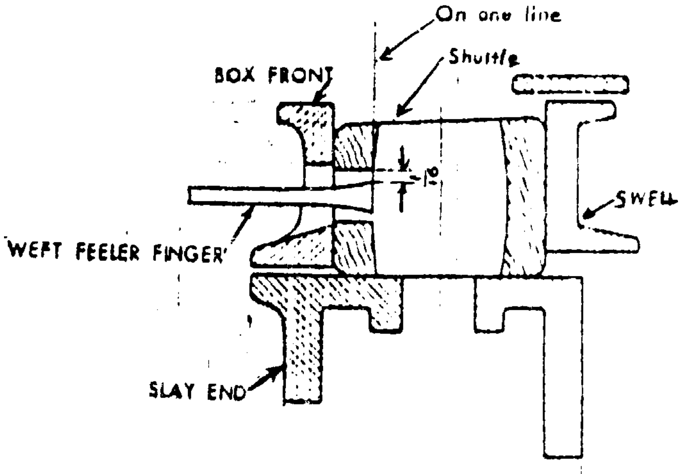
C - ASSEMBLY

1. Put weft feeler box with the bracket.
2. Assemble feeler box (away from loom) and handle bracket.
3. Put weft feeler connecting rod to the weft feeler and straddle bug finger lifter.

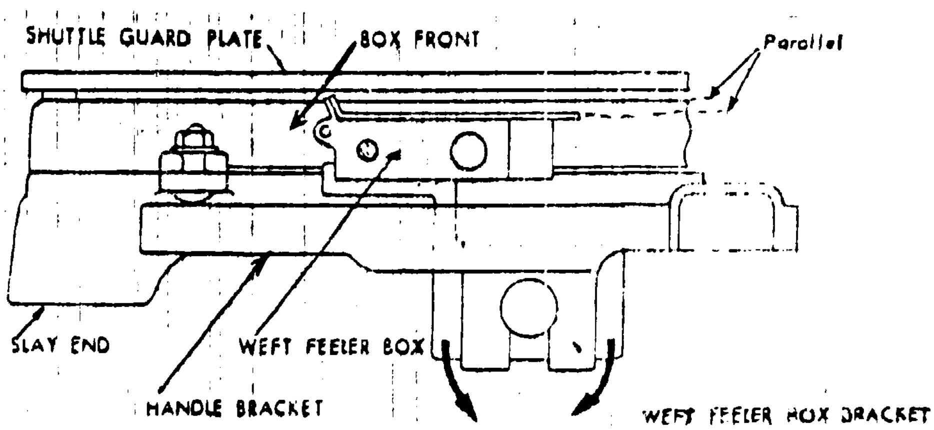
D - ADJUSTMENTS

SETTING OF WEFT FEELER BOX BRACKET

Shuttle in handle side (FS). Move sley until tip of weft feeler finger is on line with inside wall of shuttle. Fix weft feeler box to give clearance of 1/16" between upper edge of feeler finger and upper face of slot in shuttle.

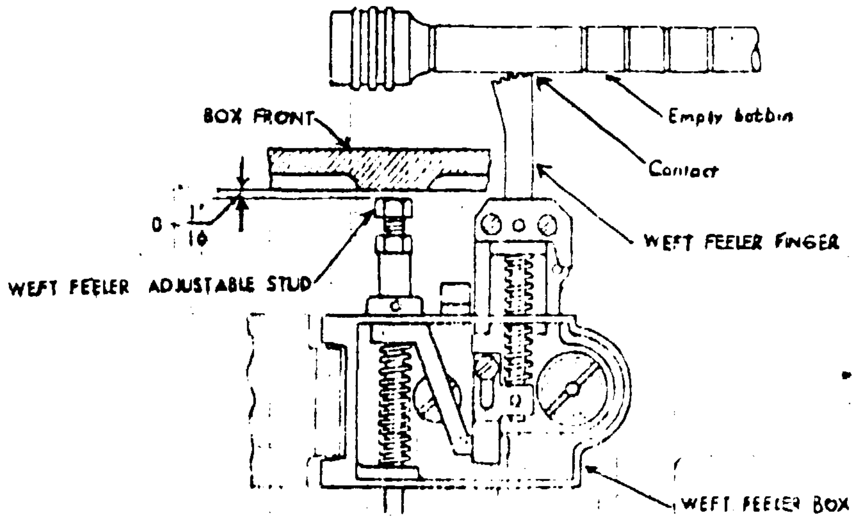


WEFT FEELER BOX MUST BE PARALLEL TO BOX FRONT



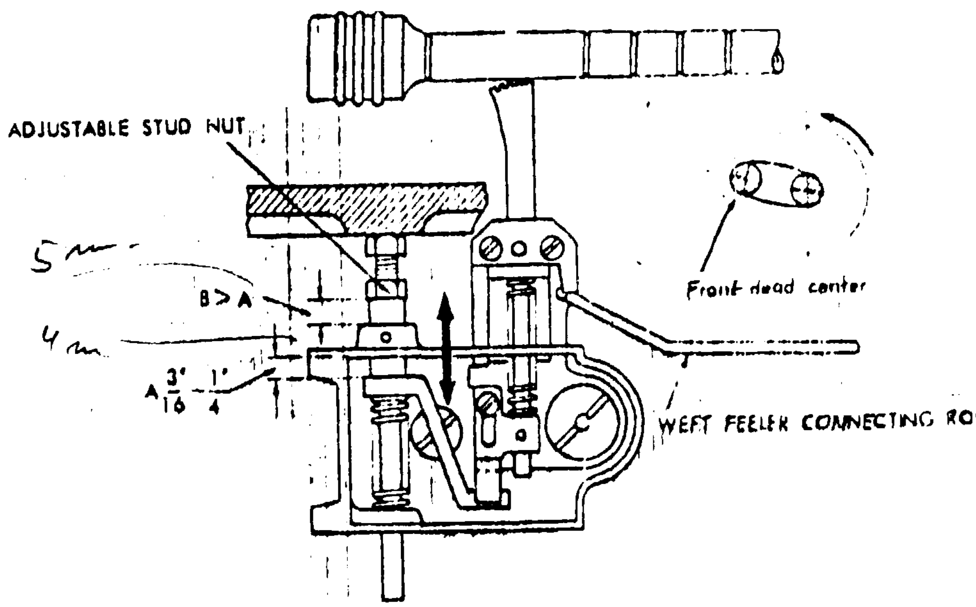
ADJUSTMENT OF WEFT FEELER ADJUSTABLE STUD

Turn sley so weft feeler finger is brought into contact with empty pirn, then adjust length of stud to give clearance of 0-1/16" between box front & adjustable stud.



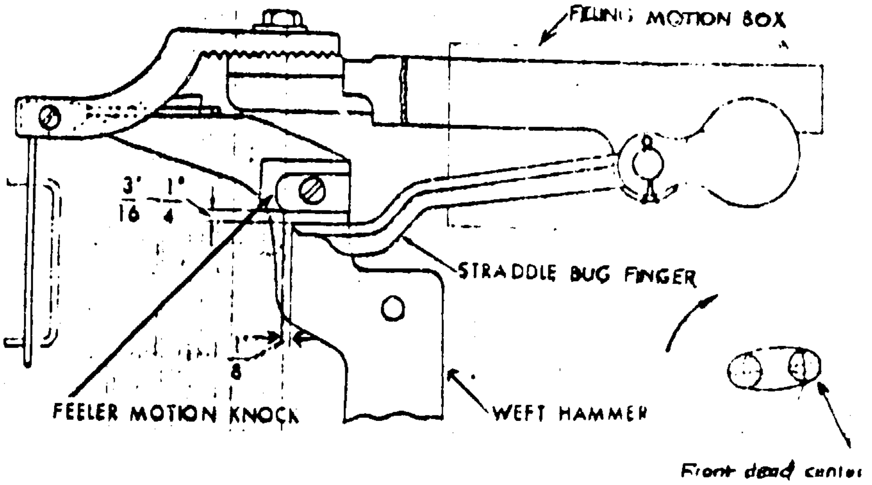
ADJUSTMENT OF WEFT FEELER BOX

Sley at Fdc. move weft feeler box back or forth to give inside strike of 3/16"-¼" & outside stroke slightly longer.



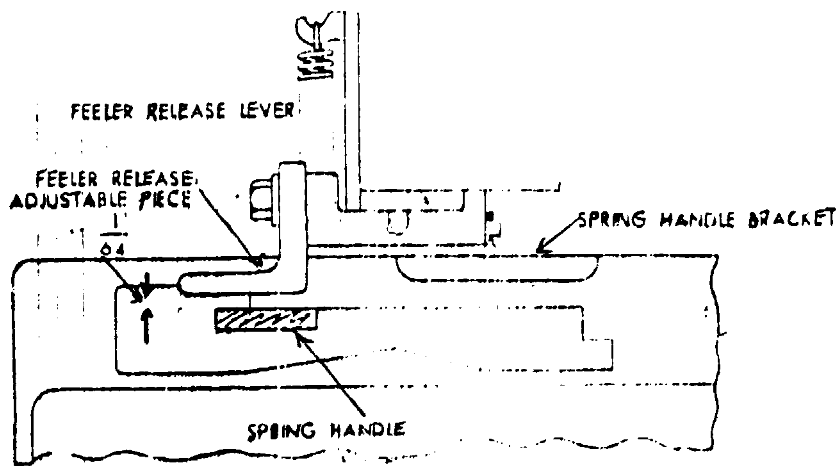
ADJUSTMENT OF FEELER CONNECTION ROD & FEELER MOTION KNOCK

Clearance of 3/16"-¼" between upper face of tip of straddle bug finger & lower face of feeler motion knock.



FEELER RELEASE ADJUSTABLE PIECE

Clearance of 1/64" between adjustable piece and spring handle.



E - PROBLEMS CREATED BY THE WEFT FEELER

- Miss change
- Broken pick
- No change
- Damage feeler carrier slides
- Damage shuttle

7B CHANGE CONTROL

A - FUNCTION - Replace an empty pin by a full one when needed.

B - PARTS
- Weft hammer
- Straddle bug finger
- Feeler motion knock
- Shuttle feeler and bracket
- Shuttle feeler stud
- Starting rod spring
- Starting rod and finger

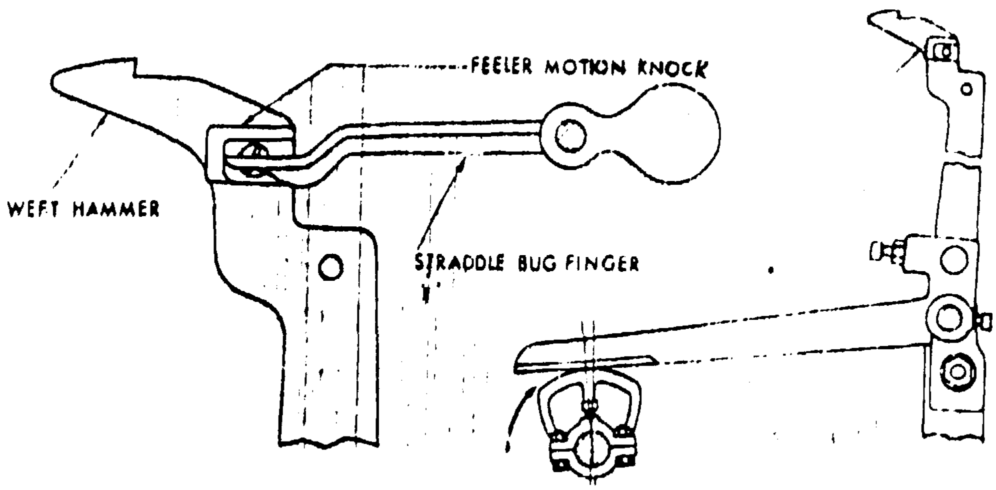
C - ASSEMBLY

1. Put shuttle feeler bracket to side frame and put on shuttle feeler.
2. Put shuttle feeler spring on starting rod and spring bracket to side frame.

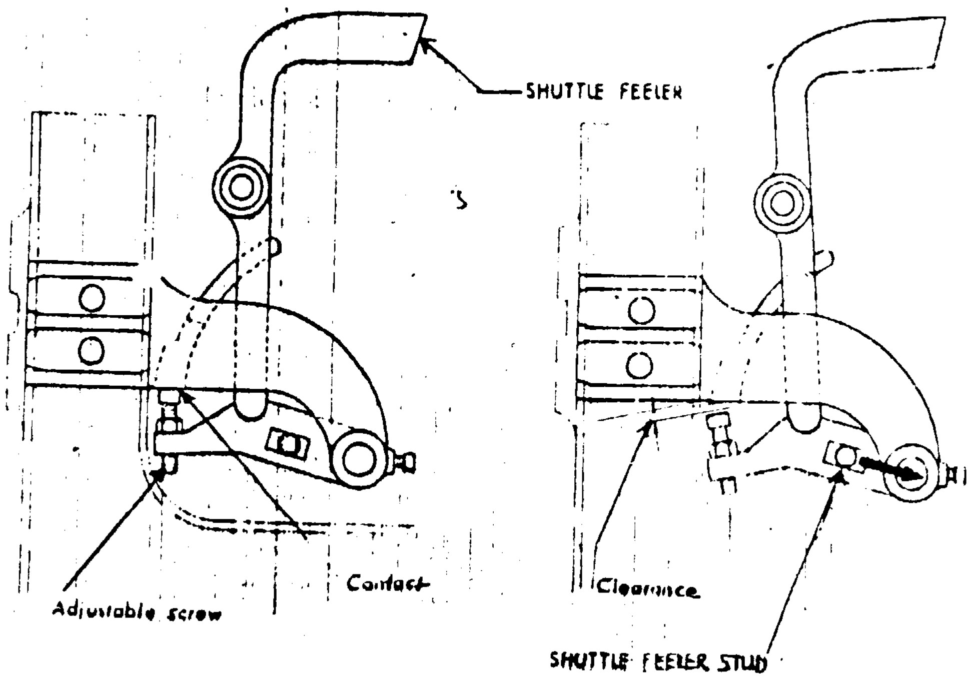
D - ADJUSTMENTS

SHUTTLE FEELER STUD & STARTINGROD SPRING ADJUSTMENT

Engage straddle bug finger with feeler motion knock. Turn crank shaft until weft hammer lever is on top pos.of cam.



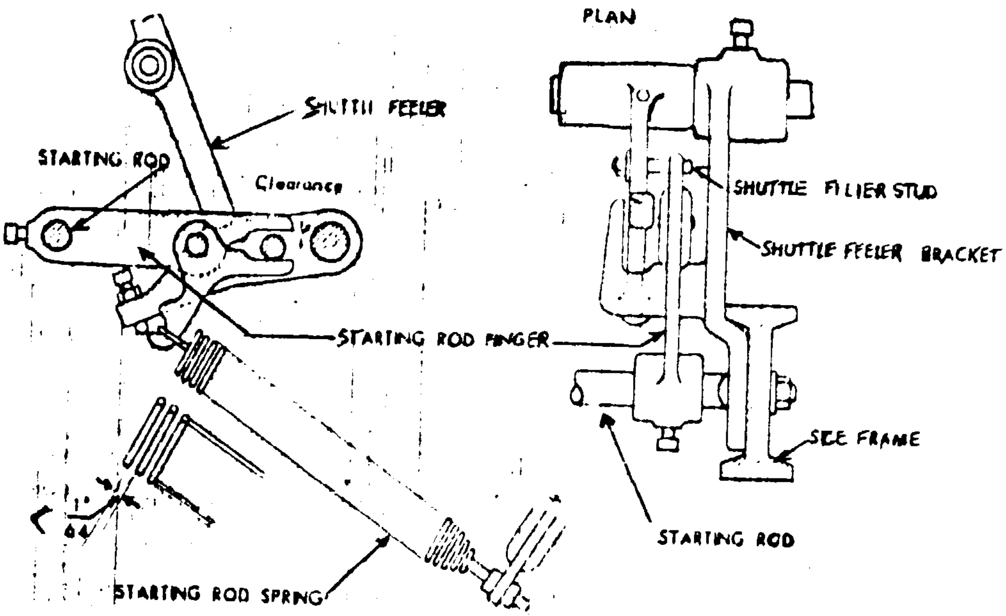
Adjustment screw should be outwards to contact bottom surface of shuttle feeler bracket.



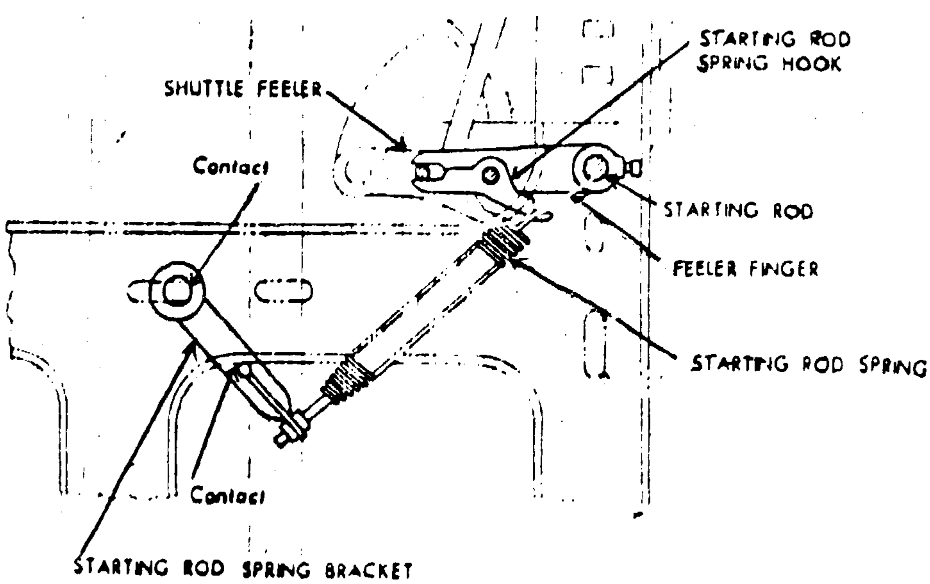
Starting rod finger should act a little in excess to give small clearance.

ADJUSTMENT OF STARTING ROD SPRING

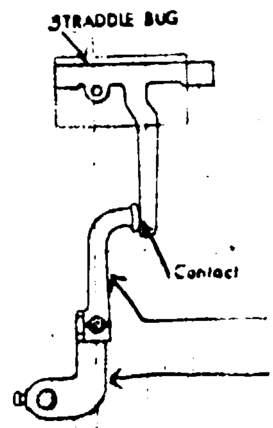
Tension spring and fasten nut to give clearance of less than 1/64" between each coil of spring.



Setting of starting rod spring bracket should be nearest possible position to front of loom within the bolt hole on side frame, with projection in contact with lower face of side frame.



Setting of starting rod finger tip by contact to straddle bug at background position.



E - LOOM PROBLEMS CREATED BY - TRANSFER & HAMMER

HIGH

- Hang bobbin
- Break weft on change
- Damage shuttle
- Damage hammer

LOW

- Break on change
- Knock pirn through shuttle
- Damage shuttle
- Damage hammer
- Damage box plate

GROUP 8 : A BATTERY
B PIRN CHANGE

8A BATTERY (Magazine)

A - FUNCTION

Holds the pirns (bobbins) for the change

B - PARTS

- Bobbin Disc
- Small end disc
- Bobbin support
- Bobbin guide
- Bobbin shute
- Buffer spring and stand
- Buffer strap and buffer holder
- Hopper stand
- Hopper stay
- Bunter

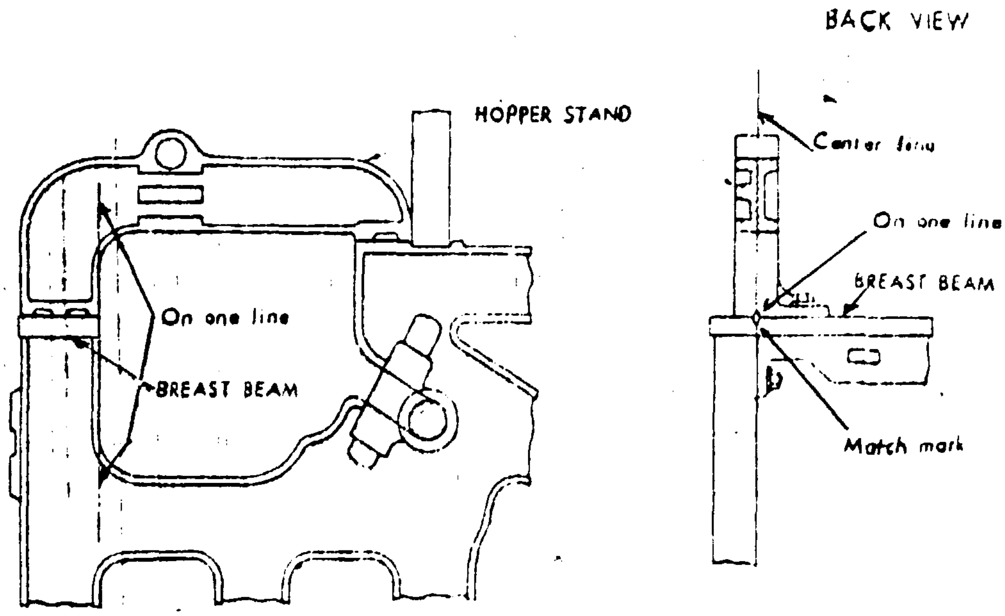
C - ASSEMBLY

1. Put hopper stay on the breast beam and side frame
2. Put hopper stand on hopper stay put axel in the bobbin disc and put it on the hopper stand
3. Put assembled bobbin support on hopper stand
4. Put hold back pawl to stand. Put transferer stud to the stand. Put on transferer with feed pawl and latch assembly, transferer spring and spring collar on the transferer stud
5. Put pin in the transferer spring collar on transferer stud

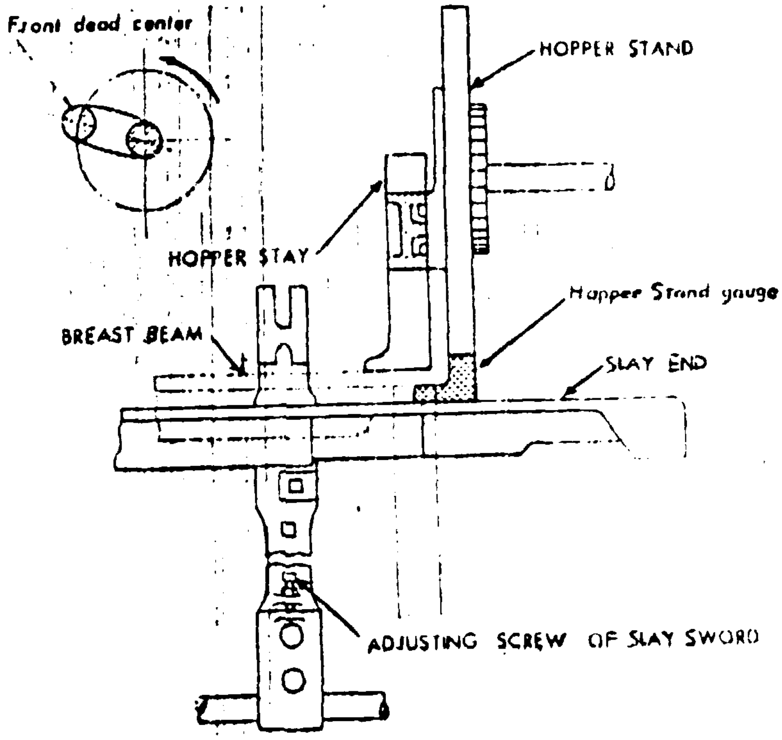
6. Put bobbin butt (tip holder) on hopperstand axel. Put on thread guide and holder
7. Put latch depressor to shuttle feeler.
8. Put cutter bracket on transferer stud. Put assembled cutter on cutter bracket. Put cutter starting stud & cutter depressor to the cutter bracket
9. Put bunter to the sley. Put bobbin shute bracket to side frame and put on bobbin shute
10. Put empty bobbin receiver stand to side frame

D - ADJUSTMENTS

Back face of hopper stand stay & breast beam to be in line, seen from side also in line. Seen from front use match mark. Not on Tirdc loom.



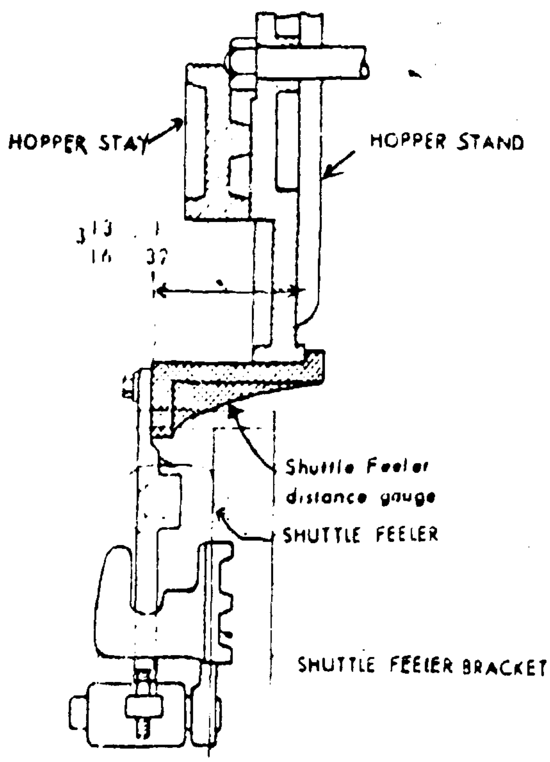
Height of sley is adjusted by screw on sley sword using hopper stand gauge (No.16) distance 47.5 mm. To level sley use sley height gauge (no.19) use at both ends of sley at least twice before tightening the adjustment screw.



Setting of shuttle feeler & hopper stand is done by use of SHUTTLE FEELER DISTANCE GAUGE (No.25) distance to be 97.5 mm.

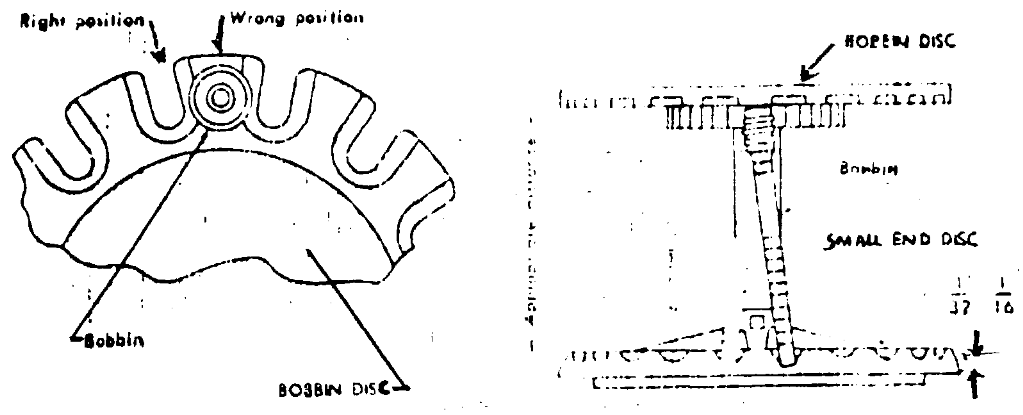
Correct by filing shuttle feeler bracket.

FRONT VIEW



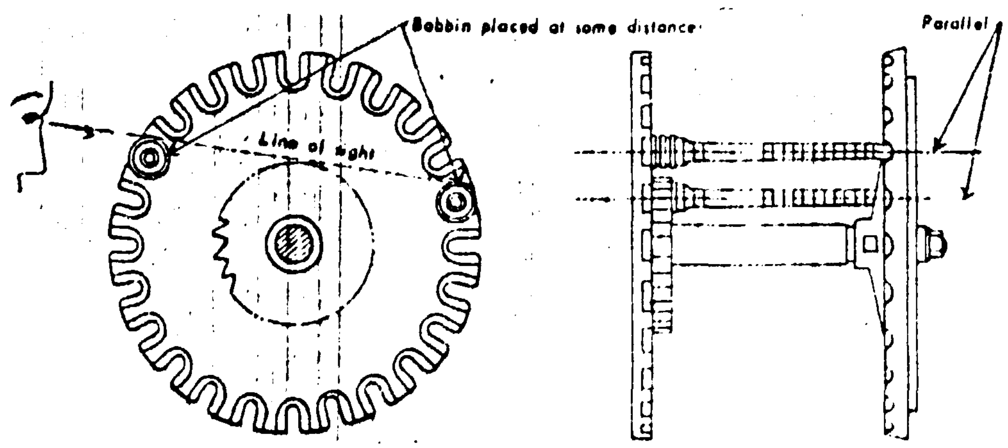
POSITION OF SMALL END DISC

Distance between pirn tip and butt with spring depressed - 1/32" - 1/16"



TO CHECK IF PIRNS ARE PARALLEL

Put 2 pirns into bobbin disc with some space between them . Adjust small end disc so both pirns are parallel.



HOPPER STAND is adjusted by using BOX FRONT GAUGE (No.22) to get contact between gauge and box fly back and inside edge of gauge and sley end. TRANSFERER STUD GAUGE (No.23) to give clearance of 2 mm. between gauge and front box gauge (No.22).

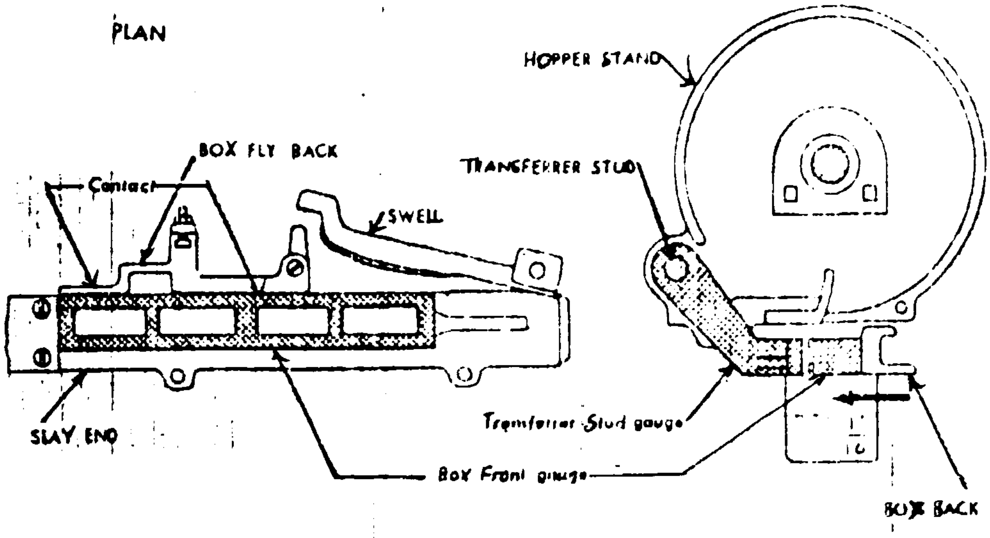
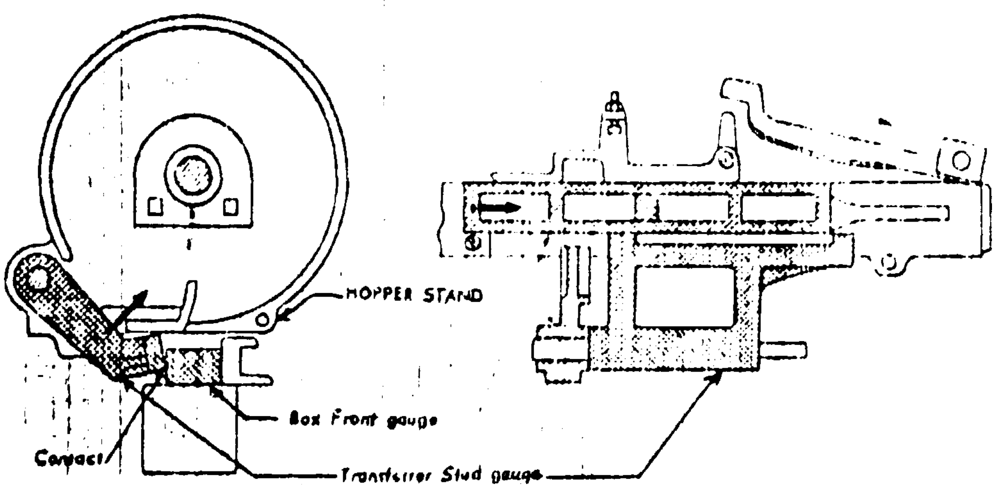


Fig. 100C.

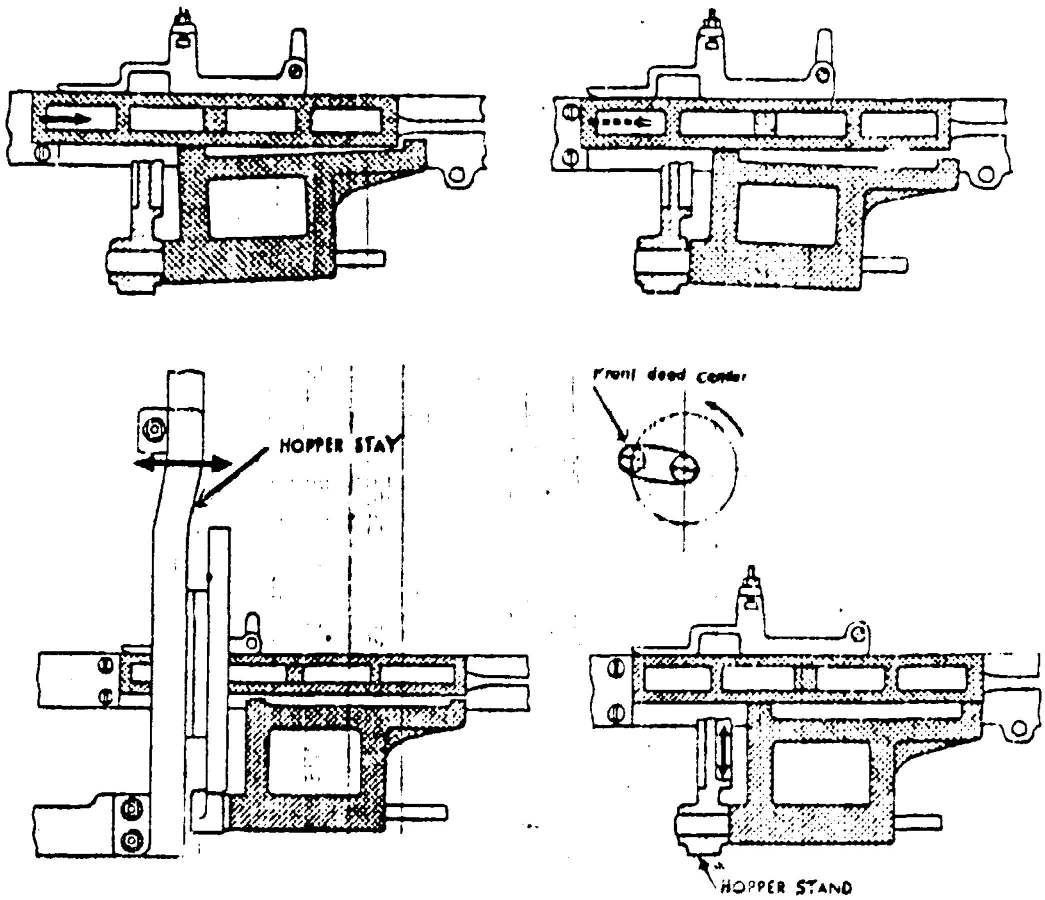


To make sure that transferer stud gauge and box front gauge is parallel.

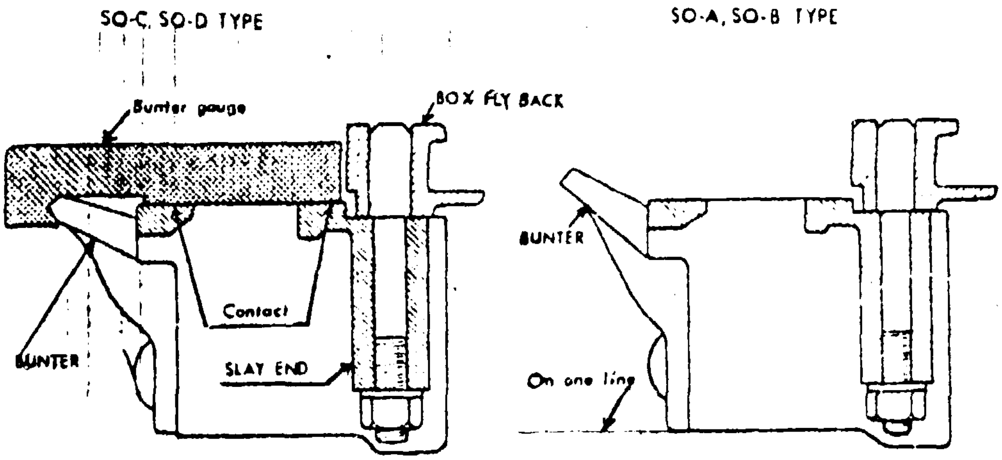
a- Lift T.S.Gauge upwards with R.H. into contact with box front gauge.

b- L. H. slide B.F. gauge strictly along box fly back to inside of loom until gauge gets out of contact with outside tip of T.S.gauge.

c- Slide back gauge to original position and check the gauge to be in contact with outside tip of T.S.gauge if not parallel move hopper stay to left or right on side frame. Then set sley at Fdc and move hopper stand forward or backward so T.S. gauge (No.23) will be in light contact with box front gauge (No.22)



Bunter adjustments are made by using bunter gauge (No.26) touched to sley end.



E - <u>LOOM PROBLEMS CREATED BY THE BATTERY</u>

- Break weft on change
- Break pirns
- Break shuttle
- Smash
- False change
- Damaged pirn tips

8B <u>PIRN CHANGE</u>

A - <u>FUNCTION</u>

To change an empty pirn in the shuttle with a full bobbin from the battery.

B - <u>PARTS</u>

- Shuttle feeler and bracket
- Standing rod, spring and hook
- Feeler finger
- Straddle bug
- Transterer (hammer)
- Latch depressor
- Transferer spring and collar
- Latch stand and slide
- Latch bunter
- Feed pawl

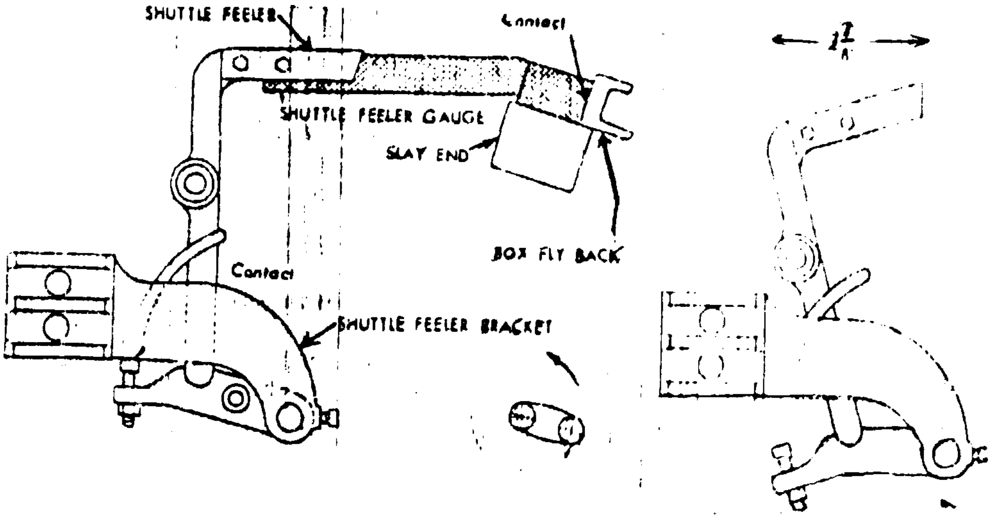
C - <u>ASSEMBLY</u>

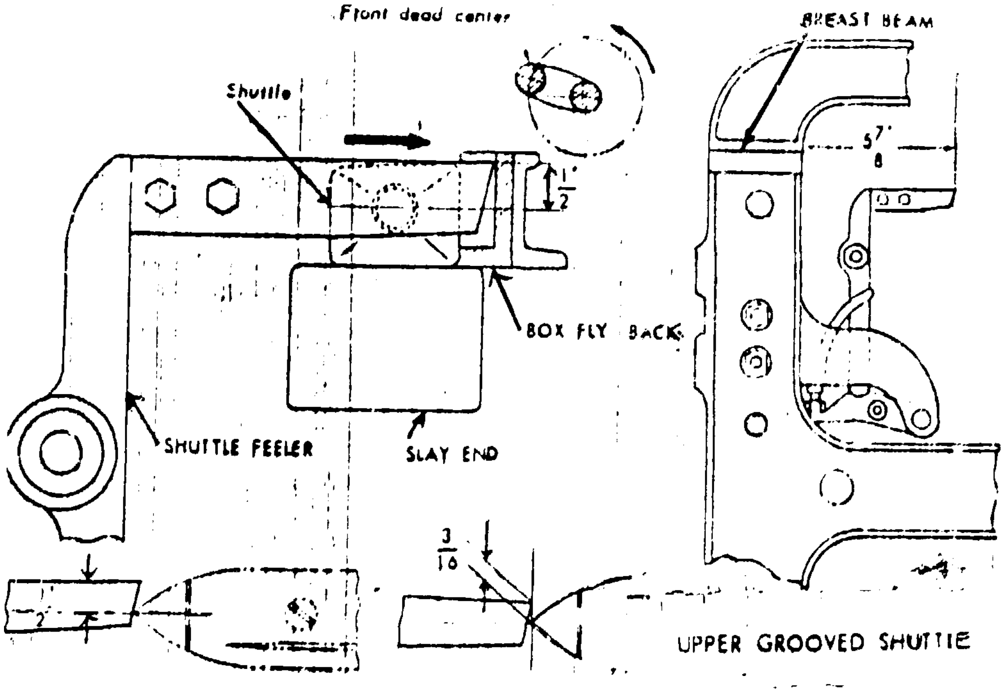
Included in battery

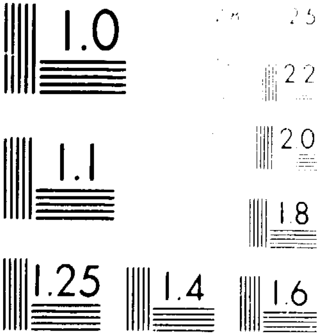
D - <u>ADJUSTMENTS</u>

Setting of shuttle feeler by using SHUTTLE FEELER GAUGE (No.24).

Loom position Fdc - shuttle feeler back distance of 2 7/8" between tip of shuttle feeler and breast beam.

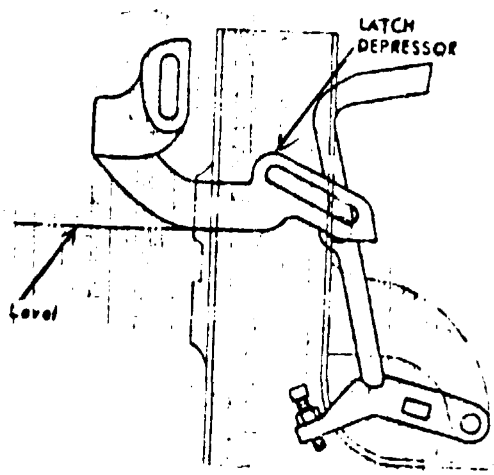

SHUTTLE FEELER
Contact
SHUTTLE FEELER GAUGE
SLAY END
BOX FLY BACK
Contact
SHUTTLE FEELER BRACKET


Front dead center
BREAST BEAM
Shuttle
$\frac{1}{2}$"
$5\frac{7}{8}$"
BOX FLY BACK
SHUTTLE FEELER
SLAY END
$\frac{3}{16}$
2"
UPPER GROOVED SHUTTLE

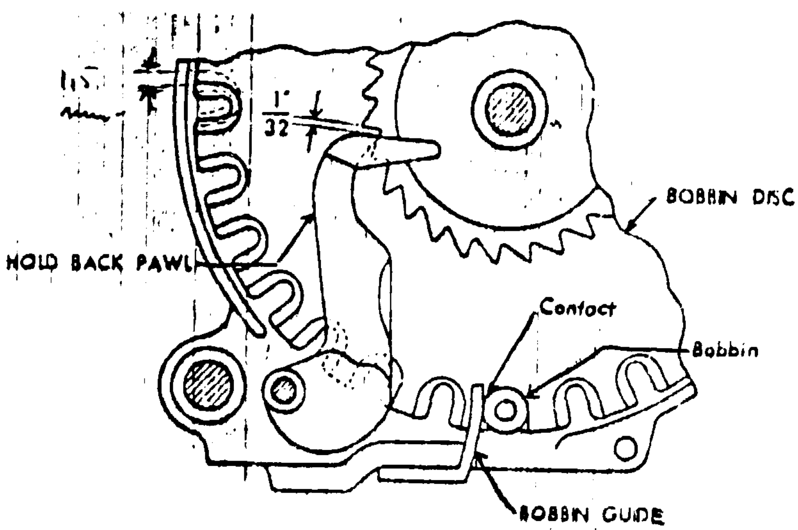

1.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Fitting of latch depressor with lowest face level when shuttle feeler is in normal position.

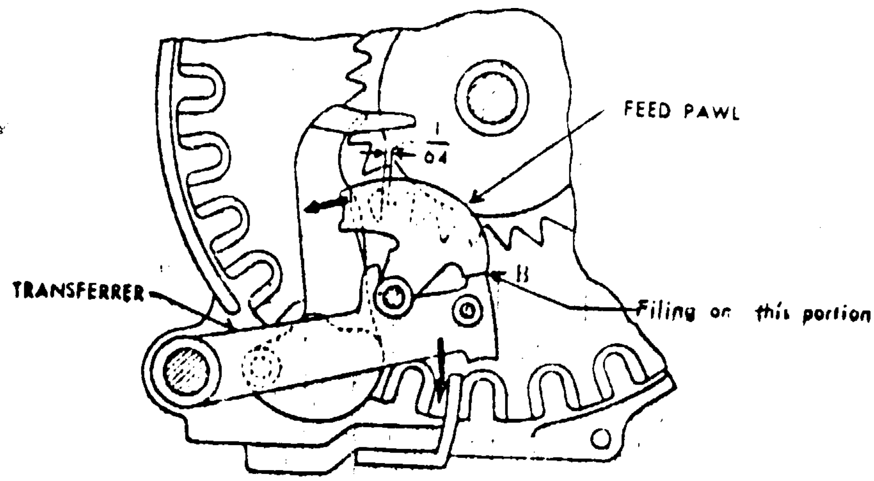
SO-C, SO-D TYPE LOOMS



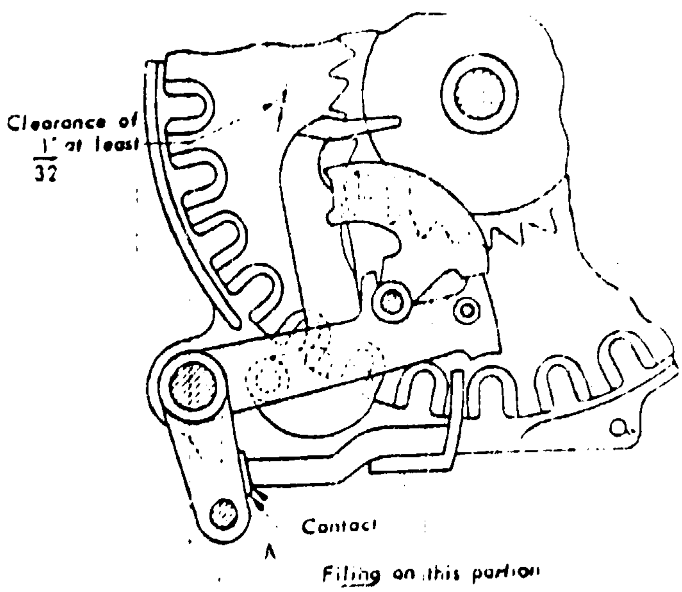
Hold back pawl clearance of 1/32" 1 mm. Filing should be done very carefully to get correct inclination of pawl, which gives 1.5 mm. backwards rotation when pushed into contact with bobbin disc.

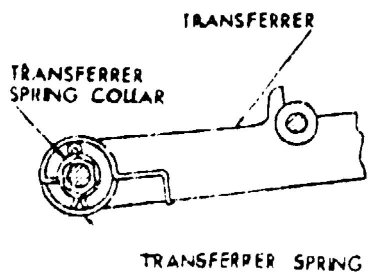


Feed pawl. Put the transferer on its stud and push it downwards. Part B on figure 109 should be filed to give clearance of 0.5. mm. between tooth of bobbin disc and feed pawl.



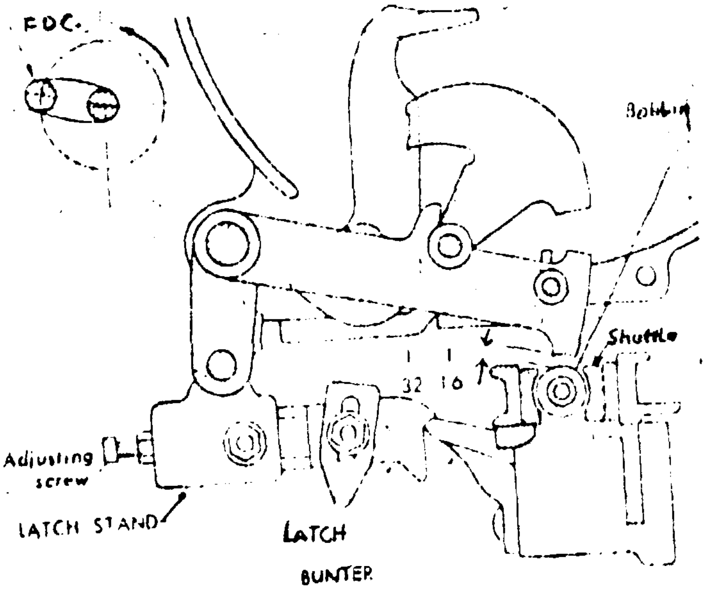
Setting of transferer by filing A figure 110 to get clearance of 1 mm. or a little larger between bobbin disc tooth and hold back pawl, when lower part of transferer touches hopper stand.



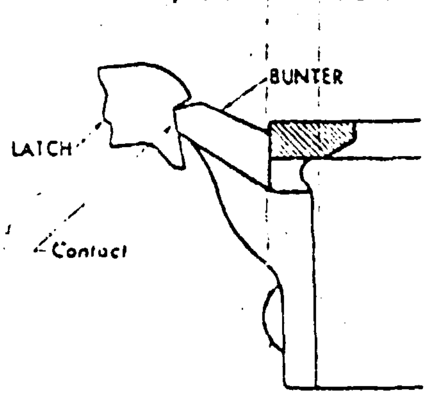


Turn spring collar 1 turn to give correct strength.

Setting of latch, latch finger & spring shuttle B.S. with bobbin - loom at Fdc. bunter into mesh. Set adjustment screw (latch stand) to give clearance of 1/32" - 1/16" (0.5 - 1.5 mm) between transferer and bobbin ring. Bunter tip to engage latch recess correctly at bottom.



SO-C, SO-D TYPE LOOMS



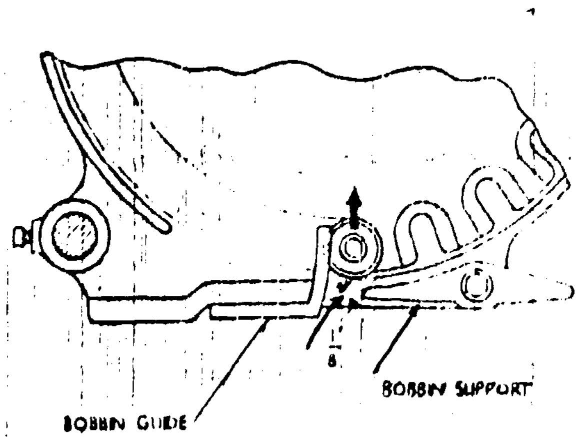
FITTING THREAD GUIDE

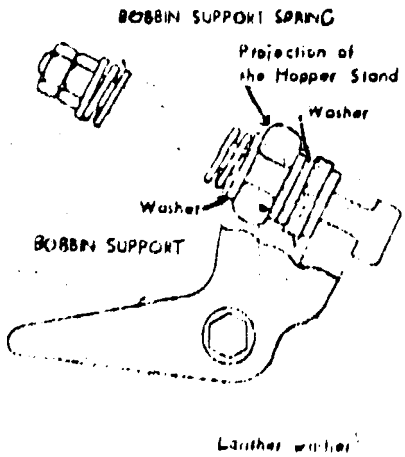
Should be on line - pirn to thread guide

ADJUSTMENT OF BOBBIN SUPPORT

Clearance between bobbin and bobbin support, when bobbin is in contact with bobbin guide must be about 1/8" in case the clearance is less put on additional washer.

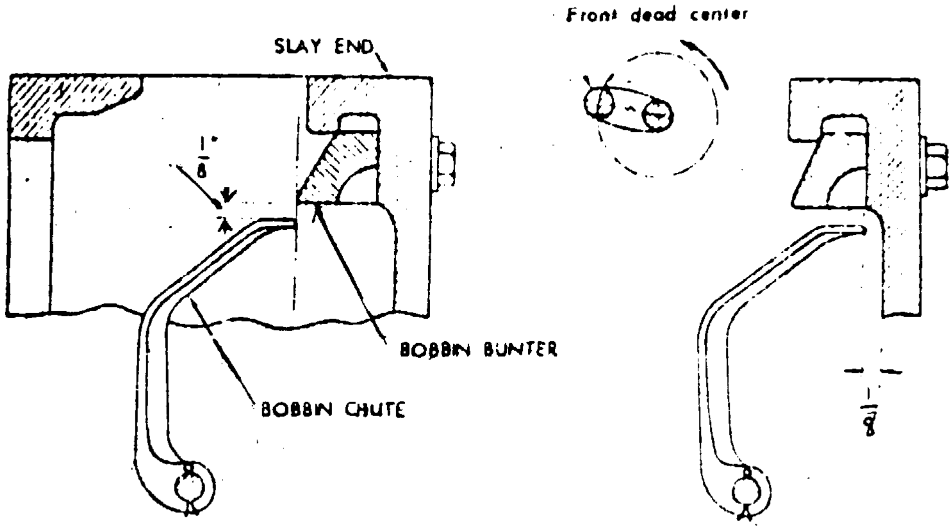
VIEWED FROM LOOM INNER SIDE



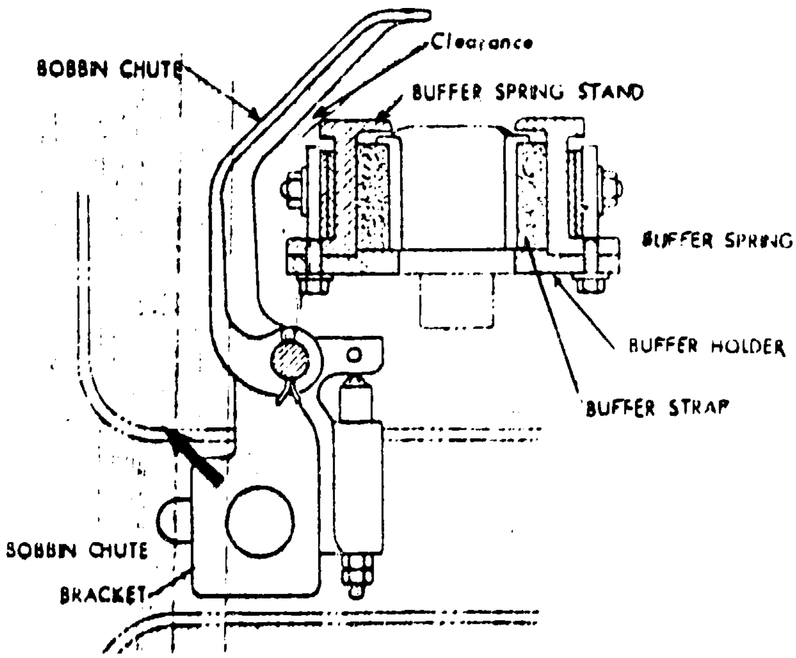


ADJUSTMENT OF BOBBIN SHUTE BRACKET

A clearance of about 1/8" between tip of bobbin shute and inside of sley end. Loom position Fdc.



Clearance between bobbin shute and buffer spring stand. No contact may occur.



E - LOOM PROBLEMS CREATED BY PIRN GHANGE

- Lash in
- Break weft
- Break on change
- False change
- Hang bobbin
- Run out
- Break shuttle
- Break pirns
- Break transterer
- Knock off change
- Smash
- Broken pick
- Personal injury
- Damage box plate

GROUP 9: <u>SHUTTLE EYE CUTTER</u>

A - <u>FUNCTION</u>

To cut the yarn of the ejected pirn at pirn change. The yarn is held before it is cut. Once closed, the cutters return to the back still holding the yarn which will then be cut by the temple cutter.

B - <u>PARTS</u>

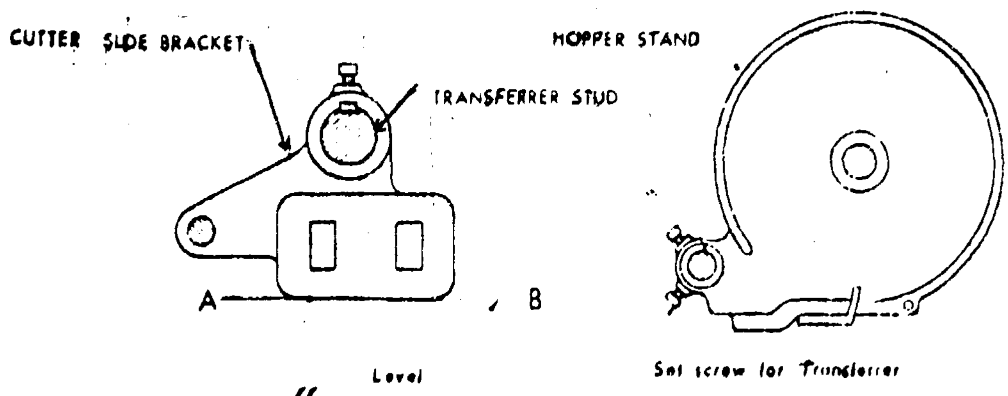
- Cutter slide bracket
- Transferer stud
- Closing trip
- Opening trip
- Cutter blade
- Cutter slide
- Cutter slide spring
- Cutter slide arm
- Cutter depressor
- Latch depressor

C - <u>ASSEMBLING</u>

The cutter unit is placed on slide ensuring that blades are positioned correctly.

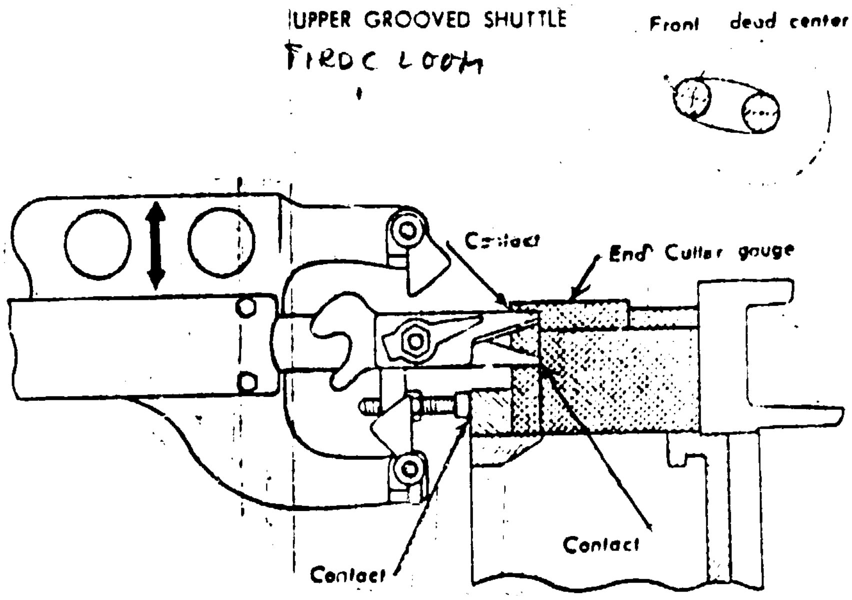
D - <u>ADJUSTMENTS</u>

Adjustment of cutter slide bracket & cutter slide must be so that line A-B is level.

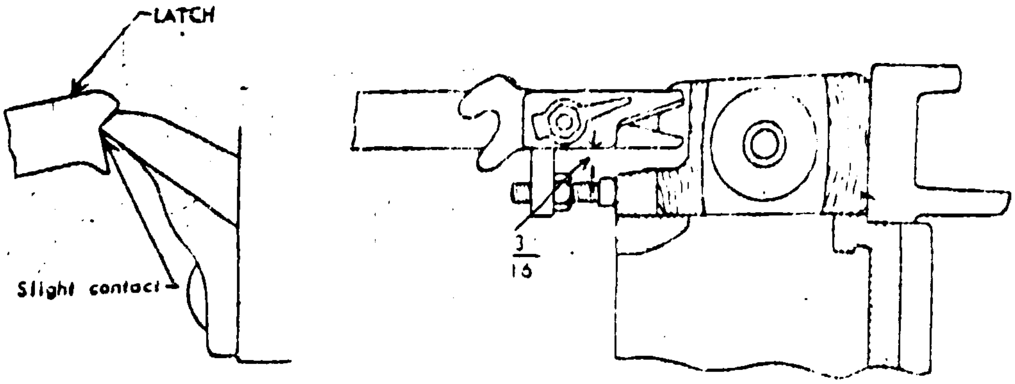


CUTTER ADJUSTMENT

Using upper grooved shuttles, put sley at Fdc. Fix cutter slide when upper face of cutter blade comes into light contact with lower face of projection of end cutter gauge (No.27or28)



Using no gauge adjust 3/16" clearance between lower face of blade of fully opened end cutter & upper face of recess of box front.



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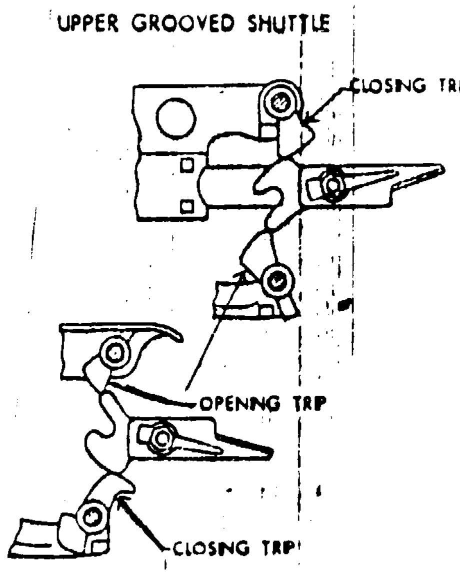
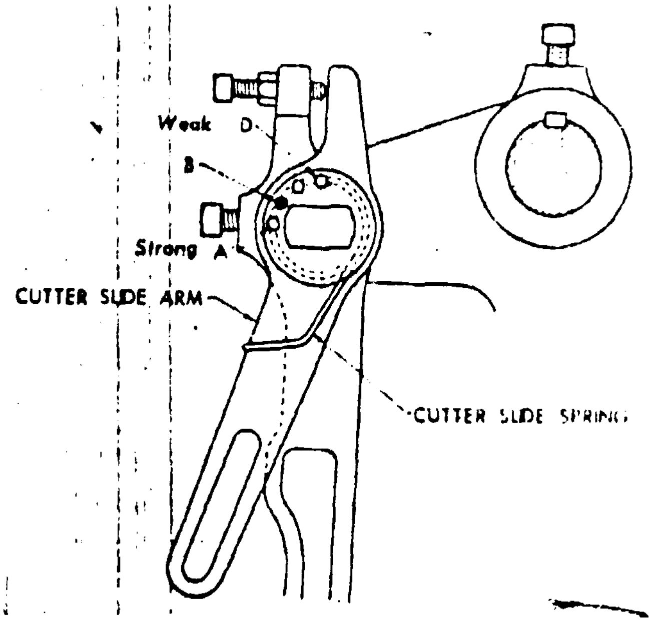
Determine the relative position of the Cutter Slide as follows.

Insert one bobbin into the Hopper and turn it into the position of changing. Put the shuttle with the bobbin inserted into the Shuttle Box on the hopper side. Then, get the Latch into engagement with the Bunter and bring the Slay to the position where the bobbin in the Hopper comes into contact with one in the shuttle. Keeping the slay in this position, with the adjusting screw in contact with the Slay determine the relative position of the Cutter Slide when the Butt of the Cutter Blade is brought just on the top of the Closing Trip attached on the Cutter Slide, by moving the Cutter Slide back and forth (Fig. 114B)



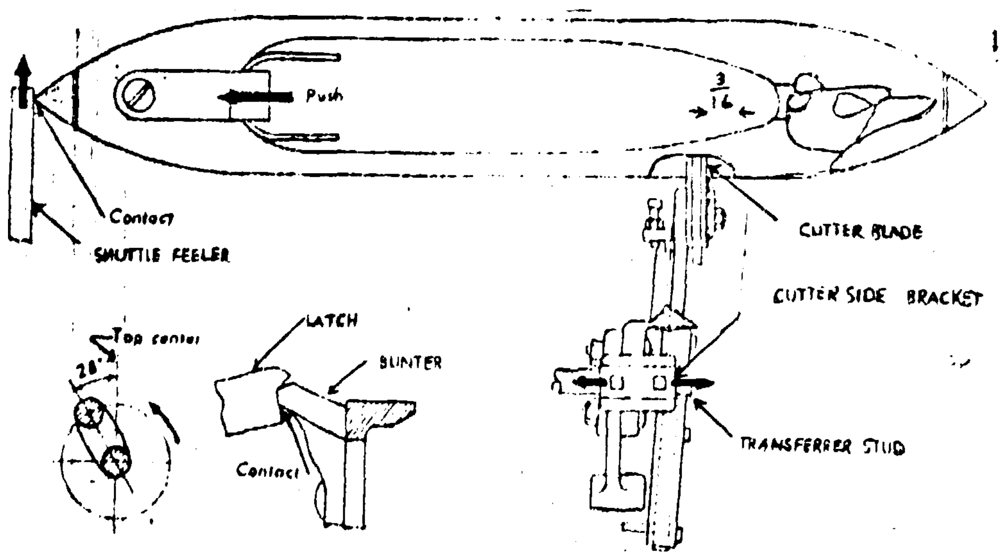
ADJUST THE CUTTER SLIDE SPRING

The cutter slide spring should be used under such a basic application that the more quickly the loom runs the more strong the spring must be.
The spring it is the strongest when hooked on the hole A, but usually it is applied on the hole B.



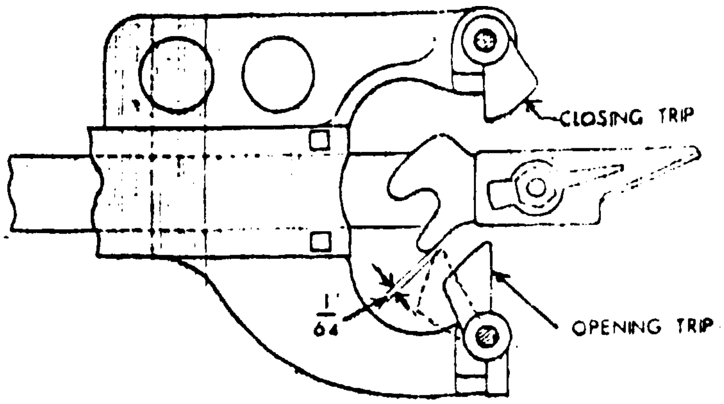
ADJUST CUTTER SLIDE BRACKET

Shuttle in B.S.(hopper side)-tip in contact ith shuttle feeler.Sley 28^{o}past T.C.push cutter arm outward till adjustment screw on cutter arm contacts front of sley end.

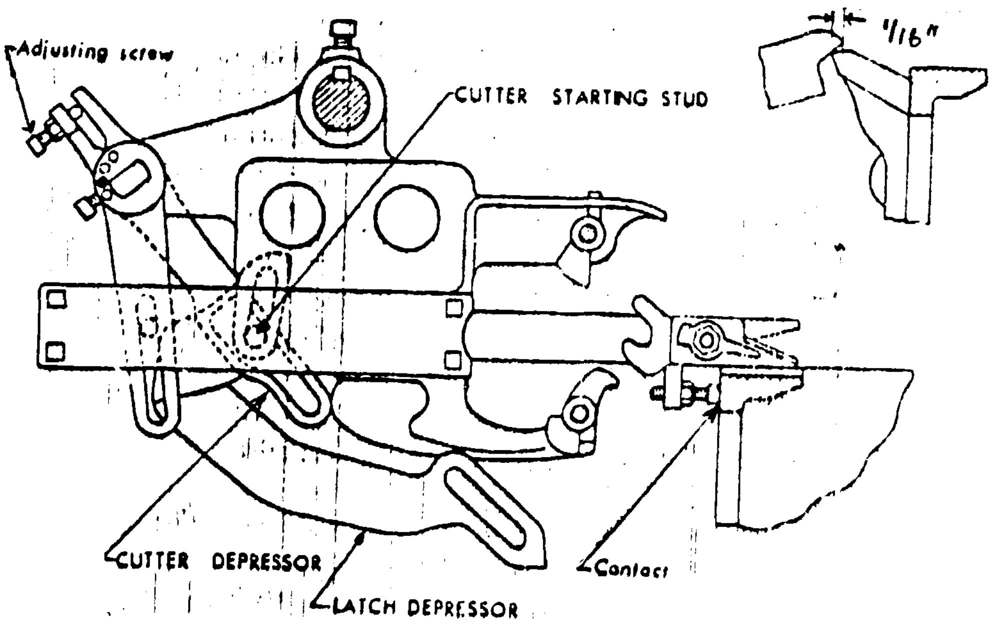


ADJUSTMENT OF CUTTING STARTING STUD

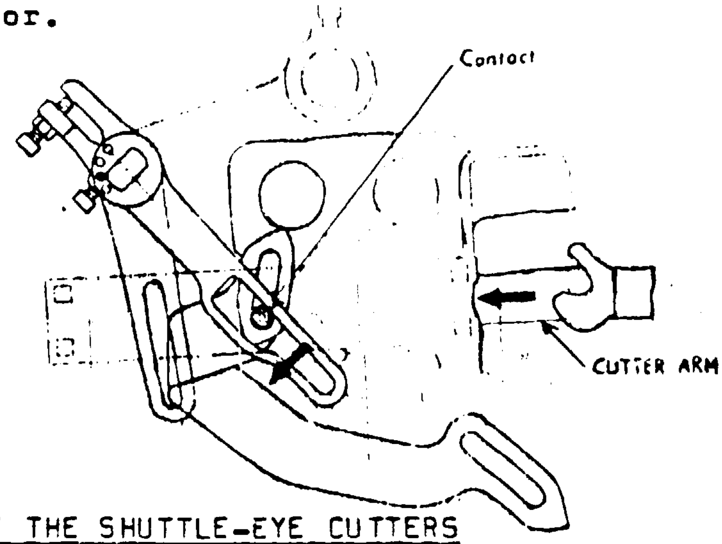
Adjustment screw attached on upper end of cutter depressor so that butt of cutter blades closed may stop a little over opening trip when shuttle feeler returned to normal position and cutter retracted towards front of loom



Adjustment of protruding movement of cutter. Fix position of cutter starting stud so clearance of 1/16" between tip of bunter and upper projection of latch.



Cutter starting stud fitted on upper part within fitting slot on latch depressor, adjustment screw of cutter arm come early into contact with sley. Cutter arm can slide 1/4" due to range of slot on cutter depressor.



E - LOOM PROBLEMS CREATED BY THE SHUTTLE-EYE CUTTERS

1. Lash in
2. Break weft
3. Break on change
4. Run out
5. Knock-off on change
6. Buzz shuttle
7. Broken pick

GROUP 10: A : VIBRATOR
B : LET OFF

10 A: VIBRATOR

A - FUNCTION

To even out warp tension between open & closed shed.

B - PARTS

- Vibrator bracket
- Easing cam
- Easing cam arm
- Shaft easing lever
- Feeling roller
- Arm bracket

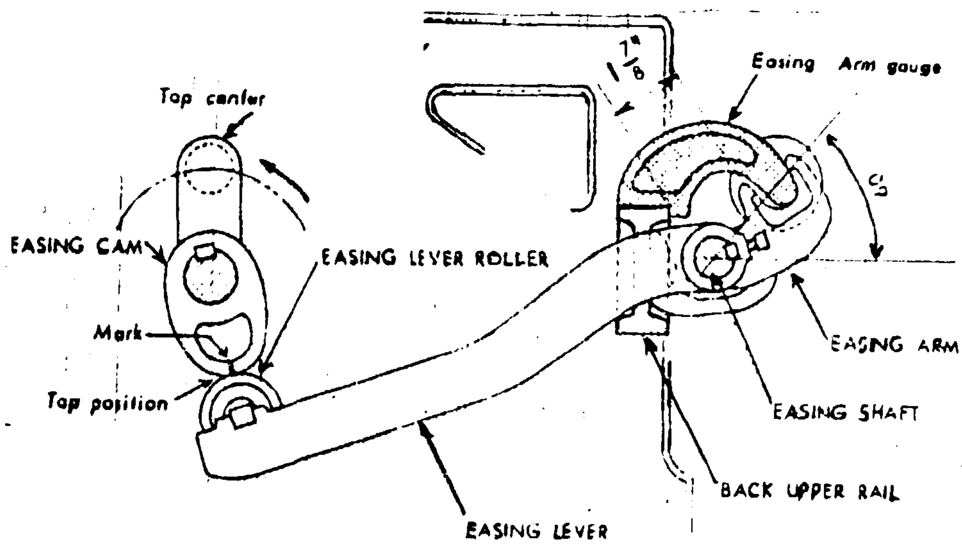
C - ASSEMBLING

1. Fix easing shaft & warp stop motion bracket with the top back cross rail on both sides
2. Fix easing shaft on the bracket
3. Fix easing arm & easing lever on battery side of easing shaft
4. Fix easing cam on hopper side of crank shaft
5. Put easing lever roller on its position
6. Put easing roller on its position on easing arm
7. Fix guide beam at its bracket

D - ADJUSTMENTS

ADJUSTING EASING CAM & EASING ARM

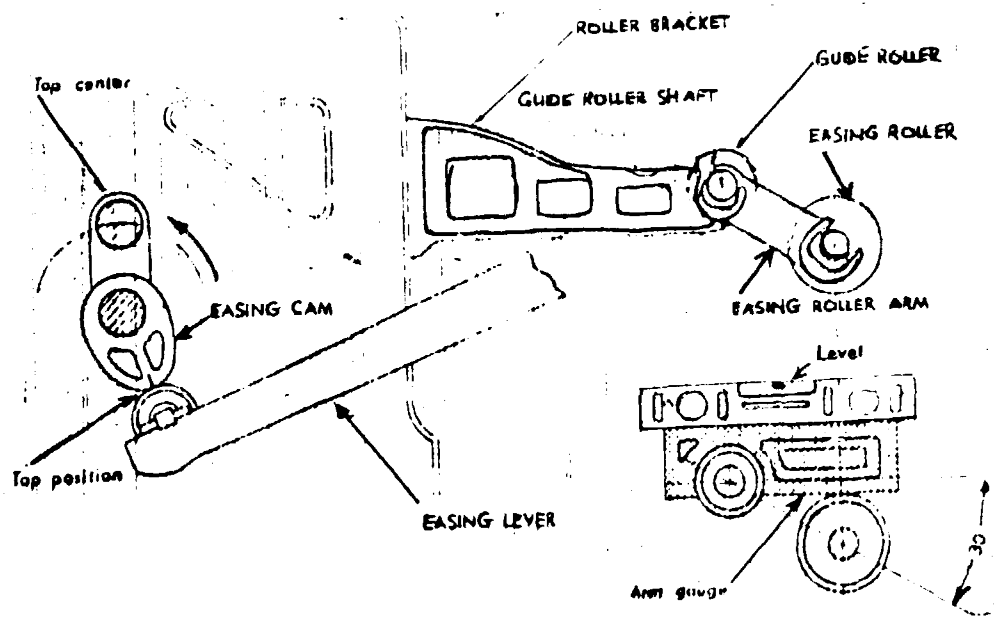
Crank in T.C., easing lever in contact with cam (mark) put easing arm gauge on back upper rail with tip into easing roller bearing fixing with no gauge, use distance of 1 7/8" between inside end of easing roller bearing & outside end of back upper rail. Not on TIRDC loom.



For twill weaves - disconnect easing lever.

2 ROLLERS EASING SYSTEM

Heald shafts level easing lever in contact with top position of cam. Put easing roller arm gauge (No.32) on easing roller and guide roller to give 30^{o}.



E - LOOM PROBLEMS CREATED BY VIBRATOR

VIBRATOR CAM TIMING

1. Break ends
2. Wavy cloth
3. Irregular weave
4. Strain warp yarn

WHIP ROLL

TOO HIGH

1. Over shots
2. Skips
3. Throw shuttle
4. Damage shuttle
5. Damage leather
6. Kinky weft

TOO LOW

1. Warp breaks

10 B - LET OFF

A - FUNCTION

To regulate the unwinding of the warp yarn on the beam in such a way that tension of warp remains constant independant of the diameter of the warp on the beam.

B - PARTS

- Weight levers + shaft + brackets + stop
- Back cross rail side frames & weights
- Auto let off motion driving bracket + feed driving arm
- Beam presser + shaft + bracket
- Feed back shaft + brackets
- Feed back bevel gears
- Shifter leaver, collar, foot pedal + pedal connecting rod + collar + spring
- Ratchet feeder + joint rod + ratchet separator connecting rod + ratchet separator
- Spring handle bottom bracket beam brackets
- Feed connecting rod + feed driving arm
- Transmission gear
- Ratched feeder bracket
- Parabola curve cam
- Sector lever + boss tension arm + feeling roller
- Slot lever + driving slot lever
- Sley sword joint + pin + bracket
- Indicator lever + stop stud + indicator
- Regulator bracket + roller
- Feed regulator + bracket

- Ratchet feeder joint rod
- Feeding stud (feeding pawl)
- Sector brake base + cam
- Brake lining
- Break release bracket
- Brake + brake pulley
- Feed back shaft shifter lever collar
- Ratchet separator + connection rod
- Ratchet separator lever + joint
- Separator vertical rod spring
- Tension connecting rod

C - ASSEMBLY

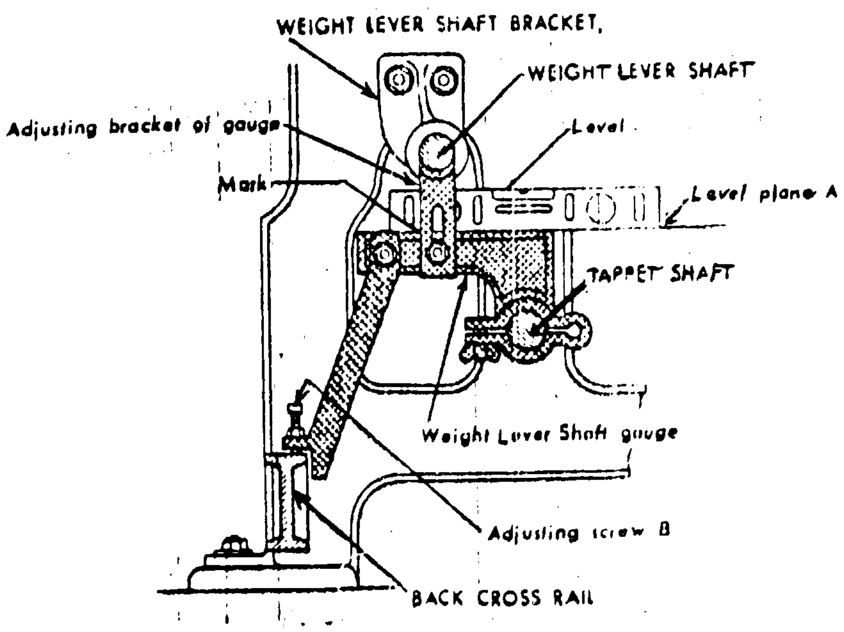
1. Fit weight lever shaft on its bracket inside of side frame. Fix weight levers on both outersides of weight lever shaft
2. Fix assembled auto - let off driving bracket by means of 2 bolts A+B
3. Beam presser shaft bracket is attached with feeler side (FS) transverse cross rail. Beam presser shaft has a spring pressure arm towards B.S., the other side of shaft is attached to assembled auto-let off driving bracket
4. Feed back shaft with smallest bevel pinion is fixed in lower part of FS. frame, keeping shifter lever collar on shaft
5. The other portion of the feed back shaft is attached with hand wheel shaft in the weavers side through a bevel pinion
6. There is a pedal in F.S. separator horizontal rod is attached to foot lever which is attached to brake release bracket through shifter lever

7. Fix F.S. beam bracket along with transmission gear assembly
8. Fit ratchet feeler bracket with F.S. beam bracket
9. Fix tatchet separator with ratched separator rod
10. Fix brake on pulley at ratchet shaft and brake release rod. Put one end with brake and other at connection of shaft at bottom
11. Feed regulator bracket is fitted in fender stay while the feed regulator is fitted to bracket
12. Indicator plate on indicator lever where the ratchet feeder joint rod's end is attached with the feed regulator
13. Fix feeling roller bracket on side frame
14. Fix tension connecting rod with weight lever and tension arm

D - <u>ADJUSTMENTS</u>

<u>FITTING OF WEIGHT LEVER SHAFT</u>

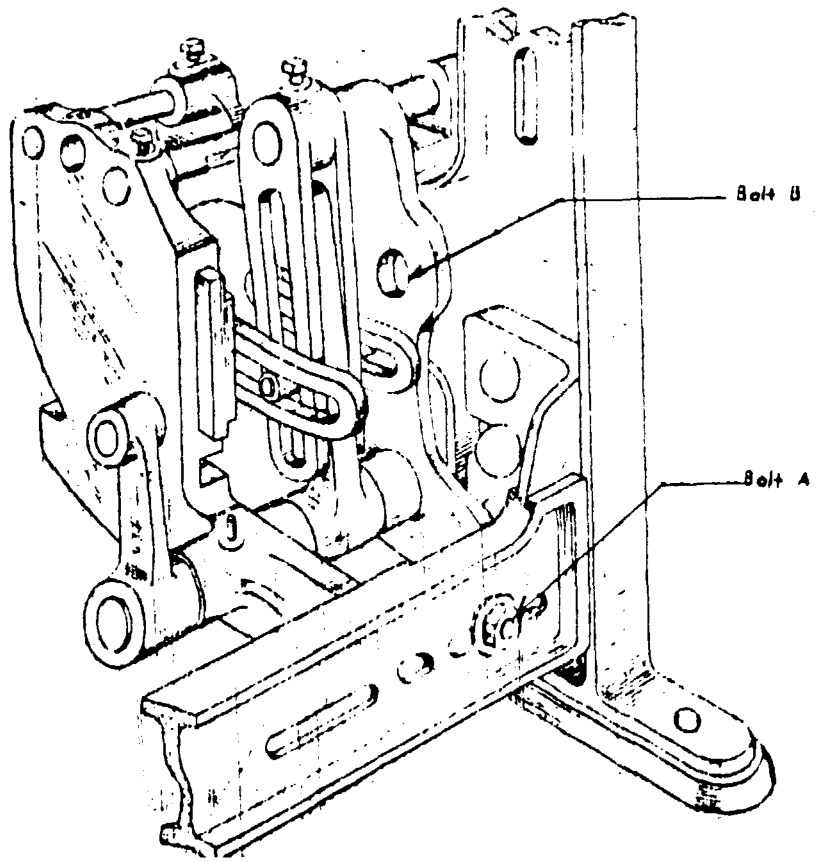
Attach weight lever shaft gauge (No.4) into back cross rail and tappet shaft. Surface A - to be level by adjusting screw B. Adjusting bracket of gauge to be fixed so the mark meet horizontal surface A.



ADJUSTMENT OF AUTO LET-OFF MOTION DRIVING BRACKET

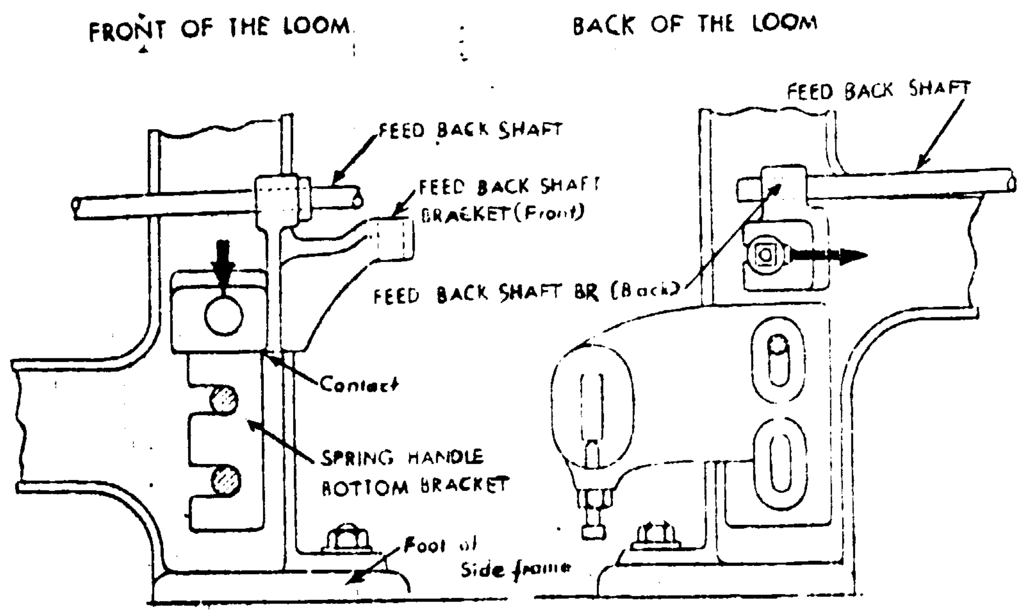
Loosen bolt A on back cross rail & tighten up again.
Loosen bolt B on side frame & tighten. Repeat twice, checking that lever parts can move smoothly - file to adjust.

ASSEMBLY OF AUTO LET OFF MOTION DRIVING BRACKET



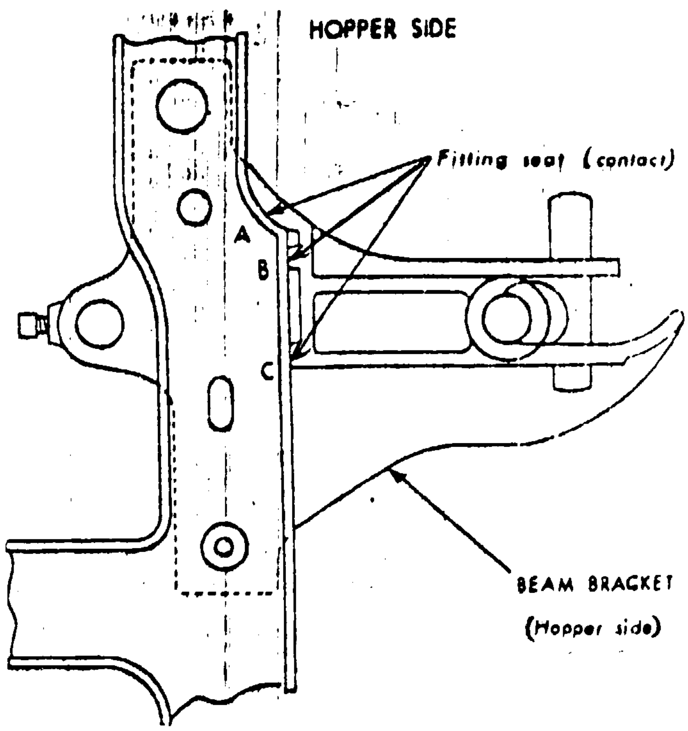
FITTING FEED BACK SHAFT BRACKET

The front bracket should be fixed in the lowest part of setting bolt hole and the other at back co be fixed in foremost part of setting bolt.



FITTING OF BEAM BRACKET

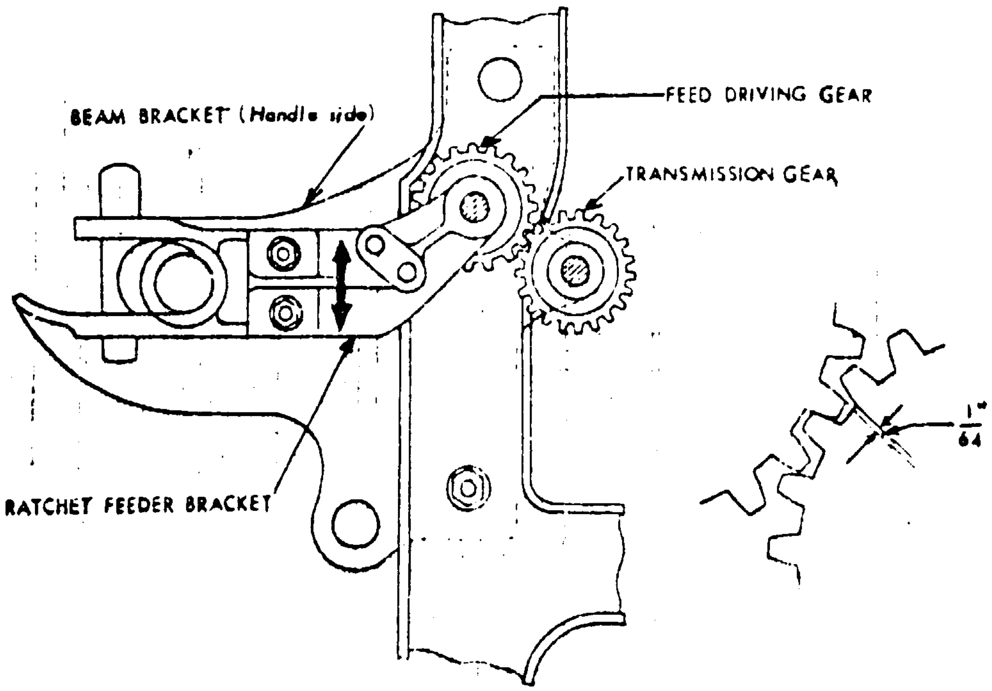
Beam bracket to fit each seat A-B-C strictly sticks to side frame.



ADJUSTMENT OF RATCHET FEEDER BRACKET

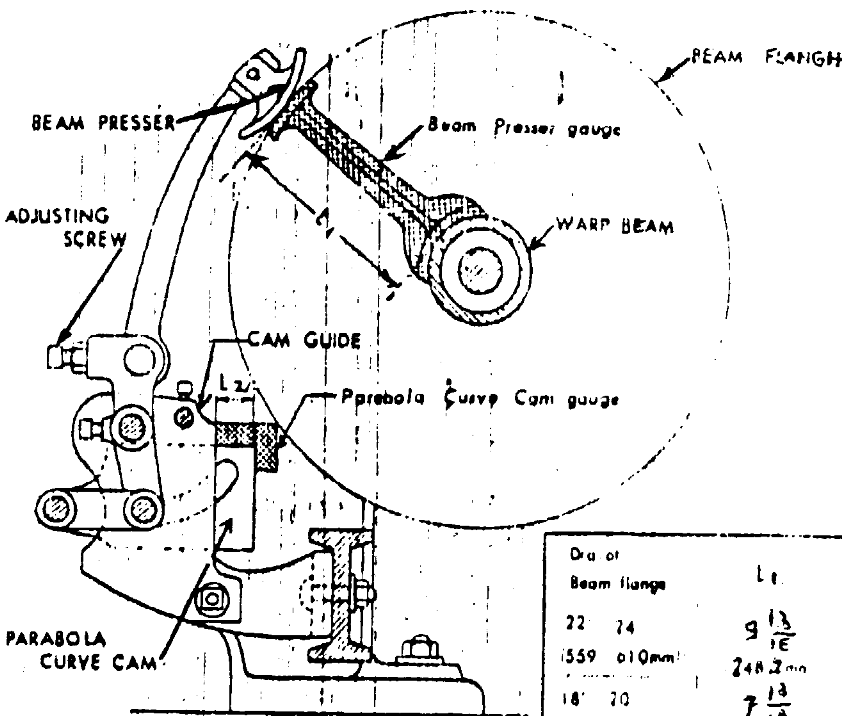
Transmission gears to mesh correctly clearance 1/64" adjust by raising or lowering ratchet feeder bracket.

HANDLE SIDE



ADJUSTMENT OF BEAM PRESSER

Distance (L1) between empty beam and beam presser by beam presser gauge (No.7)-A.Length (L2) between face of parabola curve cam and rear of loom (gauge No.8)

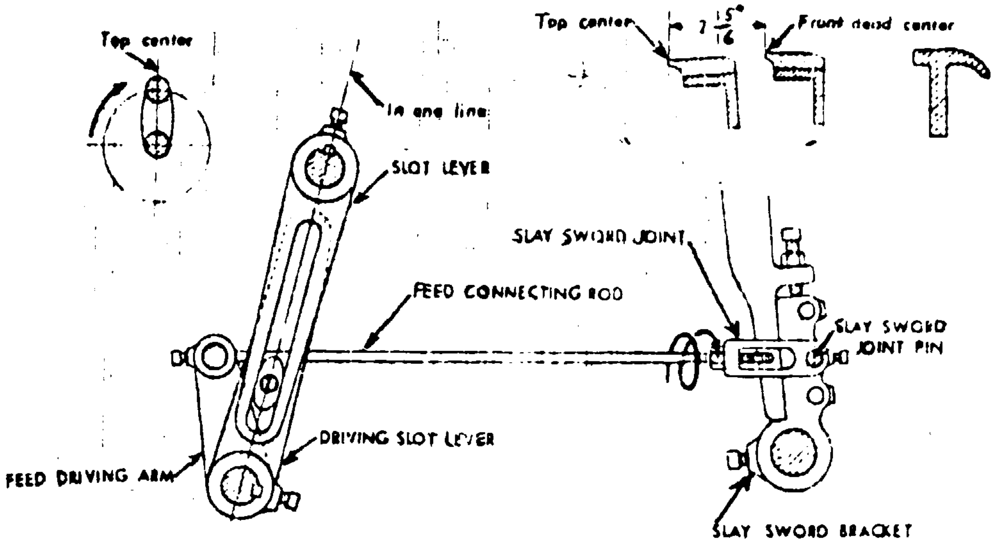


Dia of Beam flange	L_1	L_2
22" 24" (559 610mm)	$9\frac{13}{16}$ (248.2mm)	$1\frac{11}{32}$ (34.1mm)
18" 20" (457 508mm)	$7\frac{13}{16}$ (197.7mm)	$1\frac{11}{16}$ (42.9mm)

ADJUSTMENT OF FEED CONNECTING ROD

Crank at T.C.

Turn sley sword joint so centre lines of slot lever & driving slot lever will coincide use upper hole for low picks & bottom hole for high picks.



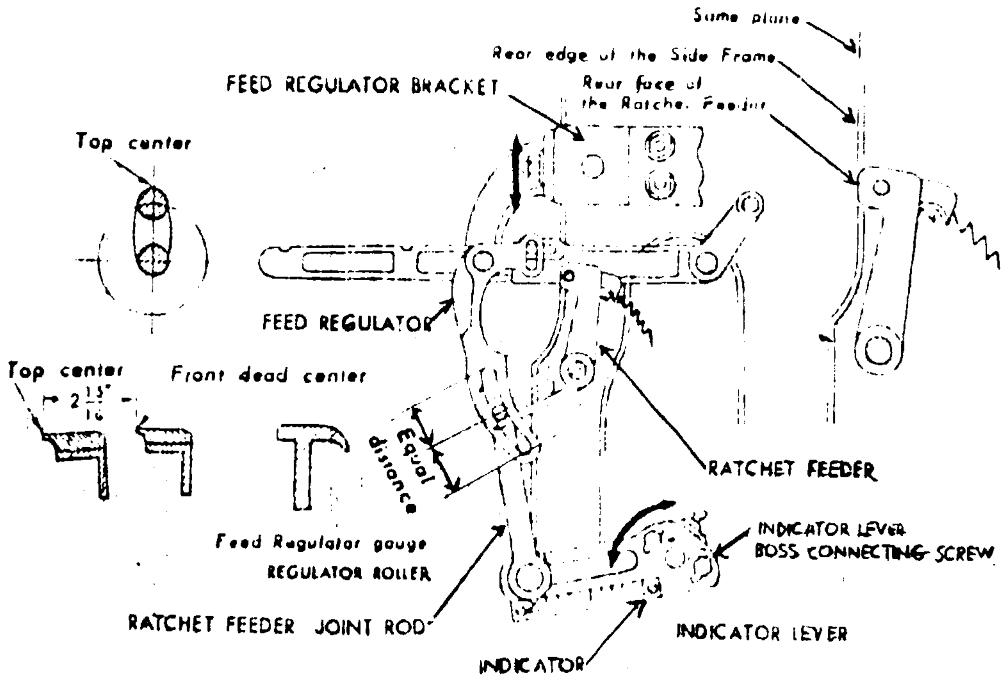
INDICATOR LEVER & REGULATOR BRACKET

Crank at T.C.

Centre line of slot lever & driving slot lever to coincide, indicator to be set at 10 on indicator lever.

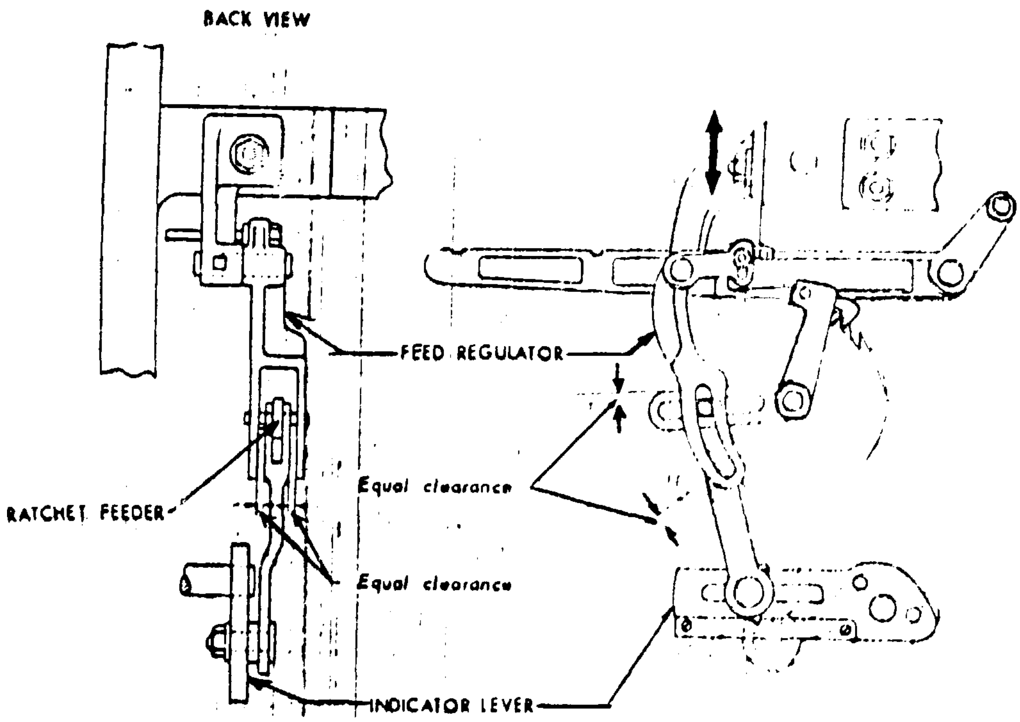
Regulator roller of ratchet feeder joint rod should be on rearmost part of slot in ratchet feeder.

Adjust joining part of ratchet lever with its boss so that the rear face of upper part is in same plane as rear edge of side frame.



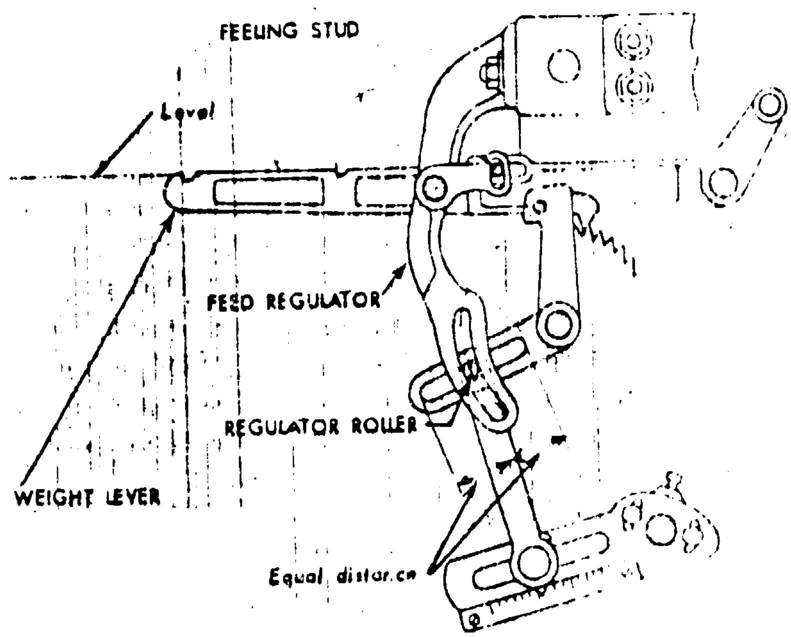
HEIGHT ADJUSTMENT OF FEED REGULATOR BRACKET

Upper part of ratchet feeder joint rod to be in centre of arc shaped slot of feed regulator.



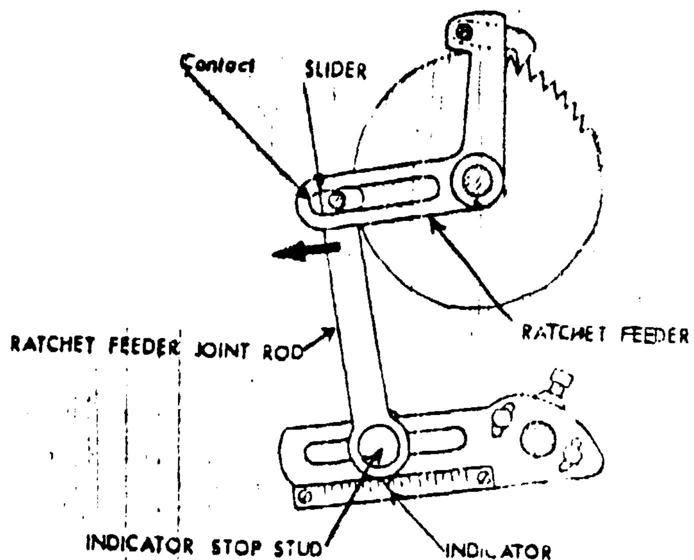
FITTING OF FEELER STUD

Weight lever approx, lever regulator roll in centre of slot of ratchet feeder.

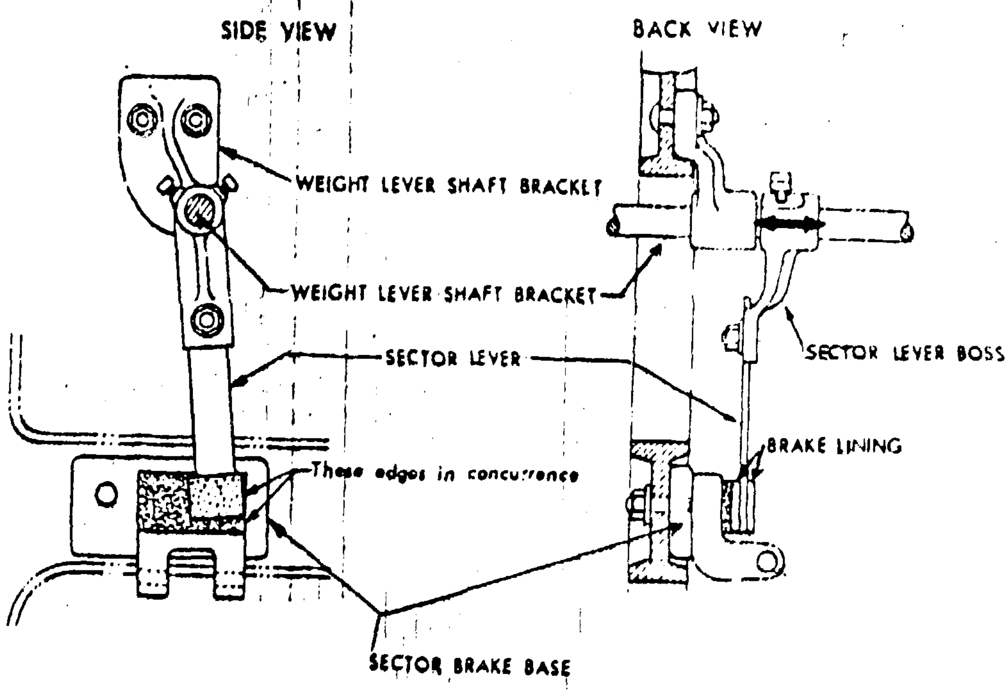


ADJUSTMENT OF SECTOR LEVER

Determine the lateral position of the sector lever boss on the weight lever shaft by adjustment so that the front end of the sector lever lining may be in concurrence with that of the sector brake base lining & at the same time each flank of linings of the sector brake base & sector lever may come into slight contact with each other.

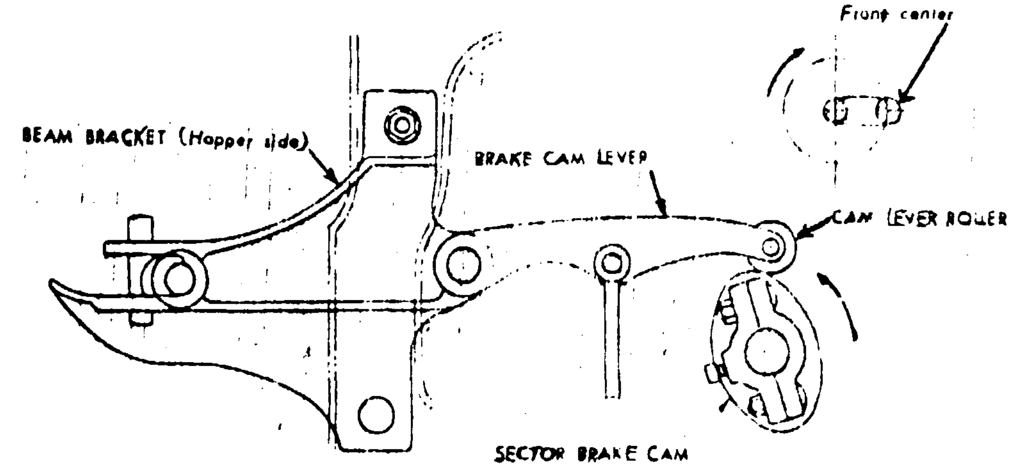


(Fig. 149B) — NOT ON TIRDC L00



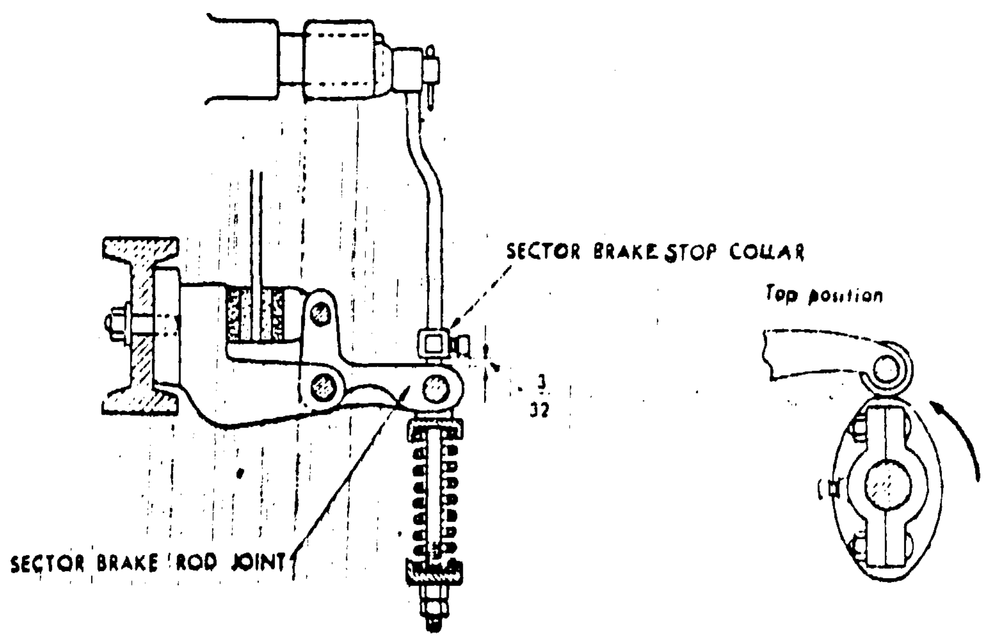
FITTING OF SECTOR BRAKE CAM

Crank in FC (not FDC), cam lever roller just passing top pos.



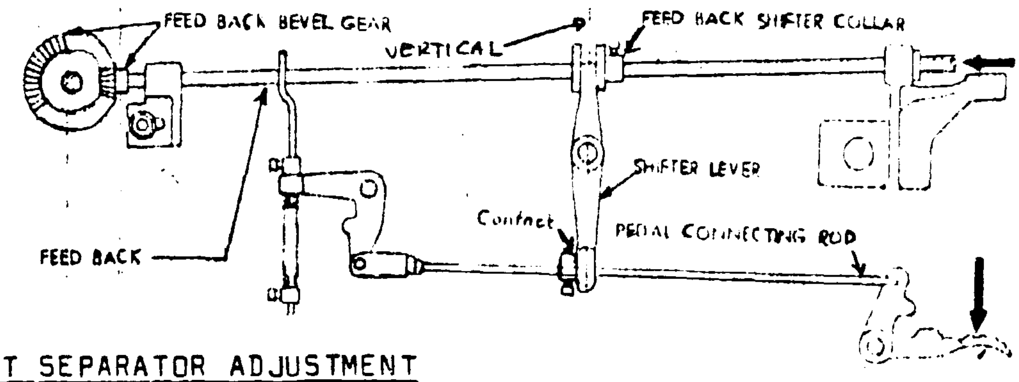
ADJUSTING SECTOR BRAKE STOP COLLAR

Cam lever roller in top pos. (each sector brake lining in strict contact), adjust sector stop collar on brake vertical rod about 3/32" clearance. Strength of spring depends upon the fabric. Stronger for heavier fabrics.



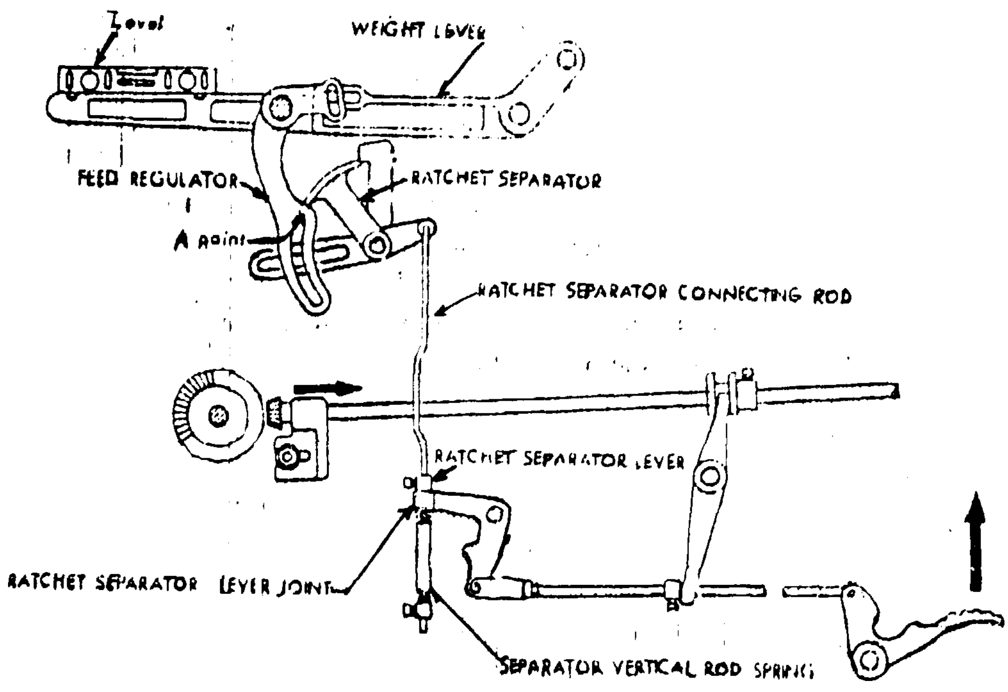
ADJUSTING STOP COLLAR ON PEDAL CONNECTING ROD

Fix collar when shifter is vertical & pushing feed back shaft fully back, treading the foot pedal, so feed back bevel gears mesh.



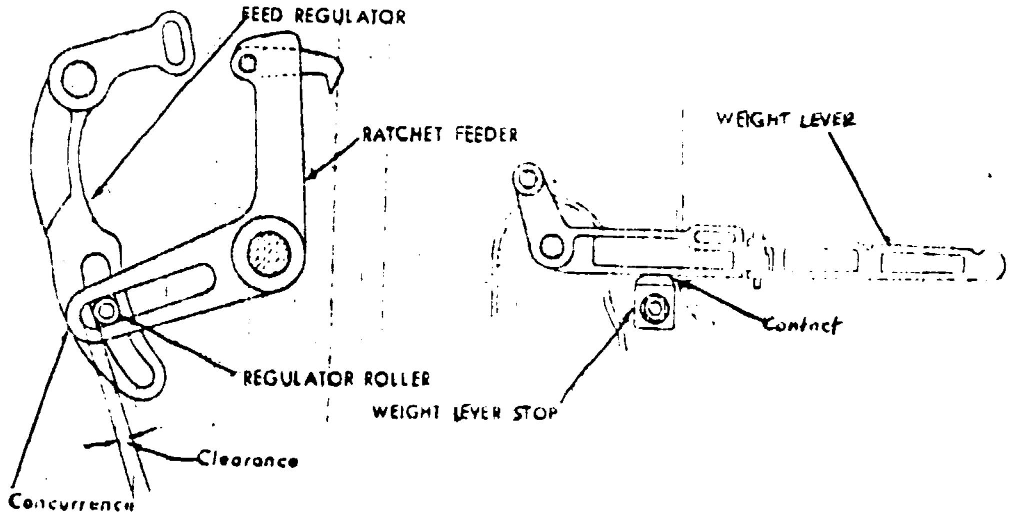
RATCHET SEPARATOR ADJUSTMENT

Fix collar when weight lever is level & ratchet separator is pushed completely backwards, so lower tip A of ratchet separator meet top of ARC shaped slot in feed regulator



WEIGHT LEVER STOP ADJUSTMENT

Push down weight lever, hold feed regulator so outside edge reaches end of ratchet feeder, fix weight lever stop on side frame touching weight lever.



ADJUSTMENT OF INDICATOR STOP STUD

See table

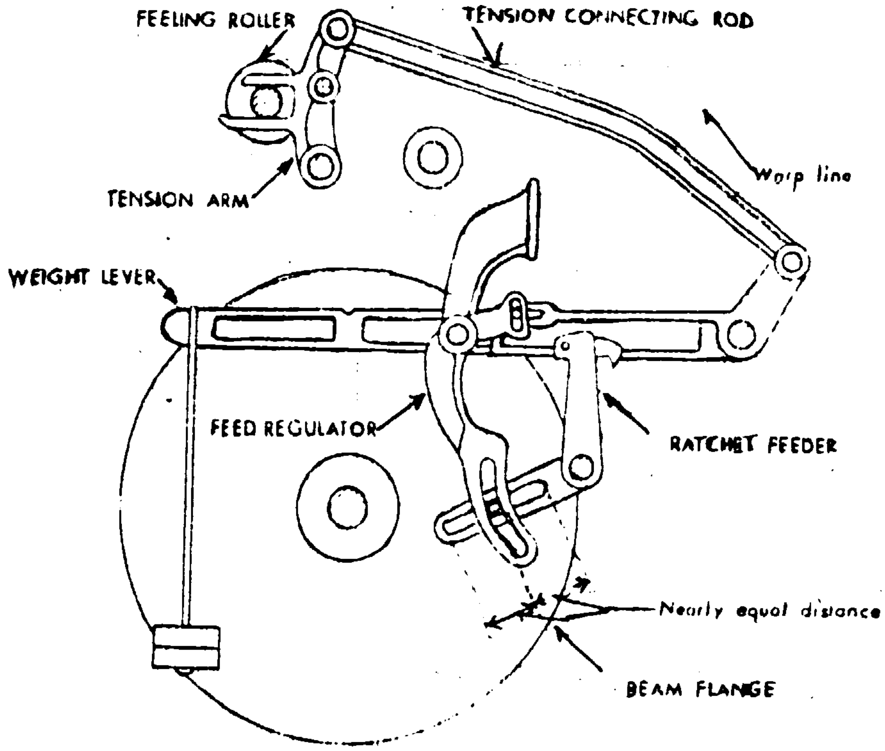
In case of 18" (457mm), 20" (508mm) flange — Picks per inch.

Graduation of Indicator		10.0		9.0		8.0		7.0		6.0		5.0		4.0		3.0		2.0		1.0
Position of Slay Sword Joint Pin	A	36	42			50				60				80				110		200
	B	23	25	27			32		36			42			50		60			80
	C	60			80						110						200			

In case of 22" (559mm), 24" (610mm) flange

Graduation of Indicator		10.0		9.0		8.0		7.0		6.0		5.0		4.0		3.0		2.0		1.0
Position of Slay Sword Joint Pin	A	26	30			36				44				57				81		141
	B	17	19	21			23		26			30			36		44			57
	C	44			57						81						141			

In case the regulator roller shifts from center to back of slot in ratchet feeder move indicator to smaller graduation. If regulator roller shifts from centre to front, move indicator to larger graduation.



E - <u>PROBLEMS CREATED BY LET OFF MOTION TOO TIGHT OR TOO LOOSE</u>

1- Break ends
2- Skips
3- Wavy cloth
4- Irregular weave
5- Bang - off
6- Overshots
7- Damaged shuttle
8- Damaged leather
9- Shuttle boxing incorrectly
10- Burst cloth
11- Smash

GROUP 11: <u>WARP STOP MOTION</u>

A - <u>FUNCTION</u>

Stops the loom when a warp end breaks

B - <u>PARTS</u>

- Warp stop motion bracket
- Guide beam adjusting bracket
- Guide beam frame
- Le-se rod + bracket
- Yarn guide bar
- Excentric cam
- Oscillating rod + arm + spring
- Extentric strap stand
- Feeler bars
- Collar
- Oscillating shaft + end
- Warp stop swing lever
- Swing lever connecting pin
- Connecting vertical rod
- Lifting shaft arm
- Horizontal connecting rod
- Knocking head + hammer + rod + knocking rod set
- Lifting finger
- Horizontal lever at front

C - <u>ASSEMBLING</u>

1-Fix stop motion box with its bracket

2-Fix oscillating shaft under stop motion box

3-Fix excentric cam on bottom shaft

4-Fix oscillating rod arm in excentric strap stand

5-Fix oscillating rod arm on shaft and arm

6-Fit connecting vertical rod with oscillating shaft, with help of shaft end

7-Fix warp stop swing lever on weight lever shaft bracket

8-Attach horizontal connecting rod to warp stop swing lever

9-Fix lifting shaft arm on lifting shaft

10-Fix lifting shaft bracket on spring handle bracket

11-Fix lifting finger on lifting shaft

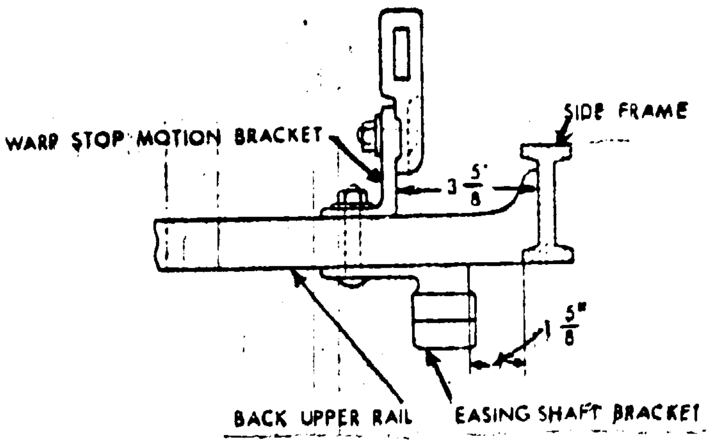
12-Fix knocking rod set on knocking rod through lifting finger

13-Fix knocking hammer to F.S. box

D - ADJUSTMENTS

ADJUSTMENT OF EASING SHAFT BRACKET & WARP STOP MOTION BRACKET

Simultaneously put easing shaft bracket and warp stop motion bracket on back upper rail. Adjust 1" 5/8" and 3" 5/8" from inner side of side frame.



Not possible on TIRDC loom.

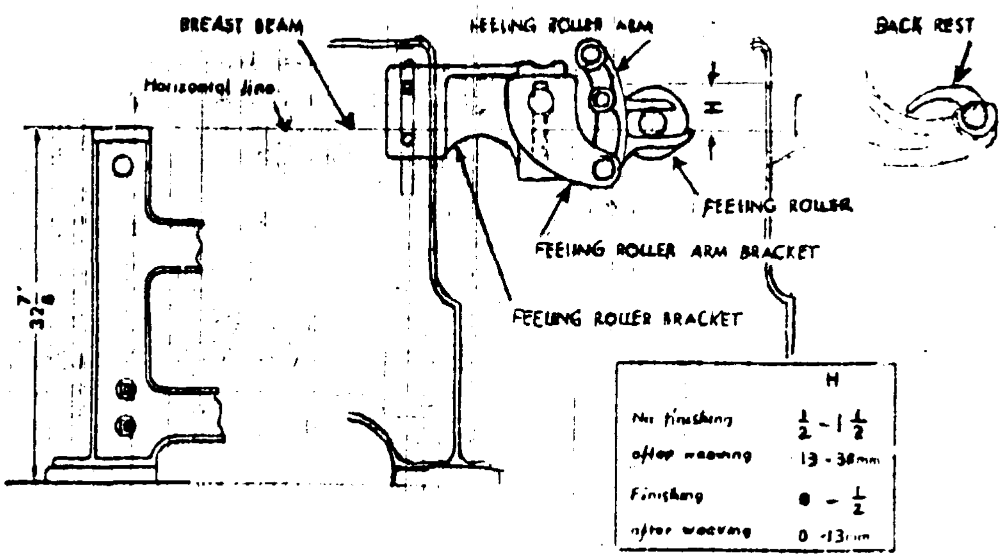
ADJUSTING WARP LINE

Depend upon type of fabric.

Plain fabric not to be finished - feeling roller or back rest to be set 1/2" - 1"1/2 higher than breast beam.

Plain fabric to be finished set 0-1/2" higher twill fabrics (1/2-1/3-1/4) set at 1" - 1"3/4 lower.

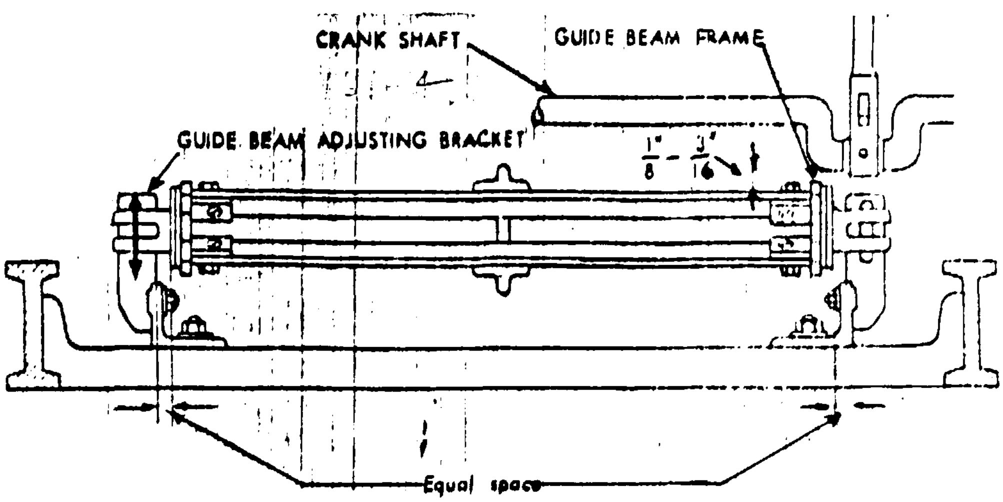
PLAIN WEAVE



	H
No finishing after weaving	$\frac{1}{2}$ - 1 $\frac{1}{2}$ 13 - 38mm
Finishing after weaving	0 - $\frac{1}{2}$ 0 -13mm

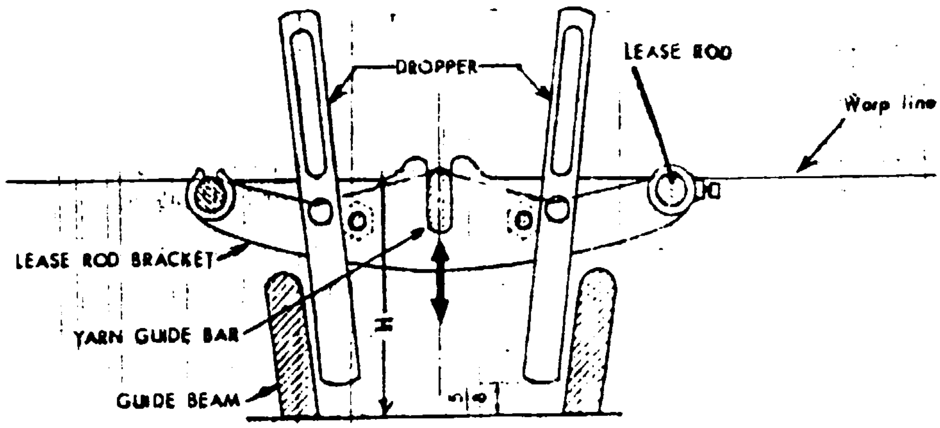
FITTING OF STOP MOTION BOX

Allow a distance of 1/8"-3/16" between crank & guide beam frame.



ADJUSTMENT OF HEIGHT OF YARN GUIDE BAR

Distance H.between lower face of guide beam and upper face of yarn guide bar should be: 3 3/8 for long drop wires.
3" for short drop wires.

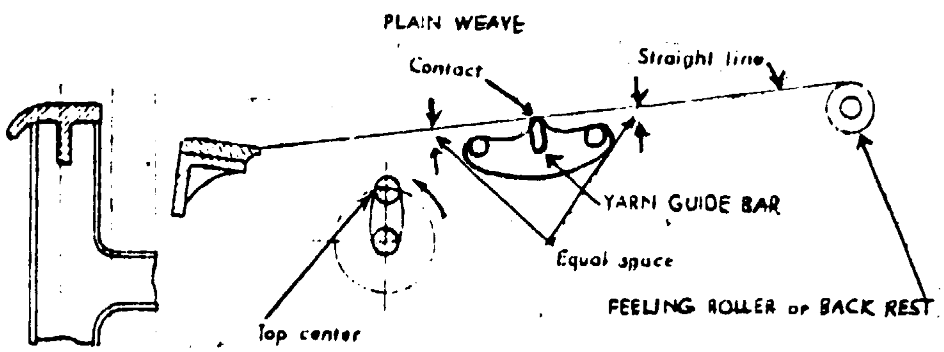


VERTICAL POS. OF STOP MOTION BOX

Plain weave - crank at TC.

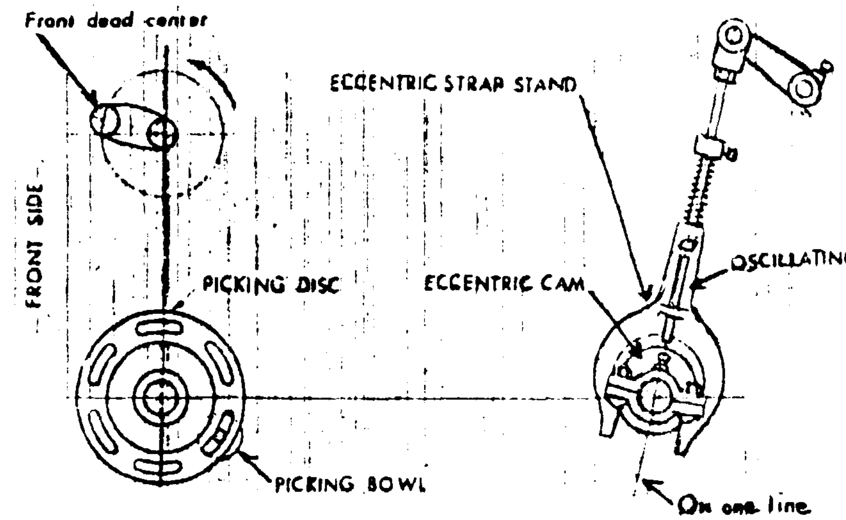
Twill weave - crank at BDC

Both lease rods to be fitted with equal space to warp line



ADJUSTMENT OF EXCENTRIC CAM

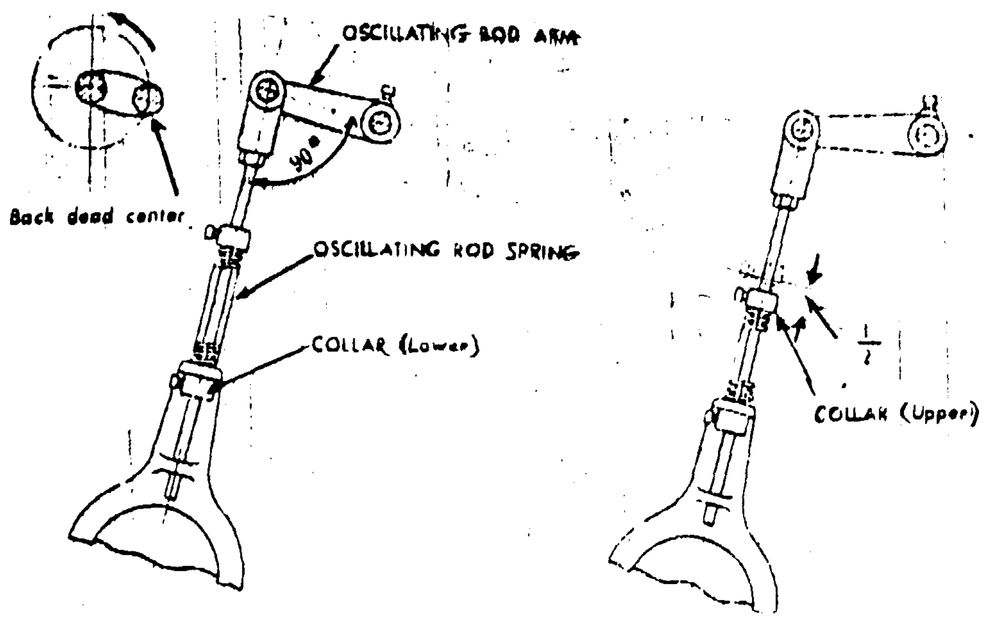
Shuttle in handle side. Picking bowl of handle side is on back of loom. Sley at FDC. cam on line with oscillating rod with set screw also on line.



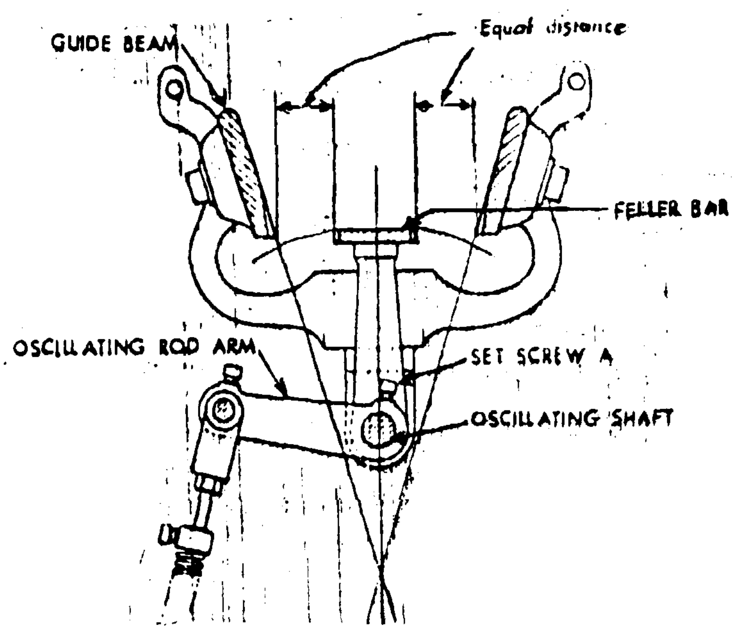
ADJUSTMENT OF OSCILLATING ROD ARM & FEELER BAR

Sley at BDC

Fix lower collar when oscillating rod arm is at 90^0 to oscillating rod. Fix upper collar by compressing spring 1/2" shorter than normal length.



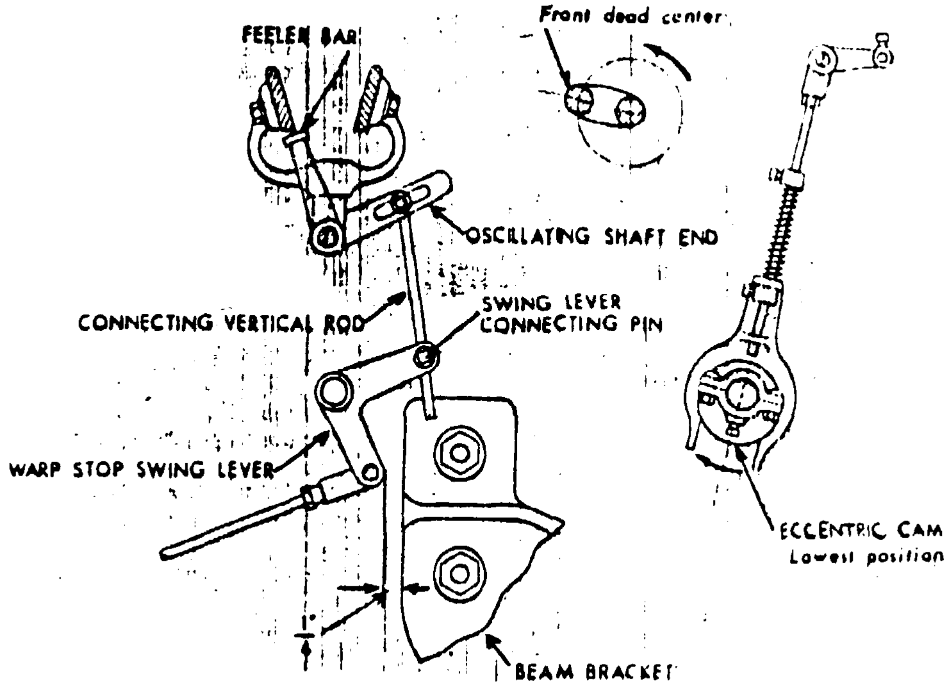
Put feeler bar in center between guide beams & fix oscillating rod arm on oscillating shaft. Turn loom one rev. and stop in BDC. & check that feeler bar is in center. If not - loosen set screw A to set half of difference. Other half by changing timing of excentric cam. Feeler bar always in centre when loom is at BDC.



Not as TIRDC loom.

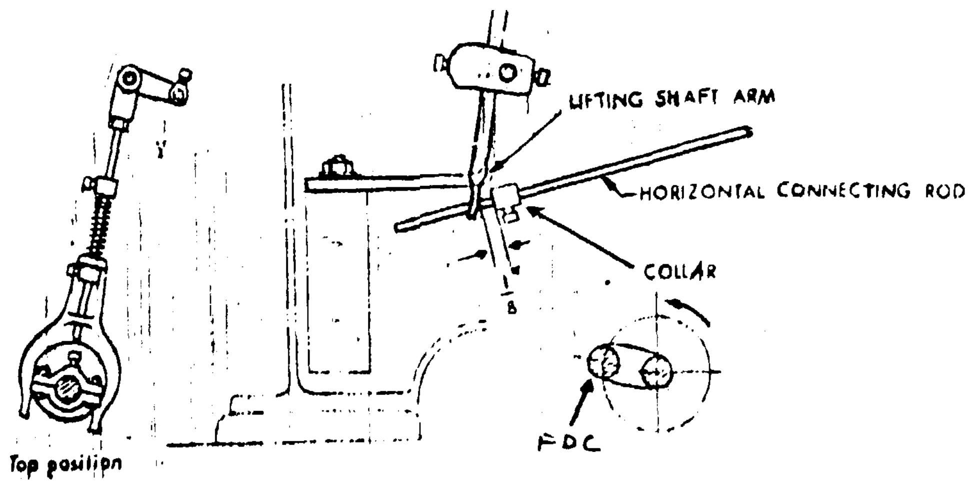
JOINING WARP STOP SWING LEVER TO CONNECTING VERTICAL ROD

Loom pos. FDC & excentric cam at lowest pos. join lever and rod with 1/4" clearance between warp stop swing lever & beam bracket.



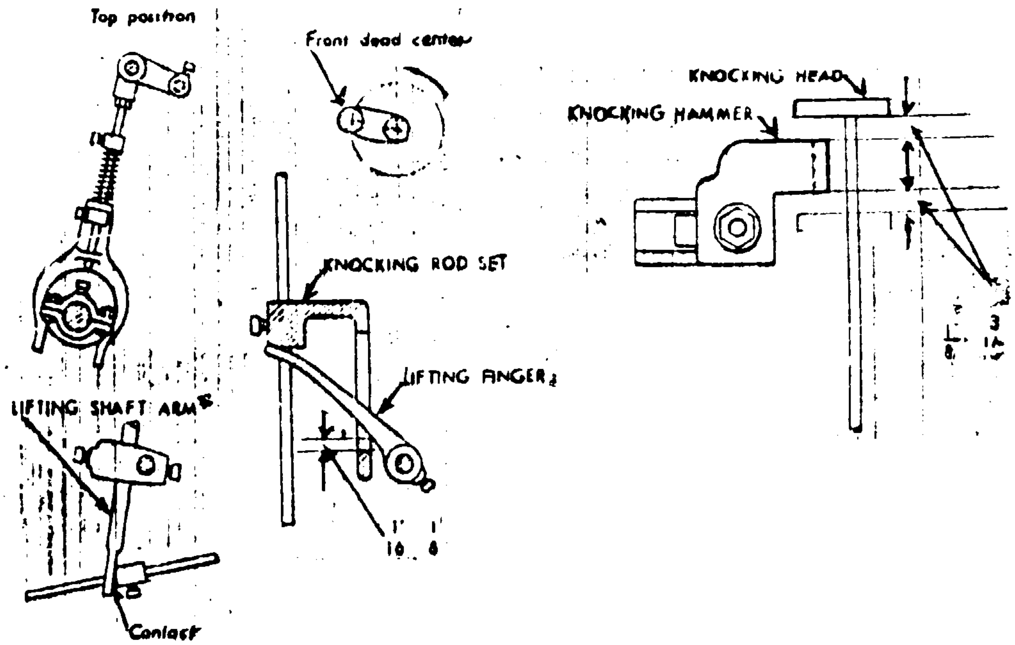
ADJUSTMENT OF COLLAR ON HORIZONTAL CONNECTING ROD

Loom pos. FDC and excentric cam at top pos. push lifting shaft arm forward fix collar at 1/8" clearance between collar and lifting shaft arm.



ADJUSTMENT OF LIFTING FINGER

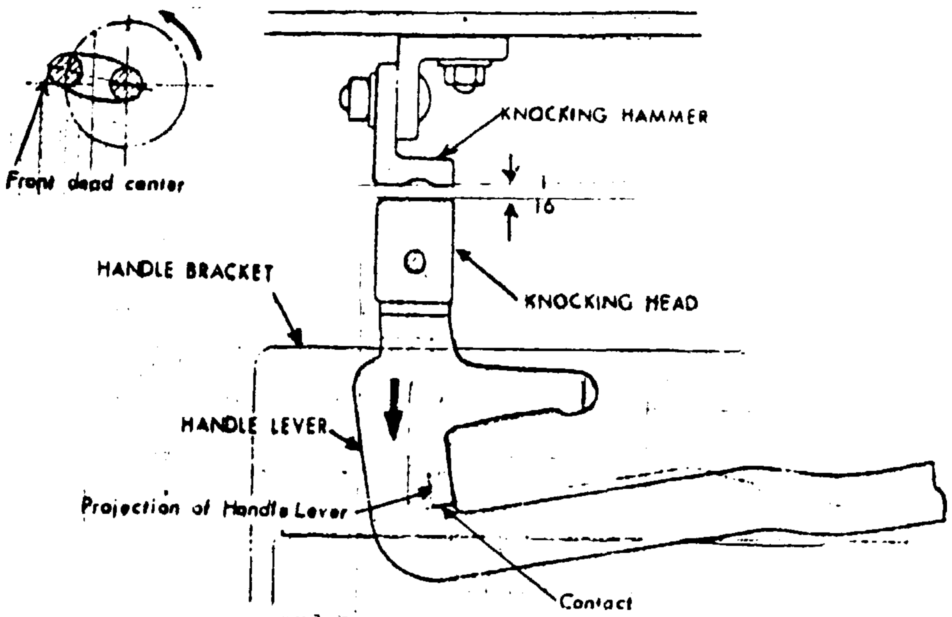
Loom pos. FDC & excentric cam at top. Lifting shaft arm in contact with collar. Fix lifting finger to 1/16"-1/8" clearance between lower end of opening in knocking rod set and lower face of lifting finger.



Adjust knocking head by the knocking rod set so equal clearance of 1/8"-3/16" is obtained between knocking head and hammer. Push handle lever backwards & turn sley so knocking hammer meets knocking head insert droppers in 2 places before and behind feeler bar, hold between guide beam & feeler bar. Hammer to strike knocking head. Amount of stroke, adjust length of lifting shaft arm or pos. of bolt joining oscillating shaft end and connecting vertical rod.

ADJUSTMENT OF KNOCKING HAMMER

Loom pos. FDC - pull forward handle lever, knocking hammer to be fitted with 1/16" clearance knocking head.



E - LOOM PROBLEMS CREATED BY WARP STOP MOTION

- Loom not stopped in proper position
- Missing ends
- Smash
- Broken shuttle
- Skips
- Ends breaking
- Unequal shed

GROUP 12: SHEDDING

A - FUNCTION

To command the up and down movement of the harnesses according to the type of weave in which the cloth is woven. The tappet while rotating pulls down the treadle as the treadle is connected to the harness, so this harness is also pulled down whereas the other harness is pulled up by the harness reversing arrangement fitted at the top of loom.

B - PARTS

- Tappets + tappet shaft
- Treadles
- Treadle heel
- Treadle bowls
- Back cross rail
- Top cross rail
- Heald shaft bottom brackets
- Heald shaft + guides + top reversing rollers + straps + hangers and wood healds
- Heald frames with healds

C - ASSEMBLY

1-Fix treadle heel at bottom cross rail

2-Fit treadles with treadle bowls on treadle heal keeping care that the longer treadle remains in B.S. of the loom

3-Fit tappet in tappet shaft in such a way that the tappet with bigger dia comes always on right hand side when fixer stands in the back side of the loom

4-Fix heald shaft bottom brackets on top cross rail

5-Fix heald shaft guide on heald shaft bottom brackets

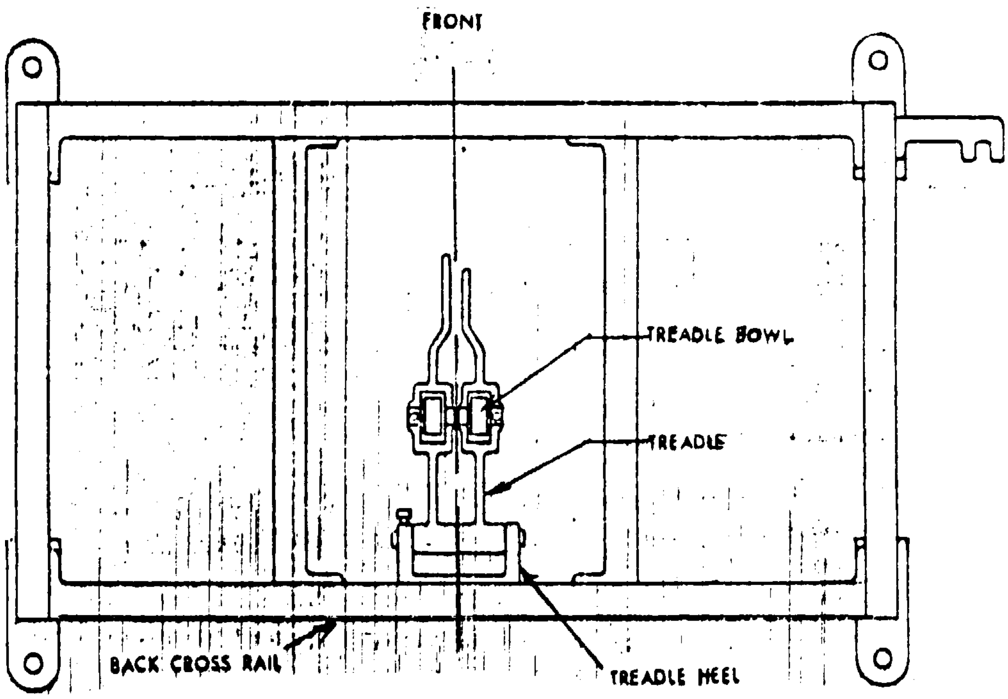
6-Put heald shaft with top reversing roller in guides

7-Fix heald frame with strap and hanger from top & bottom

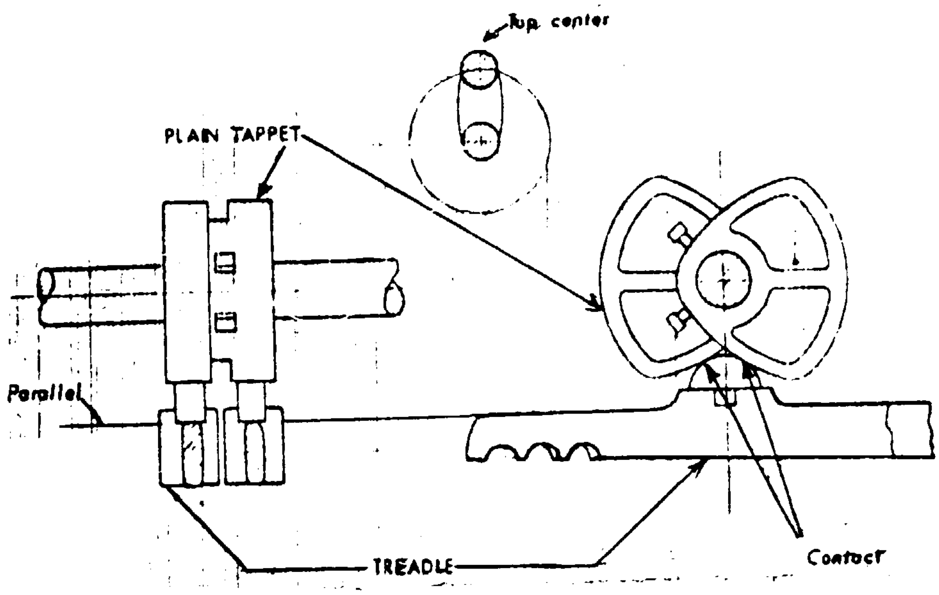
D - ADJUSTMENTS

SETTING THE TIMING OF SHEDDING

Fix the treadle heal assembled with treadles on the centre of the back cross rail.



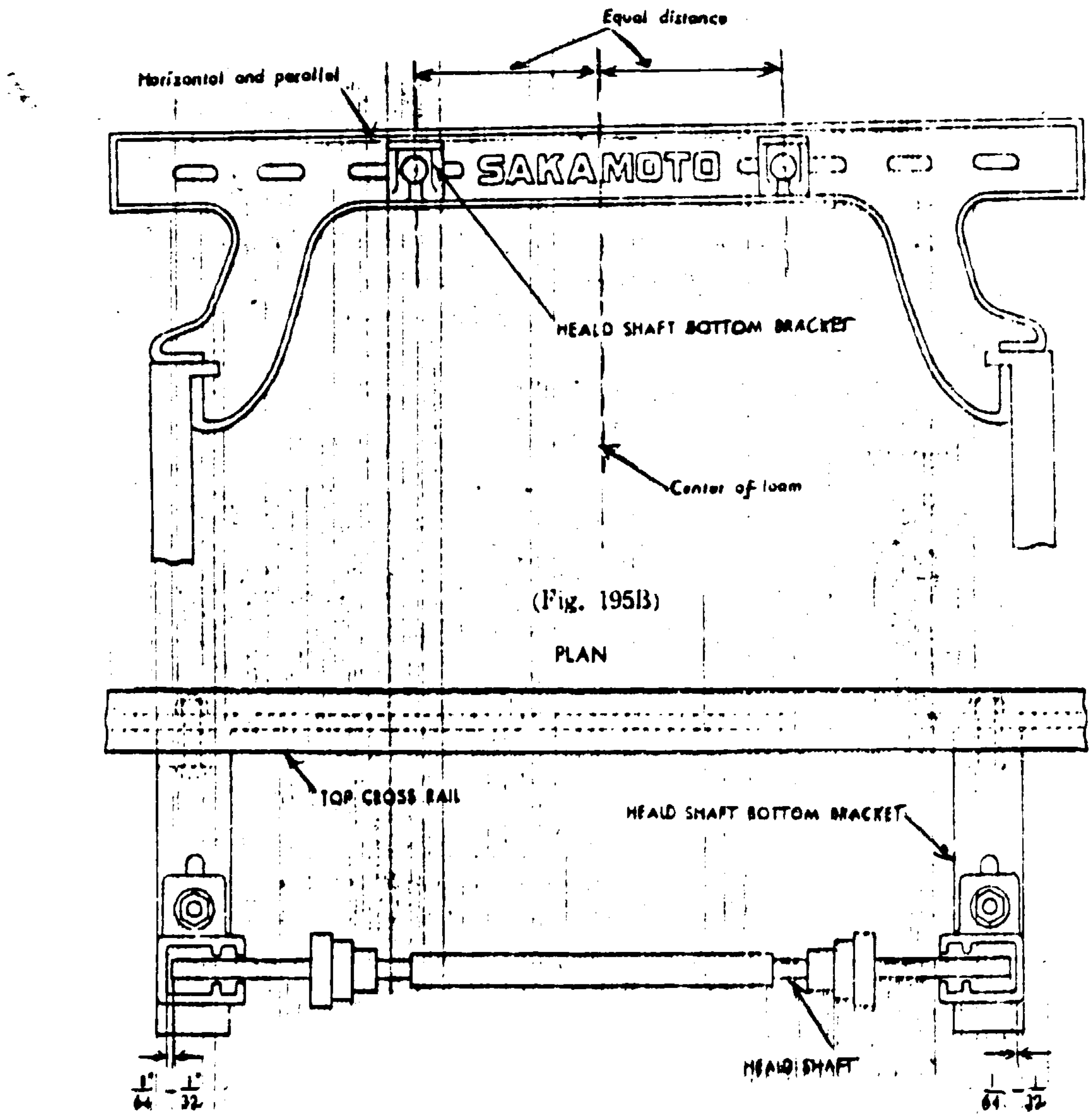
Put the crank at top center and set the plain tappets in such a way that the two treadles contacting the tappets are parallel.



SETTING OF HEALD SHAFT BOTTOM BRACKET & HEALD SHAFT

Fix the heald shaft bottom bracket with the top cross rail so that the upper surfaces of both are parallel.

Place the heald shaft in such a manner that its center and the centre of the loom are in one line. There should be a clearance of 1/64"-1/32" (0.5-1 mm) between the heald shaft & the bracket on the both ends.



(Fig. 195B)

PLAN

E - LOOM PROBLEMS CREATED BY SHEDDING HARNESS SETTING

- Overshots
- Skips
- Smash
- Break weft
- Kinky weft
- False change
- Bad change
- Knock out pirn
- Laying off
- Bang off
- Hang bobbin
- Damage raceboard

HARNESS TIMING

- Overshots
- Skips
- Smash
- Knock out pirn
- False change
- Hang bobbin
- Break weft
- Throw shuttle
- Bang off
- Damage reaceboard

PHASE 1 : CONDENSED SETTINGS

The condensed settings are a brief summary of the settings to carry out on the various loom-parts.

Its purpose is to provide the tuner with the essential information on what gauges to use and what clearances to apply when setting a certain loom part.

It is recommended to issue these condensed settings in a pocket-size booklet with each page covered with plastic (to prevent staining etc. by grease, dirty hands etc.), in order that the tuner can always carry it with him, so he can consult it when not sure about a certain setting.

1. CLUTCH.

- Spring handle - 2" from resting pos.

2. BRAKE.

- Length of connecting rod - 15-15¼"
- Tongue clearance - ¼"
- Brake hoop to lever - 1/8"

3A. BEAT UP & PROTECTOR MOTION.

- Sley sword - gauge No. 17
- Sley height - gauge No.19
- 1.7/8" between back part of wood thrash and sley fly back
- Knock off lever 1/8" between upper face and outer face
- Distance between upper part of spider pulley lever and lower part of sley sword: 1/2"-5/8"
- From read cap fix reed clearance 1/16"
- Sley fly back setting at loom pos. 20-30° past TC
- Spider pulley guide lever to bracket:1.3/8-1.½"
- Tip of guide lever to move up-down:½"- ¾"
- Spider stop finger and duck bill to overlap by:
  - Thin cloth - ½"
  - Thick cloth - ¾"

3B. TEMPLE & TEMPLE CUTTER.

- Clearance between temple case & wood thrash:3/16"
- Distance of 1/16 between temple case on handle side and 1/8" on hopper side.
- Ratchet stop finger strictly in recess when feed pawl level is 1/4" from end of opening in ratchet box.

- Distance between upper face of ratchet box and center of ratchet box stud: 1".3/8 and front faces of side frame and ratchet box:18".7/8-19"
- Clearance between temple cutter lever bracket and sley sword:1/8" and between tip of feed pawl level pin and side face of temple cutter lever 1/16"-1/8"
- Starting arm in line and starting finger in tooth push starting arm back to give clearance of 1/16-1/8"
- Clearance between lower tip of shifting rod action lever and upper face of temple rod: 1/8" cam at lowest pos.
- With temple cutter cam roller on top position of cam clearance between shifting rod and breast beam 1.5/8"
- In same position of cam roller adjust shifting rod adjuster so tips of temple cutter blades are in same plane as temple case
- Limiting screw adjustment to give some play of movable blade

(TOP)

- Fix cam: at sley pos 3/16" away from FDC towards top center
- With stop pin supports temple cutter lever: 1/32 clearance between shifter rod action lever and limiting screw.

4B.PICKING.

- Adjust box front with gauge No.22
- Adjust picking stick in centre of groove
- Clearance between upper face of picker and lower face of shuttle guard plate: 1/16"
- Clearance between lower stick guide and picking stick 1/16"

- Adjust buffer holder so 3 rings on bobbin correspond to grooves in bobbin guide and feeler finger from bunch: 7/16"
- Distance between picking stick & bumper: 3/4"
- Picking strength: see table
- Timing picking bowl in contact with picking nose when slev has moved 2".3/8" + distance between breast beam and reed at FDC backwards

5. WEFT FORK.

- Height of weft hammer: 2.½" gauge (No.21)
- Fork engages grate: 3/16 - ¼"
- Clearance between hammer & back wire: 3/16"
- Distance lifting catch to starting rod collar: 1/64"
- Clearance shifter lever to handle lever:1/64-1/32"
- Clearance between ratchet wheel tooth & check tooth of lifting catch: 3/16 - ¼"

6. TAKE-UP.

- Cloth roller lever bracket height 9¾" - 10" from cloth roll winding
- No clearance between: return lever and adjuster with stud outwards
- Cannon bracket in contact with upper backwards part of sideframe:
- No contact between: Stud wheel and int. wheel
- Clearance to be uppermost between take up lever and side frame

7A. WEFT FEELER.

- Clearance between upper edge of feeler finger & upper face of slot in shuttle: 1/16"
- Clearance between box front and adjustable stud: 0 - 1/16"
- Weft feeler box inside stroke: 3/16"-¼". Outside sightly longer
- Clearance between upper face of tip and lower face of feeler motion knock: 3/16 - ¼"
- Clearance between adjustable piece and spring handle: 1/64"

7B. CHANGE CONTROL.

- Small clearance: between starting rod finger & adjustable screw
- Clearance between each coil of spring: less than 1/64"
- Starting rod finger tip in contact to straddle bug at backward position

8A. BATTERY.

- Height of sley: use hopper stand gauge (No 16)
- Lever sley: use sley height gauge (No 19)
- Bunter adjustment: use bunter gauge (No 26)
- Shuttle feeler and hopper stand: use shuttle feeler distance gauge (No 25)
- Distance between pirn tip and butt:1/32 - 1/16"
- Pirns must be parallel
- Hopper stand: use box front gauge (No 22) & transferer stud gauge: (No 23)

8B. PIRN CHANGE.

- Setting of shuttle feeler: use shuttle feeler gauge (No 24)
- Clearance of hold back pawl: 1/32, to give 3/64" back rotation
- Clearance between tooth of bobbin disc and feed pawl: 1/64"
- Clearance between bobbin disc tooth and hold back pawl: at least 1/32"
- Setting of latch: distance between transferer & bobbin ring: 1/32 - 1/16
- Bobbin support, clearance to bobbin: 1/8"
- Clearance between tip of bobbin chute and inside sley end: 1/8"
- No contact between bobbin chute and buffer spring stand

9. SHUTTLE EYE CUTTER.

- Adjust cutter slide using end cutter gauge (No28) or 3/16" clearance between lower face of blade & upper face of recess
- Clearance cutter blade to side of groove: 3/16"
- Distance butt to opening trip: 1/64"
- Clearance between tip of bunter and upper projection of latch: 1/16"

10. LET OFF.

- Fitting of weight lever shaft using weight lever shaft gauge (No 4)
- Transmission gears to mesh: 1/64"
- Beam presser adjustment using beam presser gauge (No 7) & parabola curve gauge (No 8)

- Height adjustment: upper part of joint rod to be in centre of arch shaped slot
- Sector brake cam adjusted at FC: cam lever roller just passing top position of cam
- Clearance between sector brake rod joint and stop collar: 3/32"
- Stop collar on pedal connecting rod is fixed when shifter is vertical and pushing feed back shaft fully back

11. WARP STOP MOTION.

- Clearance between side frame and
  - a) Easing shaft bracket: 1"5/8
  - b) Warp stop motion bracket: 3" 5/8
- Adjust easing cam and easing roller by easing arm gauge (No 11) distance 1" 7/8

  WARP LINE.
  - a) Plain cloth not to be finished: 1/2-1 1/2" higher
  - b) " " to be finished: 0-1/2" higher
  - c) Twill (1/2,1/3,1/4) : 1"-1"3/4 lower
  - d) " (2/1,3/1,4/1) : 1/4" higher or lower
- Distance between easing roller and guide roller at 30°. Use easing roller arm guide (No 30)
- Distance between crank and guide beam frame: 1/8" - 3/16"
- Distance between lower face of guide beam & upper face of yarn guide bar:

  Long drop wires = 3.3/8"

  Short " = 3"
- Feeler bar in middle of guide beams
- Excentric cam, adjust at FDC: shuttle handle side cam on line with oscillating rod.
- Oscillating rod arm at 90° compress spring 1/2"
- Distance between warp stop swing lever and beam bracket: 1/4"

- Clearance between collar & lifting shaft arm: 1/8"
- Clearance between lower end of opening in knocking rod set and lower face of lifting finger: 1/16"-1/8"
- Equal clearance of 1/8"-3/16" between knocking head and knocking hammer
- Clearance between knocking hammer & knocking head: 1/16"

12. SHEDDING.

- Crank at TC-plain tappets so treadles are parallel
- Clearance between heald shaft & bracket on both ends: 1/64"-1/32"
- Distance wood thrash and back edge of sley: 1/64"

PHASE II

1. DIAGNOSTIC DEVELOPMENT
2. DIAGNOSTIC SKILL
3. METHOD OF DIAGNOSIS
4. PREVENTIVE MAINTENANCE
5. WARP OUT CHECKS
6. REASONS FOR LOOMSTOPS & DEFECTS
7. LOOM INTERFERENCE
8. QUALITY RECOGNITION

1. DIAGNOSTIC DEVELOPMENT

a. Purpose

To help the diagnostic and job planning abilities of the trainee.

b. Method

The trainee is to walk the section of the Weave Room, selected for the Training Course, each day looking for and fixing a particular type of flag. The trainee's diagnosis & corrections will be checked by the Instructor. This procedure will be followed until the trainee has fixed a specified number of each of the most common flags. The defects can also be created by the Instructor to supplement those defects noted by flagging.

The suggested number of each flag is as follows :

-warp stop motion	7
-warp tension	7
-bang off	7
-ends breaking	7
-breaking weft	7
-empty pirns	7
-false change	7
-stop on change	7
-slackweft (loom stops)	7
-uneven weave	7
-double pick	7
-damaged shuttle	7
-lashing in	7
-long tails	7
-check straps	7
-broken healds	7

In order to facilitate the control on the number of flags fixed in each group, the Instructor uses the "diagnostic development" form, as shown on page

The progress of the trainee in "flag repairing" is recorded on the "Complete" flag "-recognisation schedule"- form as shown in the section "Charts and Graphs" at the end of this manual.

In addition to flag fixing, the trainee has 12 looms set up and must perform the bi-monthly preventive maintenance on 2-3 looms per day so that all 12 looms, used in Phase 1, are maintained each week.

At this point, the trainee has perform all elements of the tuner's job, but has not actually run a section. Now he is given a job load of approx. 30%, then approx. 60% and finally 100% for approx. 3 weeks during which time he must fix flags, perform maintenance and loom checks, and properly schedule his work in order to achieve optimum time utilization and keep stop-times of the looms as low as possible.Re-training 100% load immediately.

<u>Key point</u>
Close follow-up by the Supervisor and the Instructor.

<u>Tempo</u>
The required number of flags (16x7 flags: 112 flags) should be repaired in approx. 19 days.

<u>Flag Colours:</u>

Red - Fixer
Blue - Weft Shortage

Yellow - Smash/shuttle
Red+Blue+
Yellow - P.M.
" - Electric

DIAGNOSTIC DEVELOPMENT

Flag	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date	Loom	Date
Lashing in														
Empty pirns														
Broken weft														
Uneven weave														
Ends breaking														
Warp stop motion														
Warp tension														
Banging off														
False change														
Stopping on change														
Slack weft														
Double pick														
Damaged shuttle														
Long tails														
Check strap														
Broken healds														

2. DIAGNOSTIC SKILL

To enable the tuner trainee to diagnose and repair faults, the following exercises will be prepared by the Instructor for each trainee. The number of times the exercise will be performed correctly by the trainee has been already indicated. In addition to preparing the exercises, the Instructor will supplement the training by having the trainees handle flagged looms.

EXERCISES:

A. Picking

1. Loosen check strap	-bang off,bad boxing
2. Remove pick-toe	- " "
3. Move out front box plate	- "
4. Reduce stroke of picking stick	- "
5. Do nothing but stop loom	-false bang off
6. Off-set temple knife	-lashing-in/long tails

B. Weft

1. Move-in cutter protector	-no change of bobbin
2. Up-set timing of cam	- " " " "
3. Loosen cutter blades	-lash-in
4. Bend side fork	-thin place
5. Drop dog finger	-no change of bobbin
6. Remove all pirns from magazine	- " " " "

C. Shedding, beating-up, let-off, take-up & stop motions

1. Loosen off warp -slack warp
2. Bend reed -reed mark + broken ends
3. Increase let-off stroke -slack warp
4. Decrease let-off stroke -tight warp
5. Disengage take-up -loosen cloth
6. Run loom without nylon in shuttle -no brake
7. Change setting of warp stop cam -no stopping

Control-form

A form for recording the exercises carried out is shown on page
This enables the Instructor to follow the number of each exercise carried out closely; also it helps to schedule the sequence of exercises on a well-balanced plan.

3. METHOD OF DIAGNOSIS

1. QUESTION WEAVER; CHECK FOR SICKS LEFT BY HIM OR LOOK AT FLAG FORM.
2. NOTE THE POSITION OF THE SHUTTLE AND IF BOXED.
3. EXAMINE CLOTH; LOOM FOR DEFECTS. FEEL TENSION.
4. CHECK LOOM FOR BROKEN OR LOOSE PARTS, PARTICULARLY :
   - BOXES
   - PICKERS
   - STICKS
   - STRAPS
5. PICK ACROSS SHUTTLE ONCE, FEELING POWER, WATCHING BOX & FROM THE OTHER DIRECTION ONCE.
6. IF NOTHING IS NOTICED, RUN LOOM, LISTEN, OBSERVE SPEED & BOXING OF SHUTTLE.
7. CHECK PICKING, SHEDDING, BEATING UP & PIRN-CHANGE FIRST. THEN LET-OFF, TAKE-UP & WARP STOP MOTION.
8. DO NOT TRY TO FIX THE FAULT BY TRIAL OR ERROR. DETERMINE THE CAUSE FIRST & LOOK FOR WORN PARTS. EACH CHANGE YOU MAKE MAY ADD TO YOUR DIFFICULTIES IF YOU HAVE NOT FOUND THE CAUSE.
9. USE GAUGES ALL THE TIME

Name :

DIAGNOSTIC SKILL EXERCISES

			1	2	3	4	5	6	7
PICKING	1. Loosen check strap	-bang off/bad boxing							
	2. Remove pick-toe	- " "							
	3. Move out front box plate	- " "							
	4. Reduce stroke picker stick	- " "							
	5. Do nothing but stop loom	-false bang off							
	6. Off-set temple knife	-lashing in/long tails							
WEFT	1. Move in cutter protector	-no pirn change							
	2. Upset timing of cam	- " " "							
	3. Loosen cutter blades	-Lashing-in							
	4. Bend side fork	-thin place							
	5. Drop dog finger	-no pirn change							
	6. Remove all pirns from magazine	- " " "							
SHEDDING TAKE-UP; BEATING-UP; LET-OFF. STOP MOTIONS.	1. Loosen off warp	-slack warp							
	2. Bend reed	-reed mark broken ends							
	3. Increase let-off stroke	-slack warp							
	4. Decrease let-off stroke	-tight warp							
	5. Disengage take-up	-loose cloth							
	6. Run loom without nylon(shuttle)	-slack weft loom stops							
	7. Change setting of warp stop cam	-no stopping							

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4. PREVENTIVE MAINTENANCE

To maintain quality and high production levels, looms must be in good mechanical condition; proper setting on looms must be maintained at all times.
To ensure that they are, tuners must control and check looms on a regular routine basis.

The inspection and control of looms has been scheduled on a shift basis, a daily basis and on a weekly basis. The following schedule will be applied.

1. A tuner is responsible for the repairing flags on 48 looms (a tuner's section)
   A tuner is responsible for the control and checking of 16 looms (his particular section) and carrying out the preventive maintenance of these looms.

2. Preventive maintenance
   - 2.1 Daily maintenance and check of his 16 looms
     - a. shuttle well boxed
     - b. shuttle condition (eye.jaw,nylon.screws,surface)
     - c. shuttle eye and temple cutter
     - d. weft grid clean
     - e. mechanical feeler
     - f. warp tension
   - 2.2 Bi-monthly preventive maintenance of his 16 looms
     In order to ensure that each loom is completely checked once per fortnight, the tuner has to check and carry out preventive maintenance on an average of 1-2 looms per day. Should an excessive amount of flag-repairs and/or daily maintenance prevent the tuner of carrying out the bi-monthly maintenance during his normal working hours, he should be asked to carry the last one out during overtime in order to respect the determined schedule.

In order to help the tuner to keep a record of his progress in preventive maintenance the form, shown on page , has been designed.
It shows the checks to be carried out and has columns for ticking off the looms, that has been c hecked.
The normal procedure for filling out the form is that the tuner writes in the colums "Loom no." the number of his looms in mathematical order (e.g. 13,14,15,16 etc.up to 27) and ticks off in the day-column the day he tackled a particular loom.
Although the tuner is not obliged to check the looms in the order as appear on the form, it is advisable to maintain that order as much as possible, which will ensure that approx. a fortnight passes by between a check of a particular loom.

During the Training Course the trainee has to carry out preventive maintenance, as described before, When the trainee has carried out it on a loom, the Instructor checks his performance by using the form "Evaluation of Preventive Maintenence", shown in the last section,"Charts & Graphs" of this manual.

When the tuner finds that the shuttle of a loom has to be replaced, special care has to be taken in order to obtain a long life and trouble free running of the new one.
On page is shown the procedure, that must be followed when fitting a new shuttle.

<u>Daily:</u>

a. Quick check of all <u>48 looms</u> on
   1. Boxing of shuttle
   2. Temple knife
   3. Warp tension
   4. Pirn change (hammer,thread cutter)

4. PREVENTIVE MAINTENANCE.

4.1. SCHEDULE OF THE PERIODICAL MAINTENANCE JOB STANDARDS.

LOCATION	CHECK POINTS
A AT WARP OUT:	
1. Side Lever part	1. Check the Side Lever Fiber against damage and excessive wear. 2. Adjustment of picking stroke. 3. Looseness of Bolts on the Picking Nose & Side Lever.
2. Buffer part	1. Wrong function of the Buffer. 2. Check elongation of the Buffer Strap & find the Buffer that travels less than 1½" (38 mm). 3. Check the Buffer Strap against damage.
3. Picking Stick part	1. Check the Picking Stick & picker against wear. 2. Correct setting of the Picking Stick 3. Strength of the Picking Stick Spring
4. Let off Motion part	1. Let off amount of warp in one revolution of the loom (Check the position of Indicator Stop Stud on the Indicator Lever).
5. Temple Case	1. Check the setting position of Temple Case in relation to cloth fell. 2. Check the condition of Temple Roller. (needle & roller & revolution)

Location	Check points
	3. Check the Temple Cutter Blades for sharpness.
6. Warp Stop Motion part	1. Check the Feeler Bar for smoothness of movement. 2. See that the loom stops surely by dropper immediately.
B ONCE A MONTH:	
7. Tappet Shaft Bush & Tappet Shaft Stay part	1. Check the Bushes against looseness. 2. Check the Stay & Stay Bushes against looseness.
8. Crank Shaft and Connecting Rods part	1. Check the Crank Caps against play. 2. Check the Connecting Rod Brass steps & Connecting Rod Pins against play and looseness. 3. Fender Stay and Crank Shaft Bearing against looseness.
9. Sector Brake part	1. Check the condition of brake lining of the Sector Brake. 2. Check the adjustment of Brake Spring 3. Check the adjustment of Sector Brake Cam.
10. Weft Fork part	1. Check the Weft Grate against damage or looseness. 2. Check the Weft Fork against play in side direction. 3. Adjustment of the Weft Fork. Weft Hammer & Weft Motion Cam.

Location	Check points
11. Shuttle Box part	1. Check the setting of the Box Front. 2. See that the Swell can work lightly. 3. Check the Box Fly Back for light movement.
12. Weft Feeler part	1. Check the adjustment of Feeler Box & relative parts. 2. Check the adjustment of Straddle Bug Finger parts. 3. Stop position of the shuttle.
13. Hopper part	1. Check the setting of Shuttle Feeler and Latch Depresser. 2. Adjust the Latch & Bunter for correct engagement. 3. Adjustment of the Transferer. 4. Adjustment of the End cutter. 5. Check the setting of Small End Disc. 6. Check the setting of Thread Guide. 7. Check the Bobbin Disc for smooth turning. 8. Check the Hold Back Pawl & Feed Pawl against wear.
14. Oil Pipings	1. Pipe end should not be out of place. 2. Pipe should not be clogged.
15. Spring Handle and Brake part	1. Check the adjustment of Inclined Lever. 2. Be sure that brake-off works without fail.

4.3. STANDARD FOR CHECKING WEARING OF LOOM PARTS:

1) Tappet Wheel; If there is looseness of the wheel on the Tappet Shaft, and the Key Way becomes worn out by 1/32" (0.8 mm) proper repair should be made on it to overcome the troubles. Replace it with new one in case of the worn out broken teeth of the gear and that the deviation at circumference is ⅛" (3 mm) and over.

2) Crank Wheel; Repair should be made in the same way as the above case under similar condition. Replace it with new one in case of the worn out and broken teeth of the gear and that the deviation at circumference is 1/16" (1.5 mm)

3) Gearing of the Tappet Wheel & Crank Wheel; If the depth of gearing or play of both wheels is 1/16" (1.5 mm) and over, change phase of gearing of the Crank Wheel.

4) Picking Disc; If there is a looseness of the Disc, or the key way becomes worn out 1/32" (0.8 mm) and over, replace it with new one.

5) Fly Wheel and Brake Wheel; If these are loose on the Crank Shaft, or key ways of them become worn more than 1/32" (0.8 mm), repair them.

6) Tappet Shaft Bush; If the Tappet Shaft Bush has 1/32" (0.8 mm) and over of play in the bearing holes of Side Frames, replace it with new one.

7) Crank Shaft; Should be repaired or replaced with new one when it is worn out over 1/64" (0.4 mm) and the key way on the Crank Shaft worn out over 1/32" (0.8 mm)

8) Crank Shaft Bearing; Repair should be made or replace the Crank Cap if the bearing part of Side Frame becomes worn out 1/64" (0.4 mm) and over.

9) Connecting Rod Brass Steps; Do the same as the above, if under the similar condition.

10) Connecting Rod Bush; Repair it or replace it with new one if under similar condition.

11) Connecting Rod Pin; Repair should be made or replace it with new one if under similar condition.

12) Rocking Shaft Bush; Replace it with new one if the Bush becomes worn out 1/64" (0.4 mm) and over.

13) Picking Nose; If the surface of the Picking Nose contacting the Picking Bowl becomes more than ¼" (6.5 mm) in the width, replace it with new one.

14) If the Crank Shaft and Slay and Rocking Shaft have lengthwise play of 1/32" (0.8 mm), correct them.

15) Tappet Shaft; It should not have any lengthwise play.

16) Picking Stick, if worn out 3/16" (5 mm) and over at the place where the picker contacts, should be repaired or replace it with new one.

17) Weft Fork, if playing laterally ⅛" (3 mm) and over, replace it with the new one.

18) Reed should be corrected if it is jolted when the Reed Cap is put on the reed.

19) Reed should not have the lengthwise play of more than $\frac{1}{8}$" (3 mm) when it is set up.

20) When the Spider Stop Rod Bracket becomes worn out 1/64" (0.4 mm) and over, it needs to be replaced with new one. Its average life is said as 10 years when weaving high grade fabric and 20 years with low grade fabric woven.

21) The following is the way to change phases of the Crank Wheel and Tappet Wheel to change their mesh by giving some turning.

2 nd year;	move the Tappet Wheel by 1/3 turning
3 rd year;	move the Crank Wheel by 1/3 turning
4 th year;	move the Tappet Wheel by 1/3 turning
5 th year;	move the Crank Wheel by 1/3 turning
6 th year;	move the Tappet Wheel by 1/6 turning
7 th year;	move the Crank Wheel by 1/6 turning
8 th year;	move the Tappet Wheel by 1/3 turning
9 th year;	move the Crank Wheel by 1/3 turning
10 th year;	move the Tappet Wheel by 1/3 turning
11 th year;	move the Crank Wheel by 1/3 turning

When tooth crest becomes worn out to be nearly half in thickness after making above cycle completely, both Wheels need to be replaced with new ones.

22) Rotate the Rocking Shaft Bush as follows once every year to avoid play at any fixed portion.

2 nd year;	move the Bush by 1/3 turning
3 rd year;	move the Bush by 1/3 turning
4 th year;	move the Bush by 1/6 turning
5 th year;	move the Bush by 1/3 turning
6 th year;	move the Bush by 1/3 turning

23) When the Picking Bowl becomes worn out by 1/16" (1.5 mm) in outer dia., it is necessary to be replaced with new one.

24) When the Picking Bowl has a play of 1/32" (0.8 mm) and over in internal dia., it is necessary to be replaced with new one.

25) When there is a play of 1/32" (0.8 mm) and over on the Picking Stick Stud, it is necessary to be replaced with new one.

26) The worn out Treadle Bowl is necessary to be replaced when it becomes smaller by 1/16" (1.5 mm) and over in outside dia.

27) When there is a play of 1/32" (0.8 mm) and over in the bore of Treadle Bowl, it is necessary to be replaced with new one.

28) When there is a play of 1/16" (1.5 mm) and over on the Treadle Pin, it is necessary to be replaced with new one.

29) When there is a play of 1/64" (0.4 mm) and over on the Intermediate Wheel Stud, it is necessary to be replaced with new one.

30) When the Surface Roller Bracket has a play of 1/64" (0.4 mm) and over, it is necessary to be replaced with new one.

31) When there is a play of 1/32" (0.8 mm) and over on the Swell Pin, it is necessary to be replaced with new one.

32) When there is a play of 1/32" (0.8 mm) and over in the bore of Holding Catch, replace it with new one.

33) When there is a play of 1/16" (1.5 mm) and over on Taking-up Lever Pin, replace it with new one.

NEW SHUTTLE

There is a definite procedure which must be followed when fitting a new shuttle in order to obtain long shuttle life and trouble free running.

1. NEW SHUTTLE

   Ensure that all bolts and nuts of the shuttle are well tightened.

2. EXAMINE OLD SHUTTLE

   Marks or damage on the old shuttle will often indicate where loom adjustments are required.
   If the back is rippled, the reed alignment must be adjusted.
   Marking on the top may indicate sheds off race board or a too early setting of the crossing time.

3. SET THE BOXES

   Set each box in turn with the new shuttle so that the swell springs may be relaxed.

4. RUN THE LOOM

   Run the loom, checking each side for correct boxing without rebounding. Adjust check straps, swell springs and picking force as required. Do not let the loom make a transfer at this stage.

5. CHECK THE TRANSFER

   Put the loom on transfer by hand. Check latch is up to correct height.
   Check correct shuttle position for transfer.
   Check shuttle eye cutter.
   Check temple cutter.
   Adjust height of hammer on transfer.
   Run loom, observe automatic transfer.
   Check back frequently for minor adjustments as the shuttle gets polished and set to shape.

5. WARP OUT CHECK

After a new warp has been put in the loom, the following checks have to be carried out by the tuner before the loom is turned over to the weaver.

A complete daily and bi-monthly maintenance check on the loom whether or not this loom is part of his own set of looms for the routine preventive maintenance.

A loom tuner noting that the warp will come out during the fortnight, will only perform the bi-monthly maintenance on that loom when the loom is down for warp changing. When the warp has been taken out and the loom has been cleaned, the tuner will make the following checks:

-1. Shuttle
-2. Leathers
-3. Crank arms
-4. Pickers - picking sticks
-5. Straps and bumpers
-6. Pick,stroke and power setting
-7. Protection motion
-8. Swords
-9. Warp and weft stop motion
-10. Harness straps and threadles

After the warp is in the loom, the following checks are to be made:

-1. Harness setting
-2. Harness timing
-3. Warp tension
-4. Vibrator cam
-5. Temple settings
-6. Warp & weft stop motion (working condition)

5.1. MAINTENANCE OF THE LOOM AT WARP-OUT.

Checks should be made also on the following points at warp out to maintain the looms in good condition.

a) There should be the clearance of $\frac{1}{8}$" (3 mm) between the Brake Lever and Brake Hoop, when the Spring Handle is in off position.

b) There should be the distance of 1"7/8 (48 mm) between the Wood Thrash and Slay Fly Back when the Slay Fly Back is swung back open with projection of the Spider Stop Rod Spring Slot in contact with the bottom of Angle Slay. Simultaneously the Knocking off Lever should be set as its tip is placed $\frac{1}{8}$" (3 mm) lower from the top end of Knocking Off Bolt head.

c) Check to see that the Weft Fork Wires are in the center of the openings in the Weft Grate and the depth of protruding of the Fork should be 3/16"-$\frac{1}{2}$" (4.5-6.5 mm) when the Slay is on the front dead center.

d) There should be the clearance of 3/16" (4.5 mm) between the Back Wire of Weft Fork and projection in the Weft Hammer when the Weft Hammer Lever is on the low position of the Weft Motion Cam.

e) There should be the clearance of 1/16" (1.5 mm) between the Back Wire of Weft Fork and projection in the Weft Hammer when the Slay is on the front dead center.

f) When the Back Wire of Weft Fork is hooked on the projection of the Weft Hammer and the Weft Hammer Lever contacts the top position of the Weft Motion Cam, the Spring Handle is pushed off and a little clearance should be left between the Shifting Lever and Handle Lever.

g) There should be the clearance of ⅛" (3.5 mm) and 3/16"-¼" (5-6 mm), respectively between the Feeler Motion Knock and the tip of the Straddle Bug Finger, bottom of the Feeler Motion Knock and the upper face of the Straddle Bug Finger when the Slay is at the FDC.

h) There should be the clearance of 3/16" (5 mm) between the upper surface of the Wood Thrash & lower face of the Temple Case in vertical direction when the Wood Thrash comes below the Temple Case.

i) The clearance between the reed and the Temple Case should be 1/16" (1.5 mm) at the handle side and ⅛" (3 mm) at the hopper side, when the Slay comes to the FDC.

j) Be sure that the Temple Cutter of SOT 2 type repeats the cutting action for 5 times with both Blades in perfectly close contact with each other.

k) There should be the clearance of 1/32"-1/16"(0.5-1.5 mm) between the Transferrer and the Bobbin Ring when the full bobbin is pushed into the shuttle by the Transferrer with the Slay on the FDC.

l) When the Shuttle Feeler projects and the Bunter comes into engagement with the Latch, check to see that the engagement of the Bunter with the Latch is correctly in accordance with our setting instruction for SO-A and SO C Type Loom.

m) The setting position of the End Cutter in vertical and cross direction to the loom should be conformed to the instruction.

n) The tip of the Bunter should pass over the tip of Latch by 1/16" (1.5 mm) when the Shuttle Feeler projects and the adjusting screw in the End Cutter Arm comes into contact with the front face of the Slay End.

Insert into the Shuttle Box at the hopper side the shuttle having full bobbin and effect the bobbin change. Check to see that the End Cutter never fails to hold the end of weft yarn on the exhausted bobbin.

o) Stop position of the shuttle in the Shuttle Box on both sides should be adjusted in accordance with the instruction.

p) The distance should be ¾" (19 mm) between the Picking Stick and the Bumper.

q) Picking stroke should be adjusted in accordance with the instruction. Be sure that picking is effected when the Slay comes to the position 2⅜" (60 mm) apart from the front dead center.

r) Check to see that the Slay Fly Back is in close contact through the whole length with the reed when the reed is put on the position. The Spider Stop Fingers should be in slight contact with Duck Bills when the Slay comes to the FDC.

s) The Spider Pulley should begin to contact with the Spider Pulley Guide Lever when the Slay is on the position from the TC (3"...76 mm apart from cloth fell) to 5 degrees past it.

t) When the Slay comes to the FDC there should be the equal clearance of 1/8"-3/16" (3-5 mm) both in space provided between the Knocking Hammer and Knocking Head which moves up and down in vertical direction. The Spring Handle should be shifted surely into the off position when the dropper is dropped between the Guide Beam and the Feeler Bar.

u) Lubricate the Suspender in the Spider Stop Rod and the Oscillating Shaft Bracket in Warp Stop Motion.

v) Box Fly Backs and Swells should work smoothly.

LOOM INSPECTION AT BEAM GAITING

Date:__________ Shift:__________ Section:________ Checked by:________

	Variety.					
	Beam Gaited L.No.					
	Before Beam Gaiting					
1.	Cleaning					
2.	Lubrication					
	After Beam Gaiting					
1.	Shuttle Condition					
2.	Reed alignment					
3.	Shuttle Line					
4.	Stick Centre					
5.	Tappet position,Shed Timing					
6.	Size of Shed					
7.	Warp tension					
8.	Warp stop at Crossing of Harness					
9.	Weft stop motion					
10.	Check letback/meshing of gears					
11.	Weft Changing					
12.	Setting & Working of Weftanters					
13.	Positioning of Temples					
14.	Setting & Working of Temple Cutters					
15.	Selvedge crossing of ends,Wrong Drafting					
16.	Cloth Width, Picks Weft count					

SIGNATURE:____________

QUALITY CHANGE INSTRUCTION

PURPOSE: TO STANDARDISE LOOM SETTING
TO MAKE CHECKS MORE EFFECTIVE AS ALL WILL BE MEASURING TO SAME STANDARD.

METHOD: FOR EACH CLOTH QUALITY A SPECIFICATION OF LOOM SETTINGS MUST BE DEVELOPED.

A FORM TO BE DEVELOPED
(SEE APPENDIX)

THE FORM TO BE DISPLAYED ON EACH LOOM, TO SHOW THE CLOTH QUALITY RUN AS WELL AS THE SETTINGS OF THE LOOM, WITH COMMENTS WHERE STANDARD SETTING ARE NOT ADHERED TO

JUBLIEE SPINNING & WEAVING MILLS	QUALITY SPECIFICATION AND STANDARD LOOM SETTING. LOOM NO.______	WERNER BRUSSELS

QUALITY STYLE		WIDTH REED		TOTAL ENDS	
WIDTH CLOTH		Gm/M2		OZ/sq.yd	
WARP NE		BLEND		ENDS/1"	
WEFT NE		BLEND		PICKS/1"	
REED		ENDS/DENT		SELVEDGE	
LOOM TYPE		PICK WHEEL		SIZING (TYPE/%)	

LOOM ADJUSTMENTS

DROPWIRE POS		BACK REST POS	
DROPWIRE(THICK-NESS) OR WEIGHT		WHIP ROLL POS	
SHEDDING TIMING		NO. OF SHAFTS	
LIFT			
PICKING TIMING			

BEAM CHANGE	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN	DATE SIGN
FITTER PRODUCTION FITTER 1ST.ROLL INSPECTION								

REMARKS.

6. REASONS FOR LOOM STOPS & DEFECTS:

6.1. BANGING-OFF (SHUTTLE STOPPING IN THE SHED).

a) Check up the picking timing at both sides against delay. See that the Slay is $2\frac{3}{8}$"-$2\frac{1}{2}$" (60-64 mm) before the fell of cloth.

b) Check up the picking motion at both sides against shortage of stroke.

c) The shuttle should not be rebounded in the shuttle box at both sides.

d) Check up the picker against damage,

e) Check up the Side Lever and Picking Stick against occurrence of cracks.

f) Check up the Buffer Strap against damage.

g) Be sure that the shuttle is boxed fully in the shuttle box when the loom is started. Check should be made at this time to see that the Buffer Strap on opposite side is in the forward position.(to the center of the loom)

h) Check up the stop position of the shuttle at the hopper side to see that the red vulcanized fiber will stop in a position between two marks on the Shuttle Guard Plate.

i) Make certain that the Heald Frames are hung correctly.

j) Check up the Picking Bowl and Nose, Tappet Shaft Bush, Tappet, Crank Wheel and Tappet Wheel against excessive wear.

k) Check up if the adjustment of the Spider Pulley Lever is proper or not.

l) Check up the Brake for effective work.

m) The Side Lever should stay always in contact with the Side Lever Bumper.

6.2. IMPROPER SHUTTLE RUNNING.

a) Check up picking timing at both sides for correctness to see that the slay is 2⅜"-2½" (60-64 mm) before the fell of cloth.

b) Check up the Picking Stick against excessive wear.

c) Check up the Picker against damage.

d) Check up shuttle rebounding in the shuttle box at both sides.

e) Check up the Side Lever & Picking Stick against occurrence of cracks.

f) Make certain that the Heald Frames are hung correctly.

g) Check up the Shedding Motion for correct timing.

h) Check up the adjustment of the Spider Pulley Lever for correctness.

i) Check up the Picking Bowl & Nose,Tappet Shaft Bush,Tappet, crank Wheel & Tappet Wheel against wear.

j) The Shuttle Guard Plate should not be raised too much.

k) Make certain that there is the step of 1/64"(0.4 mm) between the Shuttle Guard Plate & Wood Thrash.

l) Make certain that the reed sweep & slay sweep are in good order.

m) Check up the shuttle against excessive wear.

n) Check up the setting of the Box Front.

o) Be sure that the Swell is in good order.Check up the Swell spring and other relative parts.

p) Be sure of smooth running of the loom with no uneveness of rotation.

q) There should not be vibration of the slay & its relative Parts.

r) See that the reed has no cross play in top & bottom haulk.

s) Check to see that the reed & Box Fly Back should make right angle respectively, to the Wood Thrash & the upper face of Slay End.

t) The Side Lever should stay always in contact with the Side Lever Bumper.

6.3. TROUBLES IN BOBBIN CHANGE.

Be sure that change will take place when the Straddle Bug Finger is brought into engagement with the Feeler Motion Knock by pushing down the front part of Straddle Bug Finger while the loom is running. Check should be made on the following points in the item A when change is effected, and on the points in B if it is not effected.

Item A

a) Be sure that there is the distance of $\frac{1}{8}$" (3.5 mm) between the Straddle Bug Finger and Feeler Motion Knock in horizontal direction with the Slay on the front dead center.

b) There should be the clearance of 3/16"-1/4" (5-6 mm) between the Straddle Bug Finger and Feeler Motion Knock in vertical direction.

c) The Feeler Finger Slide Spring should not be adjusted excessively weak.

d) The shuttle should come to stop with the red vulcanized fiber between two marks on the Shuttle Guard Plate. Shuttle rebound should not be permitted.

e) Check bunch yardage that is 3.5 times the width of the warp width.

f) Check up mixing of the bobbins with short bunch or no bunch built.

g) Be sure that the Side Lever stays always in contact with the Side Lever Bumper.

Item B

a) Picking should not be timed too late at the handle side. Note: the reed situated $2\frac{3}{8}$"-$2\frac{1}{2}$" (60-64 mm) backward from the cloth fell.

b) Stroke of the Picking Stick should not be too short at the handle side.

c) Check up the Picking Stick and Side Lever of handle against cracks.

d) See that the Shuttle Feeler can protrude smoothly when the loom is turned by hand with the Straddle Bug Finger in engagement with the Feeler Motion Knock. Check should be made at the same time to see that the Bunter engages with the Latch properly.

e) The shuttle should be boxed fully in the shuttle box with the red vulcanized fiber between two marks on the Shuttle Guard Plate at the hopper side when the loom stops.

f) Be sure that the shuttle stopping position at the hopper side is between two marks always without shuttle rebound while the loom is running.

g) Be sure that the Starting Rod Finger Tip should slightly contact with the foot of the Straddle Bug.

h) Check up to see that the Shuttle Feeler should be set up correctly. (Measure the distance between the Breast Beam and Shuttle Feeler Tip when the Shuttle Feeler protrudes).

i) Shuttle rebound should not be permitted in the shuttle box on handle side while the loom is running.

j) The Side Lever should stay always in contact with the Side Lever Bumper.

6.4. CHANGE BEFORE THE PIRN BECOMES EMPTY (PIECE BOBBIN CHANGE)

a) Picking at hopper side should not be set up for too late timing.

b) Picking should not be too weak at the hopper side.

c) Check up the Picking Stick & Side Lever of hopper side against cracks.

d) The Feeler Finger Slide Spring should not be adjusted too strong.

e) See that there is sufficient clearance between the Straddle Bug Finger & Feeler Motion Knock in vertical direction.

f) The Feeler Finger should contact the bobbin a little earlier than the time when the adjustable bolt head in the Weft Feeler will contact the Box Front.

g) The tip of nylon made Feeler Finger should not become worn out to be blunt.

h) Shuttle rebound should not be permitted at the hopper side.

i) The Side Lever should stay always in contact with the Side Lever Bumper.

6.5. DOUBLE PICK CAUSED BY MISPICKS.(EXCEPT DOUBLE PICK BY WEFT BREAKAGE IN SHED).

A) Mispicks just after the change

a) Check up picking time at the handle side.

b) See that the picking stroke at the handle side is not too short.

c) Check up the adjustment and proper working of the Weft Feeler.

d) The Starting Rod Finger Tip should be in slight contact with the foot of the Straddle Bug.

e) The Shuttle Feeler should protrude smoothly when the loom is turned by hand with the Straddle Bug Finger in contact with the Feeler Motion Knock.

f) The Latch should engage with the Bunter when the Shuttle Feeler is on the protruded position.

g) Bunch-yardage should be more than 3.5 times the warp width.

h) Check up to see that there are mixed no bobbins with short bunch.

i) The Shuttle Feeler should be set up correctly. Measure the distance between the Breast Beam & Shuttle Feeler Tip when the Feeler comes to the protruded position.

j) Shuttle rebound should not be found in the Shuttle Box at the handle side.

B) Frequent occurrence of the mispicks

a) The Temple at hopper side or the Temple Cutter should not be fixed too much outward to the back of the loom.

b) Check up the front face of the shuttle against burrs or scratch.

c) Check up the Box Front against burrs or scratch.

d) The picker should not catch the weft yarn.

e) The bottom surface of the picker should not touch with the upper surface of the Slay End (bottom surface of Shuttle Box) at the hopper side when the lower grooved shuttle is used.

f) The Side Lever should stay always in contact with the Side Lever Bumper.

6.6. WEFT BREAKAGE.

a) Bad bobbins of any type should not be used, for example such as the bobbins with scratch or loose rings.

b) Be sure that the yarn remnant should be removed completely from the exhaust bobbins before the empty bobbins are supplied to the pirn winder.

c) Over structure of the pirn winder should be perfectly cleaned.

d) Weft yarn should not be wound on the bobbin to excessively large diameter. This causes the varn breakage due to touch with the inside walls of the shuttle.

e) Weft yarn should be wound on the bobbin with proper tension.

f) Weft yarn should be wound on the bobbin so that the knot may make its appearance on the outer surface when yarn breakage occurs in pirn winding.

g) Weft yarn tail end should be taken off by a hopper filler when the full bobbins are mounted on the Hopper.

h) The bobbin holder should not be set loose in the shuttle. This makes the center of bobbin out of alignment with that of the shuttle eye, resulting in the weft breakage.

i) Check up the front face of the shuttle against burrs and scratch.

j) Ballooning causes the weft varn to fly out of the shuttle eye when the weft is unwound from the bobbin. In this case, stick the stripe of fur on the inside walls of the shuttle so as to avoid ballooning.

k) Weft yarn should not be caught by the fur sticked on the inside walls of the shuttle. To make lining, prepare the recess in such a depth as the thickness of skin and in about ½" (12 mm) width on the inside of the wall of the shuttle.

l) The gap should not exceed 1/64" (0.4 mm) between the reed and Box Fly Back in horizontal direction not to cause the damage on the back face of the shuttle.

m) Inspect the shuttle against badly wearing out or scratch appearing on the front face due to the excessive tightness of the Swell Spring.

n) Weft yarn should not fly out of the shuttle eye, resulting from the shuttle rebound.

o) Check up timing of the picking against delay.

p) The shuttle should not be rebounded in the Shuttle Box due to the excessive strength of the picking motion.

q) Check up the setting up of the Box Front. Wider space of the Shuttle Box will permit the shuttle to rebound in the Shuttle Box.

If the shuttle becomes worn to be narrow in the width, the Box Front should be set up so that the width of the Shuttle Box will be smaller than the standard.

r) Check up the picker at the hopper side against scratch or rugged surface.

s) There should be the clearance of about 1/16" (1.5 mm) between the bottom face of the picker and the upper face of the Slay End when the lower grooved shuttle is used.

t) Discrimination should be made between weft breakage in change and weft breakage by other causes.

u) There may occur the yarn breakage caused by the too deep engagement of the Weft Fork and the Weft Grate.

v) There may be some occasion where the weft yarn will be caught between the shuttle and the Box Front at the hopper side, resulting in the weft breakage when the lower grooved shuttle is used. Stick the stripe of fur on the lower part of the Box Front.

w) There may be some occasion where the weft breakage will take place as the loose yarn flown over the Box Front is caught on the inside end of the Box Front and the shuttle is thrown out of the Shuttle Box at the hopper side in case of the upper grooved shuttle in use. In this case, stick the fur on the entrance or the upper part of the Box Front.

x) The weft should have proper yarn strength.

y) The Side Lever should stay in contact always with the Side Lever Bumper.

6.7. WEFT BREAKAGE IN CHANGE.

a) Check up to see that the weft yarn can easily thread in the shuttle eye when the yarn is extended in line with the center of the shuttle by hand.

b) Be sure that the notch for the yarn on the Thread Guide is in line with the bobbin.

c) Weft yarn should be laid onto the frontward notch by one pitch of the Thread Guide.

d) Check up the picking timing at the hopper side.

e) Weft tail end should be wound on the Thread Holder so that it will not slack from the end of the bobbins put on the Hopper.

f) There should not be any waste yarn in the Hopper.

6.8. LOOM STOPPAGE IN CHANGE.

a) The mesh of the Weft Fork with the Weft Grate should not be insufficient. This causes the Weft Fork to swing back insufficiently, resulting in the loom stoppage, i.e., stoppage by fork.

b) Tension on the weft yarn should not be too low.

c) Shuttle rebound should not be found in the Shuttle Box at the handle side.

d) Bunch should be built with the required yardage of yarn.

e) No bobbin with short bunch yarn should be mixed.

f) Check up the adjustment to have proper functioning of the Weft Feeler.

g) Check up the picking-timing at the handle side.

h) Picking stroke should not be small at the handle side.

i) The Shuttle Feeler should work smoothly when the loom is turned by hand with the Straddle Bug Finger in engagement with the Feeler Motion Knock.

j) See that the Starting Rod Finger Tip is in slight contact with the foot of the Straddle Bug.

k) Check up the adjustment of the Weft Hammer Cam.

l) The shuttle should not be rebounded in the Shuttle Box at the handle side.

m) The Side Lever should stay always in contact with the Side Lever Bumper.

6.9. <u>COP PROTRUDING ABOVE THE SHUTTLE (BY INSUFFICIENT PUSHING DOWN THE BOBBIN INTO THE SHUTTLE)</u>

a) See that the Transferrer leaves a clearance to the rings in the bobbin by 1/32"-1/16" (0.5-1.5 mm) when the Slay moves to the front dead center with the Latch in engagement with the Bunter.

b) Check up the stop position of the shuttle at the hopper side to see that the red vulcanized fiber of the shuttle will stop in a position between two marks on the Shuttle Guard Plate.

c) Check up picking-timing at the handle side.

d) Check up picking stroke at the handle side.

e) Check up to see that the Latch will engage the Bunter correctly when the Shuttle Feeler projects.

f) Check up the setting up of the Shuttle Feeler to see that the relative (lateral) position is correct to the Hopper Stand.

g) See that the Starting Rod Finger Tip is in slight contact with the foot of the Straddle Bug.

h) The bobbin holder in the shuttle should not be loose.

i) Check up the Picking Stick Spring at the hopper side against damage or breakage.

j) Check up shuttle rebound at the hopper side.

k) The Side Lever should stay always in contact with the Side Lever Bumper.

6.10. MIS-CHANGE.

a) Check up the Shuttle Feeler for correct position in conjunction with the Breast Beam (measure the distance from the Breast Beam to the Shuttle Feeler Tip when the Shuttle Feeler projects at most).

b) Check up the motion of the Shuttle Feeler and End Cutter for smooth movement when the loom is turned by hand with the Straddle Bug Finger in engagement with the Feeler Motion Knock. At this time see that the Latch is in engagement with the Bunter correctly.

c) Check up the tips of Latch and Bunter against excessive wear.

d) The Starting Rod Finger Tip should stay in contact with the foot of Straddle Bug.

e) Check up the stop position of the shuttle to see that the red vulcanized fiber of shuttle will stop at the position between two marks on the Shuttle Guard Plate.

f) Be sure that the Transferrer leaves a clearance to the rings on the bobbin by 1/32-1/16" (0.5-1.5 mm) when the Slay comes to the front dead center.

g) Rebounding shuttle should not be permitted in the shuttle box at the handle side.

h) The Side Lever should stay always in contact with the Side Lever Bumper.

6.11. DRAG-INS (OF TAIL END OF WEFT IN THE SHED)

a) Check up the stop position of shuttle to see that the red vulcanized fiber of shuttle tip will stop in the Shuttle Box between marks on the Shuttle Guard Plate. Shuttle rebounding should not be permitted in the Shuttle Box.

b) The Shuttle Guard Plate should not be raised too high. Be sure that the shuttle is not afloat highly in the Shuttle Box due to the picker worn out excessively.

c) See that the Temple Cutter cuts surely the remaining yarn on exhaust bobbin just after bobbin change.

d) The Side Lever should stay always in contact with the Side Lever Bumper.

e) Check up the setting of the Latch Depressor. (SO A, SO-B type looms)

f) Check up the engagement of the Latch with the Bunter when the Shuttle Feeler protrudes (SO A, SO-B type looms).

Following articles are applied to the loom provided with the End Cutter.

g) The Cutter Slide Spring should not be used with lower tension. Check for correct tension.

h) Check to see that the End Cutter does not fail to hold the end of weft yarn. Be sure that the Blades of the Cutter are assured with the sharp edges.

i) Check up the adjusting screw in the lower part of End Cutter so that it will come into contact with the Slay End when the tip of the Bunter passes over the Latch by 1/16" (1.5 mm).

j) Check to see that the End Cutter is adjusted so that moving part of the Cutter Blade can pass a little over the Opening Trip when the Shuttle Feeler returns to its original position.

k) Check up the lateral position of the Cutter Slide Bracket.

l) Check up the adjustment of the adjusting screw in the lower part of the tip of Cutter Arm.

m) Make certain that the Cutter Blades are not in touch with the Box Front and Slay End.

n) Check up the vertical position of the End Cutter.

6.12. BAR MARK (STRIPED EFFECT)

A) Bar by mixed weft

a) Check against mixed weft of different count.

b) Be sure that uneven weft yarn is not used in the dense fabric near the limit of weaving capacity of the loom.

B) Bar by weft breakage

A) Thin place

a) Broken yarn trailed by the shuttle makes the Weft Fork jump at every pick and keeps the loom running, resulting in the thin place on the fabric.

b) There are some occasions when the loom does not stop as slow speed running of the shuttle touching Weft Fork does not actuate the weft stop motion.

c) Check to see that the Slip Catch is adjusted so that it will move by one and half pitch of the Ratchet Wheel teeth.

d) Check up the rotation of the Surface Roller against uneven motion by its unbalanced distribution of weight. Uneven motion will cause the thin place on the fabric being weven with warp yarns of lower tension.

e) Check up the adjustment of the Lifting Catch.

f) The Cloth Roller Lever Spring should not be too tight in its application for weaving the fabric with lower tension on warp yarn.

B) Thick place

a) Check up the adjustment of Slip Catch. It should be adjusted so that it will move by one and half pitch of the Ratchet Wheel teeth.

b) Check up the Slip Bracket against looseness of its setting bolt.

c) Check up the setting of the Slip Catch Bracket.

d) There should not be excessive backlash of the gears in Taking up Motion.

e) Check up the shaft and studs in Taking up Motion against excessive wear.

f) The Strip should not be wound in the wrong way to the setting of the perforation.

g) Check the Strip against excessive wear.

h) Check the Strip against looseness on the Surface Roller.

i) No use should be made of the strip with excessively fine perforation on the surface in relation to the fabric woven.

C) Bar in selvage

a) The Temple Roller should rotate smoothly.

b) Covering of the Temple Cap upon the Temple Roller should not be too deep for the cloth.

D) Bar by starting (thick and thin place)

a) The Warp Beam should not be let back excessively or insufficiently after mending the defects on the fabric. That is, the Warp Beam should be let back so that the roller in the slot of the Ratchet Feeder may stay in the center of the slot in case of Positive Let off Motion.

E) Bar by doffing cloth roller (thick place)

a) The Slay should be in the front dead center when the Cloth Roller is doffed from the loom.

F) Bar by bobbin change (thick place)

a) Lower tension on the weft just after the change than in normal running will cause the loom to stop. The loom should be started after the cloth is wound up by the pitch of one pick. Otherwise the thick place will occur on the cloth.

b) Adjustment should be made to prevent the loom from stopping at the time of bobbin change.

G) Bar by stopping the loom

A. Thin place.

a) There should hot be excessive looseness on the Beating Motion part. (The Crank plain bearings, Connecting Rods and Rocking Shaft should not be worn excessively.)

b) Both brackets of the Spider Stop Rod should not be worn nor playing excessively.

c) The Spider Stop Rod should not be bent due to the breakage or wearing of the Spider Stop Rod Suspender.

d) Duck Bills should be in strict contact with the Spider Stop Fingers when the Slay is on front dead center.

e) Duck Bills should engage the Spider Stop Fingers properly in relation with the woven fabric when the Slay is in front dead center.

f) When starting the loom, the Slay should be positioned as far back as possible and help the loom to start easily by pulling the Reed Cap with hand.

g) The loom should not be restarted with the Slay reversed to the back of the loom when the loom has stopped after passing the position (45 past top center) where the loom finished the taking up motion.

h) Are the Spider Stop Finger Springs not broken ?

i) Front or Back Reed Clip on the Reed Cap should not be loose or broken.

j) The Slay Fly Back should not be loose or broken.

k) Check up the adjustment of the Sector Brake in Positive Let off Motion.

l) Check up the adjustment of the Sector Brake Cam in Positive Let off Motion.

m) Adjustment should be made on the amount of Easing Motion or Brake Chain Spring so that the Weight Lever may not vibrate up and down as far as possible in Negative Let off Motion.

n) Check up the braking effect at the time when the loom stops.

B) Thick place

a) There should not be excessive backlash in the mesh of the gears in Taking-up Motion.

b) Gears, Shafts and Studs in Taking up Motion should not be worn.

c) The Strip should not be worn out.

d) The Strip should not be wound in the wrong way to the setting of perforation.

e) Check up the Strip against looseness on the Surface Roller.

f) The Strip should have proper count in relation to the fabric woven.

g) Difference between upper lift and lower lift in shedding should not be excessively great. (Warp line should not be raised excessively).

h) In case that the loom is stopped for the long time, keep the shed closed, or the warp yarn should be slackened.

H) Bar by mechanical reason

a) The lints, accumulating on the teeth of the gears in Take up Motion, are apt to prevent the gears from rotating smoothly.

b) The Lifting Catch should work smoothly.

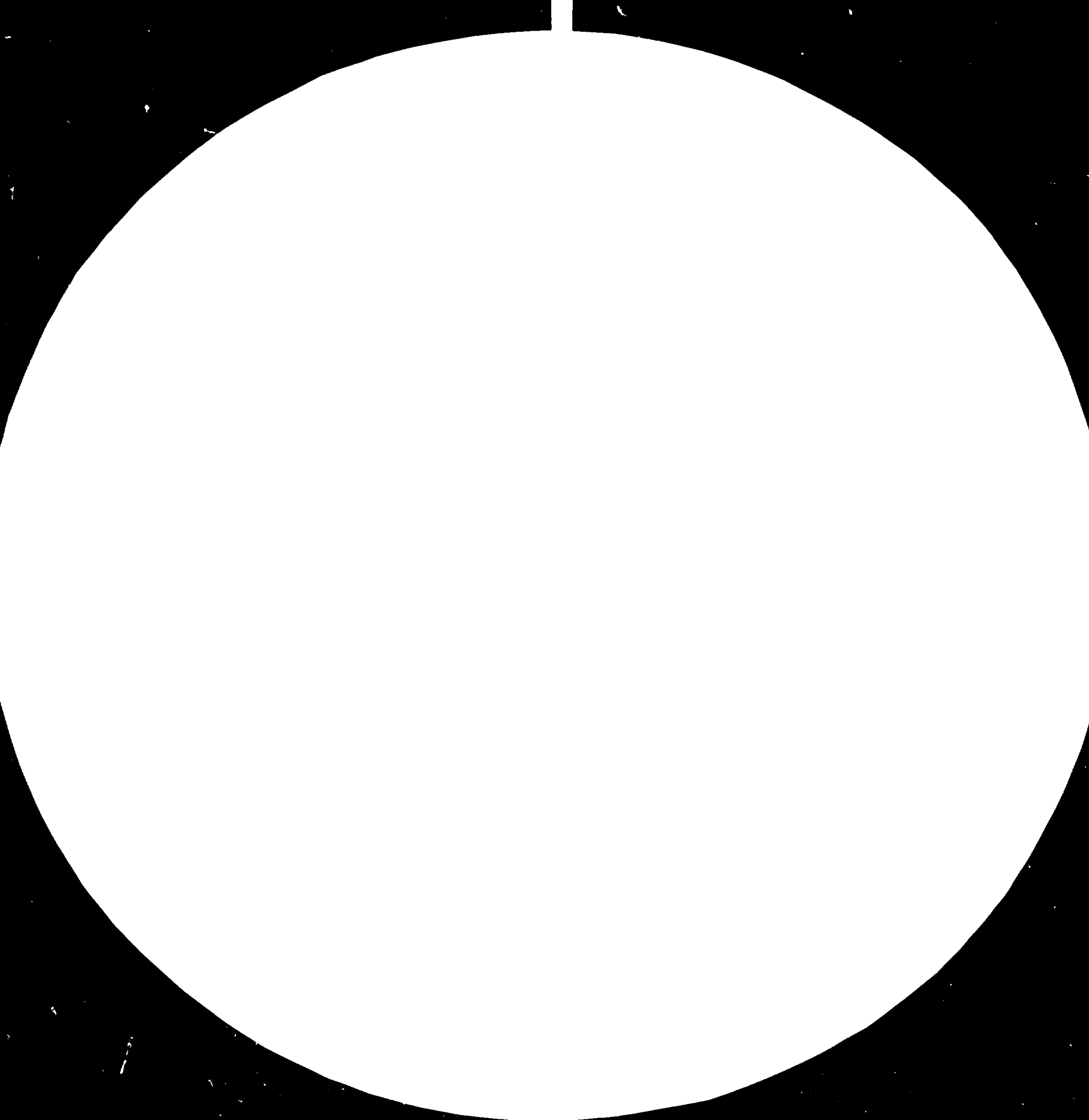
c) Check up the adjustment of the Taking up Finger.

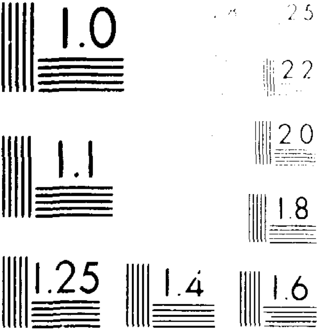
d) The gears in Taking up Motion should not be meshed too deep.

e) The Weft Fork should not be caught on the Weft Hammer due to the incorrect adjustment on the Weft Fork resulting in either excessive or insufficient jump of the Weft Fork on the Weft Hammer.

f) The Taking up Wheel should not turn with encentric motion due to the bending of the axis of Surface Roller. This causes the irregular mesh of the Taking up Wheel with the Intermediate Wheel Pinion resulting in disorderly rotation.

g) Set screws in Taking up Wheel or the Intermediate Wheel Pinion should not be loose.




1.0
2.5
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1.8
1.25
1.4
1.6

h) There should not be any such occasion as the cloth will not be taken up temporarily onto the Cloth Roller due to the insufficient mesh of the gears in Taking up Motion.

i) Tension of the Cloth Roller Spring should be sufficient enough to the fabric woven and should be equal at both sides.

j) Slippage of the cloth should not occur on the Surface Roller due to the worn Strip.

k) There should not be any excessive looseness in the Beating Motion Parts. The locm should run with uniform revolution.

l) Check up the Strip against looseness on the Surface Roller.

m) The Strip should not be wound in the wrong way for the setting of perforation on the Surface Roller.

n) The Strip should have proper count in relation to the fabric woven.

o) Check up the adjustment of the Sector Brake in Positive Let off Motion.

p) Check up the adjustment of the let off amount of warp in one pick, the position of the Ratchet Feeder, and strength of the Sector Brake Spring, so that the Weight Lever may move up and down in the minimum, in the Positive Let off Motion.

q) The Feeling Roller or Weight Lever should be set up so that they can move up and down lightly with its dead weight.

r) Let off amount should be adjusted so that the Regulator Roller will stay almost in the center of the horizontal slot in Ratchet Feeder in Positive Let off Motion.

s) Check up the adjustment of the Beam Presser in the Positive Let off Motion.

t) In case of extremely fine yarn or coarse density, there may be some occasion when the thin or thick place will take place on the cloth woven on the loom with Positive Let off Motion. The Sector Brake is preferably not used in this case.

u) There should not be too much play on the Yarn Beam on the Beam Bracket on both sides in lengthwise direction on the loom with Positive Let-off Motion. This causes the thin or thick place on the fabric.

v) The Brake of Ratchet Wheel should be adjusted properly. Excessive or insufficient force of the Brake in relation to the number of picks per inch will cause the thin or thick place on the fabric woven on the loom with Positive Let off Motion.

w) Vibration of the loom should not permit the Weight Lever to be brought into touch with the Weight Lever Lifter while running with Negative Let off Motion.

x) The Brake Chain in the Negative Let off Motion should not be worn badly.

y) The Brake Chain in Negative Let off Motion should not be dirty with oil.

z) There should not be excessive humidity in the weaving room, in case of Negative Let off Motion.

a') Fly or sticky dust should not be in the Brake Block of Chain in Negative Let off Motion. Polish it with the sand paper to remove them.

b') Check up the adjustment of the Traveling Roller in Negative Let off Motion.

c')Check up the adjustment of the Beam Presser in Negative Let off Motion.

d')Improper hanging of more than three heald frames causes thin and thick places in Negative Let off Motion.

e')Failure of lubrication to the Intermediate Wheel Stud for several days seizes this stud with the Intermediate Wheel Pinion with the result of bar on the fabric.

6.13. <u>SNARL</u>.

a) Twist setting should be applied on the weft yarn in the preparatory process.

b) The shuttle should not rebound within the Shuttle Box.

c) Check up the timing of the picking. (Distance between the reed and cloth fell is $2''\frac{3}{8}$-$2''\frac{1}{2}$ (60-64 mm).

d) Picking force should bot be excessive.

e) Check up the Buffer Strap against damage.

f) Check up the setting of the Box Front.

g) The Swell Spring should not be set up weak. Be careful that insufficient lubrication to the Swell Pin restricts the swivel of the Swell.

h) Check up the Shedding Motion for correct timing.

i) The Weft Fork should not protrude through the Weft Grate too far when the Slay comes to the front dead center.

j) Width of the fabric woven should not be too narrow in comparison with the reed space of the loom.

k) Proper tension should be applied on the weft yarn by means of the fur lined on the inside wall of the shuttle.

l) There should not be such tendency as shell-off will take place.

m) Many neps should not exist on the warp yarns.

n) Shed should be properly formed.

o) Weft should not be caught on any machine parts of the loom.

7. LOOM INTERFERENCE

The tuner normally tackles one loom at a time. When more than one loom are stopped for mechanical reason, the tuner obviously has to think on what loom he should tackle first with the aim to keep waiting time at a minimum. In general he should start with the loom, that will demand the shortest repairing time. The reason why, we will explain in the following examples, and will show how important it is to make a correct diagnostic.

Suppose that 3 looms are stopped for various mechanical reesons for which the weaver has put his flag up. Whenthe tuner comes to the looms and he estimates the times he will need for repairing the stops, for case a. 30 min.
case b. 10 min.
case c. 5 min.

We will show two methods of tackling these stops:

Method 1

Case	Time to repair	Repair priority	lost time		
			work	waiting of loom	total
a	30	3	30	5 + 10 = 15	45min.
b	10	2	10	5	15min.
c	5	1	5	0	5min.
			Total lost time on 3 looms		65min.

Method 2

Case	Time to repair	Repair priority	lost time		
			work	waiting of loom	total
a	30	1	30	0	30min.
b	10	2	10	30	40min.
c	5	3	5	30 + 10 = 40	45min.
			Total time lost on 3looms115min.		

It is obvious that Method 1 is the better one of the two, since the total time lost by waiting of the looms is 65 min., whereas with Method 2 that time is 115 min.

Normally a loomtuner should never spend longer than approx. 45 min. on one job. If for one or another reason the job will take much longer time, he should interrupt his work on that job and look if flags are up for other looms. When the diagnosis of the stop shows that the repair could be carried out in a short time, he should do this job first before going back to the first one.

8. QUALITY RECOGNITION

	KIND OF FAULT	DESCRIPTION	SOURCE AND CAUSE	RESPONSIBILITY OF FITTER
1.	Thin places	Less picks per cm than desired	When the mark occurs regularly the usual cause is a faulty weft stop motion, let-off or take-up. Irregularly the cause is often bad start up procedures by the weaver.	Stop loom-Determine cause and fix it if loom fault. Advise supervisor when man made.
2.	Thick places	Too many picks per cm in a certain area	Loom started without bringing warp to proper tension, warp, broken or improperly. Set parts of take-up, slack warp, etc.	as for thin places
3.	Weaving without weft	No picks inserted	Dirty fork grid, improperly set fork.	Stop loom-determine cause & fix.
4.	Broken pick	Parts of weft yarn missing in cloth	Bad shuttle, nylon in shuttle, shuttle eye, pirn high or low in shuttle. Shuttle bouncing, temple too close to reed, diameter of pirn too large thread cutter striking reed cutting weft	Determine cause & fix.

KIND OF FAULT	DESCRIPTION	SOURCE AND CAUSE	RESPONSIBILITY OF FITTER
5. Lashing in	Short double picks at selvedge	Temple cutter not working correctly, weft from shuttle caught in box, improper tension on weft yarn, shuttle eye not clean or rough.	Determine cause and fix.
6. Double pick	Two picks in some shed	Weft broken & caught up again without stopping loom.	Fix it.
7. Oily weft	Oily streaks running weft wise in cloth.	Oil on weft yarn, before being inserted.	Remove oily pirn & check magazine for any more oily pirns.
8. Over-and/or undershots	Weft not weaving correctly. Weft on top of cloth.	Harness not set correctly, crossed pins, broken headle, mat up, lay not properly aligned, broken or incorrectly set parts on picking motion.	Determine cause and fix it.

	KIND OF FAULT	DESCRIPTION	SOURCE AND CAUSE	RESPONSIBILITY OF FITTER
9	Tangled	Tight end or ends followed by loose end or ends on the same warp yarn.	A section of the warp ends has been held back & then suddenly released. Stuck warp.Mat up at pins.Lap on beam.	Stop loom. Advise weaver.
.0	Thread out	End missing from cloth.	Warp stop motion not working-choked pins missing pins etc.	Stop loom. Clean choked pins or repair stop motion.
11	Floating end	Warp end not weaving in place	Heddle broken at top or bottom,hanging on harness,etc.	Stop loom Determine cause and fix
12	Irregular crinkle	Wavy in warp, variation in contraction causing alternate flat crinkle and normal crinkle.	Let-off motion worn, choked or not set correctly. Top beam friction drum out of adjustment. Loose jumper motion	Stop loom Determine cause and fix.
13	Harness ships	Warp ends floating on face of cloth	Heddle loose,broken or incorrect-slack ends,harness setting, harness timing,rib broken,heddles spaced incorrectly mat up or stop motion.	Stop loom Determine cause and repair if mechanical.If mat up,advise weaver.

	KIND OF FAULT	DESCRIPTION	SOURCE & CAUSE	RESPONSIBILITY OF TUNER
14	Reed mark	Bad dent or dents in reed. Looks similar to a mis-reed.	Object too large for dent being pushed through reed, such as a reed hook turned sideways to draw an end. Staring loom with an object extending past the fell of the cloth. Loom slamming etc.	Stop loom. Repair if possible if not, consult supervisor for action to be taken.
15	Shuttle mark	A fillingwise mark or abrasion of the warp yarn caused by shuttle striking warp yarn.	Improper shedding or picking motion.Shuttle getting caught in shed and distorting weave.	Stop loom. Determine cause and fix.
16	Slack end	Kinky warp end caused by end weaving with improper tension.	End running out in warp.Incorrect tension when repairing warp break.Stuck end, clinging ends.	Stop loom. Advise weaver.
17	Wrong draw	Warp end weaving incorrectly	End drawn incorrectly in harness.	Stop loom. Advise weaver &/or supervisor.

QUESTIONNAIRES

CONTENTS

QUESTIONNAIRE NO. 1

QUALIFICATION

Questions and Answers:

1. Name 8 motions of the loom.

   Sley:harness, fork,take-up,let-off,pick,transfer,warp stop motion.

2. What safety precautions should a loomtuner take before and after fixing the loom ?

   Before:- switch off motor, put on brake, release lever and safety catch.
   Stop-time sheet on cloth.

   After:- ensure all tools have been removed from moving parts shuttle properly boxed.

3. What is the "warp" and the "pattern"?

   "Warp" is a group of yarns called ends, which are wound on the warp beam.

   "Pattern" is the arrangement and manner in which the warp ends and weft ends are interwoven.

4. What should the clearance be between the race-board and the underside of the temple?

   Clearance is 3/16 inch.

5. You have four flags close to each other, they are:

   a) Bang-off

   b) Wavy cloth

   c) Cracked shuttle

   d) Hanging harness

   In what order would you tackle them ?

You also have four flags on the other side of your sets;they are:

a) Slack warp

b) Bang-off

c) Kinky weft

d) Knock out bobbins

In what order would you tackle those?

5. 1st case: a) bang-off
   b) harness hanging
   c) Wavy cloth
   d) Cracked shuttle

   2nd case: a) knock out bobbins
   b) slack warp
   c) kinky weft
   d) bang-off

6. Name two ways of checking whether the broke is binding.
   a)at fork:- cut weft and start loom. Loom should stop with crank shaft at back (BDC) centre and shuttle in B.S.box.
   b)at warp stop motions:- shafts have to be level.

7. How do you set harness timing?
   Healds level, harness cam can now be set.

8. You have just moved the B.S. box front to put in a new shuttle.
   What part must you check before starting the loom?
   a) set box front with gauge
   b) Reset shuttle eye cutter and hammer.

9. What position of the looms is used as a "datum" before setting the weft cam and the follower.
   Sley at front centre. (FDC)

10.If the position of the warp stop motion is changed by moving it nearer to the harness, what is happening to the warp tension?
The warp tension becomes tighter.

11.How do you set the vibrator cam?
Put healds level. Whip roll cam follower on the bottom position of whip roll cam.

12.Before setting a harness, what would you-check?
Reed is to be square - back box plates aligned - temples are clean and not hitting race board or are too high from race board.

13.What is the difference between:
a) "weft-catching" and "lash-in" ?
b) "mats-up" and "tight ends"?
c) "reed mark" and "reedy cloth"?
d) "wrong draft" and "wrong dent"?

a)weft-catching=weft has been caught or hanging up on fork etc..
lash-in =excess yarn that has been pulled into the open shed at the selvedge.
b)mat-ups =loose yarn causing several warp ends to become tangled generally between drop wires & harness.
tight end =thin warp stripe (tight end) resulting from varitions on one or more ends caused by accumulation of fly size around drop wires, harness or reed.
c)reed mark =thick and thin streaks down the cloth due to reed dents not being equally spaced because of damage.

d)wrong draft =the warp ends are drawn incorrectly in the harness, as a result they do not weave properly.

wrong dent =one or more ends drawn through the wrong dent in the reed, making a streak down the cloth.

14.How can you judge the strength of a pick?

From the boxing of the shuttle.

15.What must you check before setting the pick-timing?

a. picker.
b. check strap.
c. position of shuttle in box.
d. picking stick.

16.Name the five parts which wear out first on the Sakamoto loom.

a. Treadle ball
b. Tappet cam
c. Shuttle guard plate
d. shuttle
e. weft feeler and slide

17.What are the five most common causes of a smash?

a. Protection motion
b. broken shuttle
c. high warp tension
d. bad start by the weaver
e. miss change

18. Name the three fixing jobs which take most time to diagnose & to fix.

a. cut warp ends
b. broken weft
c. loom stops for no reason

19. What causes overshots?
   a. bad harness setting
   b. mat-up in warp
   c. bad alignment of back box plates
   d. reed not square

20. What must be done before setting the "weft feeler"?
   a. position shuttle in box
   b. sley position

21. What 4 causes can make a loom run slow?
   a. clutch slipping
   b. low power
   c. brake too tight
   d. bad greasing of crank arm & bottom shaft bearings

22. Explain the five main duties of a loom tuner.
   a. preventive maintenance
   b. repair flagged looms.
   c. diagnosis of faults
   d. correct checking of new warps
   e. knowledg d application of loom settings

23. When is the warp tension the greatest during a loom cycle?
   When the reed is beating up at fell of cloth. In case of dense fabrics
   Max. shed

24. What is "double changing"?
   Continuous change of pirns.

25.What does a red ticket signify?
Red ticket from cloth inspection indicates a certain loom is producing second quality.

26.Give the six checks which a tuner should make on each loom of his set at the start of a shift?

a. shuttle boxing
b. weft feeler
c. warp tension
d. shuttle eye cutter
e. temple cutter
f. shuttle condition

QUESTIONNAIRE NO. 2

PICKING MOTION

1. Why does the shuttle run on the race board without flying through the shed?

   By the correct setting of the picking motion and the shuttle boxes.

2. Name 6 causes that stop the loom

   a. broken weft

   b. smash

   c. bang-off

   d. maladjustment of the weft fork

   e. broken ends in warp end

   f. bad boxing

3. The pick cam hub can be moved along the shaft. Where should it be located?

   Fully against cam shaft bearing

4. How many times does the cam shaft turn, compared with the crank shaft?

   1/2 turn.

5. Why is a picker stick made of wood?

   Due to its elasticity and lightness

6. What spring tension is advisable on the picker stick?

   just enough to bring back the picker stick

7. What must you do before setting the pick timing?

   Shuttle in position in box

8. Why do pick bowls get flats on them?
Worn pick cam toe; poor lubrication.

9. Where is the start of the picking action on a pick cam?
When pick bowl comes in contact with pick cam toe.

10. How can you judge the strength of a pick?
a) If the front box is adjusted properly and the shuttle bounces in box, it is too strong.(Watch marks on shuttle and top box plate)
b) If we have a bang-off or incorrect change the strength is not enough.

11. What is the "datum" against which a box front must be set?
At B.D.C. with gauges.

12. What setting on a loom will change when you use a new shuttle?
Box settings, hammer settings, and picking motion, weft feeler, height of cutters.

13. What are the clearances between shuttle and box front in B.S. & F.S. boxes?
Set with gauges

14. Name two reasons for moving the box fronts.
a. Front box plates
b. Changing shuttles

15. What parts of a picking motion wear out first?
Side lever, buffer and picker.

16.How many causes of bang-off do you know?
Poor shuttle boxing; bad pirn change; picking assembly; warp tension; bad reed alignment; clutch wear.

17.What kind of wood is a picker stick made from?
Laminate.

18.How many types of shuttles are in use in the mill and what is the difference between them?

Two types : Top discharge
Centre discharge

QUESTIONNAIRE NO. 3

BEATING MOTION

1. What is the "fell" of the cloth ?
   The edge of the cloth where the last pick has been inserted.
2. How many different kinds of temples are in use in the mill.
   1 type with 7 rings.
3. What should the clearance be between the race board and the underside of the temple ?
   Clearance is 3/16 inches.
4. What faults occur when the temple thread cutter is worn ?
   Lash-in as well as hanging ends at the selvedge.

=========

QUESTIONNAIRE NO. 4

SHEDDING MOTION

1. What is the first thing you would check before setting a harness?
   Loom should be at back centre.

2. What are the three means of adjusting the height of a harness?
   Jack straps, harness straps and treadles.

3. What clearance is required for the bottom shet ?
   1/128 - 1/64 inches.

4. How do you set the harness timing ?
   Level harness - set reed to required distance from fell of cloth and set harness cam.

5. What does the vibrating roll do ?
   Levels warp ends - provides even tension and determines quality of cover.

6. To set vibrating roll how would you set the reed ?
   Shafts level - whip roll cam down-wards.

7. How strong should the tension on top of the harness be ?
   To keep the treadle rolls in complete contact with the cams during a full turn of the crank shaft.

8. What does "harness hanging" mean ?
   Harness is not level due to broken harness strap wires.

9. What harness faults causes "overshots" ?
   Hanging harness.

10. If the whip roll is raised, what happens to the tension of the top shed and the bottom shed ?
    The top shed has less and the bottom shed has more tension.

11. If the top shed becomes slack, what cloth fault is likely to arise?
    Overshots.

QUESTIONNAIRE NO. 5

LET-OFF MOTION

1. When is the let-off handwheel used ?
   To wind or rewind the warp that has been let off.

2. If the drop wires are balancing, what does that indicates about the warp tension ?
   Too tight.

3. Name 4 ways of recognizing a slack warp.
   a) slack warp ends.
   b) overshots.
   c) slack cloth.
   d) bang off.

4. What two factors govern the speed with which the warp is let off.
   a) beam feeler
   b) ratchet

5. Give two ways of recognizing a tight warp.
   a) high tension on cloth
   b) loom banging off

6. What two cloth faults commonly occur due to a worn let off ?
   a) thin places
   b) thick places
   c) uneven weave

7. When the take-up gear lets the cloth back, does the warp wind-up through the let-off motion ?
   No - use handwheel.

QUESTIONNAIRE NO. 6

TAKE-UP MOTION

1. How many different types of take-up motion are in use in the mill ?
   One.

2. Before setting the take-up, what must be checked ?
   Side fork.

3. When is the "pick gear" changed ?
   When the construction of cloth changes and calls for a change in picks per inch.

4. Why is there no gear drive between the sand roll andthe cloth roll ?
   Because of increasing diameter of cloth roll as it fills up. The centers of the sandroller and the clothroller are pushed apart.

5. What should be checked for clearance after setting the take-up gears ?
   Pawl and hold back pawl must fit into the bese of a tooth.

QUESTIONNAIRE NO. 7

STOP MOTION

1. How many automatic devices are there on a loom, which will cause it to stop ?
   3 namely : a) warp stop motion
   b) weft stop motion
   c) shuttle protector

2. Which do you set first on a mechanical stop motion-The timing or the stroke ?
   The stroke.

3. If the warp stop motion is moved near the harness, what happens to the tension of the warp ?
   Tight tension.

4. How do you decide the position of the warp stop motion relative to the harness ?
   By the shed.

5. A large percentage of smashes are caused by not banging off at improper boxing. What motion to be checked ?
   The box motion.

QUESTIONNAIRE NO. 8

MOTOR

1. What two causes can make a loom run slow ?
   a) incorrect setting of the clutch.
   b) drop in power.
   c) bad greasing of crankarm and bottom shaft bearings.
   d) break too tight.

2. Where is the speed of the loom measured ?
   At the crank shaft.

3. Why do certain teeth in the gears wear more than the others ?
   Transmitting or drive gears have worn teeth at the point by pick bowl hitting the nose.

4. What two types of brakes are used on looms ?
   a) clutch brake
   b) wheel brake

5. If there is insufficient friction at the clutch, what will happen to the loom ?
   Reduction in picks per minute - loom banging-off - bad change - loom stopping - shuttle fly out of shed - transfer mechanism not properly functioning - leather wears out on clutch plate.

QUESTIONNAIRE NO. 9

WEFT CHANGE

1. Where should the sley be set before adjusting the weft cam follower?
   At front center.

2. Which one should you set first, the position of the weft cam of the stroke of its follower ?
   The stroke.

3. If the mechanical-feeler is incorrectly set, what fault will be caused ?
   Early changing - no bunch left on pirn possibly causing double picks.

4. What has to be checked before setting the mechanical-feeler ?
   Correct position of the shuttle in the box.

5. The mechanical-feeler has to be set on 3 dimensions: height, lateral position and distance to pirn. What are these settings ?
   - Height: Feeler 1/16 inch lower than slot in shuttle.
   - Lateral: 7/16 inch between feeler and reserve.
   - Distance: Clearance of 3/16 - 1/4 inch at inner end of adjustable bolt.

6. A recent analysis of the cause of smashes showed that quite a number of them were caused by faulty weft change action. What safety device is incorporated in the loom to prevent changing if the shuttle is not boxed ?
   If shuttle is not correctly boxed, the shuttle feeler strikes the tip of the shuttle & is forced forward, carrying with it the depressor, which eventually causes the transfer of the pirn to be stopped.

7. Explain the term "double change".

   Double change means the consecutive transfer of pirns.

C H A R T S

and

G R A P H S

CHARTS AND GRAPHS.

1. Purpose.

Charts and graphs have been designed for:

a. recording the progress of the trainees.

b. evaluating the performances of the trainee on preventive maintenance.

2. The following charts and graphs are used:

a. The completed Defect - recognition Schedule (see page 223) for recording the progress in " Diagnostic Development".

b. The Preventive Maintenance Results Efficiency (see page 225) for recording the performance of the trainee on Preventive Maintenance.

c. The Management Control Chart (see page 227) for recording the progress of the trainee on the exercises of Phase I and Phase II.

a. <u>The Complete "Flag" - recognition Schedule.</u>

As explained in the chapter on "Diagnostic Development" (page 150 of Phase II), the trainee has to repair at least 7 defects, of a particular type of loomstop.
The total number of the different reason for flagging are 16, which means that the total number of flags to repair is:
16 reasons x 7 flags per reason = 112 flags.

The vertical axe of the graph "Completed Flag" - recognition Schedule (see page 224) is divided into 110 parts & the horizontal one in 26 parts.

Each day the accumulated number of defects repaired is indicated by a mark on the crossing of the line, representing the day involved.
The marks are then connected with each other by a line, which is called the "actual progress line".

Before starting the flag-exersises and its recording a line is drawn from 0 to the crossing of the line, representing the 112 defects, with the line, representing the 24th day. That line is called the "target-line".

As long as the "actual progress line" is appearing at the left hand side of the "target-line", the trainee progresses well & will terminate all the 112 defects within 24 days.

As soon as the first line is crossing the target-line, the progress of the trainee is not according schedule & the Training Supervisor should investigate & discuss with the Instructor ways & means for getting the trainee back on the right track.

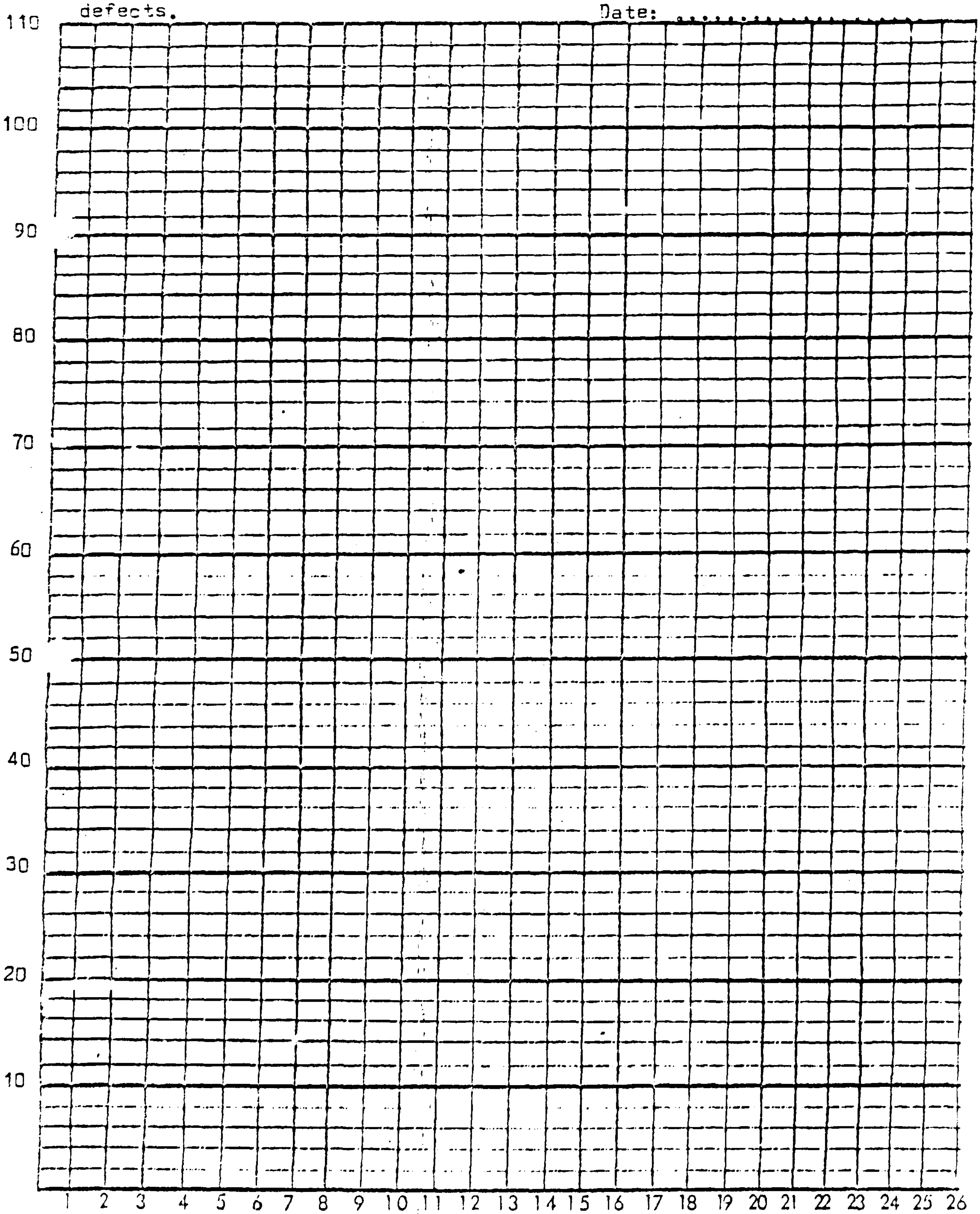
PHASE 2

COMPLETED DEFECT RECOGNITION SCHEDULE

Number of defects.

Name: ....

Date: ....



WERNER INTERNATIONAL

b. <u>The Preventive Maintenance Results Efficiency</u>.

In the chapter on "Preventive Maintenance (see page 156 of Phase II) we mentioned that the Instructor has to check and evaluate the performance of the trainee on his subject.

For this purpose he uses the form "Evauluation on Preventive Maintenance" as shown on page 226 of this section.
After the trainee has carried out the Preventive Maintenance on a frame, the Instructor checks the loom by checking all the parts as mentioned on the form.
When he finds that the settings of a certain part is not correctly made, he gives 0 points.

The total of the standard points is 100, so the total number of points, achieved by the trainee, is equal to the percentage of the total standards points.

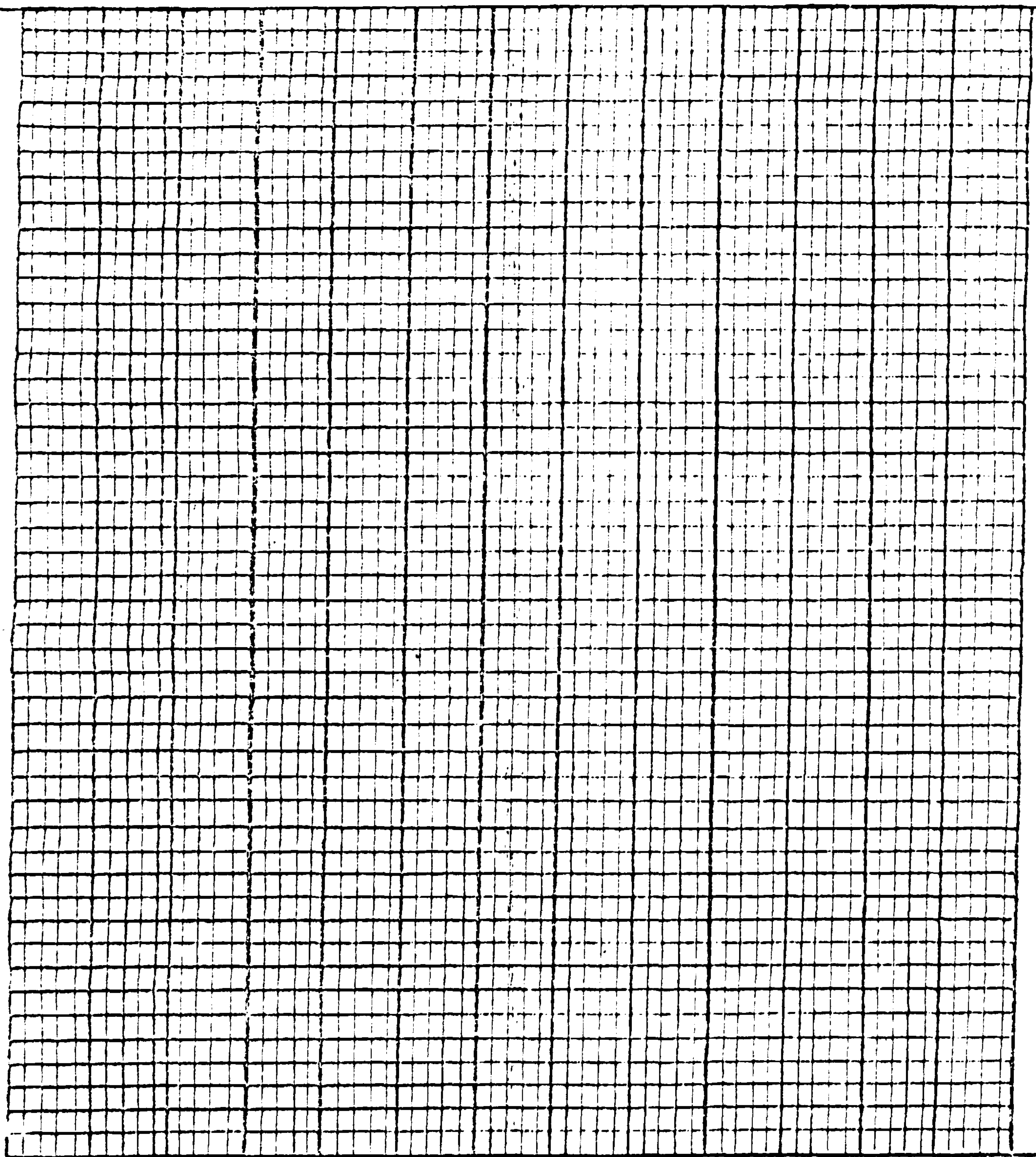
That percentage is marked on the form "Preventive Maintenance Results Efficiency", as shown on page
The Instructor writes the frame number and the date in the appropriate sqaures at the bottom of the form and marks the sqaure, situated behind the percentage achieved and vertically above the frame number.

It is expected that the trainee will achieve minimum 85 % in the beginning of these exercises and will gradually move on to 95 % - 100 %. If not, the Instructor should determine where the weak points of the trainee are and take hum back to the Training Centre for going over again the settings, where the trainee has shown his weaknesses.

<u>NOTE:</u>
This Evaluation-form could also be used for checking the performances on preventive maintenance by skilled fixers.

The Preventive Maintenance Results Efficiency.

Name:............................



% 95 90 85 80 75 70 65 60 55 50 45 40 35

FRAME Nr.:

DATE:

EVALUATION OF PREVENTIVE MAINTENANCE

Loom No. .... Tuner .... Date ....

1. PATROLLING LOOM - Loom running (Check for loose and misaligned parts)

Standard	Points	
2		A. Run out pirns
2		B. Temple cutter
1		C. Whip roll and lever
2		D. Let - off motion
1		E. Beam locks
1		F. Motor stand
1		G. Warp stop motion stand
2		H. Temples
4		I. Shuttle boxing
2		L. Take - up motion
2		M. Selvedges
20		

2. LOOM STOPPED

Standard	Points	
4		A. Swords
2		B. Square reed and alignment
6		

3. LOOM STOPPED: shuttle in F.S. box

Standard	Points	
4		A. Take out shuttle and inspect it
1		B. Check B.S. protection and crank arm bearings
1		C. Check B.S. leather and picker
1		D. Check F.S. protection and crank arm bearings
1		E. Check F.S. leather and picker
2		F. Check bumpers
1		H. a. F.S. pick timing
1		b. F.S. Picker stick
3		c. F.S. straps
1		d. F.S. stick spring
4		I. Clutch
2		K. Duck bill finger
2		L. Box setting
2		M. Duck bills
4		N. Mechanical feeler
30		

Standard	Points	
		4. MAKE A PICK and put shuttle in B.S. BOX
1		A. Strength of pick towards F.S.
1		B. Bumpers
2		
		5. LOOM STOPPED, Shuttle in B.S.BOX
1		A. a. B.S. pick timing
2		b. B.S. picker stick and guide
3		c. B.S. straps
1		d. B.S. stick spring
2		B. Shuttle boxing (alignment)
2		C. Temple setting and cutter
1		D. Hammer rest position
3		E. Hammer position on change
1		F. Shuttle feeler
1		G. Bobbin guide
1		H. Bobbin support
18		
		6. MAKE A PICK and put shuttle in F.S. BOX
1		A. Strength of pick towards B.S.
1		B. Bumpers
2		
		7. STOP MOTIONS
4		A. Warp
4		B. Weft (Fork)
2		C. Position of sley at stop
10		
		8. HARNESSES
3		A. Setting
2		B. Timing
3		C. Alignment
8		
		9. SHUTTLE EYE CUTTER
1		A. Height
1		B. Depth
2		C. Movement
4		

WERNER AMPS

BI - MONTHLY PREVENTIVE MAINTENANCE CONTROL SHEET

226 C.

Name: ....

Week ending .... | Week ending ....

Preventive maintenance to be carried out	Loom No.	SAT	SUN	MON	TUE	WED	THR	SAT	SUN	MON	TUE	WED

1. Loom running
   A. Rocker shaft
   B. Temple cutter
   C. Whip roll + lever
   D. Let off motion
   E. Beam locks
   F. Motor stand
   G. Warp stop motion stand
   H. Shuttle eye cutter
   I. Shuttle boxing
   L. Take up motion

2. Loom stopped
   A. Sword
   B. Square reed and alignment

3. Loom stopped: shuttle F.S.
   A. Take shuttle out and inspect
   B. B.S. protection, crank arm
   C. B.S. Leather and picker
   D. F.S. Protection, crank arm
   E. F.S. Leather and picker
   F. Bumper
   H. F.S. Pick timing
   Picker stick
   Strapo
   Stick spring
   I. Clutch
   K. Duck bill finger
   L. Box setting

4. Make a pick, shuttle B.S.
   A. Strength of pick to F.S.
   B. Bumper

5. Loom stopped, shuttle B.S.
   A. B.S. pick timing
   Picker stick, guide
   straps
   stick spring
   B. Bunch on pirn
   C. Shuttle boxing(alignment)
   D. Temple setting
   E. Hammer and Transfer
   F. Shuttle feeler
   G. Bobbin guide
   H. Bobbin support
   I. Top holder

6. Make a pick, shuttle F.S.
   A. Strength of pick to B.S.
   B. Bumper

7. Stop motions
   A. Warp
   B. Weft (fork)
   C. Position lay at stop

8. Harnesses
   A. Setting
   B. Timing

c. <u>Management Control Chart.</u>

The Management Control Chart, as shown on next page is the "log-book" of the course.

The chart is divided in two main parts, namely Phase I and Phase II.

<u>PHASE I.</u>

The number of days has been already inscribed on the chart, but the Instructor has to inscribe the dates, every day at the end of that day. All the six groups of exercises in Phase I are shown on the chart. When one group of exercises has been terminated by the trainee, the Instructor inscribes the loom number (s), on which the exercises were carried out, in the square, provided for it, under the group of exercises concerned and the date when the exercises were terminated.
Also he fills in the time spent on that particular group of exercises in the Training Centre (behind TC) and in the Weaving Room (behind WR).

<u>PHASE II.</u>

Here again the Instructor has to inscribe the dates under the number of days at the bottom of the part.
This part of the chart is divided into two sections:

a. <u>Preventive Maintenance.</u>

When the trainee has carried out preventive maintenance on a loom, the Instructor fills in the number of the loom, the score - the percentage of the evaluation - and the date,when it was carried out.

b. <u>Diagnostic Development.</u>

For each type of defects recording columns appear on the chart. At the end of the day, the Instructor fills in the loom, number & date, on which the particular defect-repair has been carried out by the trainee. At the end of the course each type of defect has to be tackled as per schedule (see Diagnostic Development on page of Phase II).

LOOM:

Days	1	2	3	4	5	6	7	8	9	10	11	[illegible]	13	14	15	16	17
Date																	

PHASE 1.

1	2	3	4
A. MOTOR B. CLUTCH	BRAKE	A. BEAT – UP AND PROTECTOR MOTION B. TEMPLE + CUTTER	A. SHUTTLE B. PICKING MOTION
Hours:			
TC: WR:	TC: WR:	TC: R:	TC: WR:

PHASE 2.

PREVENTIVE MAINTENANCE

Date	L.No.	Score	Date	L.No.	Score	Date	Loom No	Score	Date	L.No.	Score

DIAGNOSTIC DEVELOPMENT

WARP TENSION		BANG OFF		FALSE CHANGE		STOPPING ON CHANGE	
Loom No.	Loom No.	Loom No	Loom No	Loom No	Loom No.	Loom No.	Loom No.

Days	1	2	3	4	5	6	7	[illegible]	[illegible]	[illegible]	[illegible]	12	13	14	15	16	17
Date																	

MANAGEMENT CONTROL CHART   WERNER AMPS.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

5		6		7		8	
WEFT STOP		TAKE - UP		A. WEFT FEELER B. CHANGE CONTROL		A. BATTERY B. PIRN CHANGE	
Loom No.	Date	Loom No.	Date	Loom No.	Date	Loom No.	Date
TC:	WR:	TC:	WR:	TC:	WR:	TC:	WR:

DIAGNOSTIC

Date	L.No.	Score	Date	L.No.	Score

[illegible]		EMPTY PIRNS	
Loom No	Loom No.	Loom No	Loom No.

SLACK WEFT		DOUBLE PICK		DAMAGED SHUTTLE		LONG TAILS	
Loom No.	Loom No.	Loom No	Loom No	Loom No	Loom No	Loom No	Loom,No.

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37

NAME: ....

38	39	40	41	42	43	44	45	46	47	48			51	52	53	54	55

9		10		11		12	
SHUTTLE EYE CUTTER		A. VIBRATOR B. LET - OFF		WARP STOP MOTION		SHEDDING	
L. No.	L. No.	L. No.	L. No.	L. No.	L. No.	L. No.	L. No.
TC:	WR:	TC:	WR:	TC:	WR:	TC:	WR:

DEVELOPMENT

BROKEN WEFT		UNEVEN WEAVE		ENDS BREAKING		WARP STOP MOTION	
Loom No	Loom No	Loom No	Loom No	Loom No	Loom No	Loom No.	Loom No

CHECK STRAP		CHECK SPRING		PARALLEL SPRING		BROKEN HEALDS	
Loom No	Loom No	Loom No	Loom No	Loom No	Loom No	Loom No	Loom No

38	39	40	41	42	43	44	45	46	47	48		50	51	52	53	54	55

APPENDIX

Depending on the weave and construction, different styles have various settings of the back rest height and the heald crossing time.

The BEAM-GAITER is responsible for the correct setting of these parts but the LOOM-TUNER should know them too, in order not to off-set a loom, when he is called to the loom.

There are three reasons for altering basic settings:

1. WEAVABILITY To reduce the number of ends breaks by reducing the tension and strain of the warp.
2. "COVER" To give the cloth a smooth, unbroken appearance like a piece of writing paper, without any reediness.
3. PICK PACKING To insert a high number of picks without excessive warp tension and without "bounce" at the fell of the cloth.

Conditions (2) and (3) are met by a high back rest setting & an early crossing of the healds, depending on quality of cloth. This means that the pick is beaten up into a crossed shed, one side of which is slack. This ensures an easy insertion of the pick, the slack portion of the crossed shed offering no resistance to the pick, the crossed shed prevents the pick from springing back and the slack shed allows the ends be evenly spaced in the cloth without showing any reediness.

In the case of heavy plains this will also help weavability but would not be suitable for light plains with fragile yarns as in such cases it is important that the warp tension is shared equally between all the warp ends.

APPENDIX

NEGATIVE LET-OFF MOTION

FUNCTION.

To regulate the unwinding of the warp yarn on the beam in such a way that that tension of warp remains constant independent of the diameter of the warp on the beam.

PARTS.

- Easing Motion Cam
- Easing Lever
- Easing Shaft & Bush
- Easing Arm + Cover + Spring + Pin
- Back Roller + Bracket

- Beam Presser + Shoe
- Press Lever Shaft + Collar + Bracket
- Connecting Lever + Link
- Parabola Curve Cam + Stud + Spring
- Horizontal Lever + Washer + Stud + Bracket
- Horizontal Lever Roller + Stud
- Horizontal Lever Spring + Hook + Bracket
- Shoe Lever + Bracket + Stud
- Weight Lever + Bracket + Weight
- Travelling Roller + Holder + Pin + Cover
- Rack + Rod + Pinion + Guide + Cover + Bracket
- Foot Lever Holder + Bush
- Foot Lever Connecting Rod + Spring + Collar

- Lifting Connecting Rod + End + Support
- Weight Lever Lifter + Pin + Bracket
- Shoe Lever Hook + Lifting Arm + Brake Chain Short Hook + Hook Pin + Brake Chain
- Spring Tension Bar + Head + Easing Spring + Bracket
- Ruffle + Boss + Beam Flange + Warp Beam + Beam Core + Rivet
- Beam Cap + Beam Bracket + Cotter

ASSEMBLY.

- Put Rack Bracket alongwith Treadle Heel on Back Cross Rail and put Rack Guide and Pinion on this bracket.
- Put Shoe Lever Bracket on Back Cross Rail on both sides and put on Shoe Lever.
- Put Weight Lever Bracket on Side Frame on both sides and put Weight Levers on it.
- Put Horizontal Lever Bracket on side Frame on both sides and assemble Horizontal Lever on it.
- Assemble Travelling Roller, Rack Rod and Rack. Attach it with Rack Guide and Horizontal Lever.
- Put spring on Horizontal Lever and attach Spring to Spring Hook and to Horizontal Lever Bracket.
- Put Foot Lever Holder alongwith Push to Back Cross Rail.
- Attach Foot Lever Connecting Rod to Foot Lever Holder on Battery side and put Lifter Connecting Rod End on the other side.
- Attach Lifter Connecting Rod to Lifter Connecting Rod End.
- Put Weight Lifter Connecting on Lifter Connecting Rod. Put Foot Lever Connecting Spring with Collar on Lifter Connecting Rod and pass this Rod through Lifter Connecting Rod Support.

- Put Weight Lever Lifter alongwith Pin on Lifter Connecting Rod Support.
- Assemble Beam Presser attachment and attach it with Side Frame (Battery Side).
- Put Beam Bracket on Side Frame on both sides and put Beam Cap and Cotter for Beam Bracket on it.
- Attach Brake Chain alongwith Spring Tension Bar Head to Brake Chain Short Hook after giving one round around the Ruffle.
- Attach Brake Chain Short Hook to Shoe Lever Hook and Shoe Lever.
- Put Weight on Weight Levers.

ADJUSTMENTS.

- Level Beam Presser Shaft by using Press Lever Shaft Gauge No.29.
- Adjust Presser Shoe so that the distance between its lower face and upper face of Back Cross Rail is 13"-13½".
- Level Shoe Lever using Shoe Lever adjustable Gauge No.31.
- Adjust the height of Weight Lever using Shoe Lever and Weight Lever Gauge No.30.
- Level Rack Guide using the Level.
- Adjust the Travelling Roller Holder so that the Centre of Horizontal Lever Pin and the outer end of the Weight Lever is in one vertical line when the Presser Shoe is pushed maximum outwards.
- Adjust Brake Chain Short Hook so to obtain ¼" clearance between Weight Lever and Weight Lever Lifter.
- Place the Weight on Weight Lever so to obtain proper tension on warp sheet.

LOOM PROBLEMS CREATED BY NEGATIVE LET-OFF.

See Positive Let-Off Motion.

DISPLACEMENT OF SLEY

Crank Angle (°)	Distance Fell to Reed (Inch)	Crank Angle (°)	Distance Fell to Reed (Inch)
0 FDC	0	180 BDC	6
10	1/32	190	6
20	5/32	200	5 15/16
30	3/8	210	5 13/16
40	3/4	220	5 5/8
50	3/4	230	5 1/4
60	1 1/8	240	4 15/16
70	1 5/8	250	4 1/2
80	2 1/8	260	4 1/8
90	2 11/16	270	3 9/16
100	3 1/4	280	3
110	3 11/16	290	2 7/16
120	4 3/16	300	1 15/16
130	4 5/8	310	1 3/8
140	5	320	15/16
150	5 3/8	330	3/16
160	5 13/16	340	9/32
170	5 15/16	350	3/32