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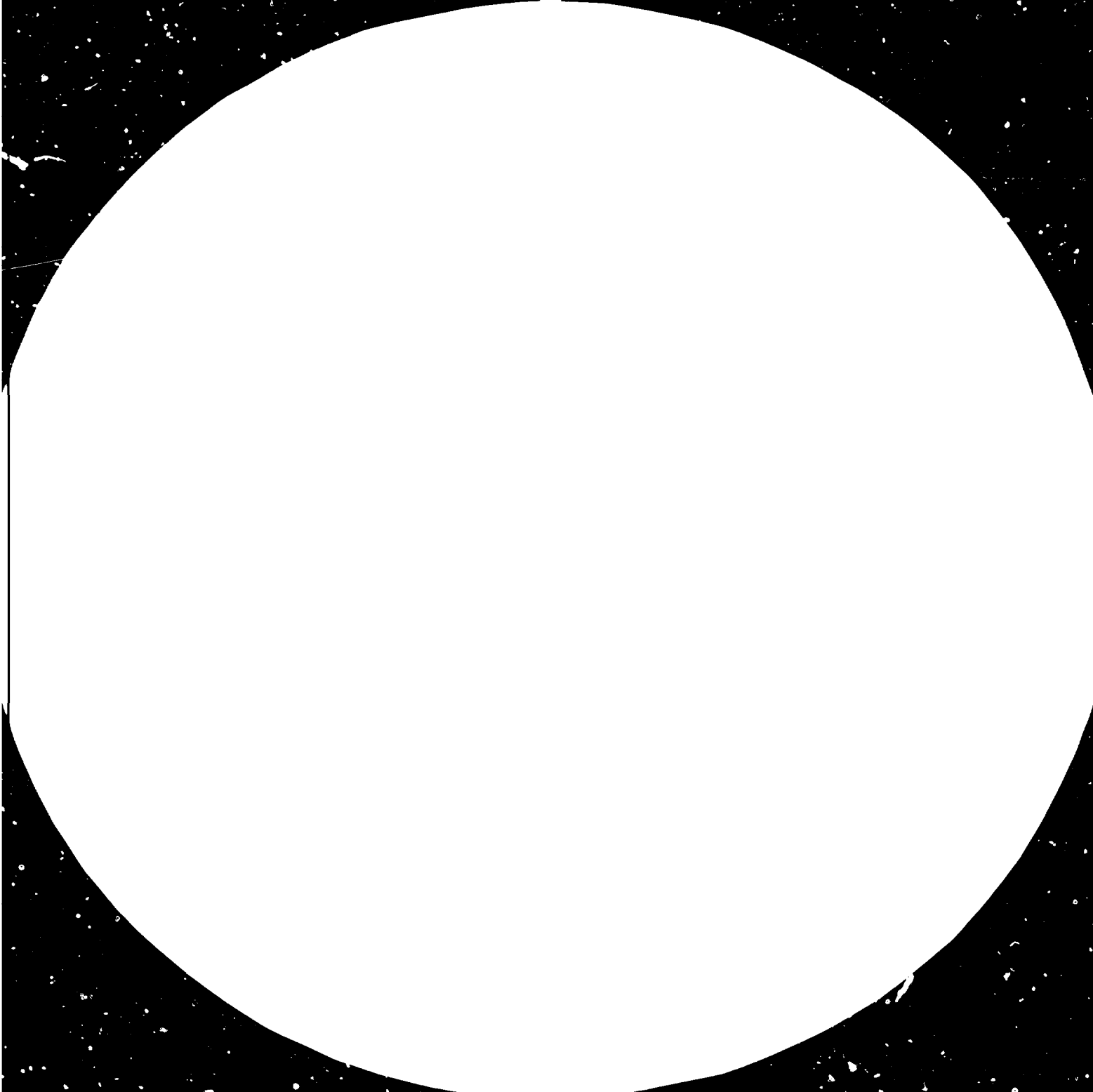
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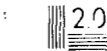
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Resolution Test Chart  
1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5

10537

Distr.  
LIMITED

UNIDO/IS-231  
12 June 1981

UNITED NATIONS INDUSTRIAL  
DEVELOPMENT ORGANIZATION

Original: ENGLISH

Users' Guides to the International Patent  
Classification (IPC)\*

I - Fertilizers

Industrial and Technological Information Bank (INTIB)

Industrial Information Section  
UNIDO Technology Programme

001131

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V.81-26502

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FOREWORD

The Industrial and Technological Information Bank (INTIB) came into existence in 1977 as a UNIDO pilot operation in four industrial sectors: Iron and Steel, Fertilizers, Agricultural Machinery and Implements, and Agro-Industries. After its successful completion, INTIB has become a permanent activity of UNIDO covering, for the time being, 20 industrial sectors. Its main objective is to facilitate the choice of technology for decision makers in developing countries.

Users' Guides to the International Patent Classification (IPC) were produced by WIPO in co-operation with the European Patent Office in the four sectors selected for the pilot operation of INTIB. They are intended to facilitate access to patent information through the use of the UNIDO Thesaurus of Industrial Development Terms. The Guides stress the importance of patent information for technology selection and describe the process of the identification of patent documents using the International Patent Classification (IPC).

It is hoped that this document will be of assistance to industrial information facilities in developing countries in identifying technologies of relevance to investment decision-making on the basis of appropriate choices of technologies.

Dr. Abd-El Rahman Khane  
Executive Director

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PREFACE

This Users' Guide to the International Patent Classification (IPC) is one of a series dealing with the use of the IPC to retrieve technological information from patent documents. Each Guide considers a well-defined technical section of direct relevance to the development process in developing countries and gives detailed guidance as to how pertinent technological disclosures contained in patent documents may be identified by using the IPC.

The series of Users' Guides to the IPC so far covers the following technical sections:

- Guide No. I - Fertilizers
- Guide No. II - Iron and Steel
- Guide No. III - Agricultural Machinery  
and Implements
- Guide No. IV - Agro-Industries

The Guides have been produced by the World Intellectual Property Organization, Geneva, in consultation with the European Patent Office, Munich, following an agreement with the United Nations Industrial Development Organization, Vienna.

REVISED EDITION  
GENEVA, 1991

Arpad Bogsch  
Director General  
WIPO

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## INTRODUCTION

1. Today, in many fields of technology, scientific and technological development is advancing at a very fast pace. Scientific and technological information is assuming increasing importance as a vital resource in the development of national economies, and has become a major factor in the formulation of national policy decisions.
2. Scientific and technological information is primarily to be found in patent documents and in technical and scientific books and periodicals. Access to that information, which is vast and rapidly expanding, demands the use of an efficient, widely accepted, classification system. This Guide describes, in general terms, the usefulness of patent documents as a source of technological information and explains how the International Patent Classification (IPC) may be used to retrieve technological information concerning FERTILIZERS.

## PATENT DOCUMENTS AS A SOURCE OF TECHNOLOGICAL INFORMATION

3. In this Guide, the expression "patent documents," means published patents for invention and published patent applications. It also includes other published documents reflecting other forms of protection for inventions, such as inventors' certificates or utility models.
4. By technical and scientific books and periodicals is meant such books and periodicals which contain texts that describe solutions to technical problems. They are sometimes referred to in English as "non-patent literature."
5. The expression "patent information" is used in this Guide not (as in some other contexts) to indicate information about patents and patent applications but to mean the technological information content of patent documents.

### Characteristics of patent documents

6. In searching for, and retrieving, technological information, patent documents have more practical importance than periodicals and books. This is so for several reasons, the most important of which are briefly described in the following paragraphs.
7. One reason is that patent documents should and, in fact, usually do, disclose solutions of technical problems more clearly, more completely and in more detail than most periodicals and books. They have to do so; otherwise the said disclosures do not qualify as "patents for invention".
8. Another reason is that patent documents bear classification symbols of a classification system--the IPC--which was so devised that it should facilitate the finding of the state of the art in a given technology. Later parts of this Guide give a detailed introduction to the IPC and deal exhaustively with the retrieval, by use of the IPC, of patent documents concerned with FERTILIZERS. Articles in periodicals and books usually do not show any classification symbols or, if they do, the classification is usually one which has not been devised for the purposes of finding the state of the art.
9. An additional reason for which patent documents are generally more useful than periodicals and books is that patent documents are drafted in a certain style and their contents are divided in certain parts which follow each other in a certain order. And this is true not only in respect of the patent documents of a given country but also in respect of the patent documents of all countries. The resulting advantage is that a searcher reads documents which have a structure with which he is familiar. Such uniform structure does not always exist in the case of articles in periodicals and books.
10. Finally, there is still another reason for which patent documents are more useful than periodicals and books. This reason lies in the fact that, characteristically, any given patent application tries to prove that the invention claimed in it is something new, and something representing the required inventive step, in relation to former inventions claimed in older patent applications.



11. Patent documents also possess a certain number of specific characteristics that make them eminently suitable for retrieval of technological information, e.g.: they normally disclose information on new inventions earlier than is disclosed in other sources of technological information; a high proportion of patent documents contain an abstract; patent documents belonging to the same family\* are frequently in a number of different languages.

12. The preceding assertions can be proven by statistics. It is estimated that only less than 10% of all the publications cited against the average patent application are citations of articles in periodicals or books. The rest, that is, on average more than 90% of the publications cited against the average patent application, are citations of patent documents.

13. Patent documents are, then, useful sources of technological information with clear advantages over other sources of technological information. There are, however, a certain number of limitations to this usefulness, which are the following:

- (a) new technology is not always sufficiently inventive to be patentable;
- (b) even where a patent has been granted by an examining Patent Office, this is not a guarantee that the invention is absolutely new;
- (c) although patent documents should be, and generally are, written in a way which allows the invention to be executed on the basis of them alone, it will frequently be cheaper and faster in practice to execute it with the cooperation of the inventor (for example, by acquiring his know-how and blueprints under a contract concluded with him) than without such cooperation.

14. Each year more than one million patent documents are published by some 70 countries. Some countries publish a patent document as a patent application and later as the granted patent. Other countries publish only the granted patent. The following twelve countries publish 80% of the world's total patent documents:

Japan	439,000	Canada	23,000
Germany (Federal Republic of)	146,000*	Spain	21,000*
Soviet Union	70,000	Australia	21,000
France	58,000	Netherlands	18,000
United States of America	49,000	Sweden	16,500
United Kingdom	43,000	Italy	12,000

(Based on WIPO Statistics for 1979)

\* including utility model publications

#### THE INTERNATIONAL PATENT CLASSIFICATION (IPC)

15. The IPC is based on an international multilateral treaty administered by the International Bureau of WIPO (the Strasbourg Agreement Concerning the International Patent Classification of 1971). The symbol or symbols of the classification to which the technical invention described in a patent document belongs are usually indicated on the patent document by the Patent Office of the country where the application was filed. Thus, the document will be retrievable according to its subject matter with the help of the IPC.

16. The IPC is now applied by over 40 Patent Offices which, taken together, issue over 90% of the patent documents of the world. By the end of 1980, some ten million patent documents had been provided with the classification symbols of the IPC. Approximately 4.0 million of them are in English, 2.0 million in French and 1.5 million in German. The remainder are in various other languages, mainly Dutch, Japanese and Russian.

17. Many years of international cooperation, which started in 1956 under the auspices of the Council of Europe, resulted, in 1971, in the Strasbourg Agreement Concerning the International Patent Classification which provided a worldwide forum for the development of the IPC.

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\* Patent documents published in different countries but relating to the same invention are generally called a "patent family".

18. The IPC, being a means for obtaining an internationally uniform classification of patent documents, has as its primary purpose the establishment of an effective search tool for the retrieval of patent documents by Patent Offices and other users to establish the novelty and evaluate the inventive step (including the assessment of technical advance and useful results or utility) of patent applications.

19. The IPC, furthermore, has the important purposes of serving as:

- (a) an instrument for the orderly arrangement of patent documents in order to facilitate access to the information contained therein;
- (b) a basis for selective dissemination of information to all users of patent information;
- (c) a basis for investigating the state of the art in given fields of technology;
- (d) a basis for the preparation of industrial property statistics which in turn permit the assessment of technological development in specific areas.

20. Keeping the IPC up to date and allotting its symbols to new patent documents is one of the largest international efforts, at least in terms of expert manpower at international and national levels, in information processing today. At the international level, an estimated 120 work-months per year, and, at the national level, an estimated 240 work-months per year are devoted to revising the IPC and adapting it to newly developing technologies and the needs of the users. The yearly effort to allot the IPC symbols to new patent documents is estimated at approximately 600 work-months (90,000 hours) of work by highly qualified Patent Office staff. It should be emphasized that such new patent documents can, subject to a possible check of the classification allotted, be directly inserted into the appropriate place in a search file organized according to the IPC.

21. The third edition of the IPC came into force on January 1, 1980. It comprises nine volumes, being the Guide and the Classification itself. The Guide, which is contained in Volume 9, explains the layout, use of symbols, principles, rules and application of the Classification contained in Volumes 1 to 8. In the following paragraphs a short outline will be given of the system and principles of the IPC as well as of the most important rules.

#### Layout and Use of Symbols

22. The IPC is a hierarchical system comprising the following classification levels, which are listed in hierarchical order:

- Sections,
- Classes,
- Subclasses,
- Groups (main groups and subgroups).

23. These different classification levels are characterized by a letter or a number. A complete classification symbol consists of a combination in which each of these levels is represented. The third edition of the IPC consists of:

- 8 sections,
- 118 classes,
- 617 subclasses, about
- 7,000 main groups, and approximately
- 47,000 subgroups.

24. The IPC is divided into eight sections, each designated by a capital letter (section symbol), as follows:

- Section A HUMAN NECESSITIES
- Section B PERFORMING OPERATIONS; TRANSPORTING
- Section C CHEMISTRY AND METALLURGY

- Section D TEXTILES AND PAPER
- Section E FIXED CONSTRUCTIONS
- Section F MECHANICAL ENGINEERING; LIGHTING;  
HEATING; WEAPONS; BLASTING
- Section G PHYSICS
- Section H ELECTRICITY

25. Each class symbol consists of the section symbol followed by a two-digit number, e.g. A 01. Each subclass symbol consists of the class symbol followed by a capital letter, e.g. A 01 B.

26. Each group symbol consists of the subclass followed by two numbers separated by an oblique stroke, either as:

- main group symbol, which consists of the subclass symbol followed by a one to three digit number, the oblique stroke and the number 00:

Example: A 01 B 1/00

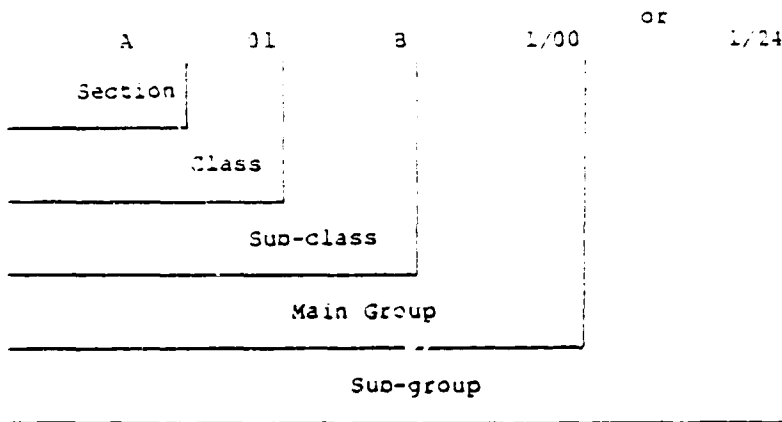
- sub-group symbol, which consists of the subclass symbol followed by the one to three digit number of its main group, the oblique stroke and a number of at least two digits other than 00:

Example: A 01 B 1/24

Any third digit after the oblique stroke is to be read as a decimal subdivision of the second digit, e.g., "/215" is to be read as "twenty one point five," and not "two hundred and fifteen."

27. A complete classification symbol comprises the combined symbols representing the section, class, subclass and main group or sub-group:

Example:



28. The hierarchy among groups is determined solely by the dots preceding the titles of sub-groups. These dots are used in place of, and avoid repetition of, the titles of hierarchically directly superior groups:

Example: C 01 B 17/00 Sulphur; Compounds thereof  
 17/72 . Sulphuric acid  
 17/74 . . Preparation  
 17/76 . . . Contact process  
 17/78 . . . . Use of special catalysts

Without the use of hierarchical levels, sub-group C 01 B 17/78 would have to have a title such as: "Preparation of sulphuric acid by using a special catalyst in the contact process."

29. In many cases, a class, subclass or group title is followed by a phrase in brackets referring to another place in the IPC. Such a phrase indicates that the subject matter identified is classified in the place referred to (or in one or more places where several are referred to). An example of such a reference can be seen in Appendix III to this document under the symbol C 05 B 19.00.

30. In certain places of the Classification, some particular classification rules are specified. The purpose of these rules is to limit multiple classification, to improve consistency and to facilitate searching.

31. The places where such rules apply are clearly marked by a note at the highest place covered by such classification rules. Such rules are:

- (a) Precedence Note - The most frequently occurring rule is the "precedence note", indicating which one of two or more places has priority in the classification of a technical subject which can be classified in more than one of these;
- (b) Last Place Rule - In certain parts or places of the Classification, where a particular technical subject is covered by two or more places of the same hierarchical level or indentation, a "last place rule" has been introduced. According to this rule, such a technical subject is classified in the one of these places which appears last in the Classification. This rule is applied successively at each hierarchical level or indentation at which the technical subject in question is covered by two or more places. In each part of the Classification (class, subclass or group), where this rule applies, this rule is clearly set out in a note specific to the subject matter concerned. The "last place rule" is in effect a systematic precedence rule which obviates the need for separate precedence notes in each of the places concerned;
- (c) Other Rules - In a limited number of places in the Classification other particular rules exist which are clearly specified in notes at the places concerned.

Relevant sub-groups of the IPC concerned with FERTILIZERS

32. The aim of identifying basic technical information necessitates the carrying out of a so-called "information search," which is made to familiarize the inquirer with the state of the art in a particular field of technology.

33. Before making a search, it is essential to establish clearly what is being sought, i.e. the technical subject has to be determined. Having formulated a clear statement of the technical subject which is being sought, the searcher has to identify the proper place for this subject in the IPC. Although the IPC is a relatively logical subdivision of technology, it is advisable for the uninitiated searcher to approach the system using the Catchword Index to the IPC, which has been elaborated in several languages, e.g., in English, French, German, Japanese and Spanish.

34. Consideration of the statement of the technical subject sought will bring to mind a word which covers broadly or specifically the field of technology with which this subject is clearly concerned. As most of the words of the Catchword Index are nouns, it is preferable to consider the name given to the relevant process or device, although it may be useful to consider other words. The Catchword Index may indicate to the searcher a precise group of the IPC as the proper place for the technical subject being sought, but often there can only be an indication of the subclass or possibly only the class or range of classes concerned.

35. A sample page of the Official Catchword Index appears in Appendix I to this document and shows, for example, the catchword "FERTILIZERS" with a number of subordinate entries with references to specific places in the IPC.

36. If use of the Catchword Index does not lead to a pertinent field of search, the "Contents of Section" (see Appendix II to this document) appearing at the beginning of each section of the IPC should be consulted. The eight sections should be scanned and the possible classes should be selected. Thereafter, the searcher should turn to those classes in order to select the subclass (or subclasses) which most satisfactorily covers the subject. The references and notes appearing in the selected subclass title should be checked for an indication of subclass content and for possible distinctions between subclasses, which in turn may indicate that the location of the desired subject is elsewhere. It is also essential to consult any notes or references appearing in the title of the relevant class, since these may also affect the subclass content.

37. When the correct subclass has been identified, the main group which, in the light of its full wording and any existing notes and references, most clearly includes the subject being sought should then be selected.

38. The most indented sub-group (i.e., having most dots) under the selected main group, which still covers the subject sought, should be chosen for search.

39. After completing the search in a chosen group, it should be considered whether the superior group (i.e., having fewer dots) under which it is indented should be searched, since a wider subject which includes the subject sought may be classified there.

40. Appendix III to this document shows an excerpt of the IPC giving the whole of sub-class C 05 B relating to phosphatic fertilizers, and Appendix IV shows photocopies of front pages of patent documents published by the United Kingdom Patent Office (GB Patent No. 1 402 542), by the French Patent Office (FR Patent Application No. 2 295 911), by the United States Patent and Trademark Office (US Patent No. 3,073,634) and by the Egyptian Patent Office (EG Patent No. 12636).

41. Appendix V gives an exhaustive list of thesaurus terms as defined by UNIDO as relevant to the industrial sector "FERTILIZERS." Against each term is listed the IPC symbol(s) most appropriate for the technological subject of the term. Where necessary detailed explanatory notes are given.

42. Against each IPC symbol, or group of symbols, statistical information giving the patent activity in each industrial sector is given in Appendix V. The statistics give the number of patent documents published in the year 1978, based upon information received from INPADOC (see paragraph 47 below), on which the symbol, or group of symbols, is printed. The total number of patent documents relevant to each industrial sector may be estimated by multiplying the figure given in Appendix V by a factor of 10, although that factor naturally varies between industrial sectors.

#### RETRIEVAL OF PATENT DOCUMENTS RELATING TO FERTILIZERS USING THE IPC

43. There are several ways to take cognizance of the enormous amount of technological information contained in patent documents, namely, the consultation of patent document collections organized according to the IPC or other (national) classification systems or the consultation of secondary sources of patent information, e.g., patent gazettes, abstracts services, Selective Dissemination of Information (SDI) or international referral services which, in many cases, contain also references to patent documents.

44. In view of the enormous amount of patent documents published each year, the user will almost certainly like to restrict the number of patent documents which he is interested in reading to a strict minimum. It is, therefore, likely that he will first rely on a secondary information source for a first selection of relevant documents.

#### Patent gazettes

45. To assist users in identifying primary sources of patent information, most Industrial Property Offices publish patent gazettes (also named official gazettes or official bulletins). These gazettes usually contain a certain number of indexes, e.g., by classification symbol, by name of applicant, etc., and contain entries consisting of bibliographic data relating to and marked also on the newly published patent documents. Some of these gazettes also contain abstracts of patent documents.

#### Abstracts services

46. As set forth above, many patent gazettes contain abstracts, as also do patent documents (see Appendix IV containing the first page of US Patent No. 3,073,634). There are also many patent documents which are officially published in a given language out of which abstracts--that is, a description of their technological content in a few lines--are available in another language. For example, the Japanese Patent Office publishes English abstracts of a substantial portion of its published unexamined patent applications,

whilst Derwent Publications Limited, a private firm in London, publishes each year tens of thousands of abstracts in English of patent documents published in many languages, including Russian and Japanese. Chemical Abstracts, a publication of Chemical Abstracts Service (CAS), a subsidiary of the American Chemical Society, Columbus, Ohio, United States of America, publishes abstracts in the chemical and chemical engineering field supplemented by indexes produced weekly.

#### International referral services

47. A truly international referral service for patent information came into existence in 1972. In that year, the International Patent Documentation Center (INPADOC) was created in Vienna by virtue of an Agreement between WIPO and the Republic of Austria. INPADOC stores, in a machine-readable data bank, the most important bibliographic data of each patent document, i.e., the title of the invention, its classification symbol, relevant dates, names and numbers. The said bibliographic data are either obtained from Industrial Property Offices in machine-readable form or input by INPADOC on the basis of the announcements published in patent gazettes.

48. At present, bibliographic data pertaining to patent documents published by the following 46 countries are included on a current basis in the data bank of INPADOC: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Cuba, Cyprus, Czechoslovakia, Denmark, Egypt, Finland, France, German Democratic Republic, Germany (Federal Republic of), Greece, Hong Kong, Hungary, India, Ireland, Israel, Italy, Japan, Kenya, Luxembourg, Malawi, Monaco, Mongolia, Netherlands, Norway, Philippines, Poland, Portugal, Republic of Korea, Romania, South Africa, Soviet Union, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States of America, Yugoslavia, Zambia. The data bank is growing at a rate of 16,000 patent documents per week (more than 90% of the world total) and is the largest computerized data bank of bibliographic data relating to patent documents in the world.

49. INPADOC processes the bibliographic data and provides services to government authorities and the public. The data bank can be used for answering many kinds of questions, the two most important being the following. Firstly, the data bank can be asked to identify all the patent documents belonging to any given symbol of the more than 54,000 symbols of the IPC. Here lies of course the main usefulness of the Center in giving industry and other users access to the achievements of modern technology. The Patent Classification Service (PCS) provided by INPADOC gives, on microfiche, the bibliographic data of each patent document belonging to each IPC symbol. An alternative service gives information concerning one, or a selected number of, IPC symbols. An example of the PCS is given in Appendix VI to this document. Secondly, the data bank can provide all the patent documents which in various countries have been filed for the same invention by--usually, but not necessarily--the same person, company or enterprise. Thus, one can obtain information at a glance as to the likelihood of the invention being protected in various countries, and, which is of greater interest for the purpose of access to technological information, as to the likelihood of the invention being described in different languages. INPADOC is also studying the possibility of using its services in the preparation of industrial property statistics.

50. To replace the burdensome scanning of various patent gazettes published by many countries, INPADOC publishes each week an international patent gazette, the INPADOC Patent Gazette (IPG). The IPG, which is published on microfiche, consists of three basic indexes, i.e., by number, by IPC symbol, and by standardized applicant's name, respectively, each containing references to all patent documents stored in INPADOC's data bank in the previous week. The index by IPC symbol, the Selected Classification Service (SCS), is particularly useful as a current-awareness service. An example of the SCS is given in Appendix VI. Users thus can follow easily and week by week any field of technology or the activities of any given company, enterprise or applicant.

#### Access to the primary sources of information

51. Each Patent Office has a collection of all the patent documents it has published. Each major Patent Office also has complete, or largely complete, collections of patent documents published by the Patent Offices of the other countries or at least of most of them. These collections are either in

numerical order or classified order or both. Some libraries (in developed countries) also have more or less complete collections of domestic and foreign published patent documents. Members of the general public usually are allowed to consult such collections. In major Patent Offices and major libraries, specialized staff is usually available to assist the public in locating published patent documents it is interested in.

52. Patent Offices and the libraries mentioned above are usually equipped to furnish copies of published patent documents contained in their collections to anyone who wants them and pays the prescribed price. Unit prices, mostly independent of the number of pages of the patent document, range from US dollar 0.50 for a US patent to approximately US dollars 5.00 for a Soviet Union patent. The average price per patent document, on standing order, is approximately US dollars 2.00.

53. It should be emphasized that the patent document collections available throughout the world are the result of a broad free-of-charge exchange of currently issued patent documents among countries and, more especially, among the Patent Offices of those countries under bilateral and multilateral exchange agreements. The patent documents are exchanged in the form of paper copies or in microform. It is estimated that a total of more than 15 million copies of patent documents per year are exchanged in this way. Secondary sources of patent information in the form of patent gazettes are also exchanged free of charge on a broad basis. In order to promote national and regional infrastructures, WIPO has successfully developed and sponsored procurement and exchange of primary and secondary sources of patent information for developing countries.

Conclusions

54. This Guide is intended to give the basic approach in obtaining the state of the technology in a given industrial sector in the most economic way by consulting selected patent documents.

55. For those individuals and institutions who have easy access to patent libraries and to the updated official editions of the IPC the way of action is straightforward:

- Step I - determine which of the UNIDO Thesaurus Keywords (Appendix V) reflect the main features of the technology in question;
- Step II - find out (using the second column of the Appendix V) which of the IPC units correspond to that keyword;
- Step III - consult the IPC to find out (from the definitions of main groups and subgroups) which groups to be searched;
- Step IV - Select patent documents published within a certain period and classified by the symbols of the given IPC group (the average number of patent documents published with a particular subgroup symbol is about 20 per year);
- Step V - analyse selected documents and, if necessary, other relevant documents cited in the selected ones.

56. Selection and reproduction, if necessary, of the relevant patent documents (Step IV) for the interested users may be performed on a commercial basis by the above-mentioned INPADOC (Möllwaldplatz 4, A-1041 Vienna, Austria) or by national Patent Offices or libraries (some of these institutions provide such a service).

57. Governmental institutions of developing countries may also avail themselves of still another possibility, namely, the WIPO State-of-the-Art Search program. Established as one of the forms of technical assistance to developing countries, this program enables a user to receive, free of charge, a report on the latest achievements and the general technological level in a particular field specified in the user's request and also copies of relevant patent documents.

References

1. Strasbourg Agreement Concerning the International Patent Classification of March 24, 1971 (WIPO Publication No. 275).
2. The International Patent Classification, Third Edition, 1979, and the Official Catchword Index to the Third Edition (published by Carl Heymanns Verlag KG, Steinsdorfstrasse 10, Postfach 275, Munich, Federal Republic of Germany).
3. World Patents Index; World Patents Abstracts (Derwent Publications Ltd., Rochdale House, 178 Theobalds Road, London WC1X 8RP, United Kingdom).
4. INPADOC, General Information (WIPO/INPADOC Publication No. 426 (E F G)).

[Appendices I to VI follow]



SAMPLE PAGE OF THE  
OFFICIAL CATCHWORD INDEX  
TO THE INTERNATIONAL PATENT CLASSIFICATION (IPC)  
1979 (THIRD EDITION)

FEEDWATER			FETTLING		
FEEDWATER			- process to form a food composition	A21 A23	
- supply to steam boilers	F22D				
FEELERS			FERN		
- for measuring dimensions	G01B	3/00	- stands	A47G	7/00
FEET see FOOT			FERRIES	B63B	35/54
FELLING			FERRIS		
- of trees	A01G	23/00	- wheels	A63G	27/00
FELT	D04H		FERRO-ELECTRIC		
adhesives for producing wool -	D06M	11/00 13/00 15/00	- selection of - materials	H01G	7/06
- peculiar to paper-making machines	D21F	7/08	FERROTYPE	G03C	1/64
roofing -	D06N	5/00	FERROUS metallurgy see IRON		
FENCES, FENCING			FERRULES		
(enclosures)	E04H	17/00	- for umbrellas or walking sticks	A45B	9/04
doors or gates for -	E06B	11/02			
electrified wire -	A01K	3/00	FERTILISERS		
- for children	A47D	13/06	agricultural -	A01C	15/00 to 23/00
- for keeping vehicles on the road	E01F	15/00	- based on ammonium phosphates	C05B	7/00
snow -	E01F	7/02	- containing non-fertilising additives	C05G	3/90
FENCING			mixtures of different -	C05G	
- as a sport	A63C	69/02 71/00	nitrogenous -	C05C	
foils for -	F41B		organic -	C05F	
training apparatus for -	A63B	69/02	phosphatic -	C05B	
FENDER(S)			other inorganic -	C05D	
- on water-borne vessels	B63B	59/02	FERTILISING		
- for ships in harbours	E02B	3/22	- of roots	A01G	29/00
- piles	E02B	3/22	FESTIVAL		
FERMENTATION			- lighting	F21P	
distilling alcohol from products of -	C12F	1/00	FESTOON		
ethanolic - for beer	C12C	11/00	curtain - holders	A47H	19/00
ethanolic for wine	C12Q		FETTERING		
apparatus for - in general	C12M		- animals for operations	A61D	3/00
apparatus for - of beer	C12C	13/00	FETTLING		
apparatus for - of wine	C12Q		- of articles moulded from plastic material	B29	
micro-organisms for -	C12N		- of castings or similar articles	B24B B24C	
yeasts for -	C12N	1/16 to 1/18	- of unfired pottery	B28B	11/08 21/96
- process for producing specific compounds	C12P		percussive hand-tools for -	B25D	
measuring or testing of - process	C12Q				
distillation of, rectification of, or recovery of by-products from, the products of - process	C12F				

CONTENTS OF IPC SECTION C-CHEMISTRY AND METALLURGY  
SECTION C - CHEMISTRY AND METALLURGY

Definitions for Section C:

Alkali metals: Li, Na, K, Rb, Cs, Fr  
Alkaline earth metals: Ca, Sr, Ba, Ra  
Lanthanides: elements with atomic numbers 57 to 71 inclusive  
Rare earths: Sc, Y, Lanthanides  
Actinides: elements with atomic numbers 89 to 103 inclusive  
Refractory metals: Ti, V, Cr, Zr, Nb, Mo, Hf, Ta, W  
Halogens: F, Cl, Br, I, At  
Noble gases: He, Ne, Ar, Kr, Xe, Rn  
Platinum group: Os, Ir, Pt, Ru, Rh, Pd  
Noble metals: Ag, Au, Platinum group  
Light metals: alkali metals, alkaline earth metals, Be, Al, Mg  
Heavy metals: metals other than light metals  
Iron group: Fe, Co, Ni  
Non-metals: H, B, C, Si, N, P, O, S, Se, Te, noble gases, halogens  
Metals: elements other than non-metals  
Transition elements: elements with atomic numbers 21 to 30 inclusive, 39 to 48 inclusive, 57 to 80 inclusive, 89 upwards

CONTENTS OF SECTION (References and notes omitted)

Sub-Section: CHEMISTRY

C 01	INORGANIC CHEMISTRY .....	9	C 04 B	Lime; Cements; Ceramics; Stone or the like; Sound or thermal insulating materials .....	25
C 01 B	Non-metallic elements, compounds thereof .....	9	C 05	FERTILISERS; MANUFACTURE THEREOF .....	30
C 01 C	Ammonia; Cyanogen; Compounds thereof .....	14	C 05 B	Phosphatic fertilisers .....	30
C 01 D	Compounds of alkali metals, i.e. lithium, sodium, potassium, rubidium, caesium, or francium .....	14	C 05 C	Nitrogenous fertilisers .....	30
C 01 F	Compounds of the metals beryllium, magnesium, aluminium, calcium, strontium, barium, radium, thorium, or of the rare-earth metals .....	15	C 05 D	Inorganic fertilisers not covered by sub-classes C 05 B, C, Fertilisers producing carbon dioxide .....	31
C 01 G	Compounds containing metals not covered by sub-classes C 01 D or C 01 F .....	17	C 05 F	Organic fertilisers not covered by sub-classes C 05 B, C, e.g. fertilisers from waste or refuse .....	31
C 02	TREATMENT OF WATER, WASTE WATER, SEWAGE, OR SLUDGE .....	19	C 05 G	Mixtures of fertilisers belonging individually to different sub-classes of class C 05; Mixtures of one or more fertilisers with materials not having a specifically fertilising activity, e.g. pesticides, soil conditioners, wetting agents .....	31
C 02 F	Treatment of water, waste water, sewage, or sludge .....	19	C 06	EXPLOSIVES; MATCHES .....	33
C 03	GLASS; MINERAL AND SLAG WOOL .....	21	C 06 B	Explosives or thermic compositions; Manufacture thereof; Use of single substances as explosives .....	33
C 03 B	Manufacture, shaping, and supplementary processes .....	21	C 06 C	Detonating or priming devices; Fuzes; Chemical lighters; Pyrophoric compositions .....	35
C 03 C	Chemical composition of glasses, glazes, or vitreous enamels; Surface treatment of glass; Joining glass to glass or other materials .....	24	C 06 D	Means for generating smoke or mist; Gas-attack compositions; Generation of gas for blasting or propulsion (chemical part) .....	35
C 04	CEMENTS; CERAMICS, ETC.; SOUND OR THERMAL INSULATING MATERIALS .....	26	C 06 F	Matches; Manufacture of matches .....	35

Appendix II

C 07	<b>ORGANIC CHEMISTRY</b> .....	37	C 10	<b>PETROLEUM, GAS AND COKE INDUSTRIES; TECHNICAL GASES CONTAINING CARBON MONOXIDE; FUELS; LUBRICANTS; PEAT</b> .....	142
C 07 B	General methods and apparatus of organic chemistry .....	37	C 10 B	Destructive distillation of carbonaceous materials for production of gas, coke, tar, and similar materials .....	142
C 07 C	Acyclic and carbocyclic compounds .....	38	C 10 C	Working-up pitch, asphalt, bitumen, tar; Pyroligneous acid .....	144
C 07 D	Heterocyclic compounds .....	68	C 10 F	Cutting, drying, and working-up of peat .....	144
C 07 F	Acyclic, carbocyclic or heterocyclic compounds containing elements other than carbon, hydrogen, halogen, oxygen, nitrogen, sulphur, selenium or tellurium .....	97	C 10 G	Cracking hydrocarbon oils: Production of liquid hydrocarbon mixtures from materials other than hydrocarbons, e. g. by destructive hydrogenation; Recovery of hydrocarbon oils from oil-shale, oil-sand, or gases; Refining mixtures mainly consisting of hydrocarbons; Reforming of naphtha; Mineral waxes .....	145
C 07 G	Compounds of unknown constitution .....	99	C 10 H	Production of acetylene by wet methods; Its purification .....	150
C 07 H	Sugars; Derivatives thereof .....	99	C 10 J	Production of producer gas, water-gas, synthesis gas from solid carbonaceous material, or mixtures containing these gases; Carburetting air or other gases .....	150
C 07 J	Steroids .....	101	C 10 K	Purifying or modifying the chemical compositions of combustible technical gases containing carbon monoxide .....	151
C 08	<b>ORGANIC MACROMOLECULAR COMPOUNDS; THEIR PREPARATION OR CHEMICAL WORKING-UP; COMPOSITIONS BASED THEREON</b> .....	103	C 10 L	Fuels not otherwise provided for; Adding materials to fuels or fires to reduce smoke or undesirable deposits or to facilitate soot removal; Firelighters .....	152
C 08 B	Polysaccharides; Derivatives thereof .....	103	C 10 M	Lubricating compositions: The use as lubricants of chemical substances either alone or as lubricating ingredients in a composition .....	153
C 08 C	Treatment or chemical modification of rubbers .....	104	C 11	<b>ANIMAL AND VEGETABLE OILS, FATS, FATTY SUBSTANCES AND WAXES; FATTY ACIDS THEREFROM; DETERGENTS; CANDLES</b> .....	155
C 08 F	Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds .....	105	C 11 B	Producing (pressing, extraction), refining and preserving fats, fatty substances (e. g. lanolin), fatty oils and waxes, including extraction from waste materials; Essential oils; Perfumes .....	155
C 08 G	Macromolecular compounds obtained otherwise than by reactions only involving unsaturated carbon-to-carbon bonds .....	115	C 11 C	Fatty acids from fats, oils, or waxes; Candles; Fats, oils and fatty acids by chemical modification of fats, oils, or fatty acids obtained therefrom .....	155
C 08 H	Derivatives of natural macromolecular compounds .....	120	C 11 D	Detergent compositions: The use of single substances as detergents; Soap and soap-making; Resin soaps; Recovery of glycerol .....	156
C 08 J	Working-up; General processes of compounding; After-treatment .....	121	C 12	<b>BIOCHEMISTRY: BEER; SPIRITS; WINE; VINEGAR; MICROBIOLOGY; ENZYMOLOGY; MUTATION OR GENETIC ENGINEERING</b> .....	159
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C 08 L	Compositions of macromolecular compounds .....	123	C 12 F	Distillation and rectification of fermented solutions; Recovery of by-products; Denaturing of, and denatured alcohol .....	160
C 09	<b>DYES; PAINTS; POLISHES; NATURAL RESINS; ADHESIVES; MISCELLANEOUS COMPOSITIONS; MISCELLANEOUS APPLICATIONS OF MATERIALS</b> .....	129			
C 09 B	Organic dyes or closely-related compounds for producing dyes; Mordants; Lakes .....	129			
C 09 C	Treatment of inorganic materials, other than fibrous fillers, to enhance their pigmenting or filling properties; Preparation of carbon black .....	137			
C 09 D	Inks; Paints; Varnishes; Lacquers; Wood-stains; Chemical paint removers; Pastes or solids for colouring or printing .....	137			
C 09 F	Natural resins, French polish; Drying-oils; Driers (siccatives); Turpentine .....	139			
C 09 G	Polishing compositions other than French polish; Ski waxes .....	139			
C 09 H	Preparation of glue or gelatine .....	139			
C 09 J	The use of materials other than glue as adhesives; Adhesive processes in general (non-mechanical part) .....	139			
C 09 K	Compositions not provided for elsewhere; Miscellaneous applications of materials .....	140			

Appendix II

C 12 G	Wine; Other alcoholic beverages: Preparation thereof .....	160	C 21 D	Modifying the physical structure of ferrous metals; General devices for heat treatment of ferrous or non-ferrous metals or alloys; Making metal malleable by decarburisation, tempering, or other treatments .....	174
C 12 H	Pasteurisation; Sterilisation; Preservation; Purification; Clarification; Ageing .....	160	C 22	<b>METALLURGY; FERROUS OR NON-FERROUS ALLOYS; TREATMENT OF ALLOYS OR NON-FERROUS METALS</b> .....	177
C 12 J	Vinegar; Its preparation .....	160	C 22 B	Production and refining of metals; Pretreatment of raw materials .....	177
C 12 L	Pitching and depitching machines; Cellar tools .....	161	C 22 C	Alloys .....	179
C 12 M	Apparatus for enzymology or microbiology; Unicellular algae, plant or animal cell, tissue, or virus-culture apparatus .....	161	C 22 F	Changing the physical structure of non-ferrous metals and non-ferrous alloys .....	180
C 12 N	Micro-organisms or enzymes; Compositions thereof; Propagating, preserving, or maintaining micro-organisms or tissue; Mutation or genetic engineering; Culture media .....	162	C 23	<b>WORKING OR TREATMENT OF METALS, OTHER THAN BY MECHANICAL MEANS; COVERING MATERIALS WITH METALS; INHIBITING CORROSION OR INCRUSTATION IN GENERAL</b> .....	181
C 12 P	Fermentation or enzyme-using processes to synthesise a desired chemical compound or composition .....	163	C 23 C	Apparatus and processes for which provision is not made elsewhere, e.g. in classes B 05, B 44, or in sub-classes C 03 C, C 25 D, F, C 25 D, F 27 B, for covering metals or covering other materials with metals; Diffusion processes for surface treatment of metals .....	181
C 12 Q	Measuring or testing processes involving enzymes or micro-organisms; Compositions or test papers therefor; Processes of preparing such compositions; Condition-responsive control in microbiological or enzymological processes .....	166	C 23 D	Enamelling of, and applying a vitreous layer to, metals .....	182
C 12 R	Processes using micro-organisms .....	167	C 23 F	Chemical surface treatment of metals not covered by sub-classes C 23 D, C 25 D; Inhibiting corrosion or incrustation in general .....	182
C 13	<b>SUGAR OR STARCH INDUSTRY</b> .....	169	C 23 G	Cleaning and de-greasing of metallic objects by chemical methods other than electrolysis .....	183
C 13 C	Cutting mills; Shredding knives; Pulp presses .....	169	C 25	<b>ELECTROLYTIC OR ELECTROPHORETIC PROCESSES; APPARATUS THEREFOR</b> .....	184
C 13 D	Production and purification of sugar juices .....	169	C 25 B	Electrolytic or electrophoretic processes for the production of compounds or non-metals; Apparatus therefor .....	184
C 13 F	Preparation and processing of raw sugar, sugar, and syrup .....	169	C 25 C	Processes for the electrolytic production, recovery or refining of metals; Apparatus therefor .....	185
C 13 G	Evaporation apparatus; Boiling pans .....	169	C 25 D	Processes for the electrolytic or electrophoretic production of coatings; Electroforming; Apparatus therefor .....	186
C 13 H	Cutting machines for sugar; Combined cutting, sorting and packing machines for sugar .....	170	C 25 F	Processes for the electrolytic removal of materials from objects; Apparatus therefor .....	187
C 13 J	Extraction of sugar from molasses .....	170	C 30	<b>CRYSTAL GROWTH</b> .....	189
C 13 K	Glucose; Invert sugar; Lactose; Maltose; Synthesis of sugars by hydrolysis of di- or polysaccharides .....	170	C 30 B	Single-crystal growth; Unidirectional solidification of eutectic materials or unidirectional demixing of eutectoid materials; After-treatment of single crystals; Doping processes for crystals in general; Refining by zone-melting of materials in general; Apparatus therefor .....	189
C 13 L	Starch; Dextrin; Similar carbohydrates .....	170			
C 14	<b>SKINS; HIDES; PELTS; LEATHER</b> .....	171			
C 14 B	Mechanical treatment and processing of skins, hides, and leather in general; Pelt-shearing machines; Intestine-splitting machines .....	171			
C 14 C	Chemical treatment of hides, skins and leather, e.g. tanning, impregnating, finishing; Apparatus therefor; Compositions for tanning .....	172			
Sub-Section: <b>METALLURGY</b>					
C 21	<b>METALLURGY OF IRON</b> .....	173			
C 21 B	Manufacture of iron or steel .....	17			
C 21 C	Processing of pig-iron, e.g. refining, manufacture of wrought-iron and steel; Treatment in molten state of ferrous alloys .....	174			

IPC SUB-CLASS C 05 B

C 05 B

**C 05 FERTILISERS; MANUFACTURE THEREOF** (soil-conditioning compositions or soil-stabilising compositions, e.g. mulches, C 09 K, 17/00)

Notes

- (1) An ingredient in a mixture of fertilisers, or a single fertiliser which contains more than one of the chemical elements on which the subdivision into sub-classes is based, is classified only in the first of the appropriate sub-classes. Thus, a nitrophosphate or an ammoniated superphosphate is classified in C 05 B but not in C 05 C, magnesium phosphate is classified in C 05 B but not in C 05 D, and calcium cyanamide in C 05 C but not in C 05 D.
- (2) In this class it is desirable to add, in conformity with paragraph 30 of the Guide, after the double oblique stroke the symbols relating to complementary information concerning individual constituents of an invention unit which is already classified as such. This complementary information concerns the indication of ingredients of a mixture of different fertilisers or of fertilisers with non-fertilisers.

**C 05 B PHOSPHATIC FERTILISERS**

Sub-class Index

SUPERPHOSPHATES .....	17/00	ORGANIC FERTILISERS .....	15/00, 17/00
PRODUCED BY WET TREATMENTS .....	11/00	AFTER-TREATMENT .....	19/00
PRODUCED BY PYROGENIC PROCESSES .....	13/00	MIXTURES OF PHOSPHATIC FERTILISERS .....	21/00
OTHER INORGANIC FERTILISERS .....	3/00 to 9/00, 17/00		

17/00	Superphosphates, i. e. fertilisers produced by reacting rock or bone phosphates with sulphuric or phosphoric acid in such amounts and concentrations as to yield solid products directly	11/02	. Pretreatment
17/02	. Superphosphates	11/04	. . . using mineral acid
17/04	. Double-superphosphate; Triple-superphosphate Other fertilisers based essentially on monocalcium phosphate	11/06	. . . using nitric acid (nitrophosphates)
17/06	. Ammoniation of superphosphates (fertilisers based essentially on ammonium orthophosphate 7/00)	11/08	. . . using sulphuric acid
17/10	. Apparatus for the manufacture of superphosphates	11/10	. . . using orthophosphoric acid
3/00	Fertilisers based essentially on di-calcium phosphate (11/00 takes precedence)	11/12	. . . using aqueous hydrochloric acid
5/00	Thomas phosphate; Other slag phosphates	11/14	. . . using wet gaseous acids
7/00	Fertilisers based essentially on alkali or ammonium orthophosphates (11/00 takes precedence)	11/16	. . . using alkaline lyes
9/00	Fertilisers based essentially on phosphates or double phosphates of magnesium (11/00 takes precedence)	13/00	Fertilisers produced by pyrogenic processes from phosphatic materials
11/00	Fertilisers produced by wet-treating or leaching raw materials either with acids in such amounts and concentrations as to yield solutions followed by neutralisation, or with alkaline lyes	13/02	. from rock phosphates (13/06 takes precedence)
		13/04	. from metallic phosphorus compounds, e.g. ferro-phosphorus
		13/06	. Alkali and alkaline earth meta- or polyphosphate fertilisers
		15/00	Organic phosphatic fertilisers (bone meal 17/00)
		17/00	Other phosphatic fertilisers, e.g. soft rock phosphates, bone meal
		17/02	. containing manganese
		19/00	Granulation or pelletisation of phosphatic fertilisers other than slag (granulating apparatus B 01 J 2/00; granulating slag C 04 B)
		19/02	. of superphosphates or mixtures containing them
		21/00	Mixtures of phosphatic fertilisers

[Appendix IV follows]

# PATENT SPECIFICATION

(11) 1 402 542

1 402 542

(21) Application No. 17505/71 (22) Filed 27 May 1971

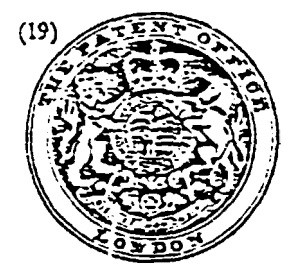
(23) Complete Specification filed 28 July 1972

(24) Complete Specification published 13 Aug. 1975

(51) INT CL<sup>3</sup> C01B 21/00, 25/00; C05B 21/00

(52) Index at acceptance  
CIA C3CD37 E4R8 E5R  
C1B 3C1 3C3

(72) Inventors BRIAN GARNER BENNETT and WILLIAM SAMUEL HOLMES



## (54) PRODUCTION OF NITROGEN AND PHOSPHORUS-CONTAINING COMPOUNDS

(71) We, ALBRIGHT & WILSON LIMITED, a British Company of P.O. Box No. 3, Oldbury, Worley, West Midlands, England, formerly of Oldbury, near Birmingham, Warwickshire, England, do hereby declare the invention, for which we pray that a Patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to the production of compounds containing both nitrogen and phosphorus atoms by the reaction of phosphorus pentoxide with liquid ammonia.

Previously it has been suggested that it is possible to obtain a diammonium diamido diphosphate having a nitrogen:phosphorus ratio of 2.0:1 by reacting liquid ammonia with phosphorus pentoxide at room temperature for 5 to 6 weeks. It has also been proposed to condense ammonia gas onto phosphorus pentoxide and then hold the mixture under pressure at temperatures of less than 42°C for 3 weeks to obtain materials having N:P ratio of from 2.2:1 to 2.4:1 it being stated that higher temperatures result in the production of glasses.

We have now found that we may obtain products having N:P ratio greater than 2.4:1 by the reaction of liquid ammonia with phosphorus pentoxide in substantially shorter times than those previously indicated.

The present invention provides a process for the production of compounds containing both nitrogen and phosphorus and having an N:P ratio greater than 2.4:1 which comprises (1) forming a dispersion of phosphorus pentoxide in liquid ammonia by adding solid phosphorus pentoxide to excess liquid ammonia with agitation under such conditions as to prevent local temperatures exceeding 100°C (preferably so as not to exceed 80°C) and then (2) after addition of the phosphorus pentoxide in complete maintaining the reaction mixture at a temperature in the range of 30 to 100°C (preferably below 30°C) for sufficient time to produce the compounds

having the N:P ratio of greater than 2.4:1.

The local temperatures may be prevented from rising above the values stated by a combination of two factors, namely the bulk temperature of the liquid ammonia and the degree of agitation employed. Obviously the lower the bulk temperature the less is the degree of agitation required.

Preferably the process is carried out by adding the desired amount of phosphorus pentoxide to an excess of liquid ammonia at low temperature (i.e. normally below 0°C preferably below -10°C) temperatures of about -33°C being suitable, in order to ensure that there is sufficient cooling available to prevent local temperatures from exceeding 100°C. During this addition the liquid ammonia will be agitated to ensure good dispersion of the P<sub>2</sub>O<sub>5</sub>. However, alternative methods of ensuring this may be employed if desired.

If the reaction is carried out in the preferred method described above by adding phosphorus pentoxide to liquid ammonia at low temperatures, a weight ratio of at least 1.6:1, preferably greater than 3:1, most preferably about 5.0:1, of liquid ammonia over the phosphorus pentoxide should be employed. If an auxiliary cooling method is employed e.g. cooling by submerged pipes containing ammonia, or other refrigerant, or using a diluent which can cool by evaporation, then it may not be necessary to use this degree of excess of ammonia.

In order to obtain satisfactory products we have found that it is necessary that the local temperature attained during the reaction, particularly during the initial addition of phosphorus pentoxide to ammonia should not at any time exceed 100°C. Preferably no local temperature should be allowed to exceed 80°C. Once the initial release of heat resulting from the exothermic mixing of the reactants has passed the local temperatures will become more uniform and then approximate to the bulk temperature. Thus at this stage of the process it is possible, to heat the reaction

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Appendix IV

REPUBLIQUE FRANCAISE

INSTITUT NATIONAL  
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) N° de publication :  
(A n'utiliser que pour les  
commandes de reproduction).

2 295 911

A1

DEMANDE  
DE BREVET D'INVENTION

(21)

N° 75 33334

(53) Procédé pour la préparation de phosphate acide mixte de sodium et d'ammonium.

(59) Classification internationale (Int. Cl. P.) C 01 B 25/28, 25/30; C 05 B 7/00.

(22) Date de dépôt ..... 1er décembre 1975, à 13 h 30 mn.

(30) (31) (32) Priorité revendiquée : Demande de brevet déposée au Japon le 27 décembre 1974, n. 142.915/1974 au nom de la demanderesse.

(41) Date de la mise à la disposition du public de la demande ..... B.O.P.I. - «Listes» n. 30 du 23-7-1976.

(71) Déposant : CENTRAL GLASS COMPANY LTD., résident au Japon.

(72) Invention de :

(73) Titulaire : *Idem* (71)

(74) Mandataire : Cabinet Bossard.

United States Patent [19]

[1:] 4,073,634

Pircon et al.

[45] Feb. 14, 1978

[57] PROCESS FOR PRODUCTION OF FERTILIZERS

[76] Inventors: Ladislav J. Pircon, 305 Canterbury Lane, Oak Brook, Ill. 60521; Ralph E. Peck, 3100 S. Michigan Ave., Chicago, Ill. 60616

[21] Appl. No.: 677,778

[22] Filed: Apr. 16, 1976

[51] Int. Cl.<sup>2</sup> ..... C05B 11/08

[52] U.S. Cl. .... 71/37; 71/40; 55/73; 423/242

[58] Field of Search ..... 55/73; 423/242; 71/31, 71/37, 40

[56] References Cited

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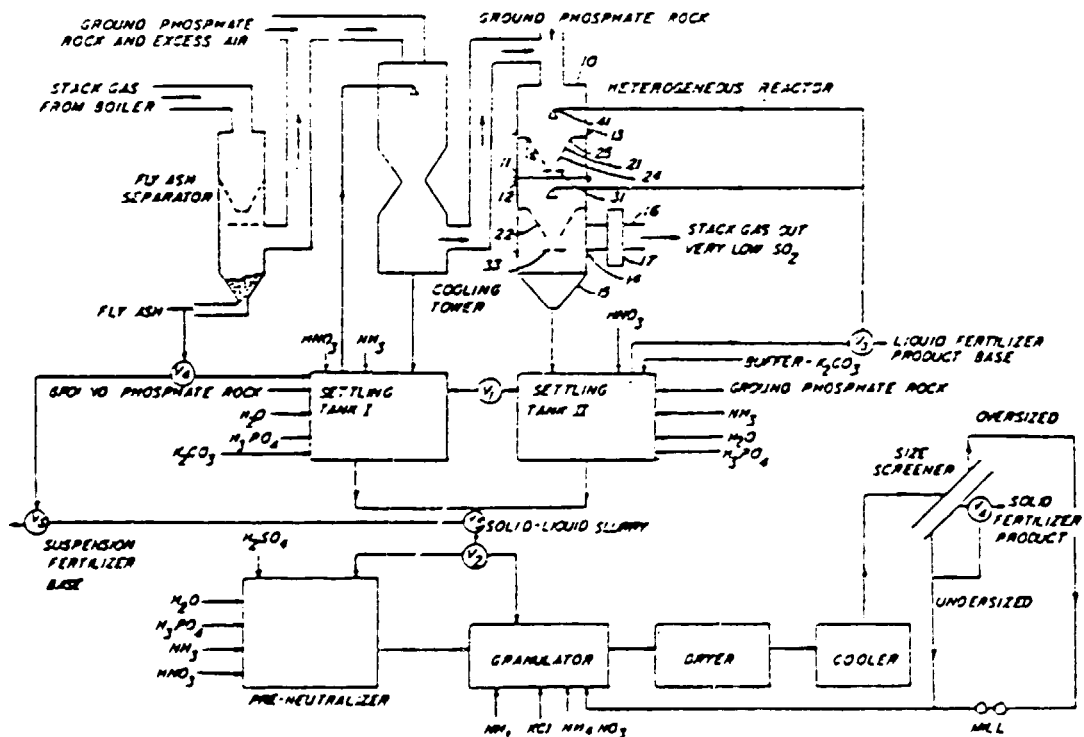
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Primary Examiner—Frank A. Spear, Jr.  
Assistant Examiner—Ferris H. Lander  
Attorney, Agent, or Firm—Thomas W. Speckman

[57] ABSTRACT

A process for the production of fertilizer comprising reacting sulfur oxide containing gas and water in a multiple state reactor to form sulfur containing acid, reacting the sulfur containing acid with a basic ion selected from the group consisting of calcium, ammonium and potassium ions, the calcium being derived from a salt selected from the group consisting of phosphatic and nitrogeous salts, to form a fertilizer selected from the group consisting of phosphatic, nitrogeous and potassium fertilizers and combinations thereof. This process is suitable for the utilization of sulfur oxides resulting from the combustion of high sulfur containing fossil fuels and sulfur producing chemical processes. The process of this invention enables the utilization of low concentration sulfur acid in the acidification of phosphate rock utilizing a multiple state reactor.

10 Claims, 2 Drawing Figures







جمهورية مصر العربية  
وزارة البحث العلمي والابتكار والذرة  
مكتب براءات الاختراع

Int Cl<sup>2</sup> • C 05 G 3/06

	[٥١]
فئة	[٥٢]
براءة أصلية رقم ١٢٦٢٦	[١١]
براءة إضافية رقم	[٦١]
١٩٧٥ / ٥٨	[٢١] رقم الطلب :
١٩٧٥ / ٢ / ١١	[٢٢] تاريخ تقديم الطلب :
	[٤٥] تاريخ إصدار البراءة :
	[٣٠] الاسبقية
١/٣٤٥٩٥٨٦ - ٤/٣٤٥٩٥٨٤ - ٥/٢٤٥٩٥٨٥ - ٩/٢٤٠٦٧١٤	[٣١] رقم الاسبقية :
١٩٧٤/١٣/١٧ - ١٩٧٤/١٣/١٧ - ١٩٧٤/٢/١٣ - ١٩٧٤/١٣/١٧	[٣٢] تاريخ الاسبقية :
	[٢٣] اسم الدولة : جمهورية ألمانيا الاتحادية

[٥٤] نسبة الاختراع : الاسمدة

[٧١] اسم مالك البراءة : شيرينج اكنديجيز اشافت برلين أونند برجاكن - شركة مساهمة

مركز ما العام / مولر شتراس ١٧٠ - ١٧٨ ، برلين ، ألمانيا الاتحادية

[٧٢] اسم المخترع : روبرت ايزن - هانز ميزيتش - ألفريد شتايدر

[٦٠] للبراءات ذات الصلة بموضوع الاختراع :

[Appendix V follows]

APPENDIX V

UNIDO THESAURUS TERMS  
AND THEIR IPC EQUIVALENTS

	Equivalent symbols of the IPC (Third Edition)	Statistical data (No. of patent documents published in 1978)
AMMONIA	C 01 C 1/04	75
ICI process		
Kellogg process		
Topsoc process		
Montedison process		
AMMONIA SYNTHESIS GAS*	C 01 B 2/30	19
Steam reforming of naphta	C 01 B 2/16	14
ICI process		
Partial oxidation of oil	C 01 B 2/14	29
Texaco process		
Shell process		
Gasification of coal	C 10 J 3/00 to 5/00	475
Lurgi process		
Koppers-Totzek process		
Winkler process		
Electrolytic method	C 25 B 1/02 to 1/12	149
de Nora process		
AMMONIUM CHLORIDE	C 01 C 1/16; C 05 C 3/00	24
Ugine Kuhlmann direct- neutralization process		
Asahi Glass soda-ash cycling process		
AMMONIUM NITRATE	C 05 C 1/00 to 1/02; C 01 C 1/13	53
Kaltenbach process		
Stanniccarbon process		
SBA process		
ICI (Nitram) process		
C & I./Girdler process		
Montedison process		
Uhde process		
Fisons process		
Strengel process		
AMMONIUM PHOSPHATE NITRATE (WITH POTASH)	C 05 G 1/06	7
AMMONIUM SULPHATE	C 01 C 1/242 and 1/244; C 05 C 13/00	17
Direct-neutralization method	C 01 C 1/247	8
Gypsum process	C 01 C 1/244	2
Coke-oven gas		
AMMONIUM SULPHATE NITRATE	C 05 C 13/00	9
Uhde-Hibernia process		
PCI process		
Other processes		

\* See detailed explanatory note

Appendix 7

	Equivalent symbols of the IPC (Third Edition)	Statistical data (No. of patent documents published in 1978)
AMMONIUM SULPHATE PHOSPHATE	C 05 G 1/06	7
CALCIUM AMMONIUM NITRATE Uhde grilling-process Uhde granulating process Other processes	C 05 C 13/00	9
DIAMMONIUM PHOSPHATE (DAP)	C 05 B 7/00; C 01 B 25/28	56
MONOAMMONIUM PHOSPHATE (MAP) Fisons process (powder) PhoSAI Process (powder) Slurry process (granules)	C 05 B 7/00; C 01 B 25/28	56
NITRIC ACID Uhde process Grande Paroisse process Pintsch-Bamag process Stamcarbon process Weatherly process Chemico process SEA process Ugine Kuhlmann process Fauser-Montebison process C. & I./Girdler process	C 01 B 21/40	25
NITROGEN SOLUTIONS Aqua ammonia Ammonia + ammonium nitrate Ammonia + urea Ammonia + ammonium nitrate + urea Non-ammoniacal solutions of ammonium nitrate and urea	C 05 C 3/00 C 05 C 13/00 C 05 C 13/00 C 05 C 13/00 C 05 C 13/00	7 9 9 9 9
NITROPHOSPHATES Odda process Sulphonitric process Phosphonitric process Carbonitric process	C 05 B 11/00	5
PHOSPHORIC ACID Nissan hemihydrate-dihydrate process (conventional) Fisons hemihydrate process Classic Prayon dihydrate process Central Glass/Prayon process (dihydrate-hemihydrate) Gulf Design isothermal process (dihydrate) Dorr Oliver high-yield high- strength (HYS) process Hydrochloric acid extraction process Electric furnace process	C 01 B 25/18 - 25/239 C 01 B 25/229 C 01 B 25/226 C 01 B 25/225 C 01 B 25/231 C 01 B 25/225 C 01 B 25/229 C 01 B 25/22 C 01 B 25/20	194 104 3

Appendix V

	Equivalent symbols of the IPC (Third Edition)	Statistical data (No. of patent documents published in 1978)
POTASSIUM NITRATE	C 05 C 5/02; C 01 D 9/00 to 9/20	18
SINGLE SUPERPHOSPHATE (SSP)	C 05 B 1/02	2
SODIUM NITRATE	C 05 C 5/02; C 01 D 9/00 to 9/20	18
Guggenheim process	C 01 D 9/02	} 2
Nitrogen-oxide process	C 01 D 9/06	
SULPHURIC ACID*		
Contact process-normal version	C 01 B 17/50 - 17/60	141
Contact process-high-pressure version from pyrites	and	
Müller-Kühne method	C 01 B 17/72 - 17/94	218
SUPERPHOSPHORIC ACID		
Concentration of wet-process acid	C 01 B 25/24	3
Concentration of furnace acid		
TRIPLE SUPERPHOSPHATE (TSP)	C 05 B 1/04	3
UREA		
Stripping processes	C 07 C 126/00 to 126/08; C 05 C 9/00	227
Stamcarbon process		
Snam Progetti process		
Total-recycle processes	C 07 C 126/02	117
Chemico process		
Mitsui Toatsu process		
Montedison process		
Gas-separation recycle process		
CPI/Allied Chemical process		
UREA AMMONIUM PHOSPHATE (UAP)		
Conventional slurry process	C 05 G 1/00	74
Melt process		
Dry ingredients process		
Melt oil-cooling process		

\* See detailed explanatory note

Detailed Explanatory Notes1. Ammonia Synthesis Gas

The production of ammonia synthesis gas from hydrocarbons is a process involving many steps, the first of which is the gasification of the hydrocarbon. The relevant IPC groups for this are indicated. However the process also involves numerous other steps such as washing, reforming, conversion, separation, purification, etc. These processes are to be found in C 01 B 1/00 to 2/30. With an appropriate combination of hydrocarbons, hydrogen is produced, which when mixed with nitrogen from the air produces ammonia synthesis gas by catalytic reaction. A given patent document will normally describe in detail one step forming the whole process, e.g. an improved method of removing sulphur. Catalysts, per se, for the above chemical reactions (or any other reactions) are to be found in B 01 J 21/00 to 37/36.

2. Sulphuric Acid

The production of sulphuric acid usually takes place with the following basic steps:

- (a) The production of sulphur dioxide ( $\text{SO}_2$ ) gas, or a gas mixture containing  $\text{SO}_2$ .
- (b) The purification/separation thereof.
- (c) The conversion of  $\text{SO}_2$  into sulphuric acid ( $\text{H}_2\text{SO}_4$ ); usually by the "contact" process.

When the  $\text{SO}_2$  gas is produced by the burning of sulphur, step (b) is usually unnecessary. When produced by other means, the  $\text{SO}_2$  usually has to be purified or separated.

	Equivalent symbols of the IPC (Third Edition)	Statistical data (No of patent documents published in 1979)
<u>Step (a) Preparation of <math>\text{SO}_2</math></u>		
by burning sulphur	C 01 B 17/5	15
by roasting sulphides (e.g. pyrites)	C 01 B 17/52	5
other methods (e.g. Müller/Künne)	C 01 B 17/50	39
<u>Step (b) Purification of <math>\text{SO}_2</math></u>		
Separation; purification	C 01 B 17/56	28
<u>Step (c) Conversion into Sulphuric Acid</u>		
by the "contact" process	C 01 B 17/56 to 17/80 and	273
by other methods	C 01 B 17/82 to 17/86	3
Catalysts for the above chemical reactions (or any other reactions) are to be found in	B 01 J 21/00 to 37/36	7,612

[Appendix VI follows]

APPENDIX VI

SAMPLE OF INPADOC'S PATENT  
CLASSIFICATION SERVICE (PCS)

P C S PATENT CLASSIFICATION SERVICE		MICROFICHE		JAN/1979		78-01-01 / 78-12-29		PRODUCED: 79-01-01		PAGE: 64 984				
I P C		CC	PUB. NO.	RD	DOC. NO	IPC (ALL)	CC	PR. NO.	KA	PRIORITY NO.	APPLICANT	TITLE		
G09F	7/00	JP	78-05-06	A2	53049999	G09F	7/00	SE	76-10-15	A	76	7611401	S SYSTEMS LTD MOO ERU PURASUT D MOO RUNDODAA RU AB	OBIMENJONGJOMTANTAITHOORUGA
		NL	78-04-10	A	7711334	G09F	7/00	SE	76-10-15	A	76	7611401	H. L. PLAST M. L. UNOVALL AB TE SUNDSVALL, ZWE DE...	HOUDER VOOR INFORMATIEDRAGERS IN DE VOR R VAN EEN STRIP.
		SE	78-07-10	B	402662	G09F	7/00	SE	76-10-15	A	76	7611401	H. L. PLAST M. L. UNOVALL AB ARE	HALLARE FOR RERSFORMIGA INFORMATIONSSER
		SE	78-10-19	C	402662	G09F	7/00	SE	76-10-15	A	76	7611401	H. L. PLAST M. L. UNOVALL AB ARE	HALLARE FOR RERSFORMIGA INFORMATIONSSER
G09F	7/10	DE	77-13-16	UI	7735779	G09F	7/10	DE	77-11-23	U	77	7735779	KOLB. UDD, S239 UNNAU	KENNZEICHNUNGSSCHILD
		DE	78-12-14	A1	7816149	G09F	7/10	US	77-06-01	A	77	802441	THE READ CORP., DAYTON, OHIO (V. ST. A.)	VOM HAND EINSTELLBARE ANZEIGE
		FR	78-08-11	A1	2377676	G09F	7/10	DE	77-01-12	U	77	7700689	ROBIUS ULRICH	DISPOSITIF MANUEL POUR INDIGUER LES SCO RES DE SPORTS OU JEUX DE TOUTS TYPES
		NO	77-12-12	B	137620	G09F	7/10	FR	73-11-05	A	73	7339176	WESTBERG, AAKE GUSTAF	INFORMATIONSTAVLE.
		NO	78-03-21	C	137620	G09F	7/10	FR	73-11-05	A	73	7339176	WESTBERG, AAKE GUSTAF	INFORMATIONSTAVLE.
G09F	7/12	BR	78-01-24	U	5600675	G09F	7/12	BR	76-06-08	U	76	5600675	HALENA J	LETREIROS METALICOS ADESIVOS
		FR	78-03-24	B1	2224536	G09J	7/00	US	73-04-06	A	73	348604	MINNESOTA MINN G MANUFACTURIN G	
		FR	78-04-07	A1	2364518	G09F	7/12	FR	76-09-14	A	76	7628126	ETIQUET MAURICE	PANNEAU SUPPORT D'AUTOCOLLANTS DETACHAB LES
		GB	78-03-22	A	154924	G09B	1/06	JP	74-04-22	A	74	457	HASEI T	EDUCATIONAL AND/OR RECREATIONAL DEVICE
						A63B	33/26	JP	74-04-28	A	74	4810		
		JP	77-11-16	A2	52137290	G09F	7/12	JP	76-05-13	A	76	54708	TOKYO HORAIWA KK	WATSUPENZAI
		JP	78-07-11	B4	53022838	G09F	7/12	JP	72-09-11	A	72	91078		
		US	78-05-23	A	4090464	G09F	7/12	US	75-06-25	A	75	590351	BISHOPP; JOHN W	YANDAL GUARD SHEET
		US	78-06-27	A	4097632	G09F	7/12	US	73-07-13	A3	73	379012	SPECTOR; GEORGE LET-R-EDGE OF C	PRODUCT FOR CONSTRUCTING THREE-DIMENSIO NAL SIGN CHARACTER
G09F	7/14	AU	78-09-21	A1	23263/77	G09F	7/14	US	73-05-03	A2	73	356983	AMADA, LTD.	DISPLAT DEVICES
		FR	77-12-30	A1	2353916	G09F	7/14	AU	76-03-12	A	76	5136	SMITH, W.P.	PROCEDE DE FABRICATION DE PLAGUES A INS CRPTIONS EN RELIEF ET PLAGUES OBTENUE S PAR APPLICATION DE CE PROCEDE
		FR	78-09-01	B3	2332581	G09F	7/14	FR	75-11-19	A	75	7536066	KALBACHER BERNA RD	
		JP	78-11-25	A2	5313523	G09F	7/14	US	77-04-13	A	77	787288		
		NO	78-06-26	B	138611	G09F	7/14	SE	72-09-29	A	72	10367	MODERN MODELL, AB,	MARKERINGSANORDNING TIL ANBRINGELSE PAA KLEBENGERE

Appendix VI

I P C SELECTED CLASSIFICATION SERVICE			MICROFICHE		08/1979		PRODUCED: 79-02-23		PAGE: 3 103	
I P C	CC PUB**BAT ED	DOC. NO	IPC (ALL)	CC PR. #*DAT	PRIORITY NO.	EQUIVALENCES (PUB. BL.)	APPLICANT	TITLE	FRARE:	F09
001F	3/10					CH 71-08-31 A 507733 DE 70-10-15 A 201493 DE 75-08-26 B 131094 DE 75-10-27 C 131094 FR 71-01-08 B 2030173 GB 72-03-08 A 1266122 JP 78-06-28 B 53020711 NL 70-10-06 A 7000631 NO 73-12-03 B 120019 US 71-11-09 A 3618903				
001F	3/12	GB 79-02-14 A 1540790	001F 7/16 001F 3/12 001F 15/02 C07C 63/00 001F 3/12	DE 77-05-21 77	2723068		BUSSENCHE KG	ADHESIVE MIXED FOR ADHESIVE SPREADING MACHINES		
		SU 79-01-15 T 642290		SU 76-11-29 76	2423444		INST GAZA AN UK SSR GORLOVSKIJ KOKS KHIMICHESKIJ ZAVOD REPERITESTI TER VEZDE VALLALAT , MU	METHOD OF DETOXICATION OF SOLID WASTE OF PHOSPHORIC ANHYDRIDE PRODUCTION		
001F	3/14	HU 79-01-20 P 172922	001F 3/14	HU 75-02-05 75AA	801	DE 76-08-19 A1 2602050		APPARATUS FOR MIXING SLURRY GRANULAR AND/OR DUSTLIKE MATERIALS INTO FLUID PARTICULATE FOR PRODUCING SLUDGE AT PIPELINE CARRYING		
001F	5/00	DD 79-01-20 Z 133067	C03C 1/04 001F 5/00	DD 77-11-14 77	202064		KLINGLER, HERMAN N. DD SCHILLE, DIETRICH N. DD SCHNEIDER, ANGEL KA, DD	VERFAHREN UND VORRICHTUNG ZUR KONTINUIERLICHEN HERSTELLUNG EINER LICHTSTREIFENSCHUTTSCHICHTDISPERSION		
		FR 79-02-02 B1 2202936	001J 10/00 001F 5/00	JP 74-08-26 74	97062	DE 76-03-18 A1 2537962 FR 76-03-26 A1 2202936 GB 78-08-16 A 1521909 JP 76-02-27 A2 5102482 JP 78-11-17 B4 53043200 US 77-12-20 A 4969111 SE 78-10-02 A1 867752 DE 78-12-07 A1 2737329 FR 78-12-29 A1 2393073 JP 79-01-09 A2 54002206 NL 78-12-05 A 78005711	HITACHI CHEMICAL CO LTD			
		GB 79-01-04 A 2000195	C22C 1/02 001F 5/00	CH 77-06-02 77	6766		ALUSUISSE	PROCESS FOR THE CONTINUOUS PRODUCTION OF RECTANGULAR ALLOYS		
		GB 79-01-10 A 2000440	001F 3/02 001F 5/00	AT 77-07-01 77	4685		MAAGNER BIRD AG	METHOD AND APPARATUS FOR MIXING TWO GAS STREAMS		
		GB 79-01-17 A 2000600	001F 3/04 001F 5/00	DE 77-07-11 77	2731279		KUBA KUMLEFABRIK IA BAUERBRUNN	APPARATUS SUITABLE FOR DIVIDING A FLOWING LIQUID		

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[End of Appendix VI  
and of document]

