OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

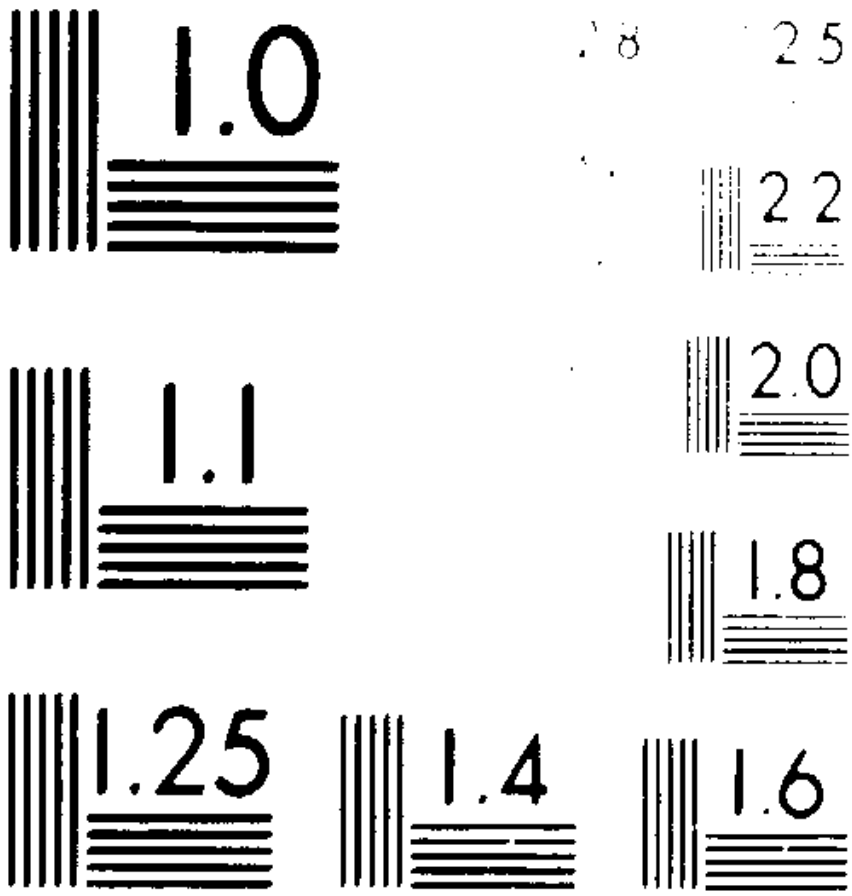
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5

borghi e baldo ingg.
spa

12182

Project DP/IND/72/045

Unido Contract 82/36

India.

Advisory Services for the Improvement of the Manufacture of Tennis Rackets in India.

Emilio Beghelli

FINAL REPORT

February 1982

borghi e baldo ingg.
spa

I Introduction

The tennis racket industry in India is concentrated in the small scale and the cottage sectors. The main areas of production of tennis rackets are Jullundur in Punjab State, and Meerut & Allahabad in Uttar Pradesh State. On an average approximately 600 tennis rackets are manufactured daily in Punjab State and the average price per unit varies between US $ 4 to US $ 5 per piece. In Uttar Pradesh State approximately 200 rackets are manufactured daily having the same average price. This production mainly consists of wooden tennis rackets. A few tennis rackets in steel are also made near Jullundur; however the quality is not very good and these rackets are basically meant for the local market. It is estimated that tennis rackets worth around US $ 1 million are manufactured annually in the country.

In India tennis is not a very popular game for the simple reason that it is too expensive for the ordinary masses. Only a few well-to-do people indulge in this sport and hence the local market is not very large. It is estimated that even in the future the popularity of this game will not rise considerably due to the expensive nature of this sport. However, there is a very good export market for this item as, internationally, this game is very well recognized and extremely popular. The problem is that Indian rackets do not meet the high standards required by the international players. In this regard a lot of product adaptation and upgrading of quality is required.

Over the last few years Indian tennis rackets manufacturers have increasingly perceived the need to take concrete steps towards improving the quality of their production so as to be able to meet the challenge posed by the high quality production of the European manufacturers. Through TDA, the Trade Development Authority, based in New Delhi, they have therefore engaged the services of UNIDO to assist them in analysing the needs of their industry.

The present report is the result of the visit of Mr. Ennio Beghelli to the local manufacturers in November 1982 and gives an indication of the problems existing and options availabe to improve the quality of the local products.

borghi e baldo ingg.
s.p.a.

II Summary

The purpose of the visit has been that of analysing the quality and methods of production of tennis rackets in India, and to see what steps can be taken to arrive at such qualitative levels as to be able to sell the product on the western markets.

At first an intervention was asked for also for frames in alloy and in glass or graphite fibre and other fibres, but on the spot it was agreed to only intervene for wooden rackets and composite rackets, and already for these big difficulties have arisen due to the scarcity of equipment, which goes to the detriment of the manufacturing possibilities and of the quality; quality which must concern not only the materials used, but also the design and the presentation of the article.

The firms contacted were:

F.C. SONDHI & CO. (INDIA) PVT. LTD.
Basti Sheikh Road, Jalandhar - 144002 INDIA

BEAT ALL SPORTS
S/108-115, Industrial Area, Jullundur INDIA

PIONEER SPORTS WORKS PVT. LTD.
Nakodar Road, Jullundur - 144003 INDIA

K.L. MALHOTRA BROTHERS
W.X.83, Basti Nau, Juliundur 144002

KOSHE & COMPANY
Basti Sheikh Road, Jullundur City

JANDIAL EXPORT HOUSE
Manufacturers & Exporters
234, Thaparnagar, Meerut

Nearly all these firms also produce other sporting goods, but for that which concerns the production of rackets, actually the first three listed are the only important ones.

In all the factories, even with a certain variation, the same working methods are used, and also nearly the same machines, as well as the same materials.

The woods used are both of local production and importation. The local wood, although being of good quality, has nearly always a worse appearance than that imported. This goes particularly for a very resistant local quality of wood of a yellow colour, frequently with large brown spots.

The imported wood is very costly, but is supplied already semi-finished and carefully chosen. On the other hand, the Indian wood is exclusively supplied in logs; it therefore requires long working, and does not permit an accurate selection.

The importation of timber is mainly from Great Britain, from Belgium, and from Yugoslavia.

Technical difficulties and lack of machinery are at the basis of a poor preparation of the timber, which generally is not cut correctly according to the natural vein. However, it is dried quite carefully.

During the visit an attempt was made to point out this deficiency, which in most cases seemed to be understood.

Another serious problem is represented by the other materials which enter directly into the production of the rackets, such as the vulcanized fibre and the new materials, such as graphite, glass fibre, and boron.

The vulcanized fibre of Indian production has a bad aesthetic appearance and tends to open up in layers with a certain ease; the other products, such as glass fibre

and graphite practically cannot be found locally, and must be imported.

For that which concerns the machines, the worst deficiencies must be attributed - above all- to the very low cost of labour, to the working habits as well as to the scarce value of the product, for which no producer has the incentive to make investments without secure guarantees.

The request most commonly made is that of assistance and collaboration with western industries, which can offer technologies and help in sales, finding themselves in direct contact with the most important markets, but in the present conditions of depression no European firm can give assurances as to sales prospects, already having problems for placing their own production.

A further problem is given by the fact that not every manufacturer is willing to let other manufacturers take advantage of the various new technologies, generally acquired after long testing periods and considerable expense.

For that which has been seen, in any case it is advisable - above all - to try to improve in the field of wooden and composite rackets, for which complete changes of the working cycle are not absolutely necessary, but it is instead sufficient to integrate it in certain of its parts.

For that which concerns the design and the presentation of the articles, the difficulties of finding paints and transfers of superior quality locally make it extremely hard to achieve a production qualitywise comparable to that of the western countries.

III Discussion of the current process technology in India

In order to better analyse the problems of Indian industry, it is useful to make a description, even if very briefly, of the local working system and of the production procedure. This will serve to clarify which can be the roads to improve the production as a whole or in part.

The present production of rackets consists of tennis, squash, and volley rackets, as well as of a considerable number of very small sized rackets, exported to Japan, which are used as an ornament for clocks.

They are mainly made of wood and the method of manufacture does not differ much between one and another.

The imported wood arrives in planks 1" thick, which is the size of the plies used in the manufacture of the frames, which are glued singly;this wood is used together with other qualities of local wood.

In the same way, the national woods purchased in logs, are reduced to 1" thick planks, and stacked in piles in the open, in spaced rows, in order to favour the air circulation, and the very hot climate dries them very quickly.

The largest logs are hand-sawn until they reach dimensions such that they can be sawn to size on the available machines.

In many cases the direction of the vein of the wood is not taken into consideration when cutting the plies and generally a degree of humidity of the wood, suitable for the glueing (about 8-10%) is not maintained.

The band saw represents the principal machine for the production of all the semi-finished pieces. The plies are cut one at a time, and the cut is quite rough.
The most sophisticated producers finish them by machine, some by hand using files, but the larger part use them as they come out from the machine.

In all the factories visited in India the wedges are made from planks of suitable thickness. They are designed in pencil on the planks and recut with the band saw, therefore they show the same defects as the plies, which is an excessively rough contact surface, which impairs the glueing, even if in certain cases wedges are retouched by hand with a file or with a sanding drum mounted on a router ("*spindle*").

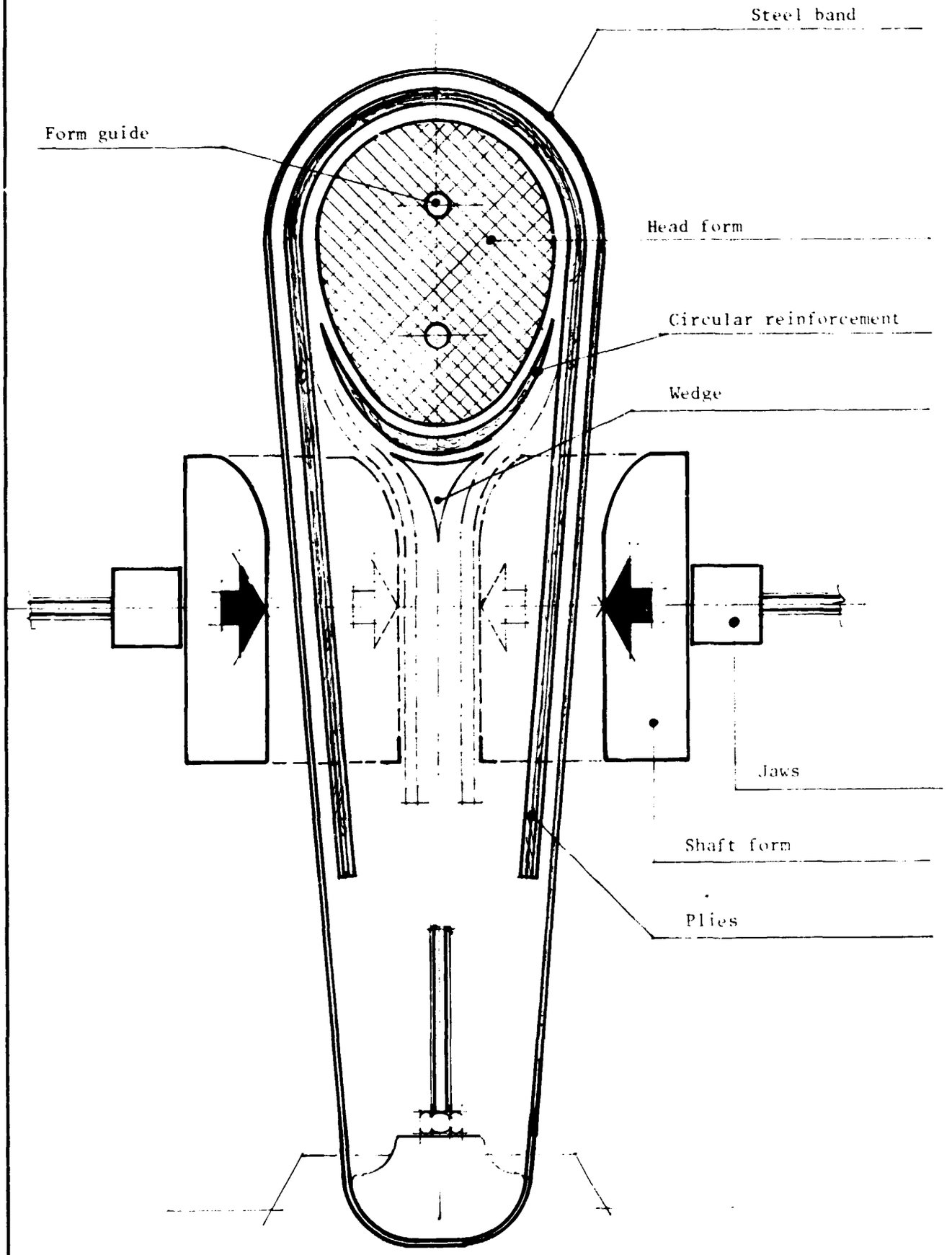
In this way it is difficult to maintain the parallelism of the surfaces to be glued and to follow the exact shape corresponding to the outlines of the racket during the glueing process.

The preparation of all the other semi-finished pieces, which are the reinforcement of a circular shape on the inside of the oval and the pieces which form the handle, proceeds in the same way. The shoulders - applied above and below the frame - are hot bent from a block of wood and then cut in slices, always with the band saw.

The glueing of the frame is carried out with hand operated bending presses, by means of a spoked wheel which the operator activates in order to tighten the frame.

The layers are pressed against a form by a steel band kept under tension by a slider worked by a screw fixed at the base of the racket. During the glueing the operator gradually releases the tension of the band, at the same time pressing the band for a greater length to the external outline of the racket by means of two lateral jaws (see figure 1).

Figure 1: Sketch of the operation manual bending press



With accurate working the result is fairly good, but it is easy to operate in the wrong way, by releasing too rapidly the action which keeps the band under tension, so that the layers do not remain firmly pressed one against the other, which is very serious particularly when ureic glues are used.

Normally the frame is worked the day after glueing, which does not allow for a good curing of the glue, which is in a better condition after a few days.

At this point the frame is planed with a combination planer, and then worked with a thickness planer, but also here the operator frequently tends to press the frame too hard onto the combination planer and therefore, if the racket is skewed, when the work is finished it will be curved, a defect which most of the time becomes more evident when the racket is strung.

At this stage, the handle and the shoulders are fixed by using clamps or small screw presses coupled for the specific use. Here also the glue is not cured for more than one day, after which the frames are taken off the form and distributed to the workers, who work a certain number of pieces per day.

From this moment onwards all the operations are carried out by hand in nearly all the factories, and the equipment consists of a hand plane, a file, and a hollow adze, with which the frames are rough-shaped and brought to some degree of finish.

The final smoothing is made with sandpaper in various sizes.

Generally the worker works squatting or sitting on the ground, the racket is placed on a piece of

wood with a notch against which the worker holds it with the help of his feet, but most of the time he must also use a hand, so that the work becomes very difficult.

The drilling is done one hole at a time with small electric drills in certain cases, in others with hand operated bow drills and artisan forged drills, and the worker is obliged to work sitting on the ground, assisting himself with his feet.

For the slotting of the holes in which the strings are fixed at the top of the oval, the implements used are either a rotary bur against which the worker places the racket free handed, without any guide, or a hammer and chisel, in which case the work is carried out in a truly original manner: from a bench projects a horizontal stick which serves as a support for about ten frames; the worker sits on the bench and holds the racket with his feet, he turns it round and moves it when it is finished in order to take another, while he holds in his hands the hammer and chisel with which he carries out the work.

The edge created between the slotting and the hole is rounded off with a hammer and punch.

With this the execution of the frame can be considered to be completed, and therefore it goes to the painting, for which nitro base paint is nearly exclusively used, with a few exceptions for polyurethane or polyester paints.

During the writer's visit a number of tests were carried out with acrylic paints for cars, very nice to look at, but one does not know with what result and particularly with how much duration and elasticity when subjected to the deformations of the racket during the game.

In the painting process, a very dense first coat is given with a rag in order to fully impregnate the frame.

Then this is rubbed down with wet abrasive paper. Then all the parts which have been painted with opaque paint are carefully puttied and rubbed down again with wet paper.

Then the second coat of paint is applied with a rag held by hand. The transfers are applied, which can either be bought ready to use, or prepared in the factory by means of self-constructed screens.

Direct screen printing is not used.

The finishing coats of paint which follow are generally sprayed.

The painting process and the design of the transfers are not such as to give a refined work as required by the market, even if sometimes the work is carried out accurately and with considerable expenditure of energy.

Although in India there is a lot of excellent raw material, the leather used for the grip has a rather poor appearance, contributing to give a very cheap appearance to the whole.

It is fixed by means of nails and also here the worker carries out the operation squatting on the ground.

The product does not have a homogeneous appearance because the hand working does not allow this, and the parts produced vary depending on the worker.

For that which concerns the stringing, this is carried out by hand by all the manufacturers, and obviously the tension of the strings is not homogeneous and does not reach adequate values.

From what has been said up until now, the reasons for the bad quality of the Indian rackets can be understood, even if the material used most of the time is not of inferior quality.

The glues used only work well under pressures of about 2 ± 3 kg per cm^2, and in conditions of perfect adherence of the materials to be joined together, for which - if the surfaces of the parts are excessively rough - there is a lack of continuity which does not allow a good glueing.

The rather rough preparation work of the semi-finished pieces does not allow for the glues used to give their best possible results.

The glues are not always used following the dosage and the instructions for use specified by the manufacturer, and above all an excessive dilution frequently gives bad results.

The various firms are not generally equipped for evaluating the mechanical characteristics of the frames. This represents a further difficulty in evaluating the deficiencies of the various models.
Frames which are built without logical criteria from the resistance point of view, but only for reasons of finding some original solution, can be frequently seen.

The low-cost labour, of which India abounds, has an unfavourable influence on investments in machines, which on the other hand are badly needed for obtaining a production of even quality, and for improving its resistance.

The use of manual labour, sought after for many articles, becomes a serious handicap for series production and in certain cases a point of weakness.

A certain pride has been noticed in the producers in managing to do the maximum possible with their own means, which can be very praiseworthy, but sometimes does not make it possible to reach the higher quality levels which are possible by using the resources and products technologically more advanced of specialized firms.

This is valid for instance for the transfers, which certain manufacturers produce themselves, obtaining rather modest results, and which instead could be bought of better quality on the market.

Considering the low cost of labour, the optimization of the layout of the plants does not represent a factor of great importance, but without doubt something could be done, at least in the industries which foresee some new construction or which have the possibility of carrying out some internal change.

In various cases, for example, the use of very expensive electric energy for the drying of the paints has been observed, while in another part of the factory considerable quantities of heat were lost in wood kilns used for bending pieces for other works.

Idle runs made due to not having studied in the slightest a more rational arrangement of the places of work, contribute to increase the cost of the product.

Undoubtedly the production process employed does not now justify long studies on the arrangement of the working phases or on their changes, but in units of new layout, as well as for new processes, and with labour costs surely increasing, the problem must be taken into consideration.

Centralized shaving and sawdust suction plants have not been seen, but in view of eventual restructurations this problem will have to be considered both for the use of shavings as fuel, and for a better layout from the point of view of health protection.

IV Modern technology and considerations on its applicability to India

IV.1 General layout

The largest Italian factory of tennis rackets in wood and composite - Messrs. S.I.R.T. S.p.A. - presents itself as a large rectangle with a section detached destined as a covered deposit for the timber, which is perhaps not altogether necessary in India, considering the local climatic conditions (see photo 1).

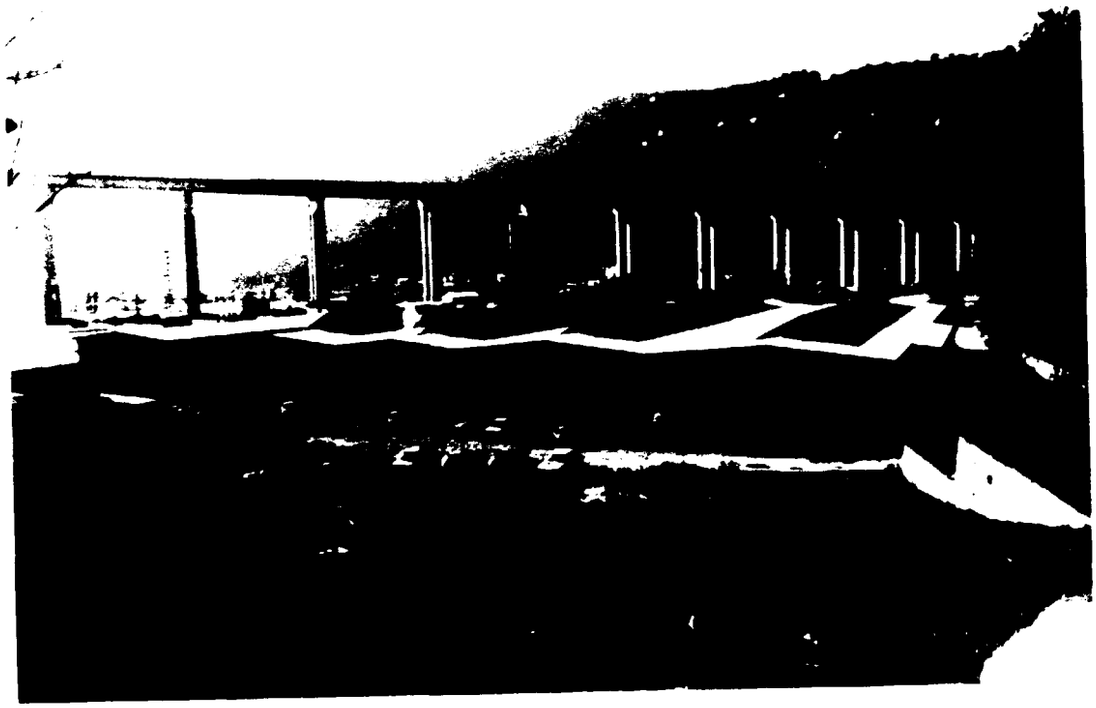
The actual factory is divided up into four sections in which the various processes are housed.

The nearest section to the deposit is the sawmill where the semi-finished pieces which go to form the frames are prepared.

In the part nearest to the timber deposit band saws, combination and thickness planers, as well as multi-blade circular saws fitted with motorized pushers for cutting the layers have therefore been installed.

In the following sections there is the assembling of the semi-finished pieces for glueing and another part of the sawmill where the various operations on the glued framestake place, such as drilling, the processing of the shoulders and the grip, etc.

Photo 1 : View of the S.I.R.T. factory



In the third section one finds all the operations relative to the glueing of the frames and of the parts which will be glued later on, as well as driers and presses.

In the last section there is a workshop for all the maintenance works, and for the study and construction of new machines, as well as a room set aside for the resistance and comparison tests of the frames.

The painting and finishing plants are situated in another separate department, not being associated with the previous processes.

IV.2 The processing

IV.2.1 The sectioning of the log

When a piece of solid wood is observed, generally the vein of the wood shows two different designs, one of thin parallel lines, the other a short, wide veining.

With equal bending, the layer with thin veining is found to be more flexible and resistant, so that it will be the task of the operatór to try to obtain the maximum number possible of layers of this type.

The planks are therefore cut from the log on the band saw in such a way as to obtain the maximum number of plies which show long and parallel veining, which determines the lesser number of rejects and breakages.

Figure 2A shows the deformations which the different sections undergo during drying, from which it is appa-

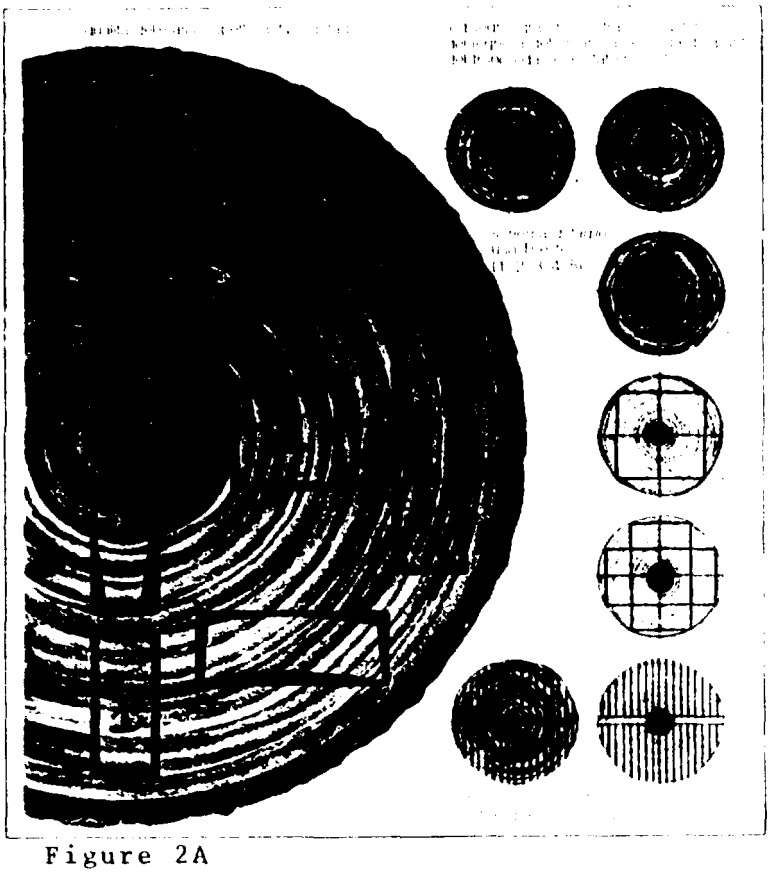


Figure 2A

ritirarsi, la sua compattezza, la possibilità di marcire, il peso, la elasticità, l'asciuttezza.

Un tronco fornirebbe quindi poche parti di prima scelta e abbondanti parti di scarsa qualità o di scarto (oltre naturalmente a quelle parti di scarto obbligate derivanti dalla forma cilindrica o conica del tronco: testate, punte, scivoli, refili).

Per ovviare a questo inconveniente si sono escogitati diversi tipi di schemi di taglio, che permettono di distribuire pregi e difetti in parti uguali in tutto lo spessore del tronco e di sfruttarlo integralmente senza sprechi. Il legno che si ottiene in questo modo è quindi di tutto di qualità media, abbastanza buono però per costruzioni di normale esigenze.

I metodi di taglio più funzionali per questo scopo sono quelli a quarti e a raggera. In questo modo infatti si eliminano completa-

Figure 2: Examples of log cutting procedures

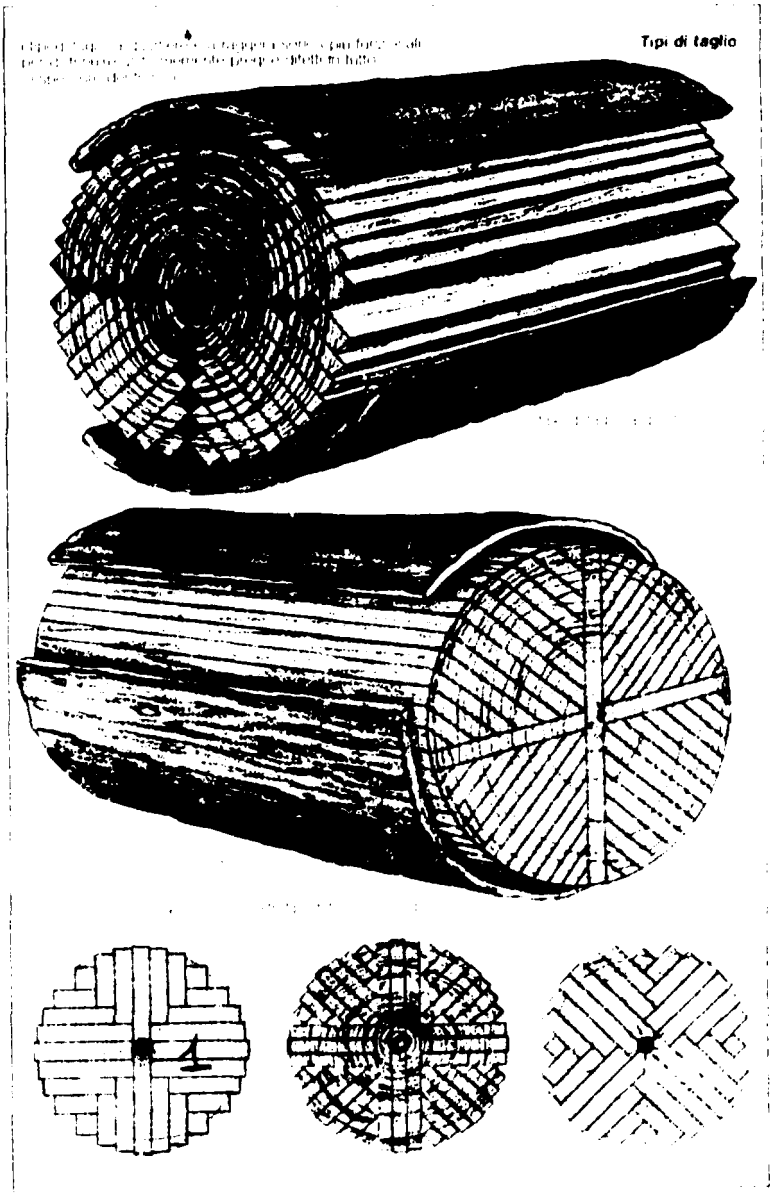
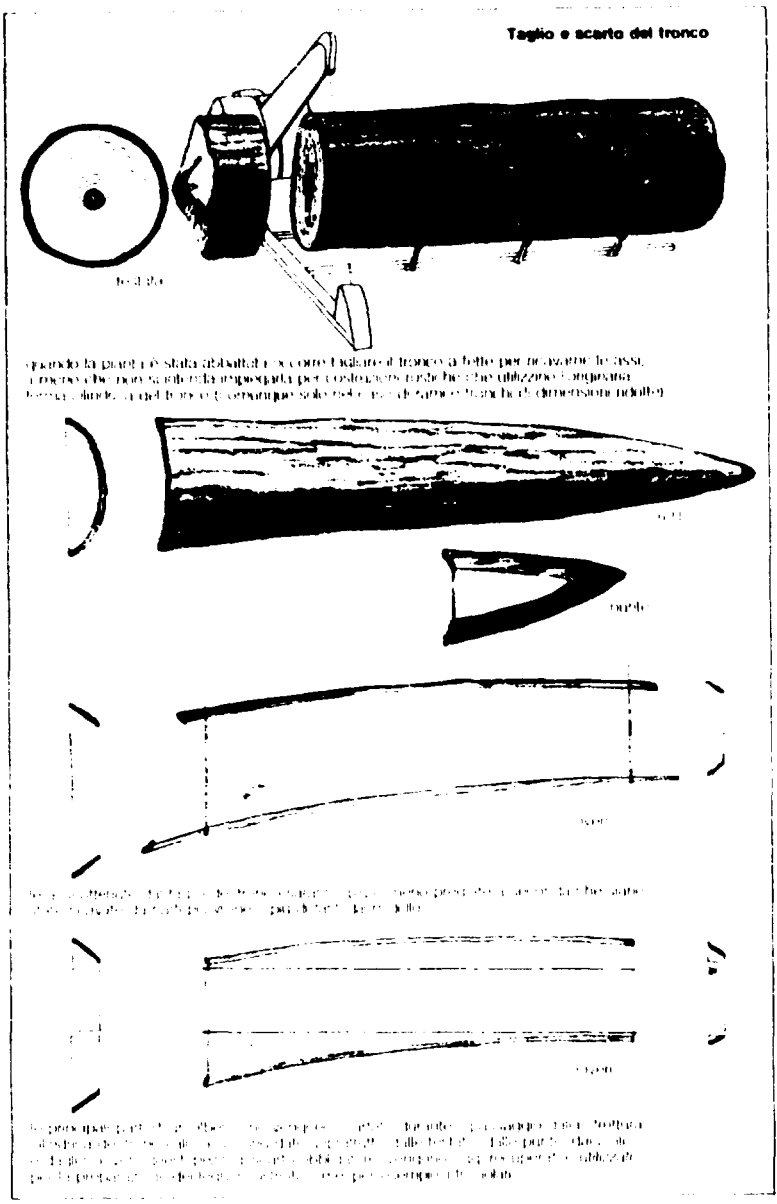


Figure 2B



5-1

Figure 2C

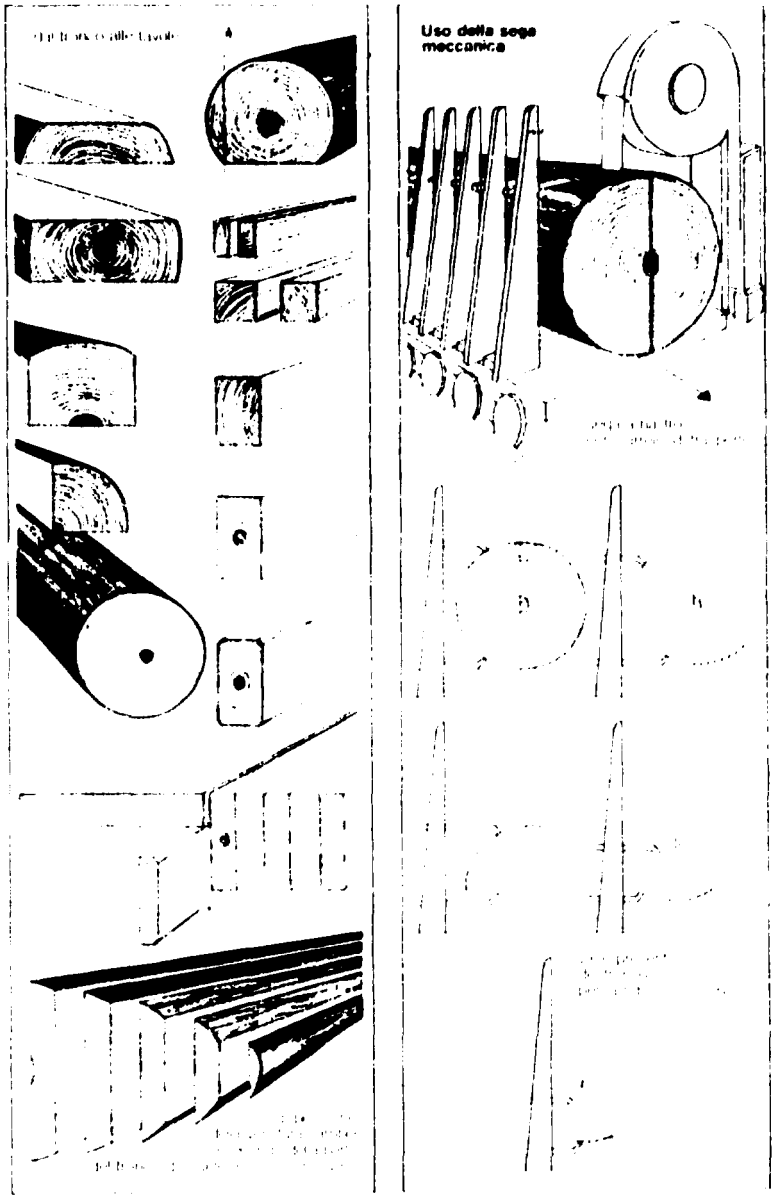


Figure 2D

rent that the sections labelled 1 and 2 are those which undergo symmetric deformations and are therefore to be preferred. In figure 2B drawing 1 shows then how the whole log must be cut to follow the vein of the wood to the greatest extent.
Figures 2C and 2D show further how the log should be cut to have the least discard of material while following the vein of the wood.

IV.2.2 The cutting of the plies

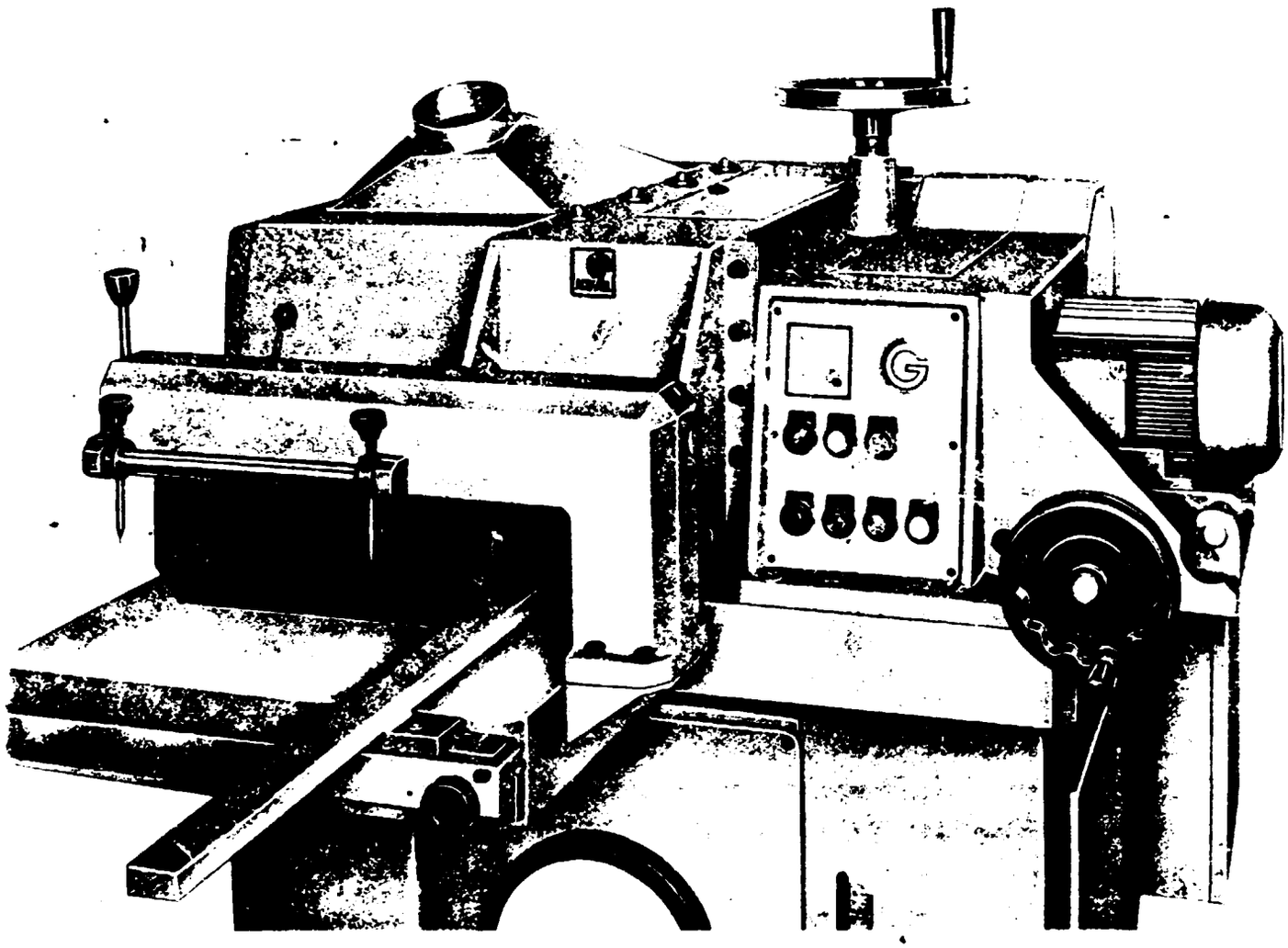
While - as has been said - in India the cutting of the plies takes place by means of band saws with the consequences described, at S.I.R.T. the plank is worked by means of the band saw and the planer in order for it to be then reduced to plies with multi-blade circular saws with up to ten blades (see figure 3 and table 1).

The product comes out finished, ready to be used in the frame; the surface can be seen to finely knurled, which ensures a good glueing.

IV.2.3 The making of the wedge

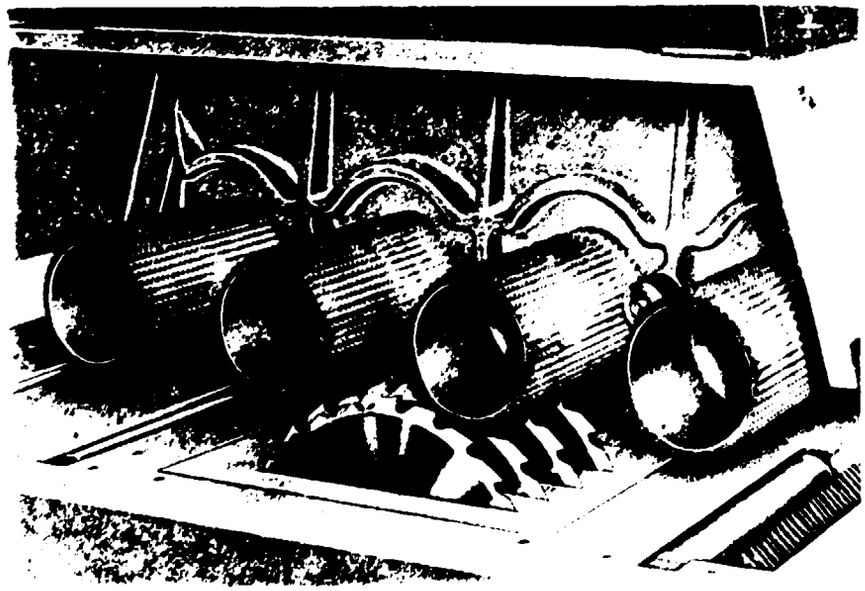
In modern factories the wedge is made of two pieces, which makes it possible to work them in the same way following the direction of the vein favourable to the cut.

Starting from a block of wood, this is cut paying the maximum attention that all the faces are strictly orthogonal (see figure 4A).



Vista anteriore della «CM - 250»

Figure 3: Multi-blade circular saw model CM 250



Detail of the traction assembly with a view of the toothed feed rollers in the upper part and sliding rollers on the level.

Particolare del gruppo di trazione con vista dei rulli dentati di avanzamento nella parte superiore e rulli di scorrimento sul piano. La feritoia di uscita delle lame viene da noi coperta con una lastra in fibroide. Dopo l'usura di questa potrà essere montata anche una piastra in legno, possibilmente duro. Su richiesta possiamo fornire anche le lame in metallo duro

Table 1: Technical data of CM 250 Circular Sawing Machine

SEGA CIRCOLARE MULTILAME AUTOMATICA « CM - 250 »

Moderna - Robusta - Massimo rendimento - Alta velocità - Mandrino in acciaio al cromo nichel bilanciato dinamicamente e staticamente.

Lunghezza utile dell'albero	mm.	180
Altezza massima di taglio	mm.	80
Diametro massimo delle lame circolari	mm.	300
Diametro foro delle lame	mm.	45
Velocità dell'albero sega	giri/1'	4000
Velocità di avanzamento variabile	m/1'	3-20
Dimensioni del piano	mm.	1580x975
Larghezza dei rulli di scorrimento	mm.	280
Larghezza dei rulli dentati di trascinamento, in acciaio	mm.	200
Motore di serie	HP	20
Motori su richiesta	HP	15-25-30
Peso	Kg.	1200
Ingombro	mm.	1602x995x1600

AUTOMATIC MULTI-BLADE CIRCOLAR SAWING MACHINES « CM - 250 »

Modern - Strong - Maximum efficiency - High speed - Spindle in chrome - nickel steel dynamically balanced.

Lenght of the shaft	mm	180
Max heigth of cut	mm.	80
Max circular saw blade diametre	mm.	300
Circular saw bore diametre	mm.	45
Speed of saw shaft	r.p.m.	4000
Variation speed of advancement	from	3 to 20 m/1'
Dimensions of table	mm.	1580x975
Width of the sliding rolls	mm.	280
Width of the seeding toothet rolls in steel	mm.	200
Principal motor	HP	20
On request, motors of	HP	15-25-30
Weigth	Kg.	1200
Overall measurements	mm.	1602x995x1600

MULTILAMES AUTOMATIQUES «CM - 250»

Moderne - Robuste - Rendement record - Haute vitesse - Mandrin en accier au chromo nichel balancé dynamiquement.

Longueur utile de l'arbre	mm.	180
Hauteur max de coupe	mm.	80
Diamètre max des lames circulaires	mm.	300
Diamètre du trou des lames	mm.	45
Vitesse de l'arbre scie	tours/1'	4000
Vitesse variable d'avancement	de 3 à 20 mt.	m/1'
Dimensions de la table	mm.	1580x975
Largeur des rouleaux d'écoulement	mm.	280
Largeur des rouleaux d'avancement dentées en acier	mm.	200
Moteur principal	HP	20
Sur demande, moteurs	HP	15-25-30
Poids	Kg.	1200
Encombrement	mm	1602x995x1600

AUTOMATISCHE VIELBLATT-KREISSÄGE « CM - 250 »

Moderne - Sehr fest - Höchstleistung - Grosse geschwindigkeit - Spindel aus chrom-nickel stahl dynamisch ausgewogen.

Länge der bohrstiftes	mm.	180
Max Schnitthoehe	mm.	80
Max Durchmesser der Kreisägerblättes	mm.	300
Loch der Kreissäger	mm.	45
Kreissägewerkseugspindel Drehzahl	Umdr/1'	4000
Holzvorschubgeschwindigkeit	mt/m1'	3-20
Abmensungen des Tisches	mm.	1580x975
Breite der Lanfrollen	mm.	280
Breite der Vorschubzahnzollen aus stahl	mm.	200
Hauptmotor	HP	20
Nach verlagen motoren	HP	15-25-30
Gewicht	Kg.	1200
Einbaumasse	mm.	1602x995x1600

Tip. Valentini Tel. 600 535 - Cardoneghe

Figure 4: Log preparation for wedge carving procedure

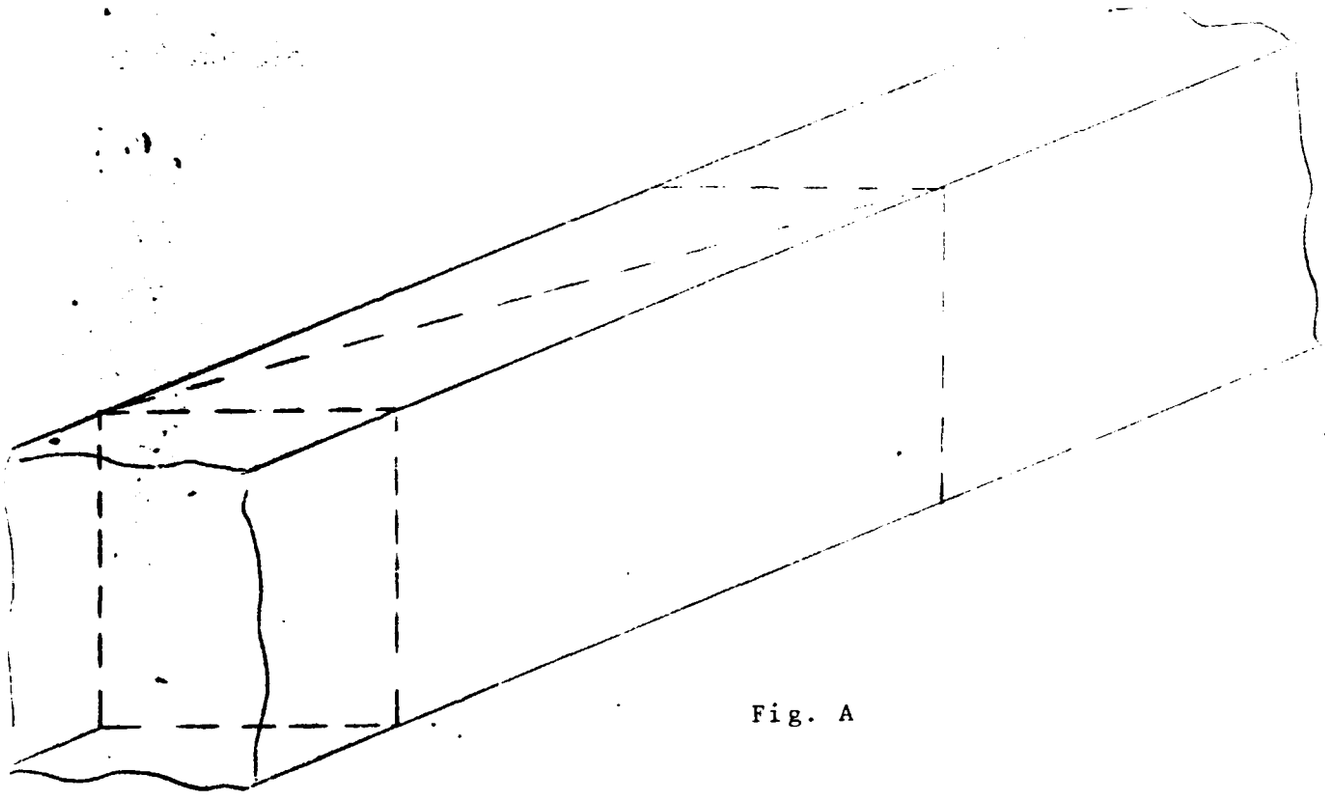


Fig. A

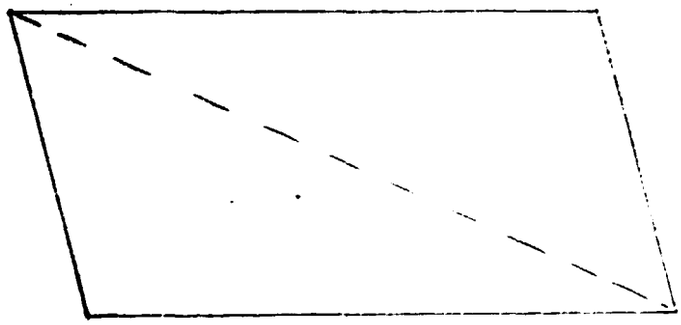


Fig. B

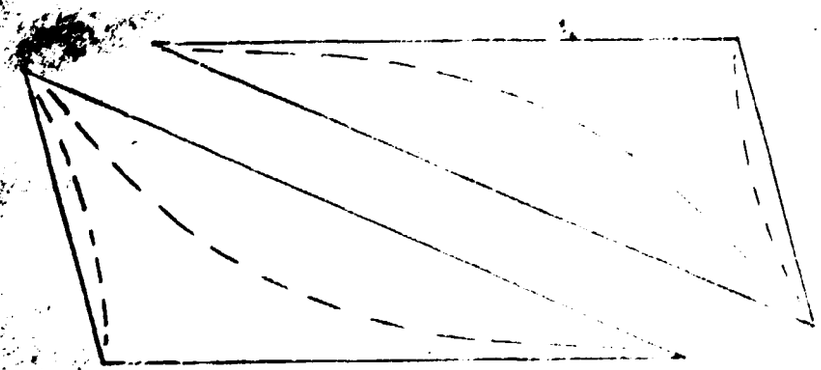


Fig. C

In the second operation, a large number of blocks of a parallelogram shape which contain the wedge are cut, and then they are cut following the traced line, thus obtaining many triangles in which the veins of the wood can be seen to be parallel to the axis of the racket (see figures 4B and 4C).

The successive shaping operation takes place on a semi-automatic machine, from which completely finished pieces come out, strictly identical.

A machine of this kind may not be appropriate for the Indian factories due to its rather high cost, but it can be easily replaced by a specially equipped router.

The procedure is the following and is further shown in the annexed drawings and photographs due to the difficulty of explaining and understanding a description in words only.

The work is carried out at a router fitted with a head complete with knives with straight cutting edges mounted orthogonally to the working surface and with a smooth ring, concentric with the cutting head, mounted on the shaft of the router or fixed to the working surface under the tool, around said shaft.

The attachment, which is substantially the same in both cases, can be made from hard wood and consists of a housing, in which the part to be worked is placed, with a blocking system with which it is held in position.

The housing exactly encloses the triangle of wood, and in its lower part the template of the material to be removed is located, so that the triangle assumes a first curved side (see figure 5A and photo 2).

The continuous line shows the line of the cut and the traced line the shape of the original triangle.

Figure 5: Wedge carving procedure

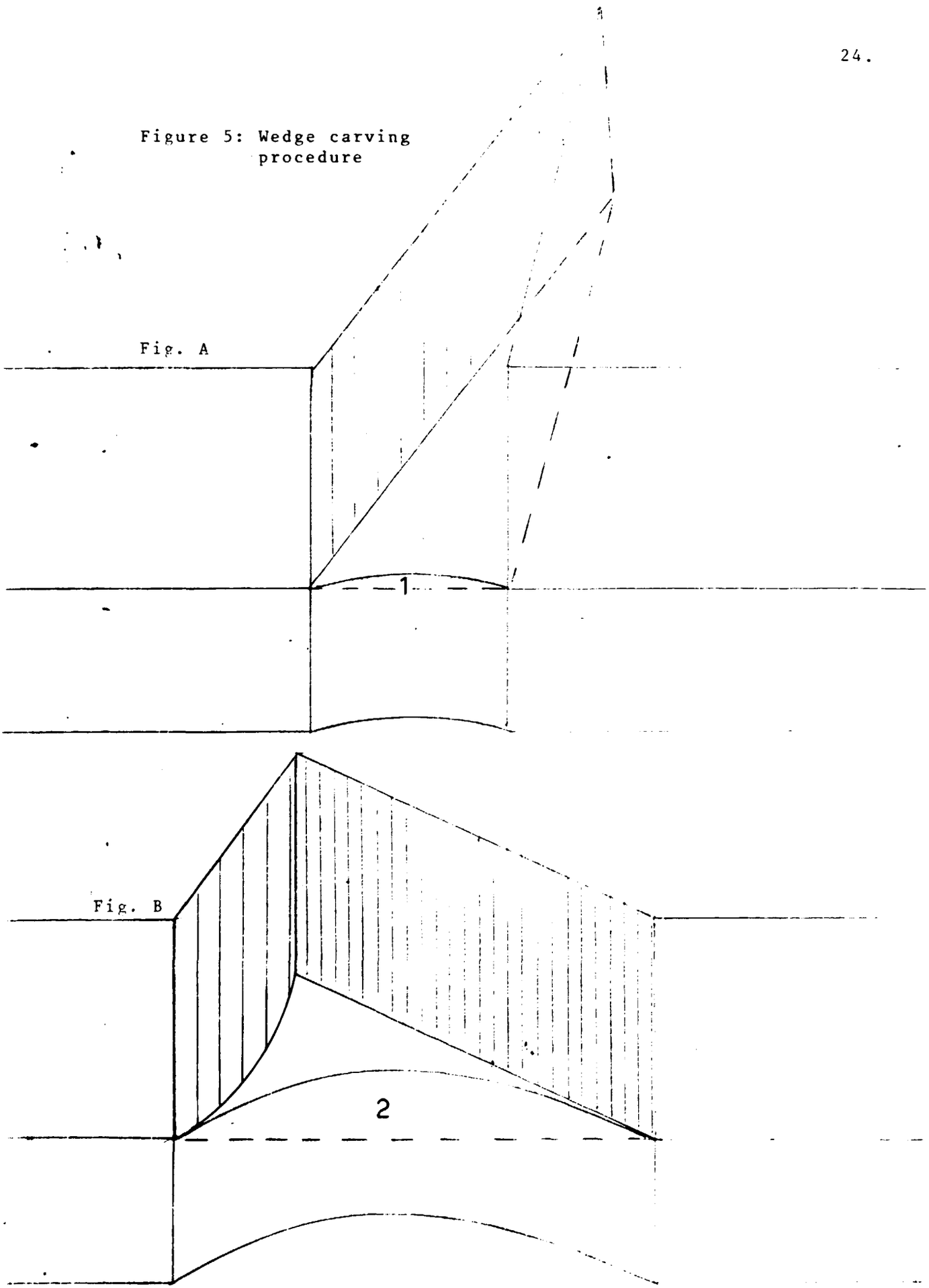
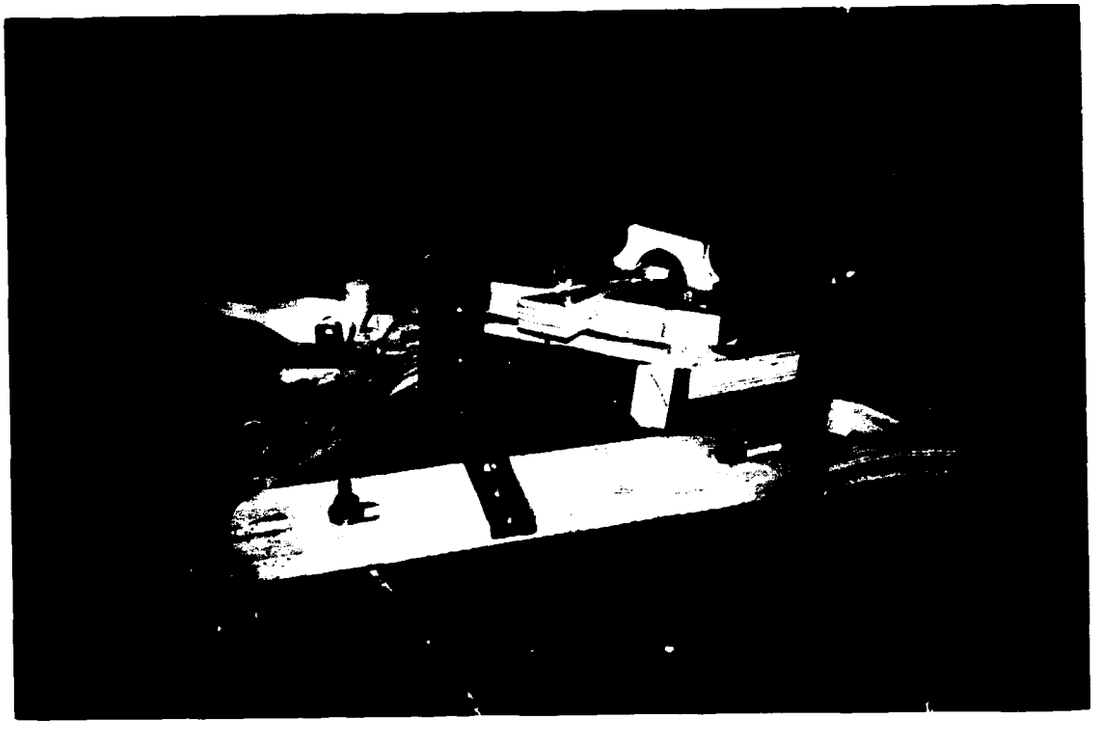
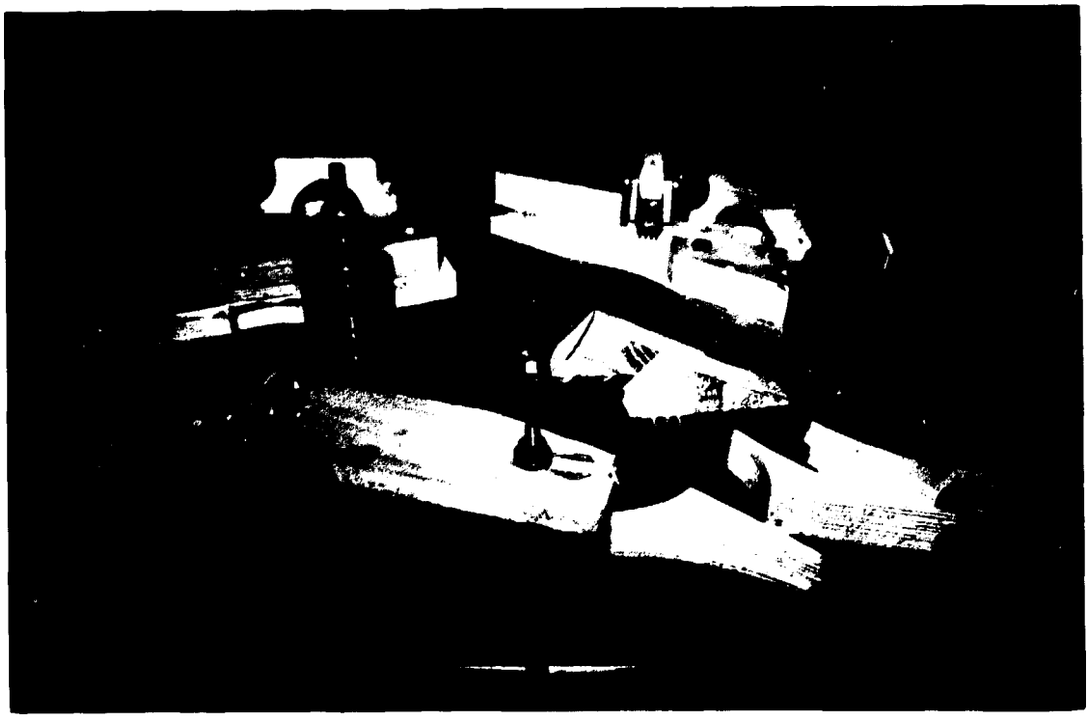


Photo 2: Wedge carving procedure





The area between the continuous line and the traced one indicates the material to be removed from the part.

By acting in the same way on the other side of the part the complete semi-finished half-wedge is obtained (see figure 5B area 2).

The work is carried out by placing the implement against the smooth ring, in such a way that the knives-holder head comes into contact with the piece to be shaped.

The shape of the base of the implement therefore acts as a copy for the part. In this way the basic elements of the racket, namely the wedge and the sandwich of the plies, are accomplished and ready for assembly.

The semi-finished parts are then conveyed to a point where they are assembled, after having been checked visually in order to avoid defects, according to the necessity of the various models (see photo 3).

The only elements to be kept under control are then the metal shapes used during the glueing, and obviously an accurate setting up of the press.

IV.2.4 The glueing of the frame

Obviously from this point of the processing onwards the racket cannot follow the logical course, because the glueing and woodworking operations cannot co-exist in the same environment, but the working phases, according to the process followed, intersect several times so that they must take place close to each other.

In the section near the saw mill the machines which carry out the finishing works of the frame are installed and following this there is the section where the glueing takes place, which also includes

Photo 3 : Assembly of semi-finished elements composing the frame

a high temperature drier for the frames which have been glued, and two other driers which are used both for the curing of the glue and for bringing the components of the frame to a degree of humidity consistent with the glues requirements (from 8 to 12%).

The hydraulic presses achieve higher pressures as compared with the manual ones, and offer easier and more reliable adjustment, but their high cost is not justified in the presence of rather limited quantities of frames (see photo 4).
Furthermore a higher productivity is perhaps not overly important in India considering the low cost of labour.

It must be pointed out, for example, that at S.I.R.T., where two frames at a time are glued using semi-finished plies of double thickness, it is possible - with oval frames of classic dimensions - to glue about 700 (sevenhundred) frames per day with only two workers, on only one press.

IV.2.5 The drying

The following step is the drying of the frames which are passed through a drier with a temperature around 65/70°C.

The saw mill is equipped with a central shaving and sawdust suction plant which conveys them to a nearby silos, from which they are automatically sent to a boiler which produces hot

borghi e baldo ingg.
spa

Photo 4: Glueing section. The driers are one on the left and one of the two presses can be seen on the right foreground, not operating

water which serves both for the heating of the environment, and for the driers and machines which require temperatures above those of the environment (see figure 6).

The frames remain in the drying room for about eight hours.

When they come out from the drier, the frames are taken from the form and placed in a room where they remain for about two weeks so that the prolonged curing gives the glue its best mechanical characteristics.

IV.2.6 The finishing of the semi-finished parts and the quality control

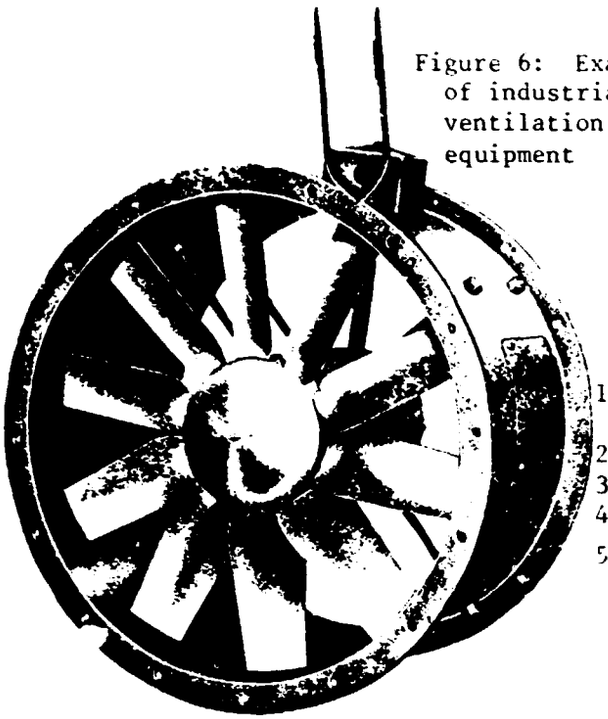
The rough frame now returns to the saw mill, where there are the planers for working and sizing the frames glued to the required thickness before starting the subsequent processes. (see photo 5).

Another check follows in order to eliminate the defective frames .
A test which is considered very important consists in bending - by means of a pneumatic cylinder - the frame up to an empirically fixed deflection value which gives a guarantee of a good glueing (see photo 6).

In the case where the frames do not pass this test they are rejected or derated. Also the frames are carefully examined one by one, and where there are defects which compromise the aesthetic and

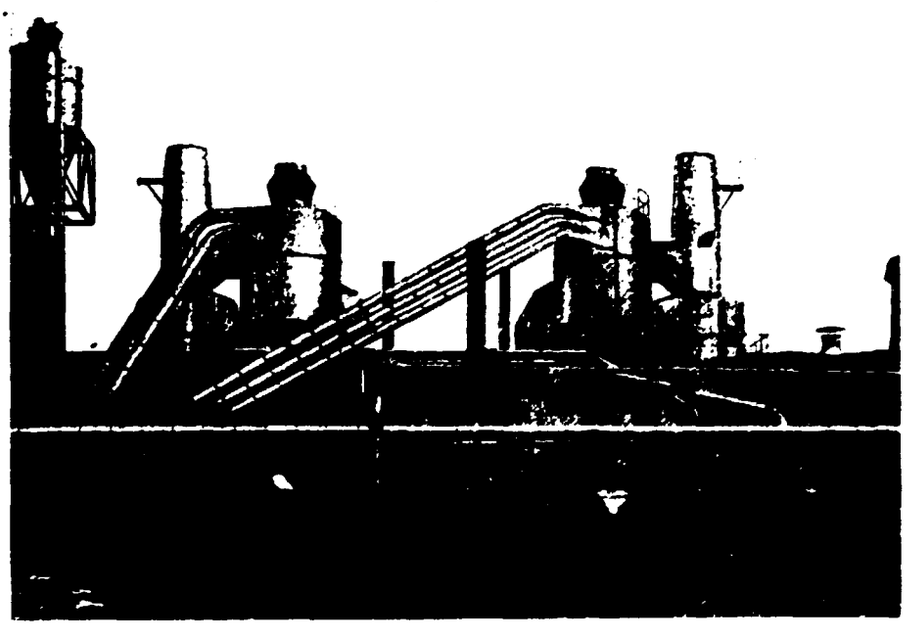
Figure 6: Examples of industrial ventilation equipment

Impianti aeromeccanici per l'industria



1. Axial-flow fan
2. Modular metal silos with separator cyclones
3. Group of high performance centrifugal fans
4. Pneumatic product transport and separation plants with cyclones
5. Cyclone-filter separator unit

1 - Ventilatore elicoidale.
2 - Silos metallici componibili con cicloni separatori.
3 - Gruppo di ventilatori centrifughi ad alto rendimento.
4 - Impianti di trasporto pneumatico e di separazione del prodotto con cicloni.
5 - Gruppo separatore ciclone-filtro.



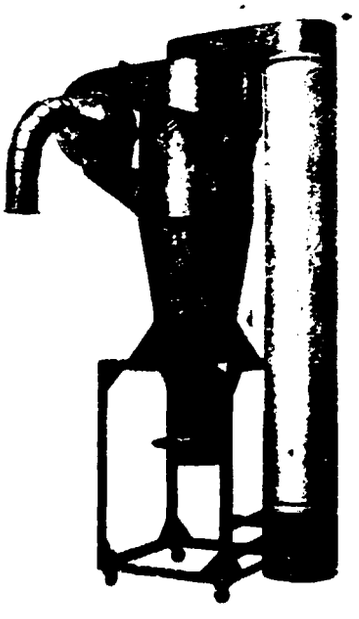
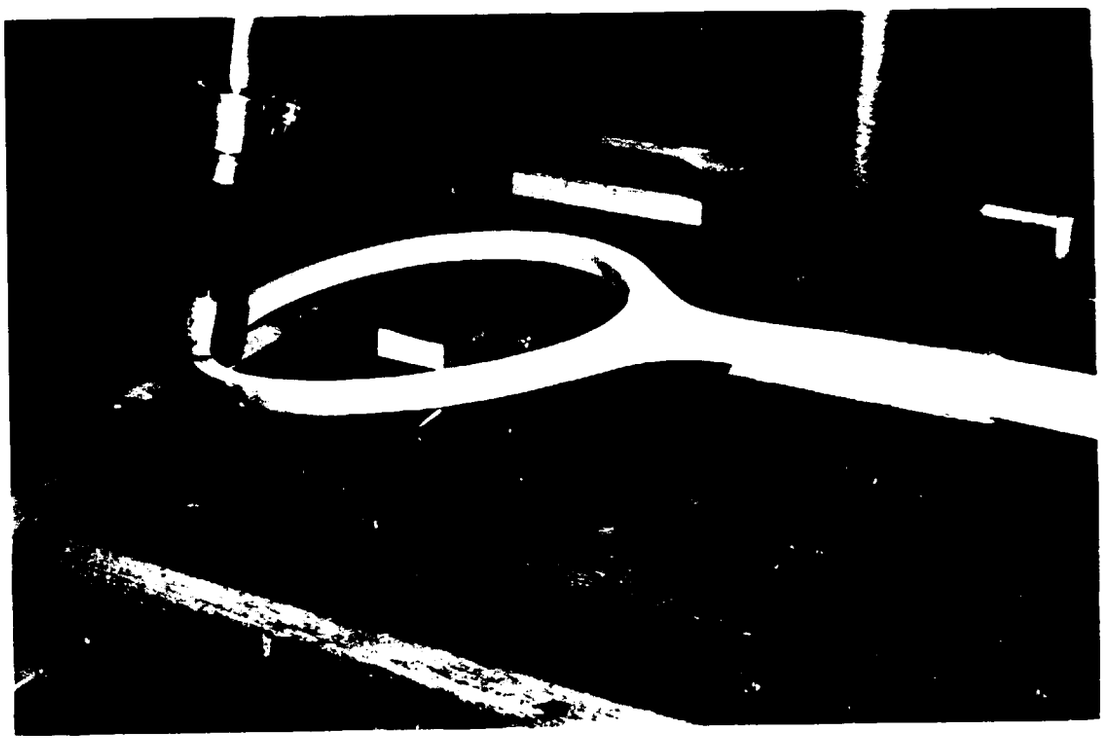


Photo 5: Band sander for frame finishing

Photo 6: Mechanical binding test



mechanical characteristics, they are derated or eliminated.

IV.2.7 The drilling and milling operations

The following operations which are carried out on the frame are the drilling of the holes, countersinking, slotting and punching.Photos 7A and 7B show two machines used for the drilling operation.

IV.2.8 Shoulders application

The frame is destined to the final models and sent for the application of the shoulders. The shoulders are made in wood or in vulcanized fibre and in an always greater number in graphite.

The wooden shoulders are generally made from solid wood, steam heated and press bent.

They are left to cure for a short time, and then cut into layers of the thickness required, after having carefully selected the parts in order to avoid defective materials.

The vulcanized fibre shoulders can have various shapes and are taken to the band saw after having nailed fibre plies one on the other (see photo 8).

The work is very rapid and quite easy to do.

A frequent problem in the cutting of the vulcanized fibres is due to badly sharpened blades, which are not very resistant due to the fact that they must be rather narrow.

Then considerable difficulties are given by the carbon fibre shoulders, a material which is not easy to find and very expensive, and for which the working is also done with special tools. The manufacture of these shoulders

Photo 7: Drilling machines

Photo 7A: Single hole drilling machine

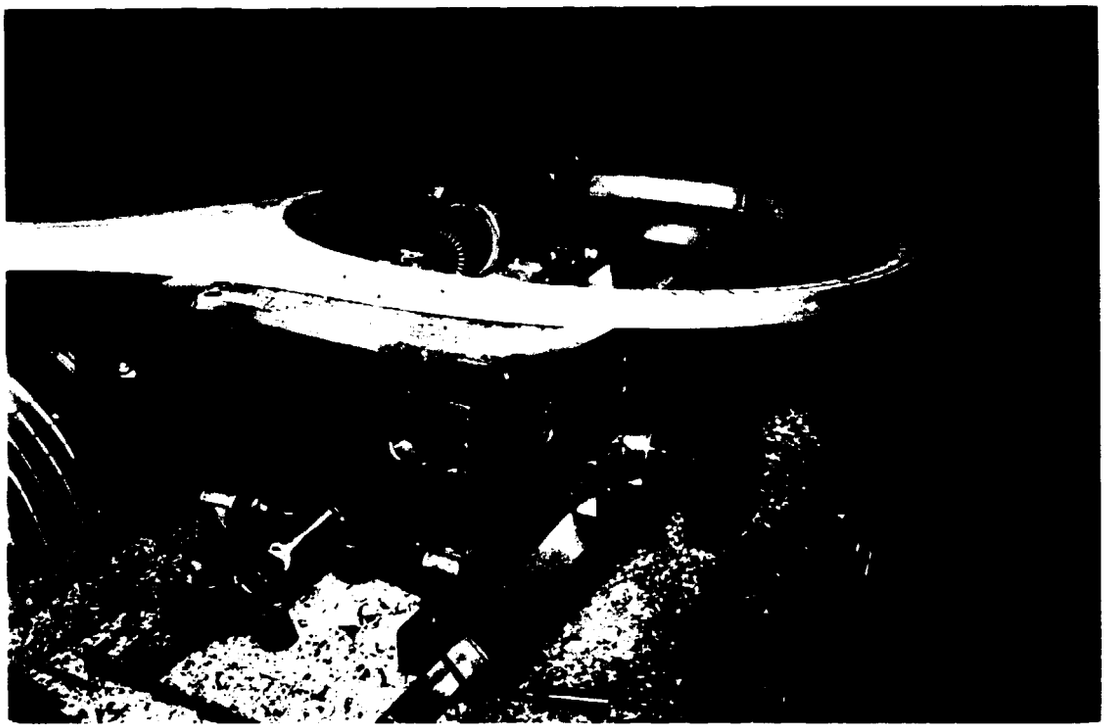


Photo 7B: Multiple hole drilling machine

Photo 8: Cutting of shoulders of vulcanized fibre with the band saw

is done by firms specialized in the proc .sing of these materials, using advanced products and techniques.

The application takes place by means of epoxy glues and the drying in special cells under pneumatic presses (see photo 9).

IV.2.9 The application of the handle

On frames entirely in wood and in vulcanized fibre, this operation does not present difficulty.

The most elementary and less costly system consists of blocks of screw presses, coupled together, in which about ten frames are glued at the same time, taking care to put separators between one handle and another in order to avoid that the frames become glued together (see photo 10A).

At S.I.R.T. there exists a special machine for this work (see photo 10B).
Bigger difficulties are met with frames in carbon fibre, for which it is necessary to use epoxy glue which requires great attention in its utilization.

IV.2.10 The shaping of the handle

This is perhaps the most complicated step in the working process as the shape required must be very precise, with sharp edges and of variable measurement. This requires an equipment of milling cutters and apparatus to contour the handle on a router in the lack of specially designed machines, which generally have very high prices (see photo 11).

At S.I.R.T. this operation takes place on a special automatic machine, which performs all the operations, but it can be carried out just as well with machines of low cost which give excellent results by following a procedure similar to that for the preparation of the wedges (see photo 12).

Photo 9: Glueing of shoulders under pneumatic press

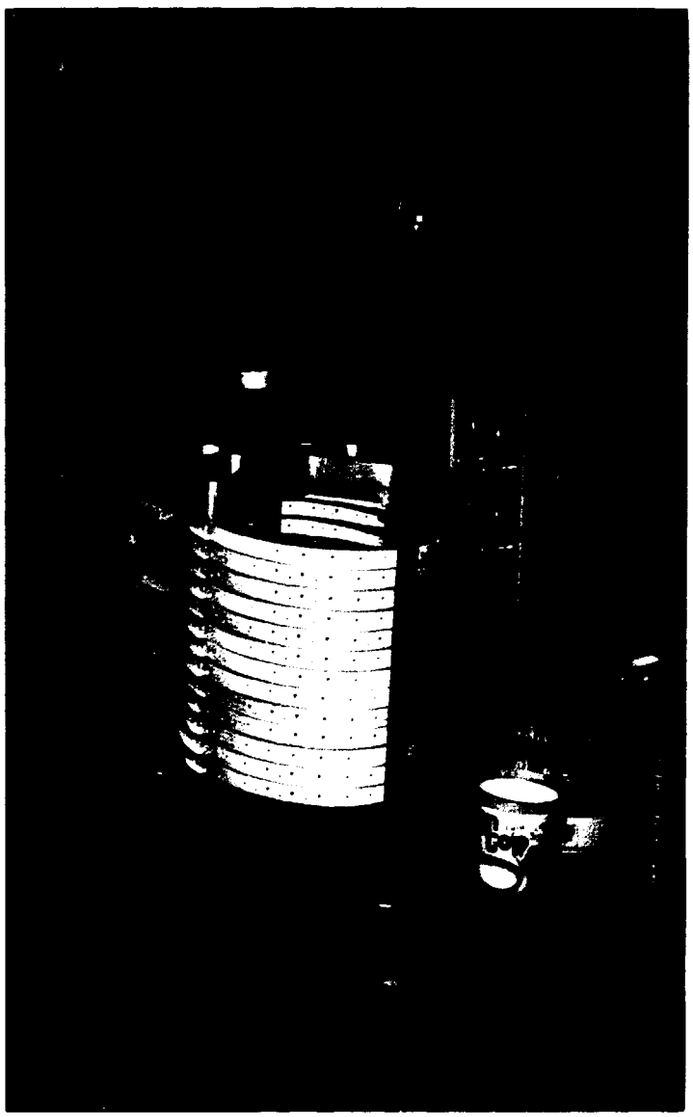


Photo 10: Glueing of handles to the shaft

Photo 10A: Glueing of handles with a screw press

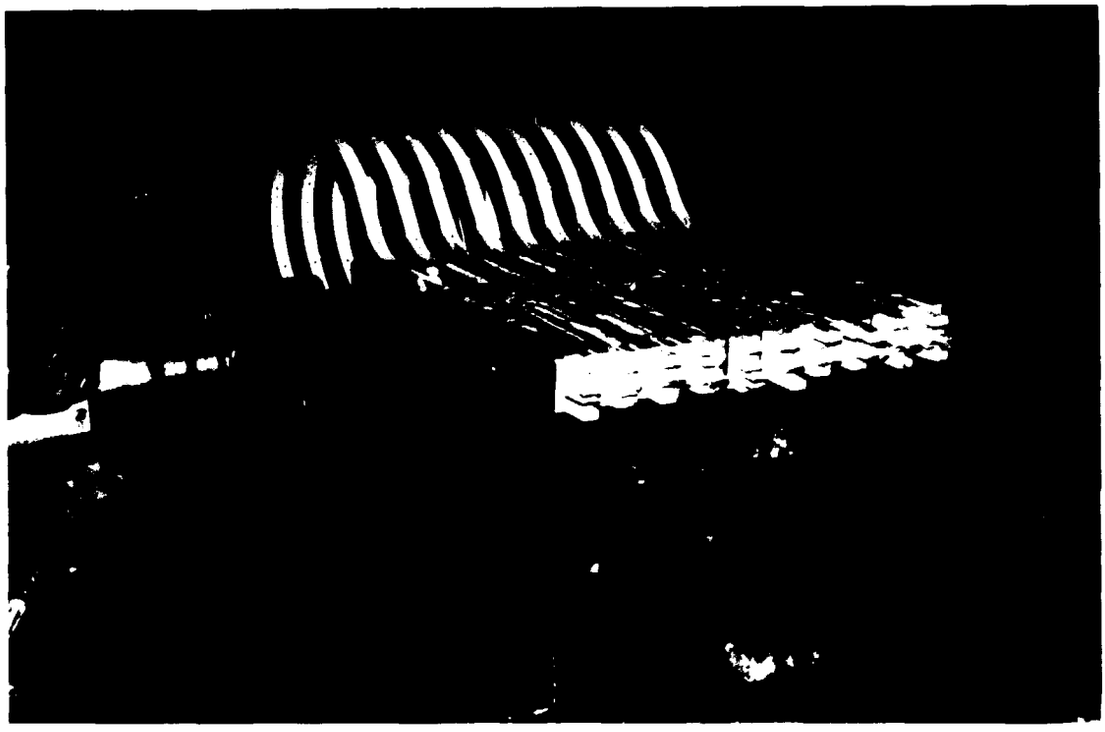


Photo 10B: Glueing of handles with a special machine

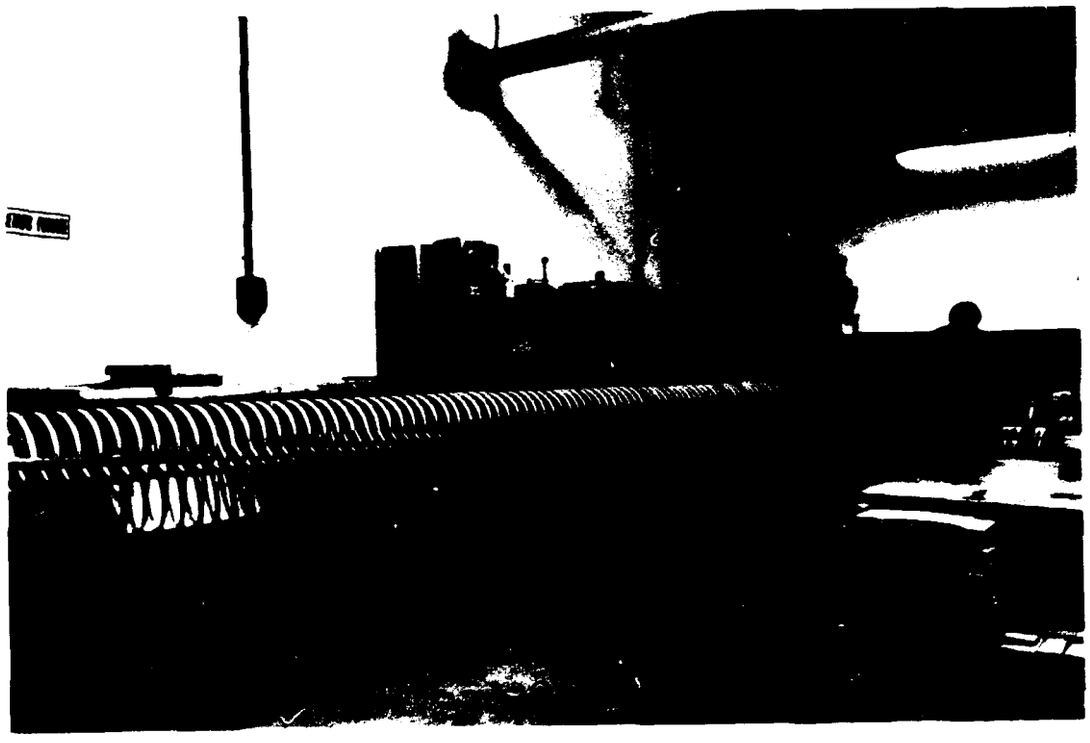


Photo 11: Handle shaping on a special machine

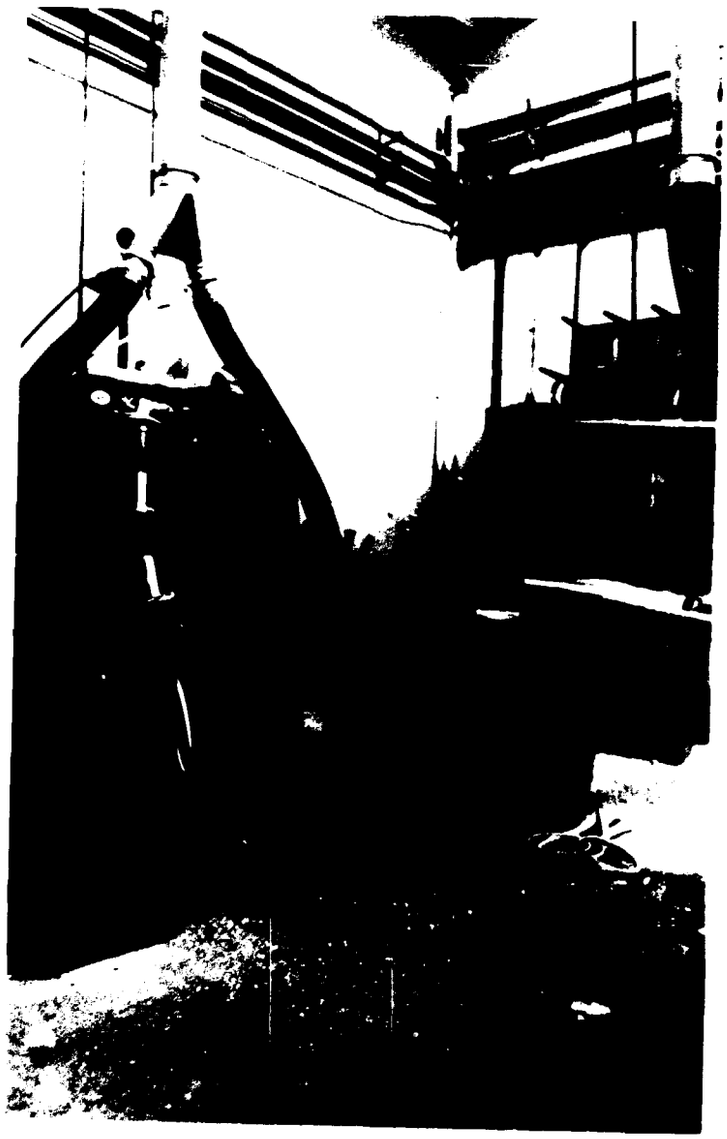
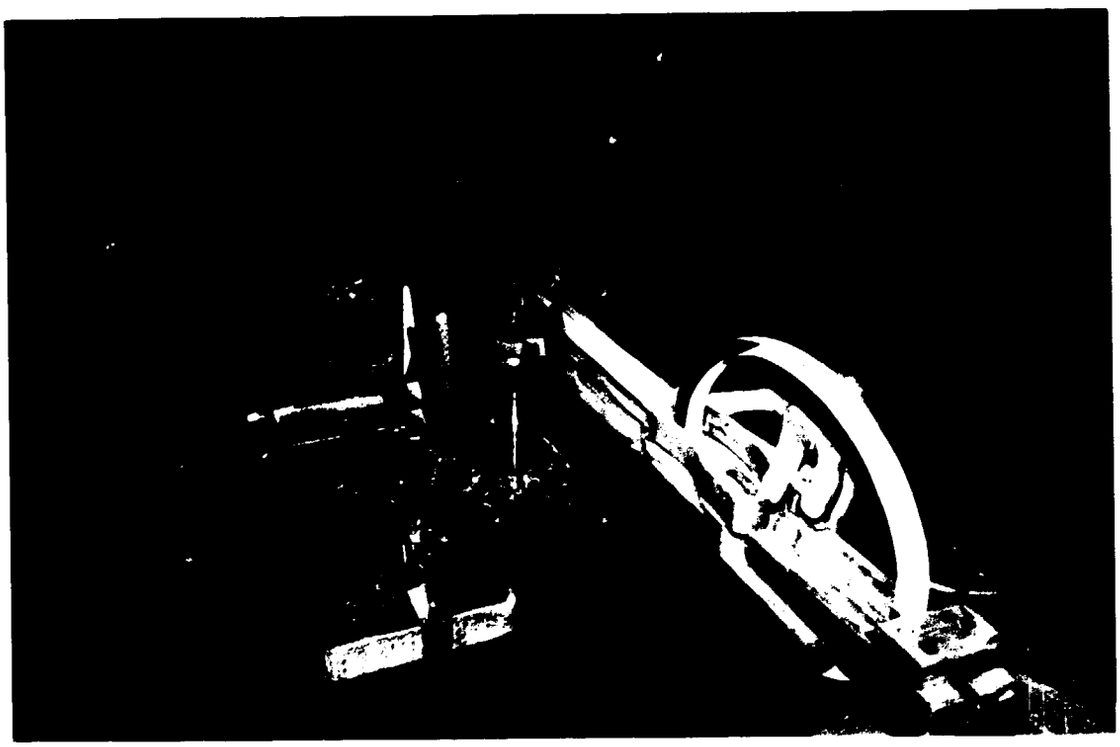


Photo 12: Shaping of the handle on a router



Naturally, the handle having a different shape from the wedge, also the router attachment must be different, but the concept is the same.

After this operation a hand finish with a very fine grain sand paper, as preparation for the painting operation is required.

IV.2.11 The painting process

The process commences with one or two coats of primer which serve to render the surface of the racket perfectly smooth and homogeneous, alternating with a careful smoothing with abrasive paper.
The procedure can change according to whether nitro or polyurethanic paints are used.

The nitro paints have a lower dry content, so that it is necessary to use greater quantities.
Also here, between one coat and another it is always necessary to smoothen with abrasive paper, at the same time applying the transfers and eventual other trimmings.

For the finishing coats polyurethanic, polyester, or acrylic paints are used which have superior characteristics for hardness and brilliance, although having good elasticity. Photo 13 shows an electrostatic painting unit.

IV.2.12 Application of the leather

The final operation is the binding of the grip, which is generally made with strips of leather, but at times also with synthetic materials. The material is fixed with clips which are fired with a compressed air pistol.

Photo 13: Electrostatic painting unit

IV.3 The use of glues

Many types of glues are available on the market and their selection depends mainly on the materials which are utilized (wood, graphite or other). Generally these glues are two component glues where one component acts as a seed or catalyst, activating the polymerization process and thus the cementing properties of the second component.
In addition to these, for the case of ureic glues, a third component is used as a retarder of the polymerization process. This component neutralizes the free radicals which initiate and propagate the polymerization process and is used whenever the two component mix begins to harden before it is applied.

For spreading the glue machines exist which are very practical especially for that which concerns the plies (see figure 7). They are small roller machines which serve to distribute the glue uniformly on the plies, with the possibility of dosing with precision the quantity of glue necessary, thus avoiding waste and zones not properly covered.

Obviously the glue can also be spread with a brush, thus avoiding the purchase of the machine, but the machine makes it possible to apply the glue in the density required by the manufacturer, a thing which the worker generally does not do when using a brush, because the denser glue is more difficult to spread, for which the worker has a tendency to dilute it excessively, thus compromising the result.

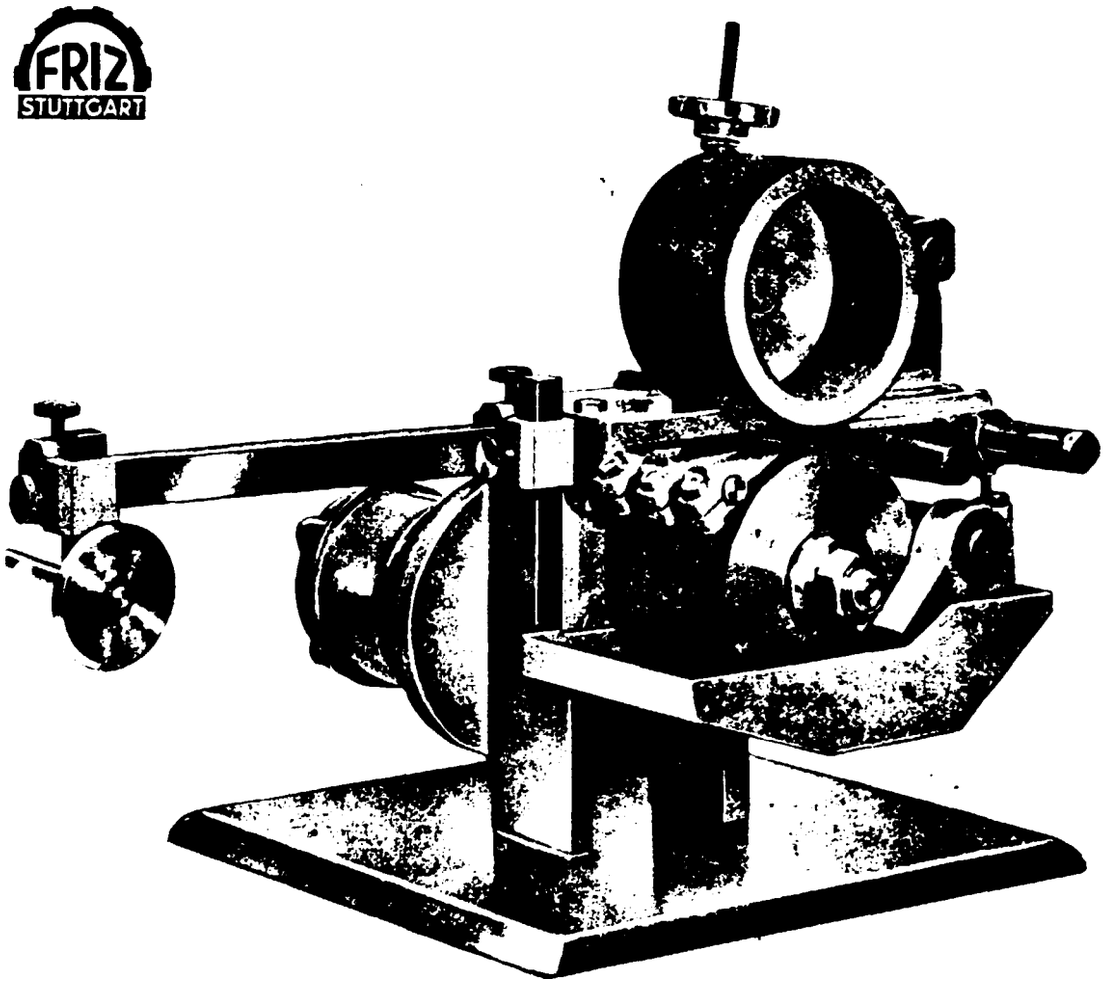
The problem of the glue becomes more serious when one uses exposy glues, at times very dense, with a tendency to harden in a short time which obliges the worker to clean his tools frequently in order to avoid their loss.

ADOLF FRIZ GMBH MASCHINENFABRIK

Gegründet 1906 **STUTTGART-BAD CANNSTATT** Telegramm-Adresse:

Fernruf 50848 **Haldenstraße 94** **Postschließfach 95** Frizwerk Stuttgart

Figure 7: Tool for glue application



Spezial-Leimauftragmaschine

Modell LAL

für Leisten, Umleimer und Furnierstreifen. Walzenbreite veränderlich von 10 bis 100 mm mit Anbaumotor 0,3 PS. Unentbehrlich für die Druckluftkantenpresse

Generally however, the glue can be spatula spread even if this involves a greater loss of time.

The glueing of the glass-fibre and graphite shoulders does not present big difficulties, but it must be carried out carefully following the instructions for the glue used.

First of all it is necessary to prepare the frame by rubbing it down with large grain sand paper taking care not to touch it with dirty or greasy hands.

It is best to wear rubber gloves.
Then the glue, a mixture of epoxy resins, is prepared, paying great attention in the dosing of the parts.

There are very many resins with specific uses, for which the type must be chosen which is suitable for the glueing of the materials in question and wood.

It is necessary to see if fabric is used for the shoulders, in which case resins must be used for the impregnation, or fibre already impregnated and polymerized, in which case glues will be used.

Undoubtedly it is easier to use sheets of this fibre, already impregnated and polymerized, but these are also much more expensive and difficult to work, for which everything possible must be done to use the fabric, even if this can require a substantial volume of extra work, as it is very difficult to obtain regular surfaces.
It is important to strictly observe the requirements of the manufacturer of the glue concerning the temperatures, and the duration of the hardening period, as well as the pressures to be applied, in order to obtain optimal work.

V Suggestions for improvements

V.1 Preliminary

As can be seen from the description of the cycle, in the production of tennis rackets there are many discontinuous operations, therefore it is rather easy to intervene in the single process steps by using new machines and rationalizing the work.

However, this can bring about considerable expenses and therefore it is presumed that there is a wish to change only that which is indispensable in order to set up an industrial type process for the purpose of obtaining a more uniform product.

It is presumed that while seeking an improvement of the production or a decrease of the costs, in India it is not wanted to reduce the use of labour; it is wanted - on the contrary - to achieve a larger use of it, which can take place exclusively by expanding the production, without necessarily changing too many machines.

Nevertheless, certain fundamental purchases cannot be avoided, mainly for replacing the truly antiquated and derelict machines.

V.2 The cutting up of the log

A fundamental problem, because it influences all the following operations, is that of the cutting up of the logs, which must be carried out in such a way as to follow the direction of the veins favourable to the cut.

This problem is especially acute in India, where lots of wood is purchased in logs and not exclusively in planks, on which it is easier to make a first quality control.

Therefore, a first equipment is suggested which consists of a band saw (see figure 8), a combination planer, and a thickness planer (see figures 9 and 10), and of a robust multi-blade circular saw (see figure 11).

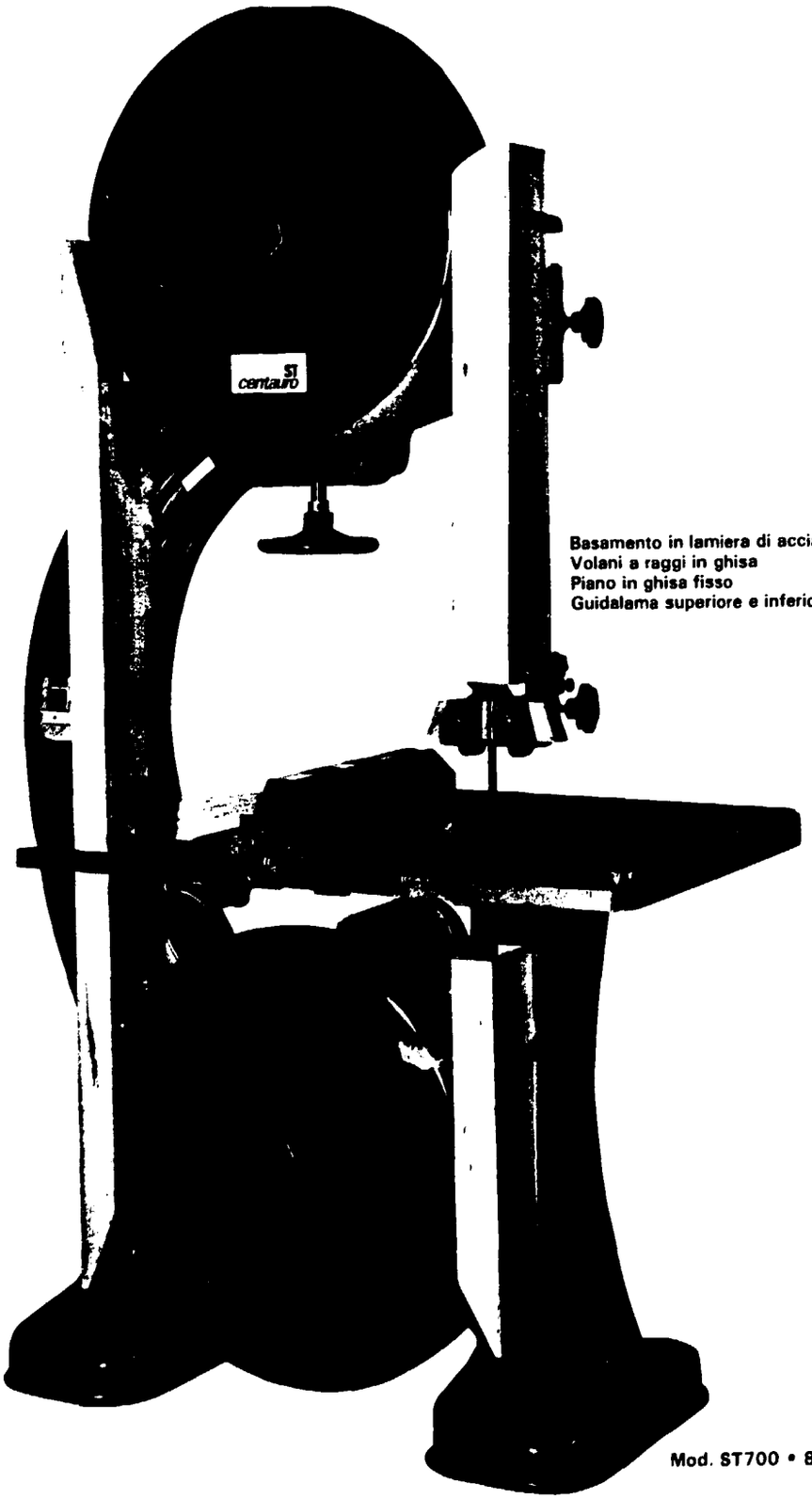
The circular saw is a machine which cannot be done without in order to obtain a good workmaship of nearly all the semi-finished parts of the racket.

At S.I.R.T. two machines are installed with motors exceeding 30 HP, fitted with automatic pushers, with which it is possible to cut 10/11 plies, of 45 mm in width at the same time, from which two frames can be made.

Figure 8: Example of recommended band saw

borghi e baldo ingg.
s.p.a

A)



Basamento in lamiera di acciaio
Volani a raggi in ghisa
Piano in ghisa fisso
Guidalama superiore e inferiore

Mod. ST700 • 800

borghi e baldo ingg.
s.p.a.

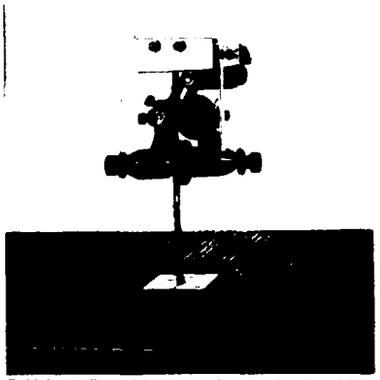
B)

seghe a nastro standard ST
500·600·700·800·900·1000

Le seghe a nastro serie ST, dalla linea invariata da oltre trent'anni, rappresentano ancora la serie di punta della nostra produzione grazie alle sue caratteristiche di robustezza, sicurezza ed alta qualità di lavoro. Prezzi concorrenziali, uniti alla completa garanzia di un anno per ogni modello ed al nostro servizio assistenza, fanno si che le macchine Centauro siano tutt'ora le più richieste su tutti i mercati del mondo.

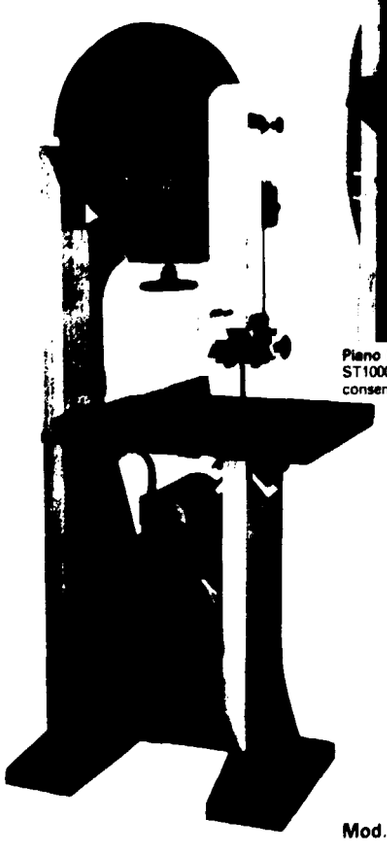
A richiesta:

Motori maggiorati
Motore monofase per ST500 • 600
Avviatore stella-triangolo
Salvamotore
Guidalama di precisione superiore e inferiore
Piano inclinabile per ST500 • 600 • 700 • 800 • 900
e vari come da listino

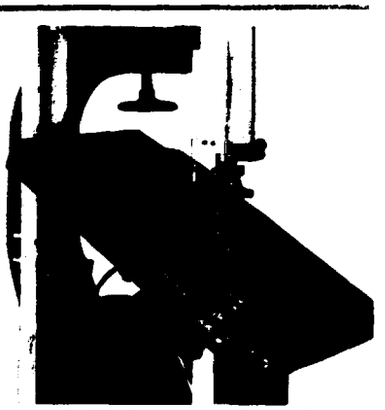


Guidalama di precisione superiore (opzionale a richiesta). Per garantire la massima precisione di taglio.

Cremagliera (opzionale a richiesta). Dispositivo per agevolare il sollevamento e l'abbassamento del guidalama.



Mod. ST500 • 600



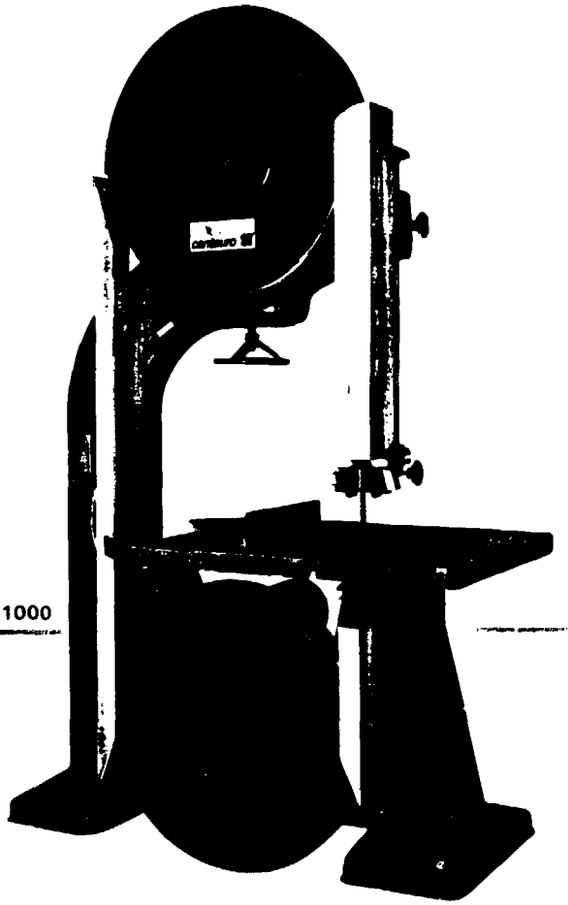
Piano inclinabile (opzionale a richiesta escluso Mod. ST1000). Raggiunge una inclinazione max. di 36° per consentire tagli angolati.

borghi e baldo ingg.
s.p.a.

C)

centauro

Macchine per la lavorazione del legno
41010 Limidi di Soliera (Mo) Italy
Tel. 059/561630 - Telex 510634 Cent I



Mod. ST900 e 1000

DATI TECNICI	ST600	ST600	ST700	ST800	ST900	ST1000
Diametro dei volani mm.	500	600	700	800	900	1000
Altezza di taglio mm.	330	355	530	530	710	710
Larghezza di taglio mm.	460	560	660	740	860	940
Dimensioni piano mm.	700 × 500	820 × 585	1010 × 700	1090 × 770	1285 × 890	1380 × 890
Max. lunghezza lama mm.	4100	4430	5170	5480	6400	6700
Min. lunghezza lama mm.	3980	4330	5020	5380	6190	6540
Max. larghezza lama mm.	25	25	35	40	45	50
Motore trifase HP	1,5	2,5	3	4	5,5	10
Giri/min. dei volani	900	715	736	660	580	580
Peso netto Kg.	180	220	345	410	600	730
Peso lordo (gabbia) Kg.	220	270	410	490	710	840
Peso lordo (cassa) Kg.	250	310	465	550	800	940
Dimensioni d'ingombro: Altezza mm.	1870	1970	2220	2250	2510	2560
Lunghezza mm.	860	1020	1320	1410	1660	1710
Larghezza mm.	600	710	840	910	890	890
Cubaggio marittimo m^3	0,98	1,15	2,08	2,15	4,13	5,00

Figure 9: Example of recommended combination planer (surfacer)

borghi e baldo ingg.
spa

A)

F4L-F5L
PIALLE A FILO

Una tecnologia d'avanguardia

Le pialle a filo F4L - F5L consentono un perfetto raddrizzamento di pezzi storti anche di notevole lunghezza perché dispongono di piani asimmetrici molto lunghi che garantiscono le condizioni di "totale appoggio" necessarie per un buon risultato.

Nelle F4L - F5L la guida è inclinabile con battute fisse di precisione a 45° e 90° e possibilità di ogni altra posizione intermedia (foto 1).

Molto semplice la messa a punto e la regolazione: un visualizzatore micrometrico di passata rende facile il rilevamento del valore dell'asportazione; apposite "battute di memoria" consentono di prefissare questo valore alla misura desiderata per permettere una lavorazione più rapida e precisa.

Bassissimo livello di rumorosità: le F4L - F5L sono le pialle a filo più silenziose: solo 76 dB (A)*.

L'evacuazione dei trucioli è facilitata da un convogliatore posto in posizione alta da terra (foto 2).

* Rilevamenti secondo norme DIN 45635/1650

Principali opzionali:

Cavatrice a punta con mandrino esagonale.

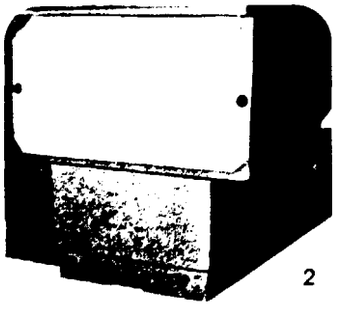
Mandrino autocentrante.

Affilacoltelli su cavatrice per consentire l'affilatura di 4 coltelli.

Albero con scavo per 2 coltelli supplementari in widia per refilare i fianchi di pannelli ricoperti di laminati.

Mensola per eseguire battute fino a 19 mm di profondità.


1


2

Le illustrazioni e i dati contenuti nel seguente prospetto non sono impegnativi. La SCM si riserva il diritto di apportare modifiche per esigenze di carattere tecnico commerciale ed organizzativo, ferme restando le caratteristiche principali delle macchine. Inoltre le parti aggiunte, come protezioni, accessori, ecc. possono essere diverse in conformità alle leggi e alle esigenze particolari dei paesi cui le macchine sono destinate.

CARATTERISTICHE TECNICHE	F4L	F5L	CAVATRICE	
Larghezza piani	600 mm	600 mm	Dimensioni piano	550x300 mm
Larghezza piano d'entrata	1400 mm	1400 mm	Corsa longitudinale	200 mm
Larghezza piano d'uscita	1350 mm	1350 mm	Corsa trasversale	160 mm
Larghezza utile di lavoro	600 mm	600 mm	Corsa verticale	120 mm
Altezza piani	800 mm	800 mm	Inclinazione piano destro da	15 mm
Velocità albero	4000 giri/min	4000 giri/min	Peso	90 Kg
Velocità albero (a richiesta)	5000 giri/min	5000 giri/min		
Coltelli	4	4		
Max. profondità a battere	20 mm	20 mm		
Dimensioni guida	1700x120 mm	1700x120 mm		
Inclinazione guida fissa a	45°	45°		
Motore	1 kW (1 HP)	1 kW (1 HP)		
Motore (a richiesta)	4 kW (5,5 HP)	4 kW (5,5 HP)		
Dimensioni	2000x850x1000 mm	2000x850x1000 mm		
Peso netto	660 Kg	745 Kg		
Peso lordo in cassa per via mare	845 Kg circa	940 Kg circa		
Ingombro cassa per via mare	2150x860x1070 mm (2,54 m³)	2150x860x1070 mm (2,84 m³)		

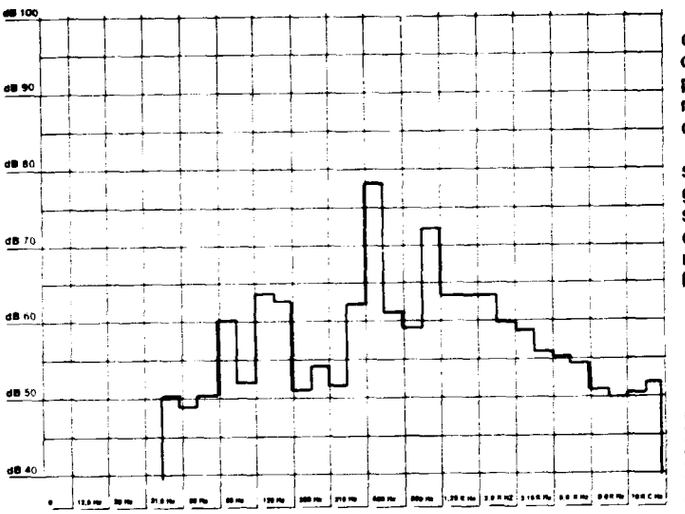
MASSIMO SIMONETTI
0396 - PAZZINI VERUCCHIO

scm

SCM International Spa 47037 Rimini (Italy) Via Emilia ...
Tel. (0541) 700111 Tx...

Figure 10: Example of recommended thickness planer

S50N BASSISSIMO LIVELLO DI RUMORE



Spettro rumore secondo norme DIN 45635/1650, valore medio complessivo 76 dB (A)

Il bassissimo livello di rumore della S 50N - solo 76 dB (A) - costituisce uno dei risultati più prestigiosi raggiunti dalla SCM nell'ambito delle ricerche compiute in questo campo.

Questo importante risultato è stato ottenuto eliminando all'origine il rumore, attraverso lo studio di forme e composizioni che hanno anche il vantaggio di rendere più completo e facile lo scarico dei trucioli.

Le illustrazioni e i dati contenuti nel seguente prospetto non sono impegnativi. La SCM si riserva di apportare modifiche per esigenze di carattere tecnico commerciale ed organizzative ferme restando le caratteristiche principali delle macchine. Inoltre le parti aggiunte come protezioni, accessori, ecc. possono essere diverse in conformità alle leggi e alle esigenze particolari dei paesi cui le macchine sono destinate.

Dati tecnici

Dimensioni del piano	500 × 1130 mm
Larghezza utile di lavoro	440 mm
Altezza utile di lavoro massima	130 mm
minima	4 mm
Motore con avviatore Y/Δ	4 kW (5,5 HP)
Aspirazione massima	6 m/s
Diametro albero	125 mm
Coltelli	4
Velocità di rotazione dell'albero	4500 giri/min
Velocità di avanzamento	7,5/18 m/min
Peso netto	400 Kg
Dimensioni	850 × 1570 × 1600 mm
Peso lordo in cassa per via mare	430 Kg circa
Ingombro cassa per via mare	1250 × 1650 × 1700 mm (3,48 m³)

Accessori di serie

4 coltelli - registracoltelli - 1 rullo nel piano - sistema PHT - indicatore numerico altezza di lavoro - oliatore - chiave di servizio.

Opzionali:

Versione senza rullo sul piano - Sollevamento automatico del piano con motore 0,15 kW (0,2 HP) - Aerotrice - rullo anteriore - Avanzamento a sezioni flottanti - Testa d'aspirazione con bocca Ø 150 mm - motore 5,5 kW (7,5 HP) - Telesalvamotore.

MASSIMO SIMONETTI
0215 - PAZZINI VERUCCHIO

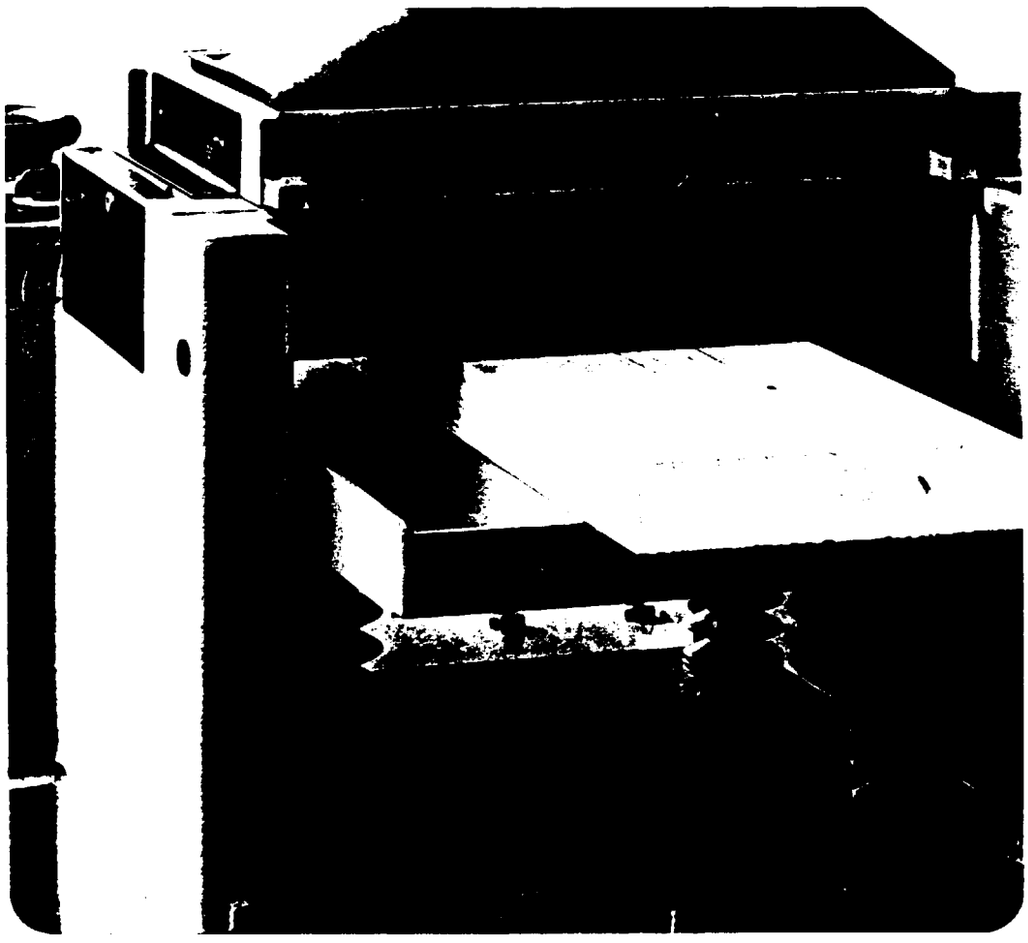
scm

SCM International Spa - Via Emilia
Tel. (0541) 2[illegible]

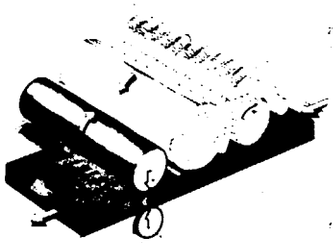
borghi e baldo ingg.
spa

B)

S50N
PIALLA A SPESSORE



scm



Avanzamento PHT: il sistema più efficace

Il rendimento di una pialla a spessore dipende in gran parte dall'efficacia del suo sistema d'avanzamento.

Il secondo gruppo d'avanzamento della S 50N è del tipo PHT (Pure Horizontal Thrust = spinta orizzontale pura): due rulli stringono il legno senza spingerlo contro il piano; l'attrito si riduce fino a oltre il 70%.

In questo modo si ottiene una forza d'avanzamento di gran lunga superiore a quella dei sistemi tradizionali, decisiva quando l'asportazione è elevata e il legno è umido o resinoso.

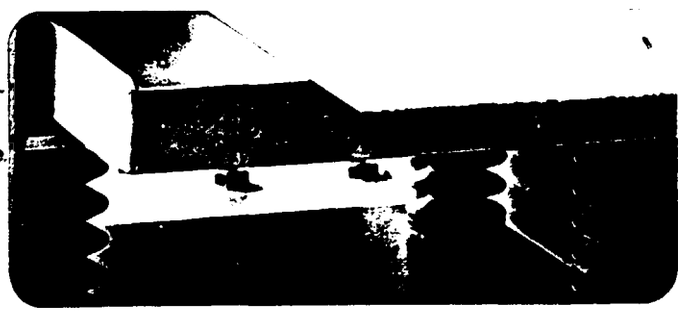
Elevata precisione

Piano su 4 colonne autobloccanti

La S 50N assicura la massima precisione grazie alla rigidità del piano. Questo poggia su 4 colonne a vite che impediscono cedimenti verticali senza richiedere bloccaggi, ed ha 4 riscontri sul basamento a garanzia della sua stabilità orizzontale.

Pressatori sezionati per una finitura sempre accurata

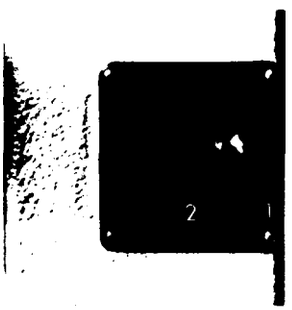
Una serie di pressatori molleggiati di piccola sezione e di struttura molto robusta preme sul legno in prossimità della zona di taglio per evitare vibrazioni.
La totale indipendenza delle singole sezioni e la loro ridotta larghezza permettono di seguire bene le ondulazioni del legno.



Curata in ogni particolare

Quadro comandi

Leva cambio velocità



Affilatrice - rettificatrice per coltelli (optional)

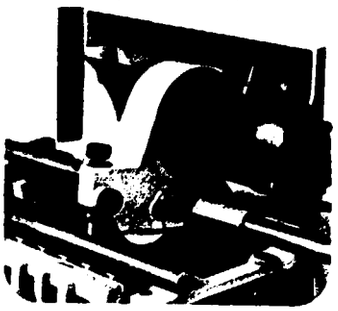
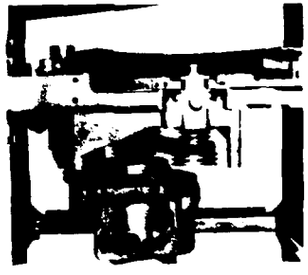


Figure 11A: Example of recommended circular sawing machine

la macchina base della moderna falegnameria

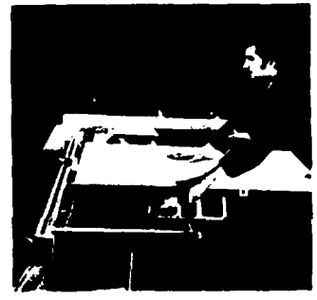


Gruppo portasega montato su grandi supporti con guide trapezoidali

Collettore scarico segatura del diametro di 120 mm

Vista posteriore della macchina in cui si nota la versatile e robusta guida di larghezza

Squadratura di un pannello sulla SI15FS - 1a fase: rifilatura.



2a fase: intestatura a 90°

3a fase: intestatura a 90° a misura

BASAMENTO

In robusta struttura di acciaio, assicura una perfetta stabilità e assoluta assenza di vibrazioni.

PIANI

Di grandi dimensioni, fortemente nervati ed accuratamente lavorati.

PIANO SCORREVOLE

Scorre su cuscinetti stagni e ruote speciali a sfere che assicurano una assoluta precisione di taglio.

GRUPPO PORTASEGA

E' montato su due grandi supporti con guide trapezoidali che permettono il recupero dei giochi.

SOLLEVAMENTO DELLA LAMA

Molto agile e veloce viene effettuato mediante volantino provvisto di cuscinetti reggispinta.

con la SI15F si possono risolvere tutti i problemi di taglio per la sua versatilità, frutto di eccezionali caratteristiche: 3 velocità dell'albero, lama inclinabile, praticità della guida di larghezza, piano aggiunto e infine la possibilità di utilizzare l'incisore

INCLINAZIONE DELLA LAMA

L'inclinazione, da 0° a 45°, si effettua manovrando una vite senza fine; ad ogni giro corrispondono 2° di inclinazione.

ALBERO

Montato su cuscinetti "stagni" che non richiedono alcuna lubrificazione, è provvisto di 3 velocità di rotazione: il cambio di velocità è estremamente agevole e veloce. L'albero è predisposto per potervi montare più di una lama e truciolatori fino a 50 mm di spessore. Il movimento viene trasmesso, per mezzo di cinghie trapezoidali, da un motore del tipo autoraffreddato facilmente ispezionabile dallo sportello di accesso.

GUIDA DI LARGHEZZA

Estremamente versatile, scorre su di una robusta barra di acciaio dentata per la registrazione micrometrica. L'elemento a cui si appoggia il pezzo è in profilato di alluminio rettangolare, spostabile nel verso della sua lunghezza; esso può essere usato sia verticalmente che orizzontalmente (per il taglio di pezzi piccoli).

SQUADRETTA GONIOMETRICA

Sul piano scorrevole è montata una squadretta goniometrica orientabile da 90° a 45°, provvista di una battuta per pezzi corti e di una battuta telescopica per pezzi lunghi. Essa può scorrere nell'apposita scanalatura per la lavorazione di pezzi corti.

PIANO AGGIUNTO

Il modello SI15FS è provvisto di piano aggiunto con supporto a bandiera e di guida telescopica orientabile da 90° a 45° con battute ribaltabili, per la squadratura di pannelli di notevole grandezza. Il piano aggiunto è facilmente asportabile.

SCARICO SEGATURA

La macchina è provvista di un collettore per lo scarico della segatura del diametro di 120 mm. che, oltre a permettere una perfetta evacuazione dei trucioli, rende estremamente facile l'allacciamento all'impianto di aspirazione.

PROTEZIONE

Il coltello divisore (spaccalegno), con movimento a parallelogramma, consente l'esecuzione di tagli non passanti. Su questo è montata la protezione in alluminio.

DISPOSITIVO INCISORE (a richiesta)

Allorchè si debbano lavorare pannelli rivestiti con laminati plastici da ambedue le parti, è indispensabile l'incisore, fornito a richiesta, per ottenere tagli perfetti esenti da scheggiature. Le facili e precise regolazioni, il motore indipendente e la possibilità di far scomparire rapidamente l'incisore sotto il piano, ne fanno un accessorio oltremodo pratico per la moderna falegnameria.

DOTAZIONE STANDARD

Protezione sega e coltello divisore
Guida di larghezza
Squadretta o guida di lunghezza

DOTAZIONE A RICHIESTA

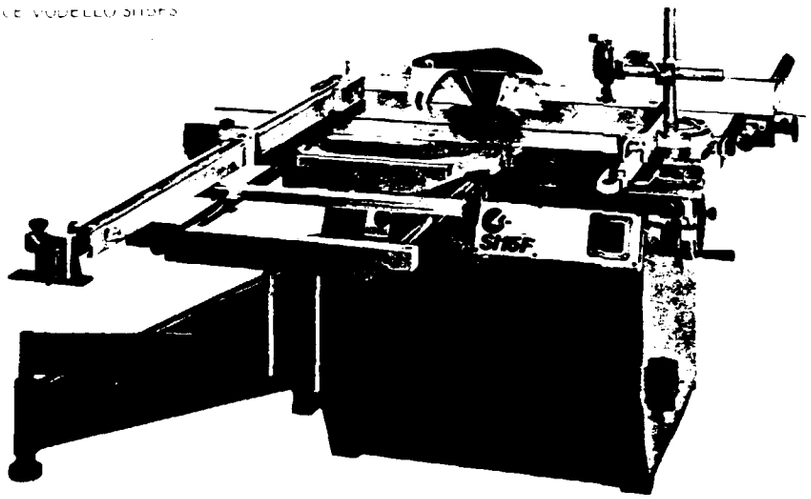
Motore 5.5 kW (7,5 HP)
Motore a 2 velocità 3,5/4,4 kW (4,8/6 HP) per 1600-2250-3000-3200-4500-6000 giri/min
Motore incisore 0,7 kW (1 HP)
Flange ⌀ 134 mm
Larghezza di taglio fino a 1270 oppure 1520 mm
Stringipezzo a eccentrico
Dispositivo incisore
Fresa per incisore
Telesalvamotore

A)

borghi e baldo ingg.
s.p.a.

B)

SQUADRATRICE MODELLO SI15FS



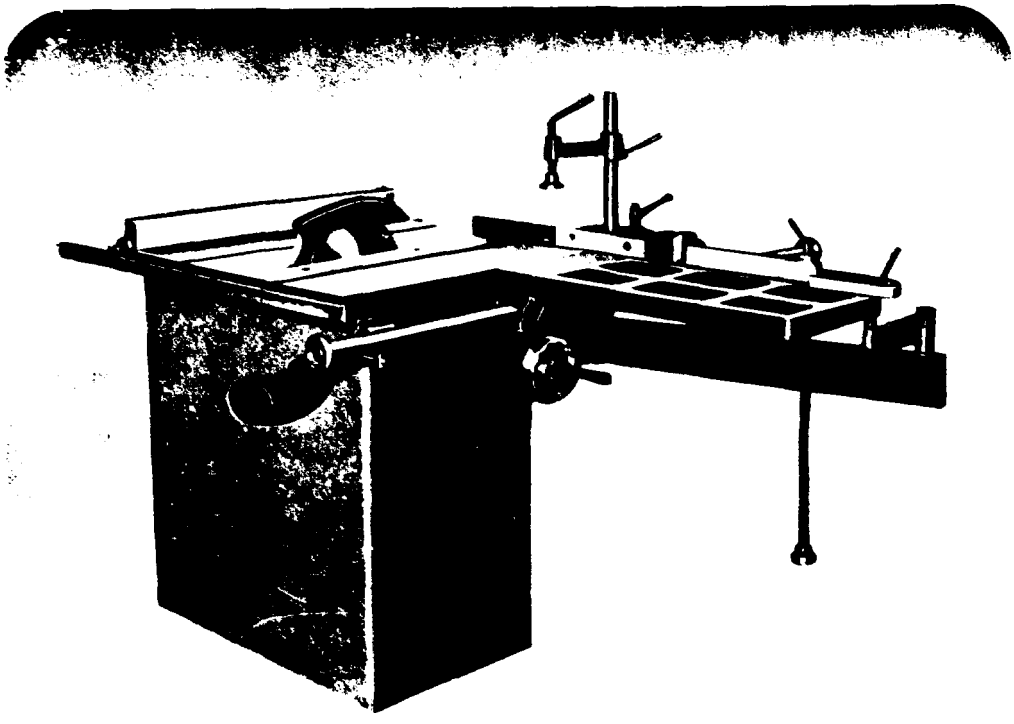
caratteristiche	SI15F		SI15FS
Diametro lama standard	350	mm	350
Diametro lama massimo (1)	400	mm	400
Massima altezza di taglio			
(con lama ⌀ 350 mm)	115	mm	115
(con lama ⌀ 400 mm)	140	mm	140
Massima altezza di taglio a 45			
(con lama ⌀ 350 mm)	80	mm	80
(con lama ⌀ 400 mm)	96	mm	96
Diametro albero	30	mm	30
Potenza motore standard	4 kW (5.5 HP)		4 kW (5.5 HP)
a richiesta	5.5 kW (7.5 HP)		5.5 kW (7.5 HP)
Velocità di rotazione dell'albero	3200-4500-6000	giri min	3200-4500-6000
Motore a 2 velocità (a richiesta)	3.5 4.4 kW (4.8 6 HP)		3.5 4.4 kW (4.8 6 HP)
Velocità di rotazione dell'albero (con motore a 2 velocità)	1500-2250-3000-3200-4500-6000	giri min	1600-2250-3000-3200-4500-6000
Larghezza di taglio	850	mm	850
Dimensioni piano fisso	1150x800	mm	1150x800
Dimensioni piano scorrevole	1350x240	mm	1350x240
con corsa	1300	mm	1300
Misure d'ingombro	1320x1360x1000	mm	2350x1360x1000
Peso netto	570	kg	660
Ingombro cassa per via mare	1570x1280x1140	mm	1570x1280x1140
	2.29	m³	2.29
Peso lordo in cassa per via mare	725	kg	815
DISPOSITIVO INCISORE (A RICHIESTA)			
Diametro fresa	105 ÷ 120	mm	105 ÷ 120
Diametro foro fresa	20	mm	20
Velocità di rotazione fresa	8300	giri min	8300
Potenza motore	0,5 kW (0,75 HP)		0,5 kW (0,75 HP)
(a richiesta)	0,7 kW (1 HP)		0,7 kW (1 HP)

(1) La lama non è mai completamente sotto il piano

L'invincibile

scm

SEGA CIRCOLARE A LAMA INCLINABILE
SCIE CIRCULAIRE A LAME INCLINABLE
CIRCULAR SAW WITH TILTING BLADE
KREISSAGE-SCHRAG STELLBAR
SIERRA CIRCULAR A HOJA INCLINABLE



borghi e baldo ingg.
s.p.a.

MAP

MOD. SI 13

Figure 11B: Example of recommended circular sawing machine

CARATTERISTICHE		CARACTERISTIQUES
Diametro massimo della lama	300 mm	Diam. max de la lame
Diametro albero	25 mm	Diam. de l'arbre
Massima altezza di taglio con lama	300 - 105 mm	Hauteur max. de coupe avec lame
Massima altezza di taglio a 45°	70 mm	Hauteur max. de coupe à 45°
Velocità di rotazione albero	3800 giri/1'	Vitesse arbre
Dimensioni del piano	700x800 mm	Dimensions de la table
Massima larghezza di taglio	1000 mm	Largeur max. de coupe
Corsa massima del carrello	1050 mm	Course du chariot
Dimensioni del carrello	700x280 mm	Dimensions de la table
Potenza motore	3 HP	Puissance du moteur
Peso netto approssimativo	310 Kg	Poids net approx.

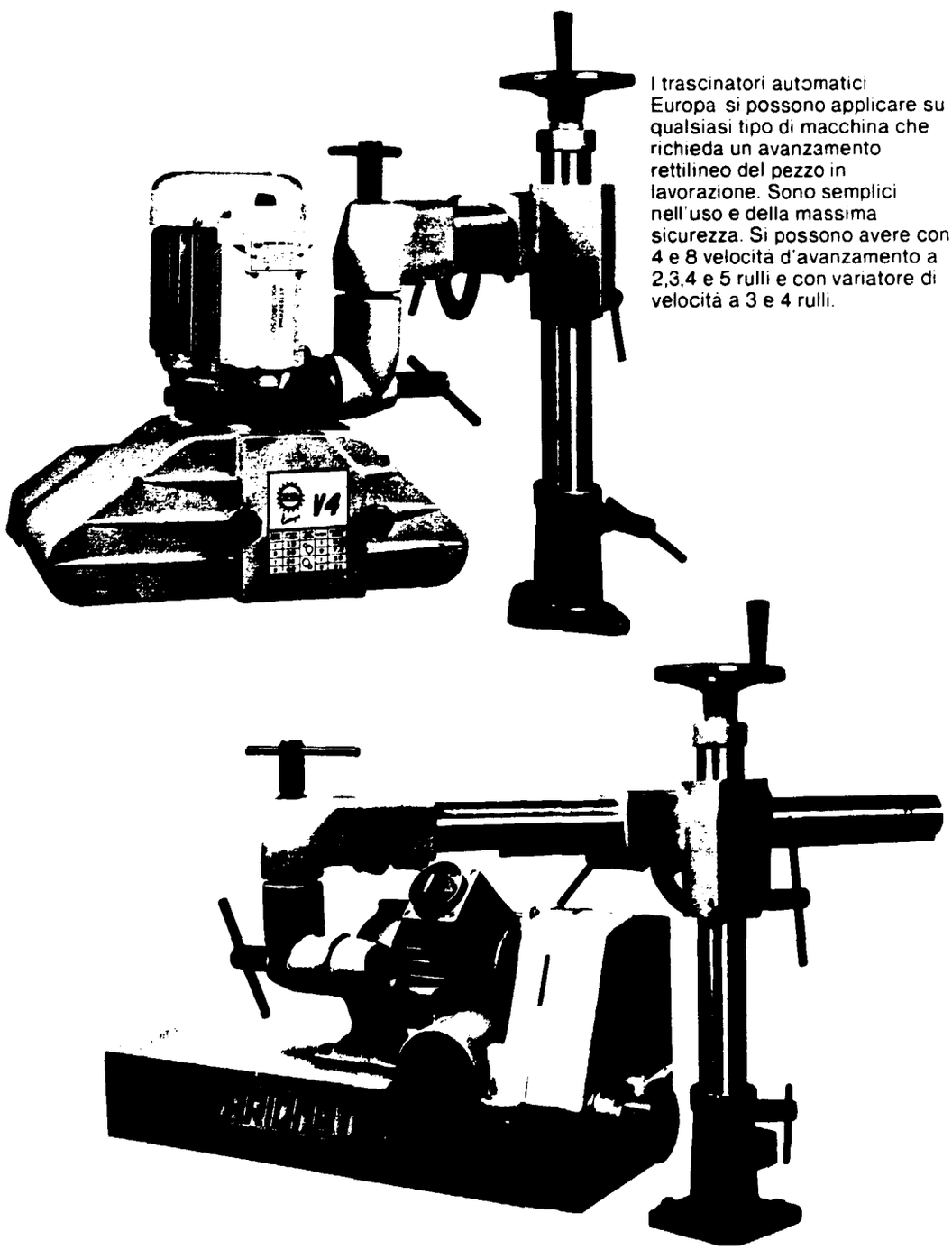
ACCESSORI A RICHIESTA		EQUIPEMENT SUR DEMANDE
Corsa carrello fino a	1270 mm	Course du chariot jusqu'à
Motore	4 HP	Moteur
Salvamotore		Disjoncteur
Freno elettrico		Frein électrique
Pesi e misure non sono impegnativo qualsiasi modifica si intende a miglioramento della macchina		Notre Maison se réserve d'apporter changements ou améliorations

TECHNICAL DATA		TECHNISCHE DATEN
Max. Diam. of saw blade	300 mm	Max. Sageblattdurchmesser
Diam. of spindle	25 mm	Sagewelledurchmesser
Max. depth of cut with saw blade	300 - 105 mm	Max. Schnitthöhe mit Sageblattdurchmesser
Max. depth of cut at 45°	70 mm	Max. Schnitthöhe bei Schwenkung des Sageblattes zu 45°
Rotation speed of spindle	3800 r.p.m.	Drehzahl der Sagewelle
Table dimensions	700x800 mm	Tischabmessungen
Max. to rip to right of saw	1050 mm	Schnittbreite zwischen Sageblatt und Anschlag
Sliding table dimensions	700x280 mm	Rolltischabmessungen
Stroke of sliding table	1000 mm	Rolltischhub
Motor power	3 HP	Motorstärke
Approx. net weight	310 Kg	Netto Gewicht Ca.

OPTIONALS EXTRA		SONDERZUBEHÖR
Stroke of sliding table up to	1270 mm	Rolltischhub bis zu
Motor	4 HP	Motor
Overload protection		Motorschutzschalter
Elect. - brake		Elektrische Bremse
Our Firm reserve herself to bring any change or improvement		Konstruktions und Massänderungen bleiben vorbehalten

Figure 12: Example of recommended pushers

SERIE EUROPA·VARIOMATIC



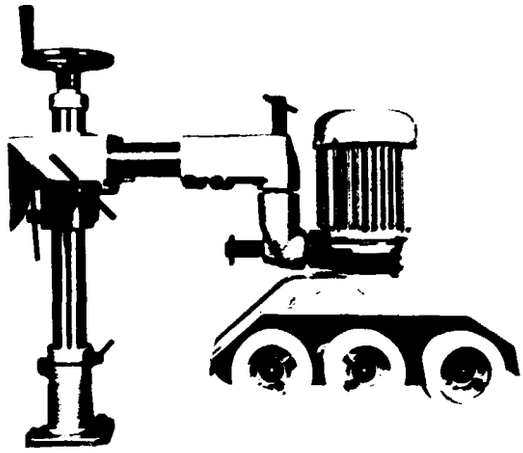
I trascinatori automatici Europa si possono applicare su qualsiasi tipo di macchina che richieda un avanzamento rettilineo del pezzo in lavorazione. Sono semplici nell'uso e della massima sicurezza. Si possono avere con 4 e 8 velocità d'avanzamento a 2,3,4 e 5 rulli e con variatore di velocità a 3 e 4 rulli.

borghi e baldo ingg.
s.p.a.

A)

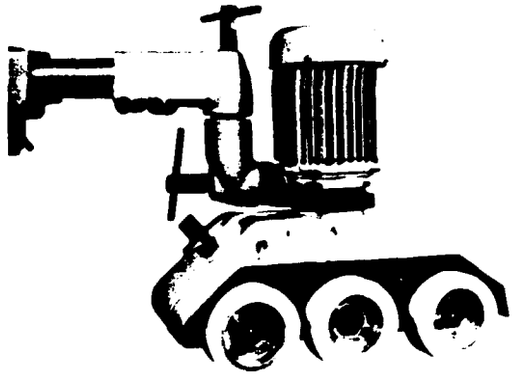
EUROPA340

3 Rulli – 4 velocità



EUROPA380

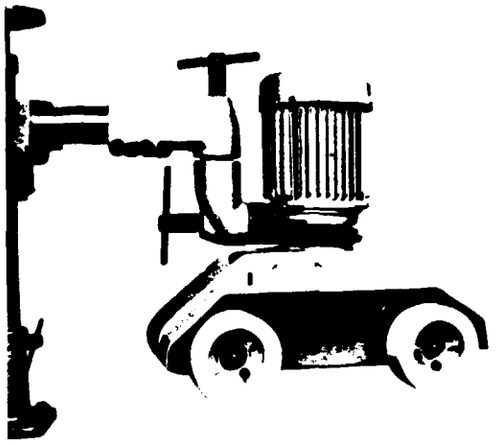
3 Rulli – 8 velocità



Caratteristiche tecniche	**Europa 340-380**	**Caracteristiques tecniques**
Regolazione verticale	mm. 250	Reglage vertical
Regolazione orizzontale	mm. 580	Reglage orizontal
Massima distanza fra colonna e ruote	mm. 580	Distance entre colonne et rouleaux
Diametro ruote avanzamento	mm. 110	Diametre des rouleaux d'avancement
Larghezza ruote avanzamento	mm. 50	Largeur des rouleaux
Motore	*HP.* 05/07	*Moteur*
Peso netto apparecchio completo:		Poids net appareil complet
Mod. 340 - 4 Velocità	kg. 68	mod. 340 – 4 Vitesse
Mod. 380 - 8 Velocità	kg. 72	mod. 380 – 8 Vitesse
Velocità tipo 340 - 4 Velocità	3,5-7,5-10-21 mt/mn	*Vitesse mod.* 340
Velocità tipo 380 - 8 Velocità	2-4-5,5-9-11-13-18-25 mt/mn.	Vitesse mod. 380
Accessori *su richiesta*		**Accesoires sur demande**
Ruote larghezza	mm. 100	Rouleaux en caoutchouc
Ruote in acciaio	mm. 50	Rouleaux crante en acier
Motore doppio voltaggio	HP. 075/1	Moteur bi-tension
Motore con maggiore potenza	HP. 1/1,5	Moteur 2 vitesse
Braccio orizzontale piu lungo di	15/20 cm.	*Colonne horizontale plus longue*
Specification		**Technische Daten**
Vertical range of adjustment	mm. 250	Vertikalverstellung
Horizontal range of adjustment	mm. 580	*Horizontalverstellung*
Distance between column and rollers	mm. 580	Abstand zwischen Saule und Rollen
Diameter of rollers	mm. 110	Vorschubrollendurchmesser
Width of rollers	mm. 50	Vorschubrollenbreite
Two speed motor	*HP.* 05-07	Motor
Complete unit net weight:		Netto gewicht
Mod. 340 – 4 speeds	kg. 68	Mod. 340
Mod. 380 – 8 speeds	kg. 72	Mod. 380
Feeding speeds mod. 340	3,5-7,5-10-21 mt/mn	Vorschubgeschwindigkeiten mod. 340
Feeding speeds mod. 380	2-4-5,5-9-11-13-18-25 mt/mn	Vorschubgeschwindigkeiten mod. 380
Optional equiment		**Zubehör auf Anfrage**
Extra large rollers	mm. 100	Breiter Vorschubrollen
Serrated steel rollers	mm. 50	Stahlwalzen gezahnt
Motor dual voltage	HP. 0,75/1	Motor doppelte Spannung
Two speed motor	HP. 1-1,5	Motor
Horizontal column longer than standard	15/20 cm.	*Horizontal-Ausleger langer als standard*

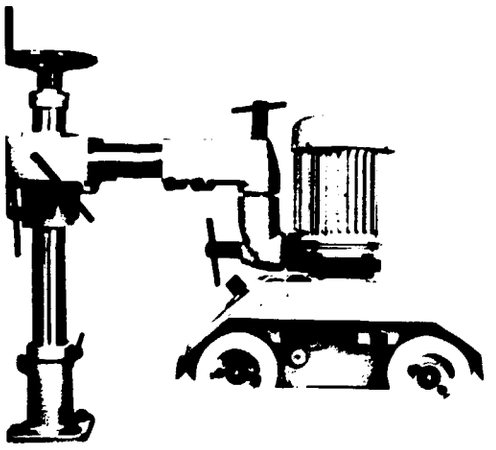
EUROPA240

2 Rulli – 4 velocità



EUROPA280

2 Rulli – 8 velocità



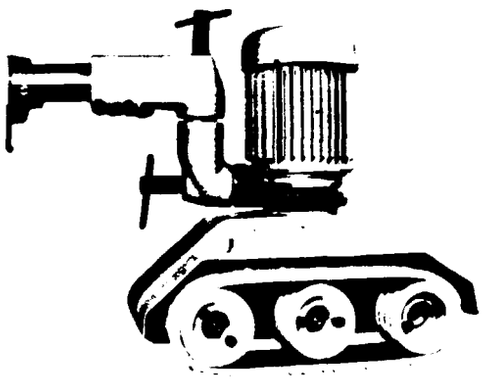
Caratteristiche tecniche	**Europa 240 - 280**	**Caracteristiques tecniques**
Regolazione verticale	mm 250	Reglage vertical
Regolazione orizzontale	mm 580	Reglage orizontal
Massima distanza fra colonna e ruote	mm 580	Distance entre colonne et rouleaux
Diametro ruote avanzamento	mm 110	Diametre des rouleaux d avancement
Larghezza ruote avanzamento	mm 50	Largeur des rouleaux d avancement
Motore	HP 05/07	Moteur
Peso netto apparecchio completo		Poids net appareil complet
Mod 240 - 4 Velocita	kg 68	mod 240 - 4 Vitesse
Mod 280 - 8 Velocita	kg 72	mod 280 - 8 Vitesse
Velocita tipo 240 - 4 Velocita	3,5-7,5-10-21 mt/mn	Vitesse mod 240
Velocita tipo 280 - 8 Velocita	2-4-5,5-9-11-13-18-25 mt/mn	Vitesse mod 280
Accessori su richiesta		**Accesoires sur demande**
Ruote larghezza	mm 100	Rouleaux en caoutchouc
Ruote in acciaio	mm 50	Rouleaux crantes en acier
Motore doppio voltaggio	HP 075/1	Moteur bi-tension
Motore con maggiore potenza	HP 1/1,5	Moteur 2 vitesse
Braccio orizzontale piu lungo di	15/20 cm	Colonne horizontale plus longue de
Specification		**Technische Daten**
Vertical range of adjustment	mm 250	Vertikalverstellung
Horizontal range of adjustment	mm 580	Horizontalverstellung
Distance between column and rollers	mm 580	Abstand zwischen Saule und Rollen
Diameter of rollers	mm 110	Vorschubrollendurchmesser
Width of rollers	mm 50	Vorschubrollenbreite
Two speed motor	HP 05-07	Motor
Complete unit net Weight		Netto gewicht
Mod 240 - 4 speeds	kg 68	Mod 240
Mod 280 - 8 speeds	kg 72	Mod 280
Feeding speeds mod 240	3,5-7,5-10-21 mt/mn	Vorschubgeschwindigkeiten mod 240
Feeding speeds mod 280	2-4-5,5-9-11-13-18-25 mt/mn	Vorschubgeschwindigkeiten mod 280
Optional equipment		**Zubehör auf Anfrage**
Extra large rollers	mm 100	Breiter Vorschubrollen
Serrated steel rollers	mm 50	Stahlwalzen gezahnt
Motor dual voltage	HP 0,75/1	Motor doppelte Spannung
Two speed motor	HP 1-1,5	Motor
Horizontal column longer than standard	15/20 cm	Horizontal-Ausleger langer als standard

borghi e baldo ingg.
s.p.a.

C)

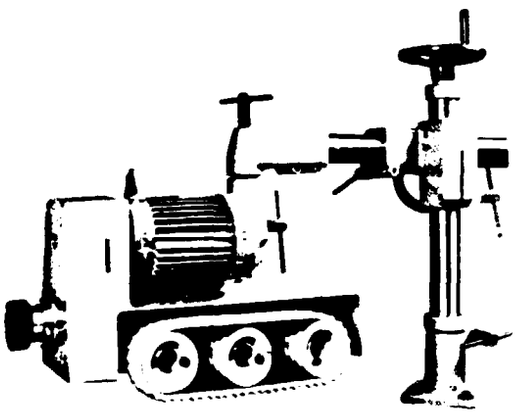
EUROPA 320c

4 V – con cingolo



VARIOMATIC 310c

cingolo – con variatore



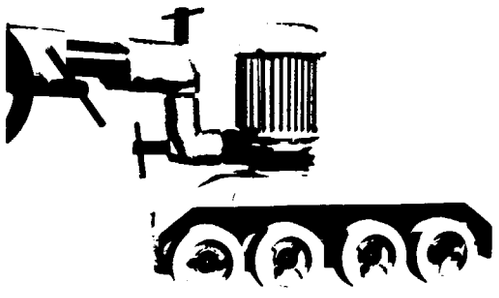
Caratteristiche tecniche	**Europa 320c - 310c**	**Caracteristiques tecniques**
Regolazione orizzontale	mm. 580	Reglage horizontal
Regolazione verticale	mm. 250	Reglage vertical
Massima distanza fra colonna e cingolo	mm. 580	Distance entre colonne et chenille
Sviluppo cingolo	mm. 925	Developpement chenille
Peso netto apparecchio completo	kg. 72	Poids net appareil complet
Velocita d'avanzamento mod. 310/C	3/22 mt/min.	Vitesse d'avancement mod. 310 C
Velocita d'avanzamento mod. 320/C	3,5-7,5-10-21 mt/min.	Vitesse mod. 320/C
Accessori su richiesta		**Accesoires sur demande**
Motore con maggiore potenza	HP. 1,5	Moteur
Colonna orizzontale piu lunga di	cm. 15/20	Colonne horizontale plus longue de
Specification		**Technische daten**
Vertical range of adjustment	mm. 250	Vertikalverstellung
Horizontal range of adjustment	mm. 580	Horizontalverstellung
Distance between column and rubber-belt	mm. 580	Abstand zwischen Saule und Riemen
Development of rubber-belt	mm. 925	Riemenspannung
Complete unit net weight	kg. 72	Netto-gewicht
Feeding speeds mod. 310/C	3/22 mt/min.	Vorschubgeschwindigkeiten mod. 310 C
Feeding speeds mod. 320/C	3,5-7,5-10-21 mt/min.	Vorschubgeschwindigkeiten mod. 320/C
Optional equipment		**Zubehör auf Anfrage**
Motor	HP. 1,5	Motor
Horizontal column longer than standard	cm. 15/20	Horizontal-Ausleger langer als Standard

borghi e baldo ingg.
s.p.a.

D)

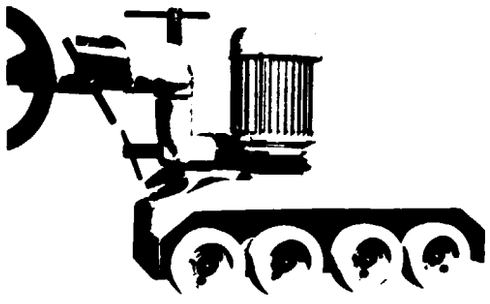
EUROPA440

4 Rulli – 4 velocità



EUROPA480

4 Rulli – 8 velocità



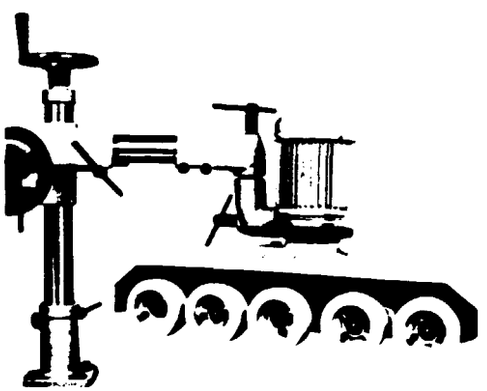
Caratteristiche tecniche	**Europa 440 - 480**	**Caracteristiques tecniques**
Regolazione Verticale	mm. 250	Reglage vertical
Regolazione orizzontale	mm. 580	Reglage horizontal
Distanza massima fra colonna e ruote	mm. 580	Distance entre colonne et rouleaux
Diametro ruote avanzamento	mm. 110	Diametre des rouleaux d'avancement
Larghezza ruote avanzamento	mm. 50	Largeur des rouleaux d'avancement
Motore	HP. 1,5	Moteur
Peso netto apparecchio completo	kg. 80	Poids net appareil complet
Velocita d'avanzamento mod. 440	3,5-7,5-10-21 mt/min	Vitesse d'avancement mod. 440
Velocita d'avanzamento mod. 480	2-4-5,5-9-11-13-18-25 mt/min	Vitesse d'avancement mod. 480
Accessori su richiesta		**Accesoires sur demande**
Ruote larghezza	mm. 100	Rouleaux en caoutchouc
Ruote in acciaio	mm. 50	Rouleaux crantes en acier
Colonna orizzontale piu lunga di	cm. 15/20	Colonne horizontale plus longue de
Specification		**Technische Daten**
Vertical range of adjustment	mm. 250	Vertikalverstellung
Horizontal range of adjustment	mm. 580	Horizontalverstellung
Distance between column and rollers	mm. 580	Abstand zwischen Saule und Rollen
Diameter of rollers	mm. 110	Vorschubrollendurchmesser
Width of rollers	mm. 50	Vorschubrollenbreite
Motor	HP. 1,5	Motor
Complete unit net weight	kg. 80	Netto gewicht
Feeding speeds mod. 440	3,5-7,5-10-21 mt/min	Vorschubgeschwindigkeiten mod. 440
Feeding speeds mod. 480	2-4-5,5-9-11-13-18-25 mt/min.	Vorschubgeschwindigkeiten mod. 480
Optional equipment		**Zubehör auf Anfrage**
Extra large rollers	mm. 100	Breiter Vorschubrollen
Serrated steel rollers	mm. 50	Stahlwalzen gezahnt
Horizontal column longer than standard	cm. 15/20	Horizontal-Ausleger langer als standard

borghi e baldo ingg.
s.p.a.

E)

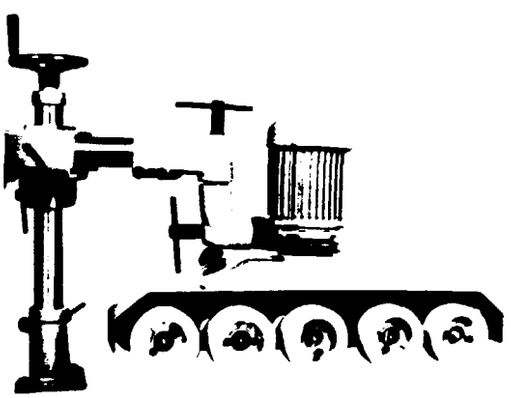
EUROPA540

5 Rulli – 4 velocità



EUROPA580

5 Rulli – 8 velocità



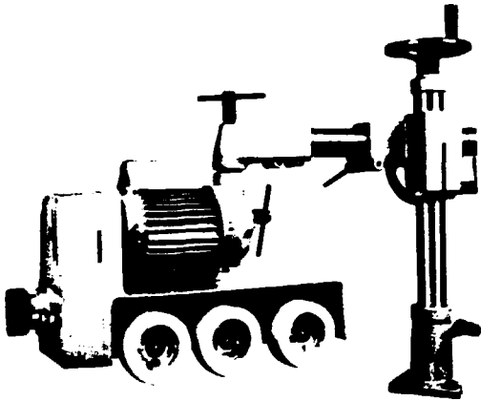
Caratteristiche tecniche	**Europa 540 - 580**	**Caracteristiques tecniques**
Regolazione verticale	mm 250	Reglage vertical
Regolazione orizzontale	mm 580	Reglage horizontal
Distanza massima fra colonna e ruote	mm 580	Distance entre colonne et rouleaux
Diametro ruote avanzamento	mm 110	Diametre des rouleaux
Larghezza ruote avanzamento	mm 50	Largeur des rouleaux
Motore	HP 1,5	Moteur
Peso netto apparecchio completo	kg. 82	Poids net appareil complet
Velocita d'avanzamento mod. 540	3,5-7,5-10-21 mt/min.	Vitesse mod. 540
Velocita d'avanzamento mod. 580	2-4-5-9-11-13-18-25 m/min.	Vitesse mod. 580
Accesori su richiesta		**Accesoires sur demande**
Ruote larghezza	mm 100	*Rouleaux en caoutchouc*
Ruote in acciaio	mm 50	Rouleaux crantes en acier
Colonna orizzontale piu lunga di	cm 15/20	Colonne horizonale plus longue de
Specification		**Technische Daten**
Vertical range of adjustment	mm 250	Vertikalverstellung
Horizontal range of adjustment	mm 580	Horizontalverstellung
Distance between column and rollers	mm 580	Abstand zwischen Saule und Rollen
Diameter of rollers	mm 110	Vorschubrollendurchmesser
Widht of rollers	mm 50	Vorschubrollenbreite
Motor	HP 1.5	Motor
Complete unit net weight	kg 82	Netto gewicht
Feeding speeds mod. 540	3,5-7,5-10-21 mt/min	Vorschubgeschwindigkeiten mod. 540
Feeding speeds mod. 580	2-4-5-9-11-13-18-25 mt/min	Vorschubgeschwindigkeiten mod. 580
Optional		**Zubehör auf Anfrage**
Extra large rollers	mm 100	Breiter Vorschubrollen
Serrated steel rollers	mm 50	Stahlwalzen gezahnt
Horizontal column longer than standard	cm 15/20	Horizontal-Ausleger langer als standard

borghi e baldo ingg.
spa

F)

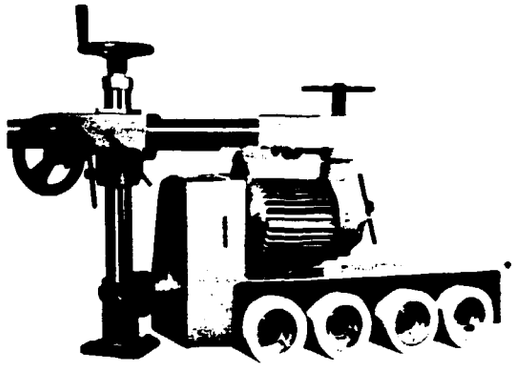
VARIOMATIC 300v

3 Rulli con variatore



VARIOMATIC 400v

4 Rulli con variatore



Caratteristiche tecniche	**Europa 300v - 400v**	**Caracteristiques tecniques**
Regolazione verticale	mm. 250	Reglage vertical
Regolazione orizzontale	mm. 580	Reglage horizontal
Massima distanza fra colonna e ruote	mm. 580	Distance entre colonne et rouleaux
Diametro ruote avanzamento	mm. 110	Diametre des rouleaux
Larghezza ruote avanzamento	mm. 50	Largeur des rouleaux
Motore	HP. 1,2	Moteur
Peso netto apparecchio completo	kg. 82	Poids net appareil complet
Velocita d'avanzamento	3/22 mt/mn	Vitesse d'avancement
Accessori su richiesta		***Acessoires sur demande***
Ruote larghezza	mm. 100	Rouleaux en caoutchouc
Ruote in acciaio	mm. 50	Rouleaux crantes en acier
Colonna orizzontale piu lunga	cm. 15/20	Colonne horizontale plus longue de
Velocita d'avanzamento	6/35 mt/mn	Vitesse d'avancement
Specification		**Technische Daten**
Vertical range of adjustment	mm. 250	Vertikalverstellung
Horizontal range of adjustment	mm. 580	Horizontalverstellung
Distance between column and rollers	mm. 580	Abstand zwischen Saule und Rollen
Diameter of rollers	mm. 110	Vorschubrollendurchmesser
Width of rollers	mm. 50	Vorschubrollenbreite
Motor	HP. 1,2	Motor
Complete unit net weight	kg. 82	Netto Gewicht
Feeding speeds	3/22 m/min	Vorschubgeschwindigkeiten
Optional equipment		**Zubehör auf Anfrage**
Extra large rollers	mm. 100	Breiter Vorschubrollen
Serrated steel rollers	mm. 50	Stahlwalzen gezahnt
Horizontal column longer than standard	cm. 15/20	Horizontal-Ausleger langer als standard
Feeding speeds	6/35 m/min	Vorschubgeschwindigkeiten

borghi e baldo ingg.
s.p.a.

G)

Zangheri & Boschetti

Zangheri e Boschetti Macchine per la lavorazione del legno. 47037 Rimini/FO, Via Romania 8/10. Tel. 0541/740410 (2 linee)

Logically, for that which has been seen in India, machines of that size are not required, but in any case it is better to buy one with a rather superabundant power in order to avoid jamming problems.

These machines are fitted with pushers or feeds (see figure 12). This equipment is nearly indispensable for obtaining a precise work on the circular saw, above all for the cutting of the plies, for which - among other things - a considerable physical effort is required in the case that more than one is cut at the same time.

As can be seen from figure 12, the pushers can have three or more rollers, but four can be considered to be the best, especially when cutting the plies, with two rollers before and two rollers after the blade; in this way unpleasant accidents can be avoided due to the return of the plies, which could be sucked back by the force of the blade.

The apparatus can be easily mounted on the machine by bolting it onto the working table.

All the pushers have the possibility of varying the speed within quite ample limits. Similar apparatus for cutting the logs and the planks exists for the band saws, and also in this case better work is obtained, but without doubt the usefulness of these tools for band saws is decidedly inferior than for the case of the circular saws.

Certainly, the investment required can be a worry, particularly when considering that now all the cutting of the plies is carried out practically with only one bandsaw; but the whole amount should be recovered in a short space of time if one thinks of the very high quantity of rejects which have been seen in all the factories, due to breakages mainly caused by the rough working of the plies.

V.3 Preparation of the wedges

In the description at chapter IV, it has been underlined how the present processing of the wedges is totally incompatible with a product of a quality competitive with the European production.

The technique described in chapter IV for shaping the wedge from a wood block has been demonstrated during the visits to the working factories and well received. Routers with special attachments to carry out the shaping of the wedge should be acquired for this operation.

The router (see figure 13) is a very versatile machine of modest dimensions, where the imagination of the operator can satisfy its whims in finding solutions to many problems, of which examples have been given, from the preparation of the wedges to the processing of the handle of the racket, to the finishing by means of sanding drums.

For the specific use, a power from 3 to 5 HP should be sufficient.

V.4 Frame finishing

A first finishing of the frame can be obtained by means of machines fitted with bands or rollers covered with sand paper of various sizes (see photo 14).

Working on a free sanding band makes it possible to smooth the racket handle without effort, and the same can be obtained for the smoothing of the inside and outside of the oval with rigid rollers.

Another very useful tool is the pneumatic roller on which a sleeve of emery cloth or paper is inserted. By inflating the roller the sleeve is fixed with the tightness required (see figures 14A and 14B).

Good results can also be obtained with segmented cloth cylinders, free or with a support of brushes on the rear part, which follow the shape of the frame with great precision.

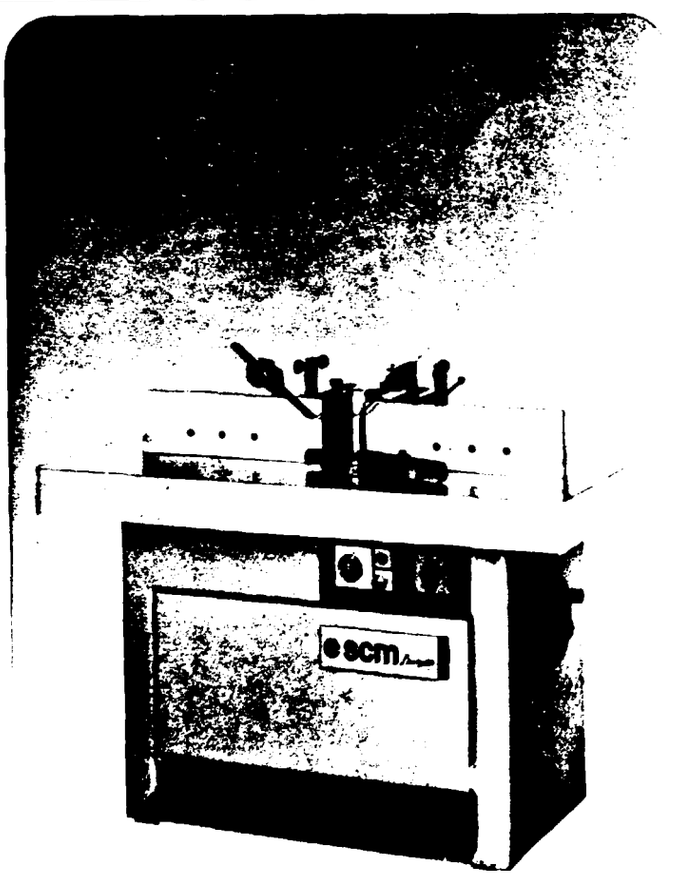
All these tools can be mounted vertically or horizontally according to the operation to be carried out.

V.5 Racket stringing

As stated in chapter III, stringing is currently carried out by hand with mediocre results. Figure 15 shows a type of stringing machine which is recommended for India for its simplicity yet sturdiness and precision.

Figure 13: Example of recommended router

T120K TOUPIE



- Piano lungo 1350 mm
- Gruppo toupie collegato direttamente al piano, per la massima compattezza e rigidità
- Guida con piani a registrazione micrometrica
- Albero che scende sotto al livello del piano per permettere l'impiego di frese in testa
- Cambio rapido a 4 rapporti (5 a richiesta, fino a 10.000 giri/min)
- Bloccaggio dell'albero a pedale
- Freno automatico a interruzione di tensione per fermare gli utensili in pochi secondi
- Motore con potenza fino a 7,5 kW (10 HP)

scm

T120K TOUPIE

Solidità e precisione

La T120K ha un cilindro molto robusto (120 mm di diametro) contenuto in una struttura portante collegata direttamente al piano di lavoro; questa soluzione offre la massima rigidità ed elimina ogni possibilità di vibrazioni, per garantire una elevata qualità del lavoro.

Grande sicurezza

Protezioni antinfortunistiche
La T120K è dotata di serie di protezioni atte a garantire la massima sicurezza dell'operatore e rispondenti alle normative dei singoli paesi cui è destinata.

Bloccaggio dell'albero a pedale
Lascia libere le mani e si disinserisce automaticamente per non creare impedimenti all'avviamento, come i sistemi di bloccaggio normali.

Freno automatico per l'arresto rapido degli utensili
Interviene ogni volta che si toglie tensione al motore (spegnimento, interruzione sulla linea ecc.); dopo pochi secondi da quando l'utensile si è fermato il freno si disattiva automaticamente per consentire una facile messa a punto.

Praticità e potenza

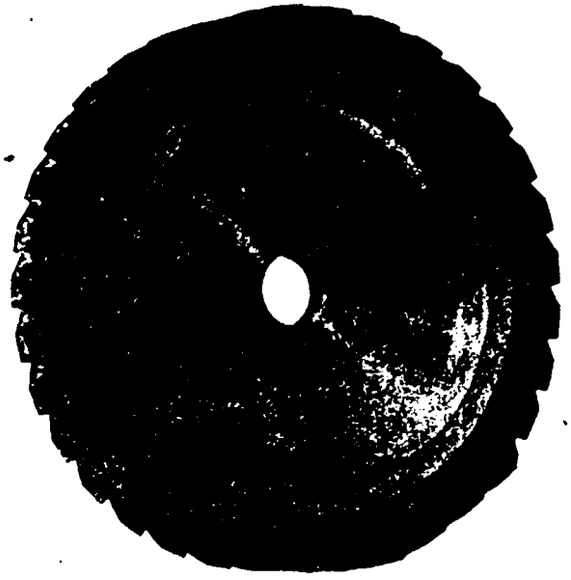
La T120K ha un piano molto lungo (1350 mm), che agevola la lavorazione di pezzi di grandi dimensioni ed è ideale per l'impiego di trascinatori automatici. La guida ha di serie i piani con registrazione micrometrica per una facile e rapida messa a punto. Il cambio a 4 rapporti (5 a richiesta) permette di scegliere velocemente il regime di giri ideale per ogni utensile ed ogni tipo di lavoro e di avere a disposizione sempre tutta la potenza del motore; per lavorazioni particolarmente pesanti la T120K può montare motori con potenza fino a 7,5 kW (10 HP).

scm
SCM International S.p.A.
47037 RIMINI - ITALY - VIA EMILIA 77
Tel. 0541/700111 - Telex 550142

Photo 14: Frame finishing with sanding drum

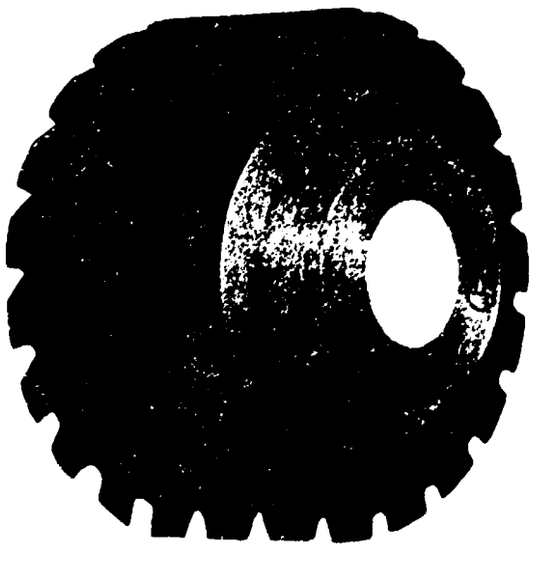
Figure 14A: Machinery for the wood working industry.

RULLO CALIBRATRICE



RUOTA SMERIGLIATRICE

RUOTA AD ESPANSIONE



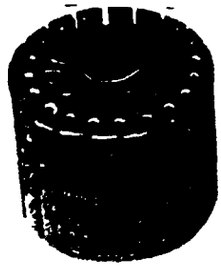
RUOTA PER NASTRO

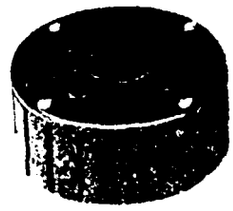
QuickWood aps
Machinery for the wood working industry

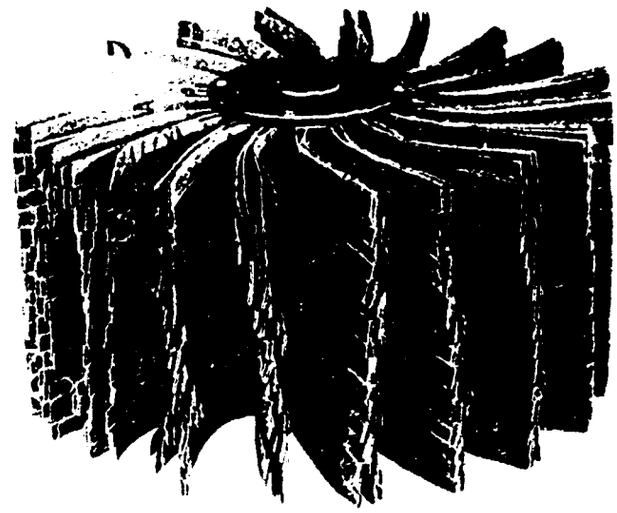
Bakkegaardsvej 35 - DK-3060 Espergaerde Denmark - Telephone + 45 2 23 19 48 - Telex 41142 QWOOD DK

Segmented sanding drum, type B 8

Figure 14B: Machinery for the wood working industry.







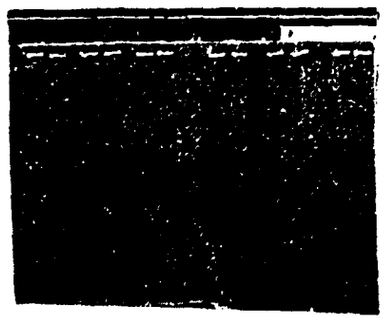
The hub is made of fibre glass, which provides a light weight, good balance, good strength, high safety and infinite durability.

The hubs can be put together from 38 mm to 762 mm with intervals of 38 mm. Operating speed: 1720-3600 RPM.

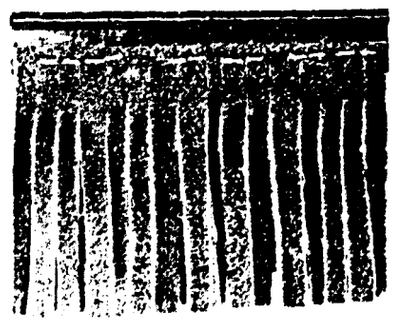
Type:	Hub dia.	With	Arbor hole	Wheel dia.	Segments
B 8:	100 mm	38 mm	30 mm	305 mm	20 pc. 100 x 38 mm

Segments for sanding drum, type B 8

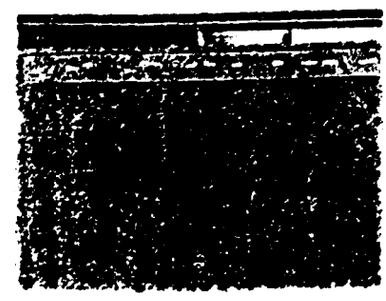
There are 3 types of segments available.



B 83 Level
For planes



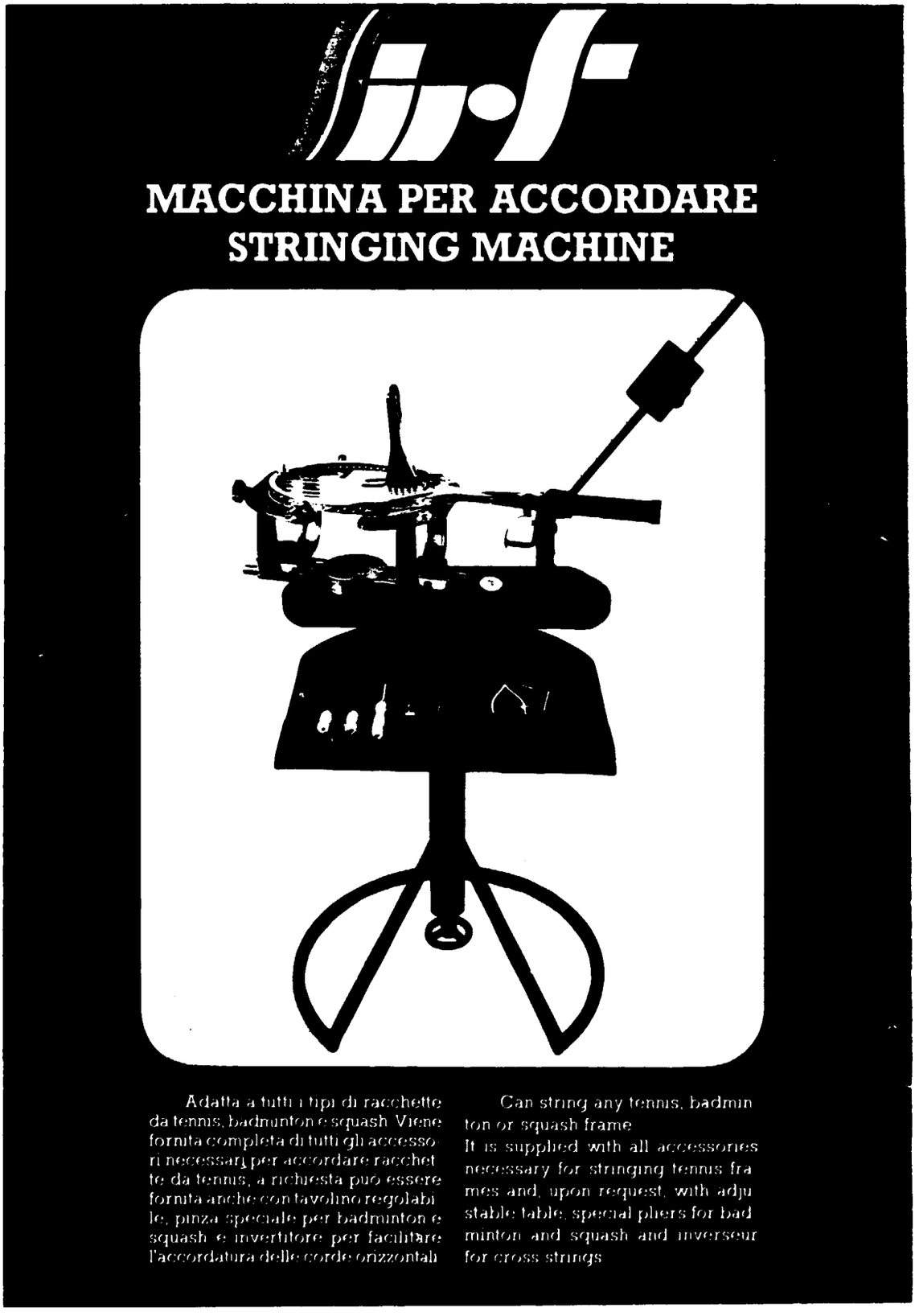
B 84 Segments
For round and
curved items



B 85 Felt
For lacquer-
and metal sanding

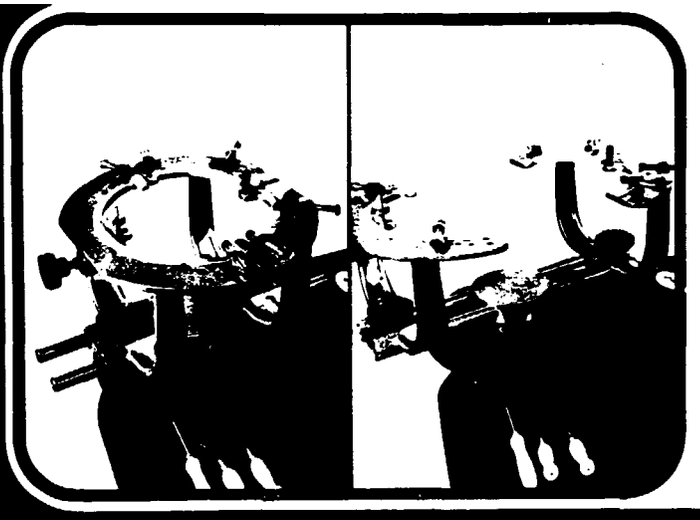
All segments are 100 mm long and 38-762 mm wide with intervals of 38 mm. They are available in grit 36-320.

Figure 15: Recommended stringing machine



borghi e baldo ingg.
spa

A)

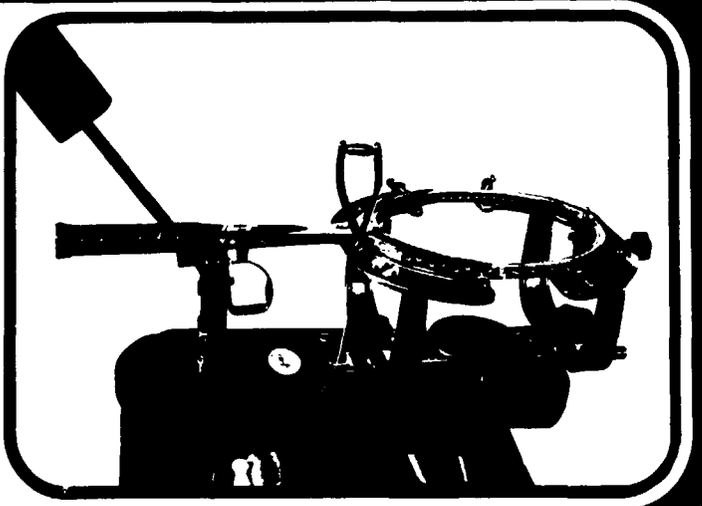


Il piatto della macchina può essere allungato e accorciato in modo da adattarsi a qualsiasi forma della testa di un telaio per tennis e anche per badminton e squash.

The plate of the machine can be adjusted to suit any shape of tennis frame and badminton and squash frames.

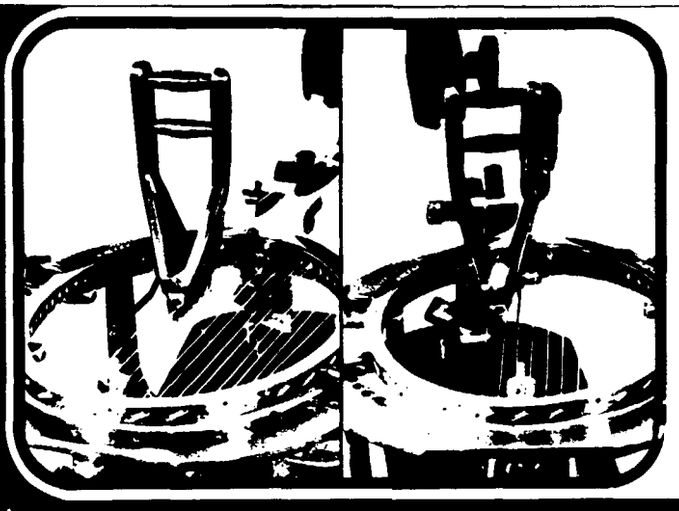
Il telaio da accordare va sistemato sul piatto della macchina con la parte superiore della testa rivolta verso il perno mobile e si fissa facendo scorrere il perno mediante l'apposita vite ed inserendo i sei morsetti nei fori del piatto. In tal modo la testa della racchetta non può deformarsi durante l'accordatura. Si inizia l'accordatura infilando le due corde centrali verticali e bloccando una di esse con la pinzetta a molla. Lasciando impegnata la pinzetta a molla, si procede al montaggio delle corde verticali con il procedimento seguente.

The frame must be placed on the plate with the top of the head towards the movable pin and is fixed in position by means of the six side screws placed in the appropriate holes in the plate. The head of the frame cannot in this way become deformed during the stringing operations. The stringing is begun by threading the two central vertical strings and fixing one of these by means of the small plier. The vertical strings of one side of the frame are then subsequently pulled.



Si regola la tensione fissando il contrappeso in modo che la parte inferiore di questo risponda all'indicazione della tensione desiderata in Kg., si avvolge poi la corda un paio di volte intorno al perno e la si fa passare tra le ganasce zigrinate. Per sbloccare e abbassare il braccio si sposta la leva a bilanciere e si fa abbassare accompagnandolo con la mano a raggiungere la posizione di equilibrio orizzontale.

The tension is regulated by fixing the weight so that its lower part corresponds with the arm to the indication of the desired tension. The string is wound a couple of times round the drum and then passed through the two plate jaws which automatically close when the lever is lowered. This is done by moving the oscillating arm and letting the tensioning arm rise slowly until it reaches the horizontal position.

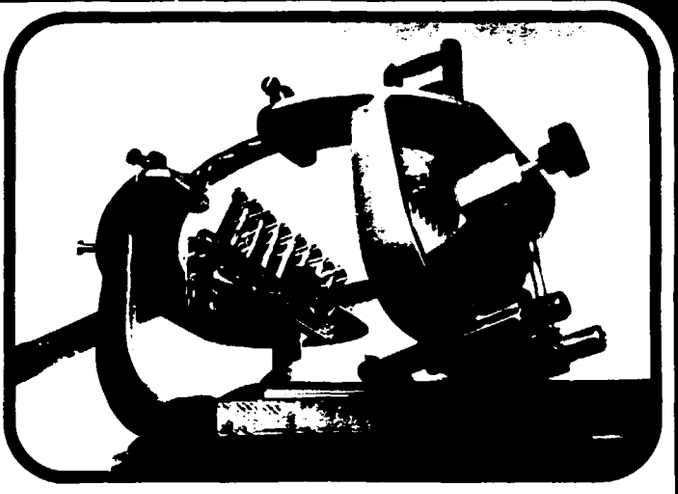


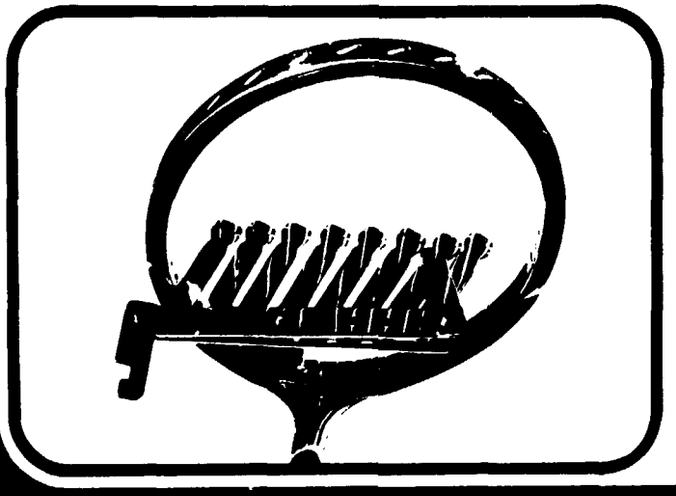
La corda appena tirata viene bloccata con pinza grande che viene inserita fra due corde successive legando la corda appena tirata con quella precendente, già in tensione. Riportando il braccio in posizione verticale, la corda viene automaticamente liberata

The tensioned string is fixed by means of the large plier that is inserted between two parallel strings, blocking the string just pulled to the preceding one. The string is then automatically released by moving the arm back into the vertical position

INVERTITORE

L'invertitore è uno strumento studiato appositamente per facilitare il montaggio delle corde orizzontali e per evitarne il dannoso sfregamento contro le verticali. Esso viene applicato alla racchetta appena terminata l'accordatura delle verticali; i denti vengono infilati fra le corde divaricandole leggermente con le dita. Prima di infilare una corda orizzontale, si spinge *l'invertitore da un lato e lo si fissa in tale posizione agganciando sul perno del penultimo dente uno dei due ganci laterali. In tal modo* la corda orizzontale può essere facilmente infilata tra le verticali divaricate e tese senza sfregamenti. Per togliere l'invertitore dalla racchetta e per consentirne l'uso quando si tendono le ultime tre o quattro corde orizzontali, si allenta la vite centrale; in tal modo la piastrina con l'incavo viene lasciata libera di scorrere orizzontalmente permettendo di sfilare dai loro perni i denti più esterni.





INVERSEUR

The inverseur is an accessory which facilitates the stringing of the horizontal strings and eliminates the friction produced by the rubbing of the horizontal strings over the verticals. The inverseur is applied to the racket immediately after the vertical strings have been pulled, the single teeth being inserted between the strings. Before threading a horizontal string the *inverseur is pushed to one side and is fixed in* this position by means of the hook. The strings are in this way alternately lowered and pushed up thus enabling the string to be pulled through easily. The inverseur can be taken off the frame and also used for the lowest horizontal strings by detaching the last teeth on both sides. This is done by loosening the central screw and moving the sliding plate to one and the other side

CARATTERISTICHE TECNICHE
TECHNICAL CHARACTERISTICS

Peso macchina (senza tavolino): Weight of machine (without table):	Kg. 17.8	Peso tavolino: Weight of table:	Kg. 12.7
Altezza: Height:	cm. 63	Altezza: Height:	cm. 85
Larghezza: Width:	cm. 31	Larghezza: Width:	cm. 56
Lunghezza: Length:	cm. 63	Lunghezza: Length:	cm. 58

ACCESSORI IN DOTAZIONE:
1 pinza grande, 1 pinza piccola, 6 morsetti, 1 punteruolo diritto, 1 punteruolo curvo, 2 punte di ricambio, 1 raddrizzacorde, 1 chiave esagonale.

ACCESSORIES INCLUDED WITH THE MACHINE:
1 large plier, 1 small plier, 6 side screws, 1 straight awl, 1 curved awl, 2 spare points, 1 string straightener, 1 hexagonal key.

ACCESSORI OPZIONALI: pinza per badminton e squash; invertitore.

OPTIONAL ACCESSORIES: plier for badminton and squash; inverseur.

Tensioni consigliate per l'accordatura

TIPO CORDA	CALIBRO CORDA	TENSIONE NORMALE kg.	TENSIONE FORTE kg.	TENSIONE COMPETIZIONE kg.
BUDELLO VS di B M W	8-8')	20	21	22
BUDELLO VS di B M W	9-9')	21	22	23
BUDELLO AFV di B M W	8-8')	19	20	21
BUDELLO AFV di B M W	9-9')	20	21	22
BUDELLO EX di B M W	8-8')	18	19	20
BUDELLO EX di B M W	9-9')	19	20	21
BUDELLO CHAMPION di B M W		19	20	
SUPERLASTEK di DUNLOP		20	21	
DUROLASTEK di DUNLOP		19	20	
HY O SHEEP		18	19	
OG O SHEEP		17	18	
V COURT W		18	19	
LEOINA HORN		18	19	
GRAFITE LEOINA 66		18	19	
HORN SHEEP SSS		17	18	
SHEEP GUN		16	17	
BLUE STAR SUPER		20	21	
THREELASTIC MAXIMA		19	20	
THREELASTIC SUPER		18	19	
THREELASTIC		17	18	
BOBYLON di B M W		17	18	
MULTIFIL di B M W		16	17	

fin-s
Factory: Borghi e Baldo ... Via Roberto, 74 ... Codice Fiscale 00080460208 2 ... Tel. (0184) 26.14.74
Telex ... 36/7 MAXIBAT

V.6 Machine tools maintenance

During the visit, self-constructed machine tools of extremely rough manufacture were seen, all sharpened by hand.

Proper machine tools maintenance particularly as regards the sharpness of the knives and blades of the different machine tools is essential to obtain good product quality. This aspect, which cannot be stressed enough, can be dealt with at two different levels.

The first level is that of implementation of a workshop with proper sharpening tools, which are available on the market in a great variety and for many applications and are not necessarily expensive.

Even though the worker may be skilled, it is absolutely impossible to sharpen a tool by hand with such a precision that all its cutters work equally well.

The problem becomes still more serious when it concerns the use of new materials, such as glass fibre, carbon fibre, kevlar and boron.

The hardness of these materials and their abrasive capacity put any conventional tool out of use in a short space of time.

While for wood high speed steel (HSS) tools give a good result, with these materials the use of hard metal (HM) cutters becomes unavoidable.

The sharpening of the tools, in this case, requires the most sophisticated machines fitted with diamond grinding wheels.

In the field of sharpening machines a machine for the sharpening of the planer cutters, one for the hard metal circular saws and one for the band saw blades and for the steel circular saw blades are therefore necessary.

For the planer cutters there exist small hand units in commerce, while for the circular and band saws it is quite easy to find combined machines which can do the various jobs (see figures 16A to D).

Logically, these machines must have a reasonable degree of precision because the good condition of the tools is essential for obtaining a good degree of the product.

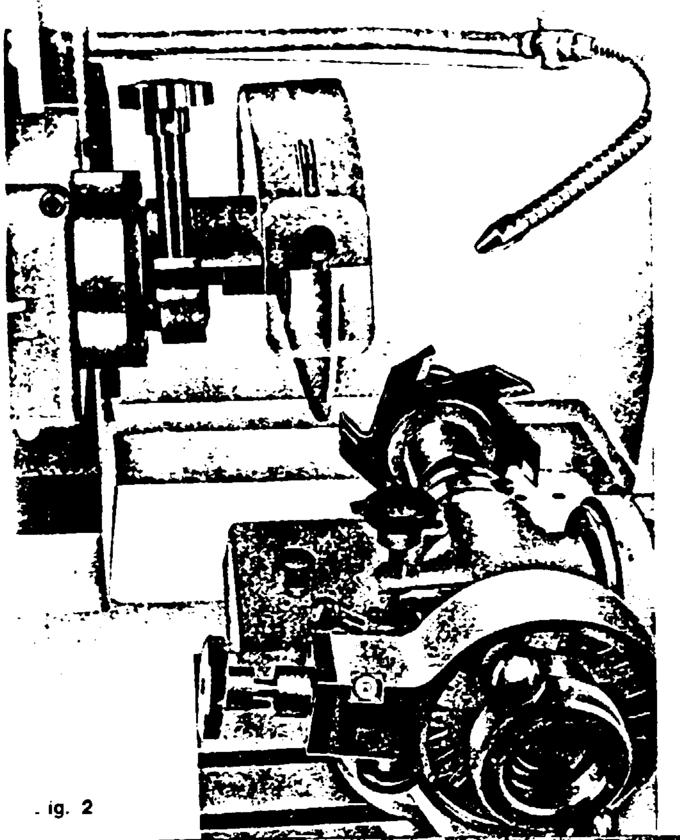


Fig. 2

Posizione di lavoro per l'affilatura di frese a profilo costante. Frese per incastri, frese per tenoni ecc.
Per questa operazione non occorre nessun accessorio speciale.

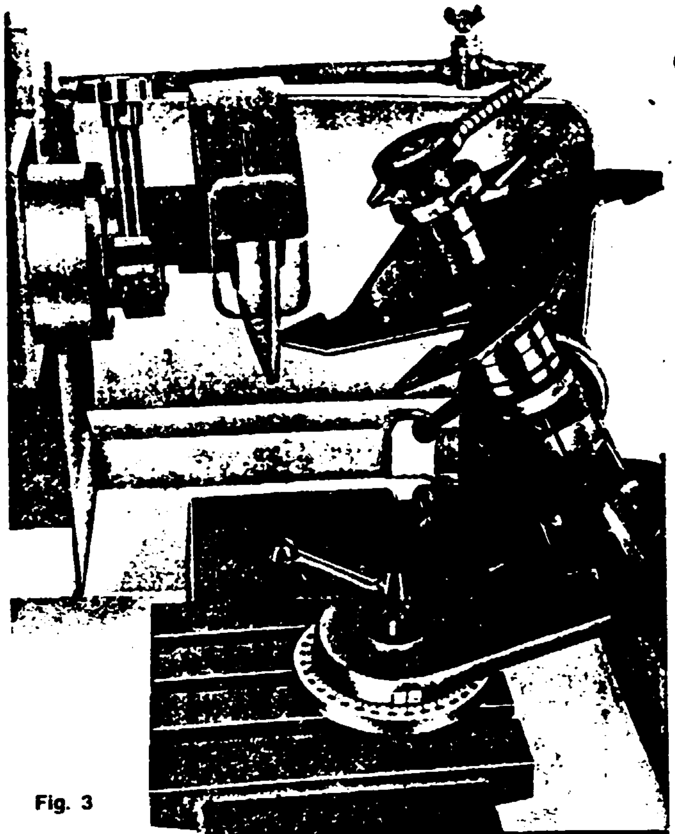


Fig. 3

Posizione di ...
fresa per ...
Per questa ...
ciale.

Figure 16A: Universal sharpening tool.

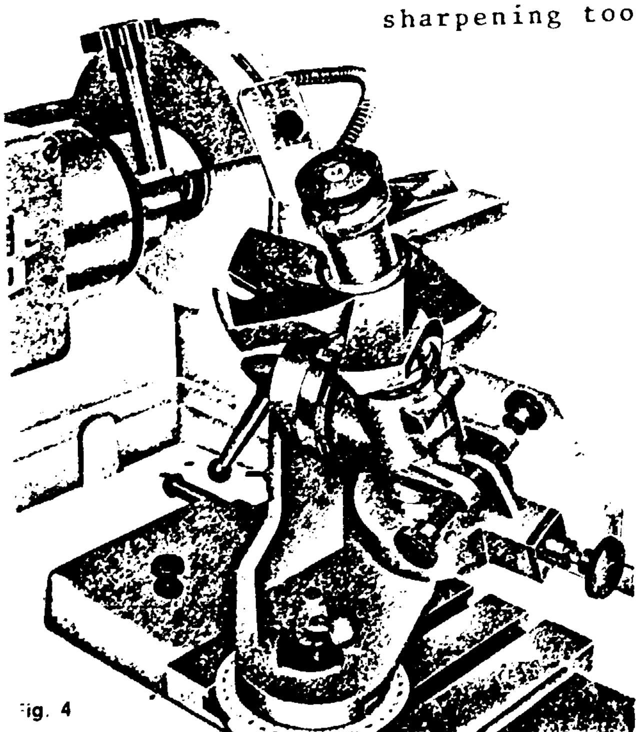


Fig. 4

Posizione di lavoro per l'affilatura di una fresa per piattabanda. Affilatura nella gola del dente.
Per questa operazione non occorre nessun accessorio speciale.

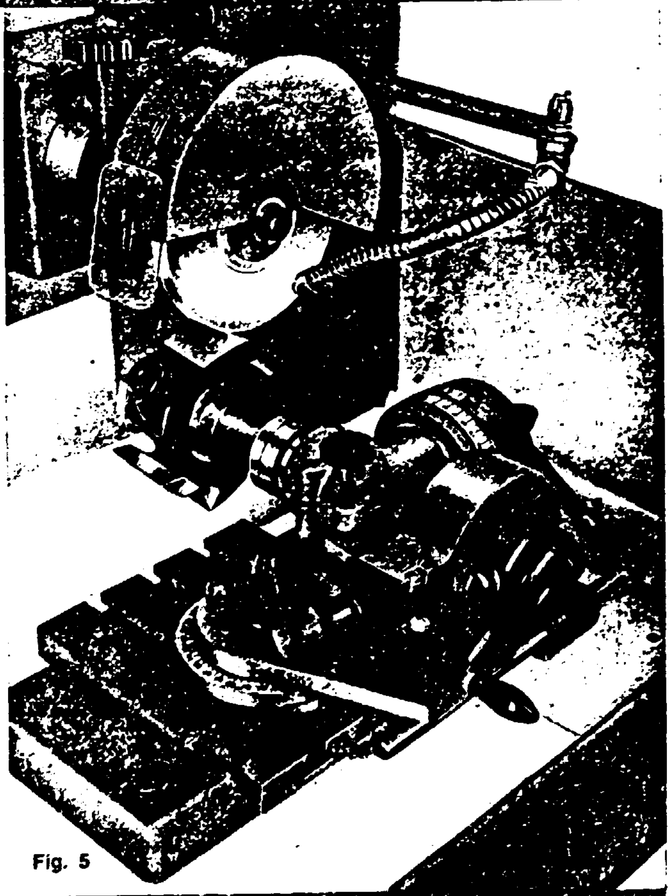


Fig. 5

Posizione di ...
Vale per frese ...
accoppia...
differenzia...
Serve ...
denti nelle ...
Per questa opera...

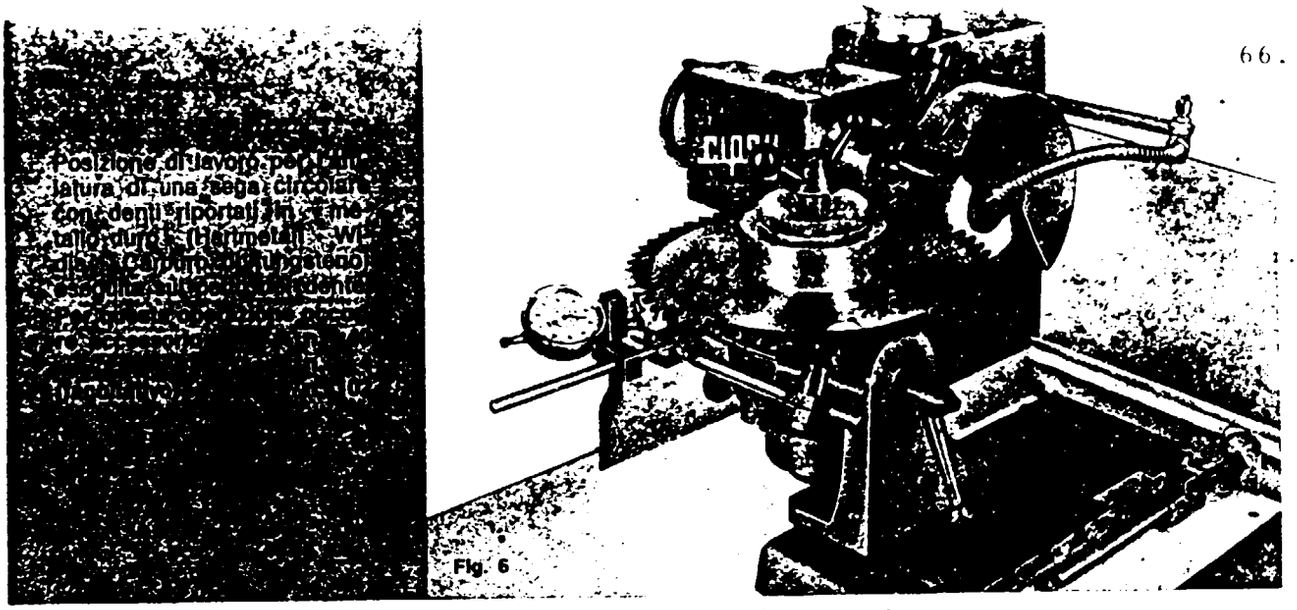
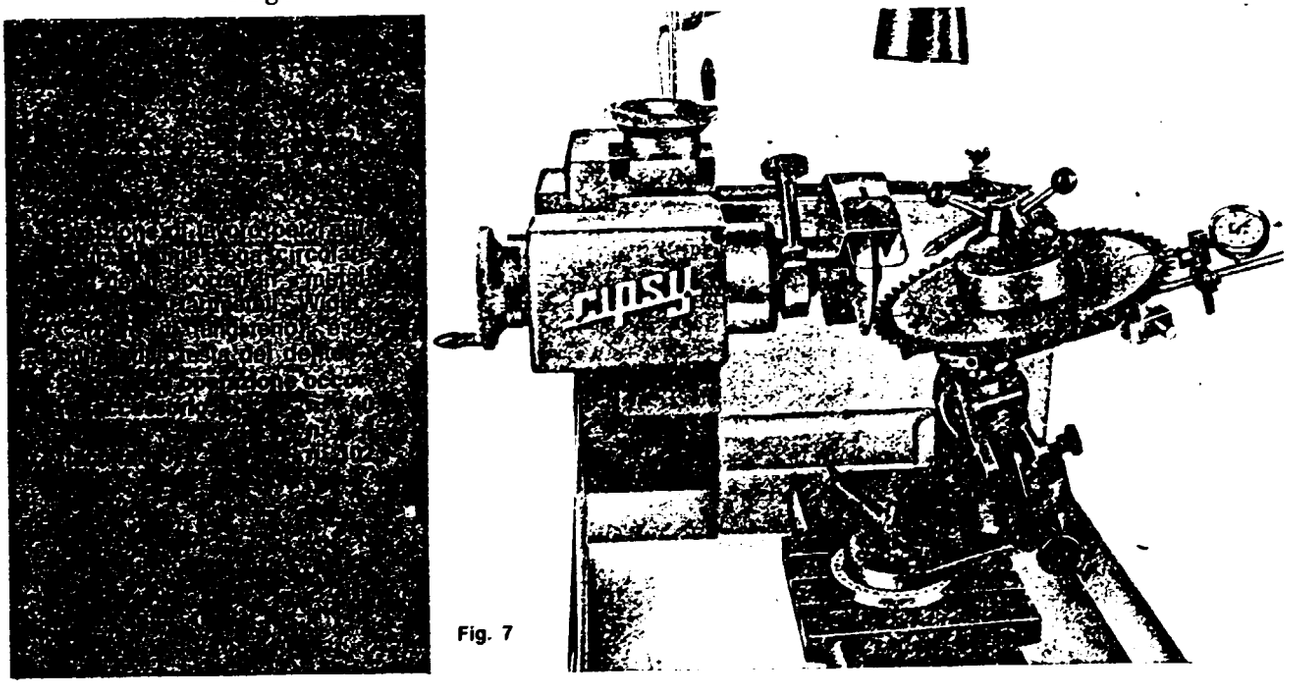
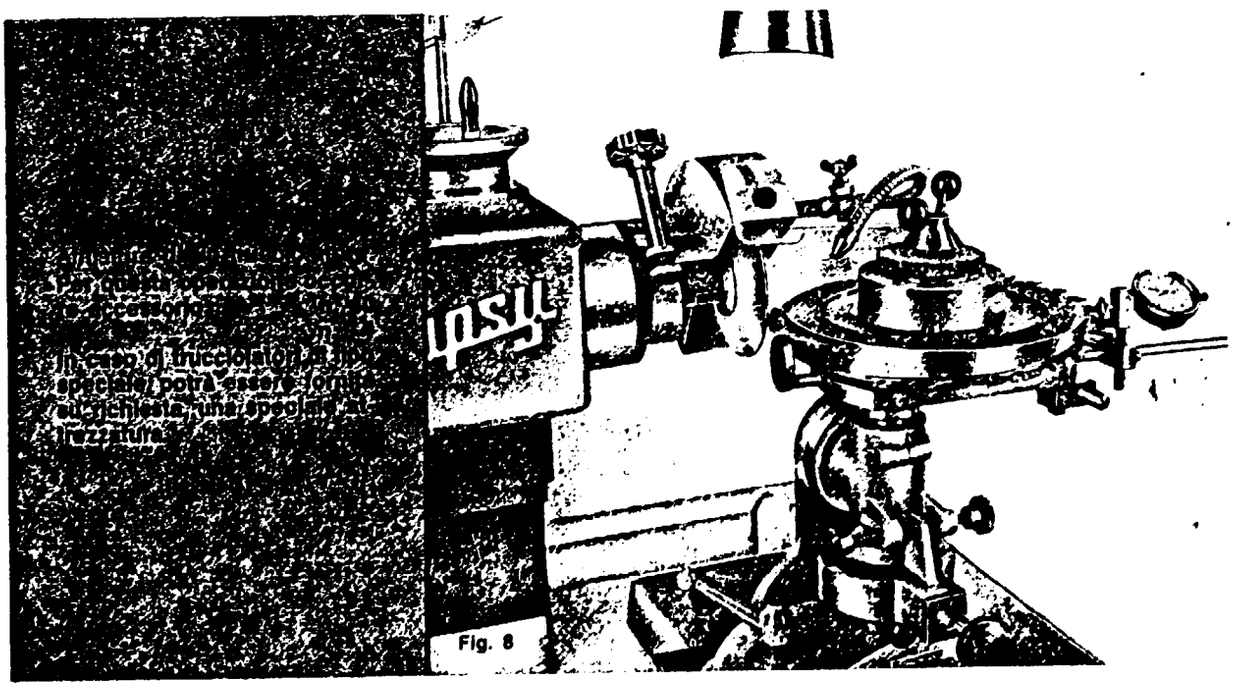
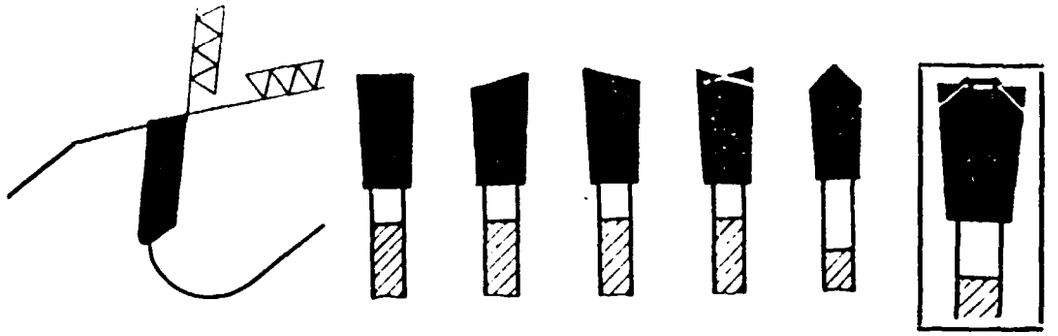


Figure 16B: Universal sharpening tools.







CARATTERISTICHE SEGHE CIRCOLARI CON RIPORTO HM AFFILABILI SU H2A

Diametro	da mm. 125 a mm. 450
Spessore	fino a mm. 6
Passo denti	fino a mm. 100
Angoli di spoglia anteriore (petto)	da —5° a 30°
Angoli di spoglia posteriore (dorso)	da 0° a 30°
Angolo di inclinazione petto	da 0° a 5°
Angolo di inclinazione dorso	da 0° a 45°

SPECIFICATIONS OF CIRCULAR SAWS WITH CARBIDE TEETH TO GRIND ON H2A

Diameter	from 125 mm. to 450 mm.
Thickness	up to 6 mm.
Pitch	up to 100 mm.
Front rake (face)	from —5° to 30°
Back rake (back)	from 0° to 30°
Angle of inclination on the face	from 0° to 5°
Angle of inclination on the back	from 0° to 45°

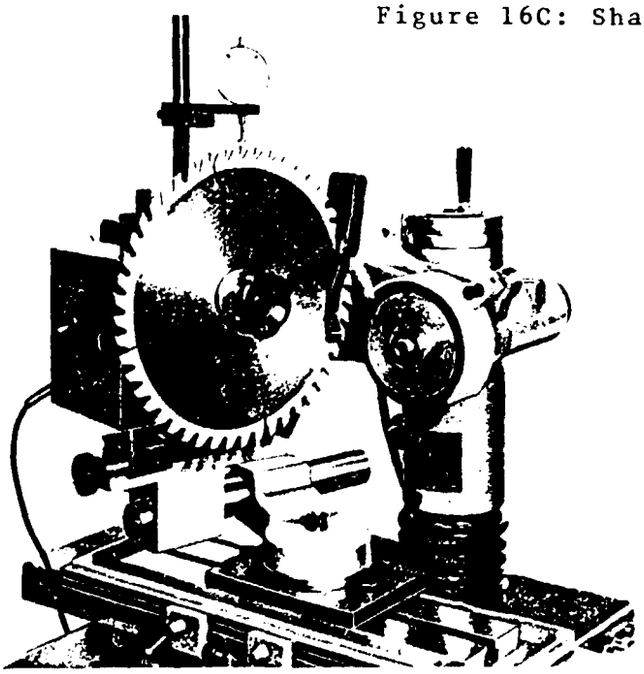
CARACTERISTIQUES LAMES DE SCIES CIRCULAIRES EN CARBURE A AFFUTER SUR H2A

Diamètre	de mm. 125 à mm. 450
Epaisseur	jusqu'à mm. 6
Pas du dent	jusqu'à mm. 100
Angle d'attaque	de —5° à 30°
Angle de dépouille	de 0° à 30°
Angle d'inclinaisons sur la face	de 0° à 5°
Angle d'inclinaisons sur le dos	de 0° à 45°

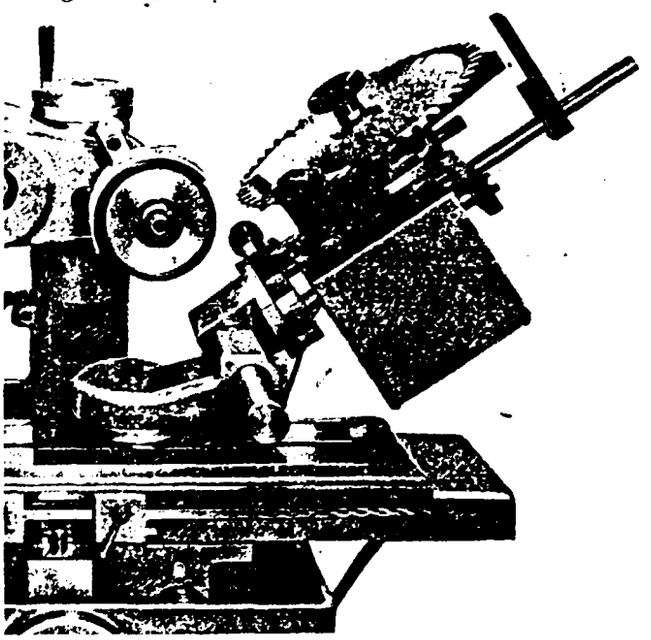
CHARAKTERISTIKS HARTMETALL KREISSAEGENBLAETTER ZU SCHLEIFEN AUF H2A

Durchmesser	von mm. 125 bis mm. 450
Dicke	bis mm. 6
Zahnteilung	bis mm. 100
Spanwinkel	von —5° bis 30°
Rückenfreiwinkel	von 0° bis 30°
Schrägungswinkel (Brust)	von 0° bis 5°
Schrägungswinkel (Rücken)	von 0° bis 45°

Figure 16C: Sharpening tool.



Affilatura sul dorso
Affûtage sur le dos
Grinding on the back
Rückenschliff



Affilatura sul petto
Affûtage sur la face
Grinding on the face
Brustschliff

L'apparecchio H2A può essere utilizzato su tutti i modelli delle nostre affilatrici universali (U10N - F36M - AF46) nonchè su qualsiasi altro tipo di affilatrici universali con capacità analoghe.

L'apparecchio H2A è dotato di tutti gli automatismi di movimento e pertanto i movimenti ortogonali dell'affilatrice su cui è montato vengono utilizzati solo nella fase di messa in posizione della lama rispetto alla mola.

L'intervento dell'operatore è richiesto solo per la predetta fase di allineamento lama-mola: il movimento di passaggio e affilatura dei singoli denti è del tutto automatico.

L'appareil H2A peut être utilisé sur tous les modèles de nos affûteuses universelles (U10N - F36M - AF46) ainsi que sur n'importe quel autre type de affûteuse universelle avec analogue capacité.

L'appareil H2A est doté de tous les automatismes de mouvement et donc les mouvements ortogonaux de l'affûteuse sur la quelle il est monté, sont utilisés seulement dans la phase de mise en position de la lame en rapport à la meule.

La présence de l'opérateur est demandée seulement pour la susdite phase d'alignement lame-meule: le mouvement de passage et affutage de chaque dent est completement automatique.

The device H2A can be utilized on all the models of our universal grinding machines (U10N - F36M - AF46) as well as on any other type of universal grinding machines with similar capacities.

The device H2A is endowed of all the automatisms of movement and therefore the orthogonal movements of the grinding machine on which it is set up, are utilized only in the phase of setup of the blade respect the wheel.

The presence of the operator is requested only for the above mentioned phase of alignment of blade-wheel: the movement of passage and grinding of the single teeth is completely automatic.

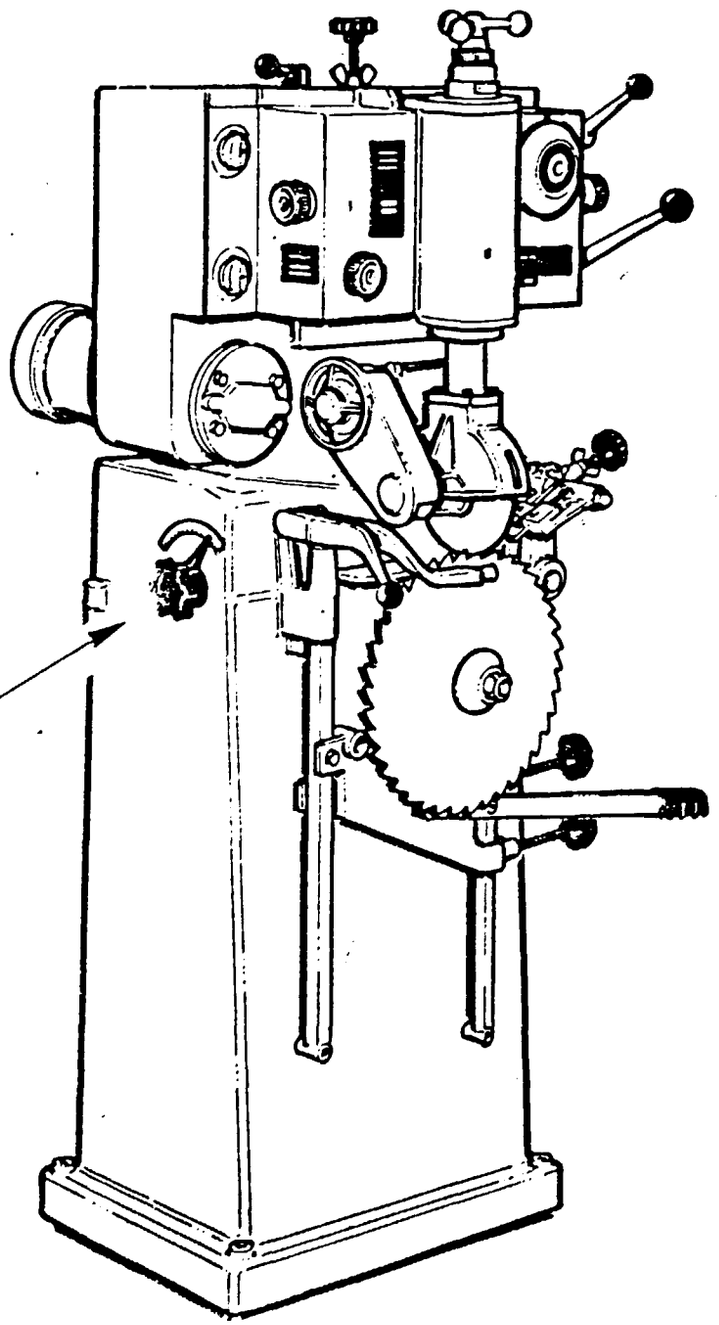
Das Gerät H2A kann auf den ganzen Modellen unseren Universal Schleifmaschinen (U10N - F36M - AF46) und auch auf jeder anderen Typ von Universal Schleifmaschinen mit ähnliche Fähigkeit gebraucht sein.

Das Gerät H2A hat die ganzen Automatiken von Bewegung und deshalb die orthogonale Bewegungen der Schleifmaschine auf dem er aufgestellt ist, sind nur auf dem Phase von Lagersetzung des Kreissägenblätts bezüglich der Schleifscheibe gebraucht.

Die Anwesenheit des Bedienungsman ist nur für die obengenannte phase von Anreihung Kreissägeblatt-Schleifscheibe gefragt.

Der Durchgang-Bewegung und Schleifung den einzeln Zähne ist gänzlich automatisch.

Figure 16D: Sharpening tool for stainless steel band and circular saw blades.



ERNATO, E' IMPORTANTE CHE
A MOLA (FIG. 2).

TO ALL'ASSE DELLA MOLA
MO IL DENTE ESTERNO PIU'
1).

DELLA MOLA, LA LAMA E'
DENTE ESTERNO RISULTERA'
(FIG. 3)

SI OPERA SUL VOLANTINO
POSTERA' COME INDICATO
NDO LA MANOPOLA VERSO
ERSO B (VERSO L'ESTERNO);
NISTRA LA LAMA SI SPO-
O MACCHINA).

During his mission, the writer invited the various manufacturers to cooperate together and to organize a sharpening workshop where they could all resolve their problems, but the proposal did not generally meet with favour, and more than one manufacturer excluded to be able to come to an agreement of this kind with his competitors.

Without doubt this solution would be the most rational, both for that which concerns the costs, and for the fact that the personnel entrusted with this operation would very quickly be able to refine their ability having a substantial amount of work to carry out.

One can understand, however, how manufacturers do not want to reveal their secrets for that which concerns the machine tools used, from which sometimes it is possible to deduce some particular type of processing used.

The second level at which this problem can be addressed is that of the acquisition of machine tools which can be easily maintained or do not require sharpening of the knives and blades.

We are referring to tools of modern type, in which the sharpening becomes possible even with rather limited means, or the use of tools with disposable tips, which is with blades which, when worn, are not resharpened but replaced.

A very large number of firms produce such excellent tools with inserts, which in the lack of a good sharpening workshop would be the ideal solution.

The tool with inserts has housings which automatically position the piece to be worked relative to the blade with various solutions.

The tool is prepared very quickly and the dimensions of the product are always strictly equal, so that their do not exist problems of constant adjustments to be made.

In the case of the use of copying machines, the matter becomes still more interesting, because the adjustment of the machine is immediate.

The obvious problem of this solution is the cost of replacing the used blades, which is comparatively high particularly when considering the low cost of the Indian labour which tends to favour the implementation of a proper workshop.

V.7 Mechanical testing equipment

A piece of equipment which should not be lacking in a rackets factory, is that relative to the testing of balance, torsion, flexibility and resistance of the frame.

The measurement of the center of gravity (on an average required at 31.5/32 cm.), does not present problems, as it is enough to balance the racket on a sharp edge and read on a measure the distance of this point from the bottom of the grip.

For the flexibility test, in which the racket behaves like a beam fixed at one end and loaded at the other, one needs to firmly fix the grip to a support.

Then the reading instrument, which is used is zeroed on this position (see photo 15).

A weight is fixed at the top of the oval (about 8 kg.) and the flex values reached by the various frames are read.

This is a comparative test, which should always be made with the same weight placed in the same position on a certain number of various frames in such a way as to be able to recognize the average value characteristic of the Indian manufacturers, and thus have a reference point for the production.

The torsion test is done in the same way, but moving the weight on the furthest point from the centre line of the frame, and also here taking various measurements.

The resistance test is the one which poses the more particular requirements. A machine is necessary which acts on the racket applying a determined pressure, and then annulling it alternatively for a certain number of cycles (at S.I.R.T. about 20,000 cycles, about 63 kg pressure applied, values also utilized by Dunlop, see photo 16).

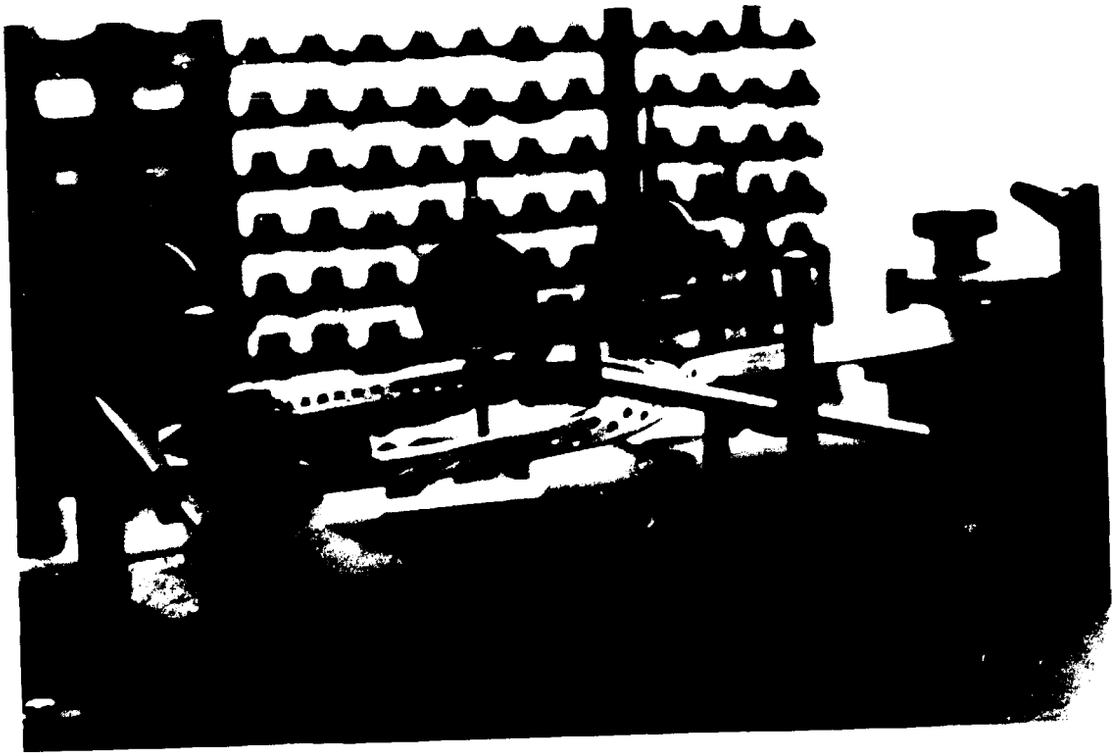
It is important that the piston travel is not fixed, but that the reversal of the piston movement takes place when the force applied is equal to the counterforce given by the frame.

Annex 1, extracted from a UNIDO document, gives further information which may be useful as a reference for Indian manufacturers.

V.8 The place of work

The place of work does not seem to be taken into consideration in India,where with exception of the few jobs done at the machines, all the other phases are carried

Photo 15: Flexibility test



83.08.31

AD 8 4

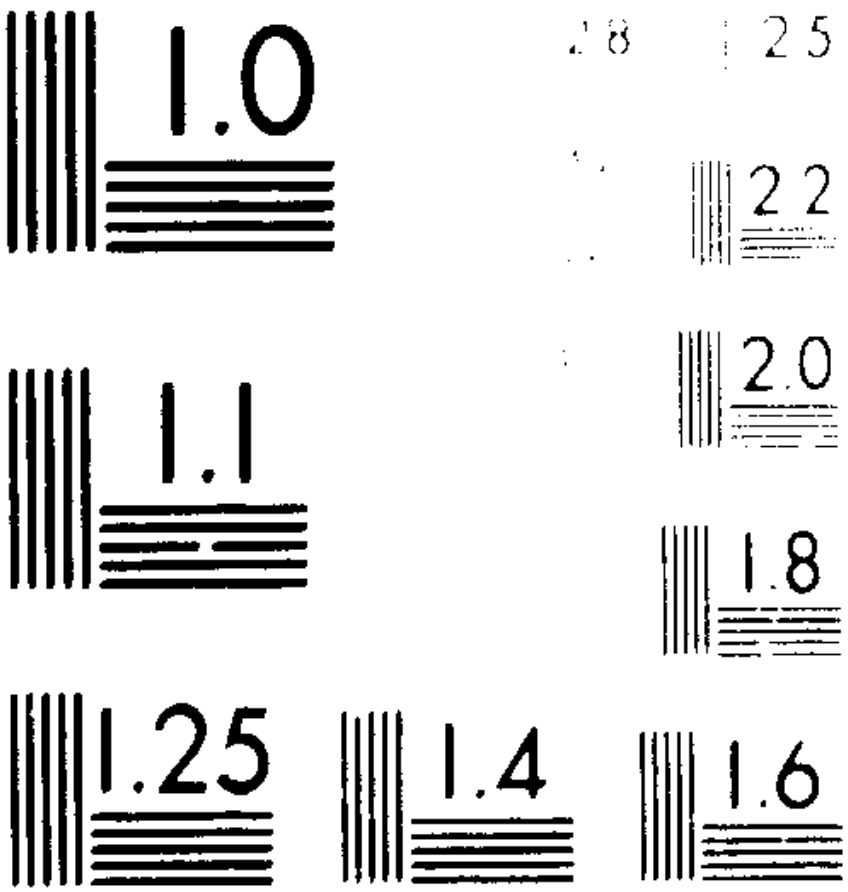
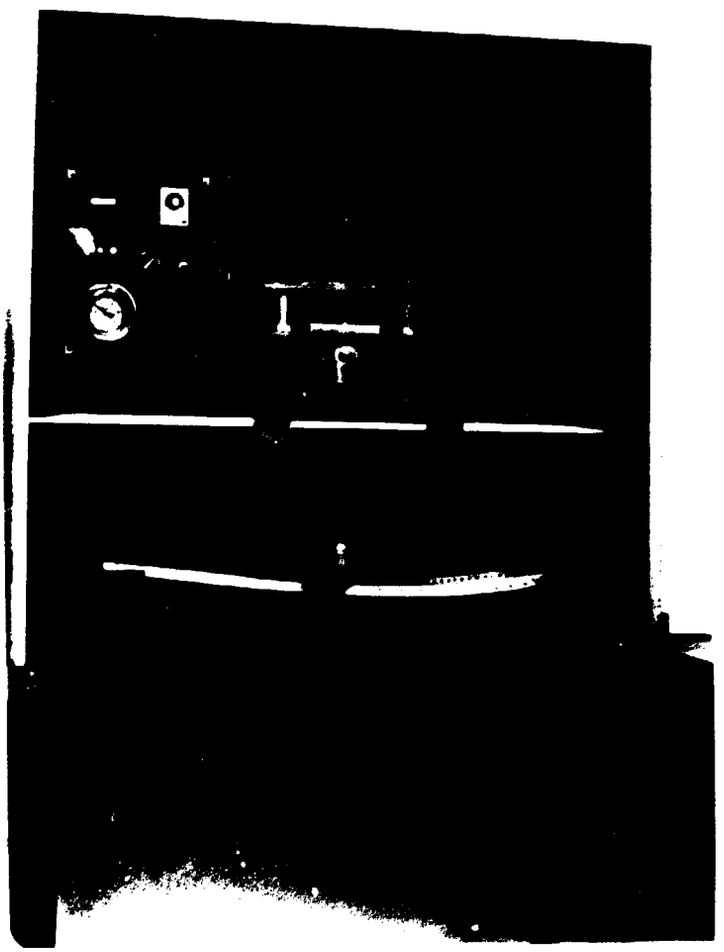

1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

Photo 16: Indurance test



out by the worker seated or squatting on the ground, with the necessity of holding the frame in one hand and with his feet, therefore using only one hand for holding the tool.

It would seem to be much more rational at least to give the operator a place of work with a bench with a vice in which to fix the racket, working standing up or sitting down according to the necessity, in such a way as to be able to use both hands for holding the tool and therefore to be able to operate with greater precision as well as less fatigue (see photo 17).

In view of the desire to expand the current production to the utilization of carbon fibres and similar materials, which are extremely hard and abrasive and require special tools for their working, as stated earlier, it must be stressed that proper suction fans and mouth covers must be foreseen to protect the operators from inhalation of the fine dust produced during milling.

V.9 Cooperation

In addition to the implementation of a common workshop, as stated earlier, a cooperation agreement has been suggested also for the procurement and eventual importation of machinery and tools, as well as raw materials.

The small dimensions of the factories, and the great distances to be covered cause the procurement costs to rise considerably, so that substantial savings could be obtained

if manufacturers joined forces to supply themselves, especially from foreign countries.
The expenses could be divided according to systems to be studied.

However, also this solution has not roused great enthusiasm, perhaps because nobody wants to reveal their sources of supply, for fear of being damaged by the others.

In any case these solutions should be tried out at once, especially for the materials to be imported in fairly consistent quantities, such as timber, for which the transport must have a considerable effect on the final cost.

Photo 17: Simple operations carried out at the bench

VI Investment costs

As has been stated earlier, the discontinuous nature of the racket manufacturing processes makes it possible to consider small investments, replacing or acquiring one machine at a time. Rather than proposing particular investments which may or not be accessible to the single manufacturers it seems therefore logical, having given precise guidelines in the previous paragraphs as to which investments should be considered as having priority in order to improve product quality, to simply give an indication of the costs for the purchase of these machines.

These costs as compared to the financial resources of the single manufacturers may prompt these to seek channels for financing or ways to set up cooperation agreements with each other, as was suggested during the visit.

Table 2 lists indicative prices for the machine tools mentioned in the text.

Table 2: Indicative prices for the machines discussed in the report

Machine tool	Prices	Price USD
Band saw Centauro 800		1450
" " " 900		1875
Pusher Variomatic		715
Thickness planer S50N		3335
Circular saw SI/13		1400
" " SI/15F		2750
Router T 120 K		2330
Sanding machine C 90 BASE		7857
Surfacer F4L		2857
SIRT stringing machine		330
Mechanical testing machines		By special order only

The above prices are those current in Italy.

VII Conclusions

VII.1 Machinery

All the industries visited have shown serious deficiencies in the machinery field. From that which has been seen, it is not easy to find modern machines in India, and above all special machines.

Some manufacturers manage to satisfy their needs by the use of craftsmen, but the result is not always very brilliant. The workshops lack good machines, and only have electric drills, lathes and welding machines, which is very little for trying to self-construct machines. The tools available are very scarce and of a decidedly inferior quality and out-of-date.

In any case, it is not necessary to purchase special machines specillay built for particular jobs. As has been demonstrated, a lot depends on the experience and imagination of the manufacturers.
With a small contriviances and unexpensive apparatus, an infinity of different jobs can be carried out on normal machines with excellent results.

Therefore, the best thing is to purchase standard machines which make it possible to carry out any work, and generally are easy to maintain, which is a very important thing in the areas visited, where the general impression is that there does not exist the possibility to have an assistance consistent with the necessities of working on an industrial scale.

In fact, the notions of the mechanics do not seem to be very developed, because the personnel is mostly self-taught and therefore unable to develop new projects and carry them out.

There are machines to be considered absolutely necessary, and others which are useful for reasons of expediency, economy and - above all - the quality of the product.

Nobody can do without a band saw, with which, at present, in India everything is done or nearly, and which have been seen in truly disastrous condition and without protections for the operator.

Other important machines are the planers for the preparation of the planks to be cut by the circular saw, the circular saw itself and the router for all the finishing works. The acquisition of a good stringing machine should also be considered.

VII.2 Tools maintenance

For all the tools utilized for the working of wood or other materials, proper maintenance of the blades and knives is essential. In all factories we have seen the tools being sharpened by hand, but this is incompatible with the standards of production desired.

VII.3 Cooperation

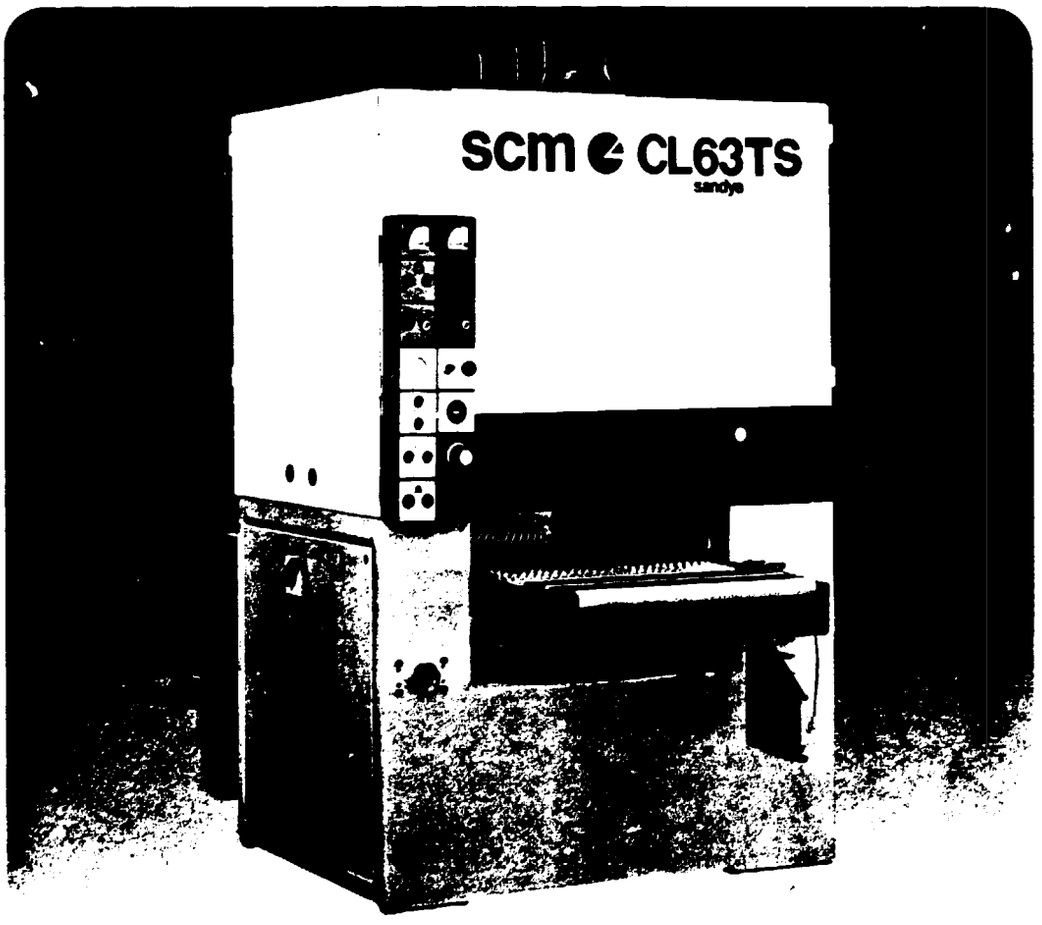
Cooperation between manufacturers for the acquisition of raw materials, machine tools and maintenance tools seems an important factor in the framework of achieving an impact on the Indian product quality.

VII.4 Technical assistance

Technical assistance from foreign manufacturers may be sought with respect to selecting the right machinery, obtaining product and price information and personnel training. Italian manufacturers are willing to cooperate further in this respect.

Figure 17: Planer for frame finishing

CL63TS
CALIBRATRICE-LEVIGATRICE



La CL63TS è una calibratrice levigatrice studiata appositamente per la lavorazione di legni massicci e corti.
Risulta quindi particolarmente adatta nella calibratura - levigatura di elementi per sedie o di particolari per mobili.

borghi e baldo ingg.
spa

A)

Caratteristiche tecniche

Larghezza utile di lavoro	630 mm
Altezza massima di lavoro	160 mm
Dimensioni dei nastri abrasivi	2150 - 640 mm
Velocità nastro gruppo calibratore	22 m/sec
Velocità nastro gruppo levigatore	20 m/sec
Motore gruppo calibratore	14.7 kW (20 HP)
Motore gruppo levigatore	11 kW (15 HP)
Motore sollevamento piano	0.4 kW (0.5 HP)
Motore avanzamento	1.1 kW (1.5 HP)
Velocità avanzamento con variatore continuo	da 4.5 a 23 m/min
Pressione di esercizio	6 Atm
Consumo aria compressa	200 nl/min
Consumo di aria aspirata per cappa	1000 m³/h
Peso netto	2080 Kg
Dimensioni	1270 - 2050 - 1310 mm - 4.38 m³
Peso lordo in cassa per via mare	2380 Kg
Ingombro cassa per via mare	1860 - 1610 - 2270 mm - 6.8 m³

A richiesta

Motore gruppo calibratore fino a 25.8 kW (35 HP)
Motore gruppo levigatore fino a 18.5 kW (25 HP)
Soffiatori oscillanti per pulizia nastri 1° e 2° gruppo (consumo per ogni gruppo 380 nl/min)
Gruppo a due velocità (calibratore, levigatore)
Piano a depressione
Rullo pulitore
Rullo satinatore (SCOTCH BRITE)

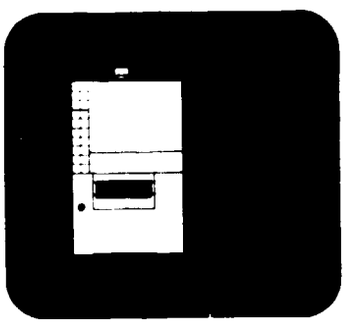
Il rullo calibratore è ricoperto in gomma con scanalature elicoidali per una maggiore durata dei nastri abrasivi.

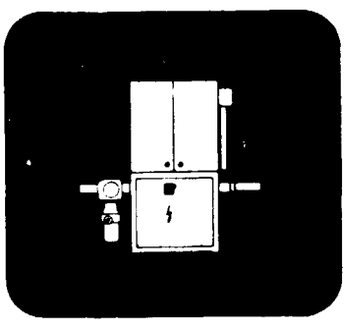
Il centraggio del tappeto è automatico e non necessita di alcun controllo da parte dell'operatore.

I soffiatori ad ugelli regolabili in velocità e traslazione, vengono ad operare nella zona di maggiore apertura (parte superiore del gruppo).

L'avviamento dei motori principali a stella-triangolo è automatico.

La regolazione del piano (in altezza) è elettrica per misure veloci ed approssimative, mentre per regolazioni decimali si agisce su un volantino.





Le illustrazioni e i dati contenuti nel seguente opuscolo non sono impegnativi. La SCM si riserva il diritto di apportare modifiche ove esigenze di carattere tecnico, commerciale ed organizzativo fermo restando le caratteristiche principali delle macchine descritte, lo richiedano. Le macchine possono essere fornite con accessori e attrezzature diverse in conformità a quanto richiesto dalle particolari disposizioni di legge vigenti nei paesi cui le macchine sono destinate.

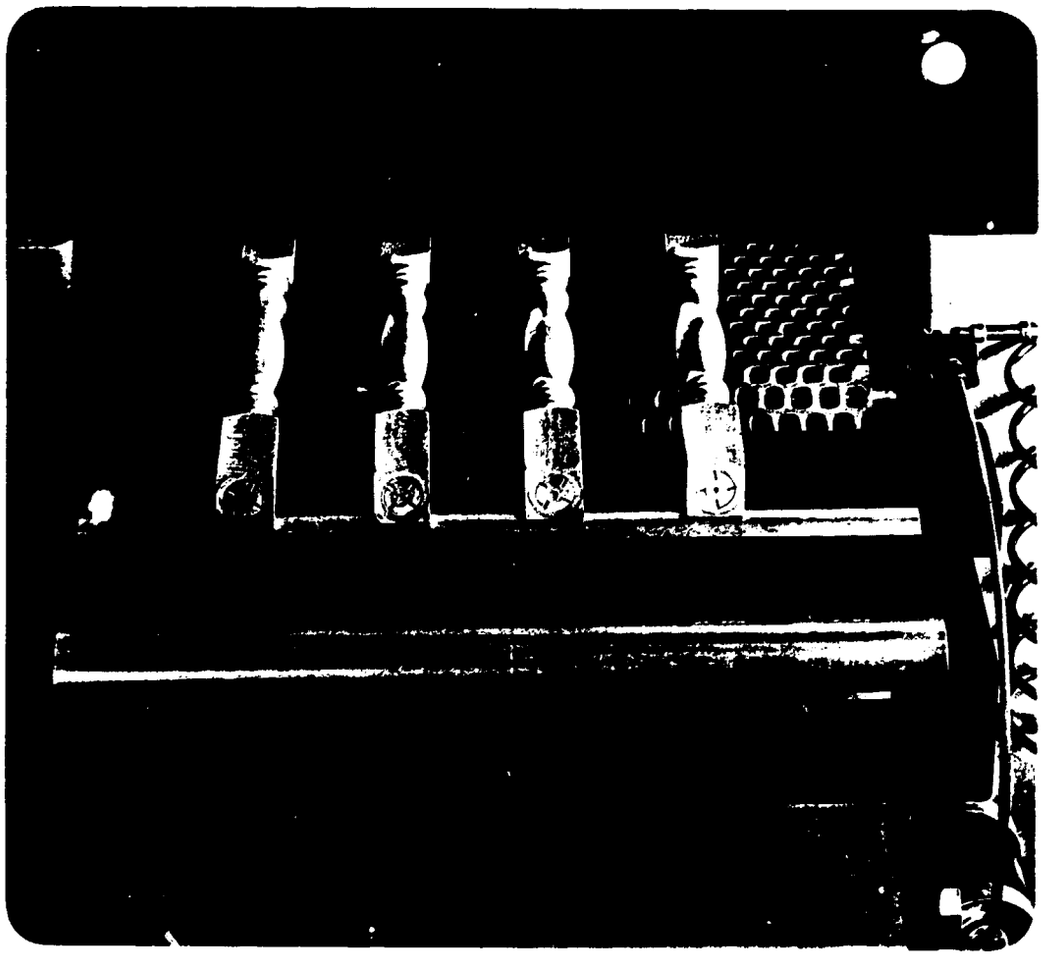
MASSIMO SIMONETTI
PAZZINI VERUCCHIO

scm

borghi e baldo ingg.
spa

B)

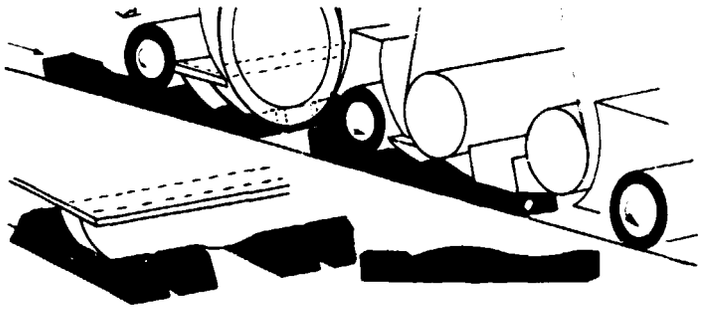
CL63TS
CALIBRATRICE-LEVIGATRICE



scm

borghi e baldo ingg.
s.p.a.

C)

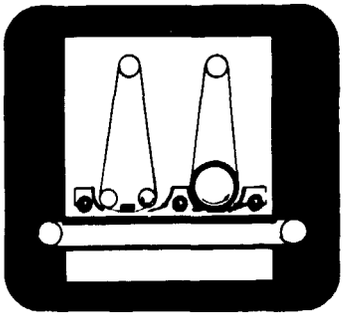


Particolarmente adatta alla lavorazione di elementi per sedie

La CL 63TS dispone di un particolare pressatore a lamelle con rulli motorizzati ricoperti in gomma tenera per lavorare contemporaneamente listelli con lievi differenze di spessore e di lunghezza limitata.

Le lamelle infatti riducono la distanza tra i pressatori permettendo di lavorare in tal modo anche pezzi corti e consentono con la loro elasticità di compensare eventuali differenze di spessore.

I rulli motorizzati inoltre, essendo ricoperti in gomma particolarmente tenera, permettono un traino costante anche in presenza di pezzi con lievi differenze di spessore.



Sicura e semplice da usare

Quadro comandi caratterizzato da colori diversi suddivisi per gruppi per facilitare il controllo e l'individuazione dei dispositivi di azionamento della macchina.

Circuito elettrico provvisto di relè termoelettrici per salvaguardare i motori principali da sovraccarichi o errori di manovra.

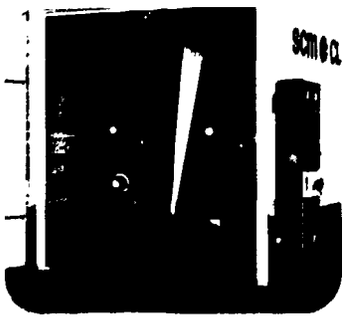
Semplici meccanismi di bloccaggio dei gruppi e pratiche guide d'inserimento per ridurre i tempi morti di montaggio dei nastri abrasivi.

Pratica e veloce nella messa a punto

Gruppi pneumatici che permettono di impostare e visualizzare le tensioni più adatte per ogni tipo di nastro abrasivo.

Manopole con scala graduata rendono molto semplice la regolazione del tampone e del rullo.

L'impianto pneumatico localizzato in un unico punto consente una manutenzione semplice e veloce.



IMPORTANT FACTORS OF A TENNIS RACKET

1. FLEXIBILITY

Flexibility, torque and center of gravity are terms that are important to the manufacturer of tennis rackets. The terms refer to the physical characteristics of tennis rackets that are being much discussed these days as the number and variety of rackets steadily increases.

There are over 100 rackets of varying sizes and weights constructed of wood, metal, fiberglass, graphite and composites of different materials. Until recently it has been difficult to compare one type of racket with another type. The only way was to ask several tennis professionals to try the racket and give their opinion; unfortunately, the response would not always be consistant because of the human element.

It has been determined that the measurable factors of flexibility, torque and center of gravity can help to make true comparisons of one racket to another eliminating the human element.

The term flexibility here means the bending action of the head and shaft of the racket in response to an applied force. During actual play, the "applied force" is a ball; in test, it is a weight suspended from the racket's head.

It is generally assumed and accepted that the more flexibility a racket has, the more power it has to give to its user. This theory is true, however, only to a point of diminishing returns. A racket featuring the feasibility of a wet noodle, for example, would not provide its user with much in the way of power.

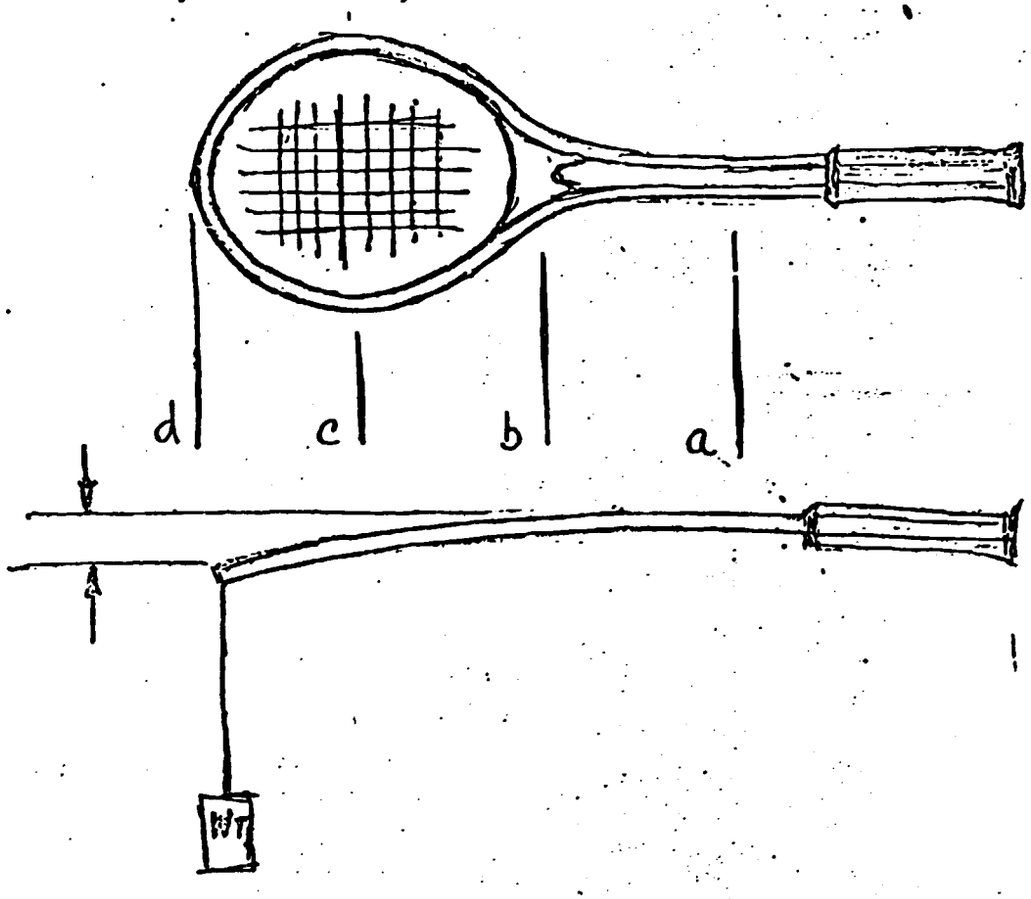
Aside from power, there is control to consider when we measure a racket's flexibility. The general rule here is that more flexibility equals less control and less flexibility equals more control.

borghi e baldo ingg.
s.p.a.

Tennis U.S.A. Magazine performed tests recently on some of the more popular rackets purchased in the U.S.
The results are shown here. With regard to flexibility a weight was suspended from several points on a racket held securely by the handle. The point "C" or point "D" would represent the more meaningful readings. (See sketch 1).

The Indian Tennis Racket Manufacturer could make comparisons by purchasing a few of these popular rackets and make similar tests. The weight used is not important.
The relative difference in results is the important information desired.

FLEXIBILITY



Flexibility

	a	b	c	d
Spalding Gonzales	.007	.033	.104	.204
Slazenger Challenger	.008	.034	.105	.216
Dunlop Maxply Fort	.009 (3)	.038 (1)	.118 (4)	.223 (5)
Wilson Stan Smith	.008	.035	.112	.228
Wilson Jack Kramer	.013	.046	.129	.245
Garcia	.015	.053	.138	.260
Bancroft Teardrop	.013	.052	.141	.262
Davis Classic	.015	.058	.168	.317
Spalding Speedshaft	.012	.065	.170	.320

SKETCH #1

2. CENTER OF GRAVITY

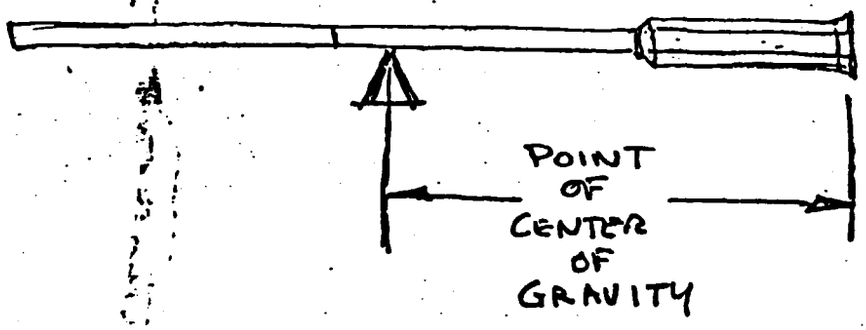
A racket's center of gravity determines its balance, or, as it is sometimes called "feel". It is the point on the racket where the racket is in balance, somewhere between the head and the handle. A racket that is "head heavy" has a center of gravity closer to the head of the racket.

Determining the center of gravity is very simple (see sketch 2). It is important to the Indian tennis racket manufacturer to be aware of this factor and to produce a racket that falls somewhere in the middle range.
The attached chart shows the center of gravity for several popular rackets expressed as a point on the racket measured up the shaft from the butt.

Some tennis players prefer head heavy over head light rackets. It usually depends on the type of game he plays. A base line player may prefer a head heavy racket because he generally has more time for a back swing and the head heavy racket gives added whipping action as the ball is stroked. A net player, however, has to make quick, reflex - like movements with the rackets and its head - heaviness might be a disadvantage.

It is best that the Indian tennis racket manufacturer stay in the middle range on all three factors of flexibility, torque and center of gravity.

The weight of a racket varies with each manufacturer. In the accompanying chart the rackets tested and were classified as a middle weight, however, the weights varied from 12.99 oz to 14.80 oz.



SKETCH # 2

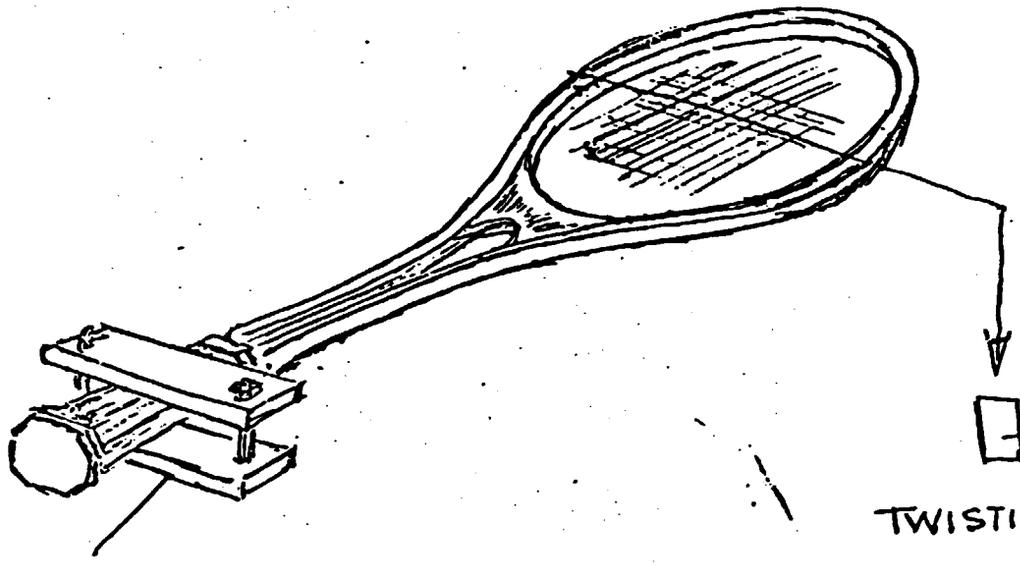
3. TORQUE

Torque is the twisting action of the racket from the head all the way to the butt. In actual play, torque occurs when a hit is "off center". That is why when you hit the "sweet spot" the hit feels so good - there is an absence of torque. Torque, like flexibility, is related to power and control on the court. Unlike flexibility, which can be good or bad depending on whose arm is attached to the racket; and unlike weight and center of gravity which are more matters of subjective tastes, torque is always bad - the less torque the racket has, the more power and control it has to give.

The test for torque can be accomplished in much the same manner as for flexibility. In addition to the weight, however, a twisting apparatus is attached to the racket. The weight applies a constant force on the apparatus causing the racket to twist in a manner similar to the action occurring as a result of an off-center hit.

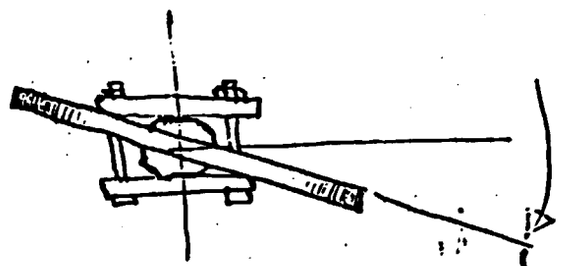
The torque data listed in the charts represents the relative "twistability" of the rackets tested. The torque experienced during play would change from shot to shot as a function of an almost infinite number of variables.

The proper interpretation of the torque chart, then, is that given the same set of circumstances the various rackets will torque more or less during play in the same relative manner as during the test. For example, referring to the chart, we see that the Dunlop racket produced a torque reading of 0.084 at a point 21 inches from the butt.
This places the Dunlop in the middle of our group of rackets as far as amount of torque is concerned. Therefore, we would expect the Spalding Gonzales and the Davis Classic to torque slightly more under the same circumstances; and we would expect the Garcia 240 to torque slightly less.



TWISTING (TORQUE)

HANDLE CLAMP



END VIEW

SKETCH #3

Wood Rackets Test #1

Racket	Suggested Retail Price	Weight	Length	Point of Center of Gravity	Bending Stiffness**	Twisting Stiffness***
Spalding Gonzales (50)*	$33	13.76	27	12.63	506	290
Wilson Challenger (49)	$40	14.80	27⅛	13.69	480	367
Dunlop Maxply Fort (48)	$40	13.29	27⅛	12.44	458	247
Wilson Stan Smith (47)	$35	13.16	27⅛	13.13	461	342
Wilson Jack Kramer (46)	$35	13.3	27⅛	13.25	432	324
Garcia (45)	$28	13.41	27	13.06	399	312
Bancroft Teardrop (44)	$40	12.99	26¾	12.93	394	263
Spalding Firm Speedshaft (42)	$55	13.60	26⅞	11.75	332	208
Davis Classic II (43)	$58	13.29	27	13.00	327	290

Metal & Composite Rackets Test #2

PDP Open (41)	$50	12.94	26¾	12⅞	559	194
Spalding Smasher III (40)	$44	13.51*	26⅞	12½	547	294
Head Professional (39)	$50	12.62	26¾	12⅞	532	178
Yonex T-7500 (35)	$42	13.09	26¾	12⅜	530	445
Rawlings Tie Breaker (37)	$60	13.54	26⅞	12⅛	499	266
Head Competition 2 (36)	$70	13.11	27	12⅝	474	305
PDP Fiberstaff (35)	$65	13.45	26¾	12⅜	403	423
Head Competition (34)	$60	12.57	27	13⅛	376	301
Willys Devastator Firm (33)	$60	14.51*	26½	12⅜	370	144
Wilson T-3000 (32)	$52	12.81	26¾	12⅞	368	160
Yamaha YCR 130 (31)	$110	13.02	26¾	12⅝	364	236
Wilson T-2000 (30)	$46	12.95	26¾	12⅞	361	158
Yamaha YCR 128 (29)	$110	13.09	26¾	12⅝	354	287
Willys Devastator Med. (28)	$60	14.13*	26½	12⅜	276	125

*For more information, circle appropriate numbers on Reader Service Card

*Strung

**Handle to tip of head; overall stiffness factor

***Handle to center of head; overall stiffness factor

Torque

This chart presents torque as measured at points 10, 15, 21 in. from the butt of the racket. The first set of data is the actual dial readings in inches. The second set of data shows the same results expressed in radians per in./lb. X 10^6, or X 1 million, so that variations from racket to racket may be more easily noticed. The weight used was 4 lb., 10 oz., extended six inches from the racket.

All figures in charts are accurate within an estimated error factor of ±5 percent.

Racket	True readings			Radians per in./lb. X 10^6 (X million)		
	10	15	21	10	15	21
Head Professional	.062	.129	.140	372	775	841
Head Competition	.031	.058	.083	186	348	498
Head Competition 2	.029	.054	.082	174	324	492
PDP Fiber Staff	.020	.041	.059	120	246	354
PDP Open	.078	.117	.129	468	702	775
Rawlings Tie Breaker	.039	.083	.094	234	498	566
Spalding Smasher III	.027	.071	.085	162	426	511
Willys Devastator Firm	.075	.147	.173	450	883	1039
Willys Devastator Med.	.065	.177	.200	390	1063	1201
Wilson T-2000	.044	.138	.158	264	829	949
Wilson T-3000	.039	.129	.156	234	775	937
Yamaha YCR 128	.046	.071	.087	276	426	523
Yamaha YCR 130	.048	.065	.106	288	511	637
Yonex T-7500	.017	.042	.056	102	252	336

Annex 2

List of persons contacted during the mission

F.C. SONDHI & CO. (INDIA) PVT.LTD.
Basti Sheikh Road, Jalandhar-144002 INDIA
Contact: Mr. Sondhi

BEAT ALL SPORTS
S/108-115, Industrial Area, Jullundur INDIA
Contact: Mr. Kolhy

PIONEER SPORTS WORKS PVT.LTD.
Nakodar Road, Jullundur-144003 INDIA
Contact: Mr.Singh

K.L. MALHOTRA BROTHERS
W.X.83, Basti Nau, Jullundur 144002
Contact: Mr. Molotra

KOSHE & COMPANY
Basti Sheikh Road, Jullundur City
Contact: Mr. Sarishti

JANDIAL EXPORT HOUSE
Manufacturers & Exporters
234,Thaparnagar,Meerut
Contact: Mr.Jandial