

PATENT EXAMINATION AND THE NEED FOR RESEARCH

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The patent system, as it exists today, is designed to implement the provision of the Constitution that empowers Congress "to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The philosophy of granting monopoly rights as a means of fostering progress and providing an incentive to invent and disseminate new knowledge was inherited from the English common law. Without question the patent system has contributed profoundly to the growth of our country and our present way of life.

Throughout our history various laws have been passed by Congress to carry out the patent provision of the Constitution. Although these laws have differed there are certain unifying principles. The granting of a patent has been made a matter of right. An inventor who complies with the provisions of the statutes must be granted a patent; it is not a discretionary matter with the Patent Office. Therefore, the Office must make a determination, in each case, as to whether or not the applicable statutory provisions have been complied with. This involves many technical and legal considerations on the part of the patent examiners who constitute the heart of the Patent Office.

Of prime importance is the determination of whether or not a patentable invention has been made. The law provides that a patent may be obtained for any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof. Thus the invention must be new and the law provides that a person is not entitled to a patent if the invention was patented or described in a printed publication in this or a foreign country before his invention thereof or more than one year prior to his application for patent. This imposes a staggering searching burden on the examiner for a description of the invention anywhere in the literature in any language can preclude the granting of a patent. The problem is further complicated by the fact that a patent may not be obtained even though the invention is not identically described in the prior literature

if the differences between the subject matter of the invention and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the field to which it pertains. In effect an inventor is charged with full knowledge of every pertinent publication. Patents are not granted for normal developments in a field - there must be, as some have termed it, a flash of genius.

In order to obtain a patent an inventor must file an application. This is typically done through a patent attorney. The application must include (a) a written description of the invention in such full, clear, concise and exact terms as will enable any one skilled in the field to which it pertains to make and use the invention, (b) one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant considers to be his invention and (c) where appropriate, a drawing of the invention. The claims define the scope of the patent protection the inventor is seeking and generally there will be a number of claims; some claiming the invention broadly and others claiming it more specifically.

At the present time we are receiving more than 80,000 applications a year. When an application is received it is checked for completeness, given a filing date and serial number and assigned to an examiner. The examining corps is organized into four operations; chemical, electrical, mechanical and general engineering. Each operation is divided into groups which are responsible for more specialized portions of these broad technical areas. In each group examiners are assigned even more specialized areas of technology. Thus, for example, one examiner might only deal with steroid chemistry and another might only deal with analog to digital converters. The subject matter for which he is responsible is called the examiner's art. In fields where there is sufficient activity several examiners might be assigned the same art. The assignment of a new application to an examiner is governed by the subject matter of the invention. By the very nature of invention applications do not always fit neatly into preconceived

pigeon holes and such applications will be assigned to the examiner having the art to which it most nearly pertains.

Sometime after receipt and assignment of the application the examiner will take it up for consideration. He must read and thoroughly understand the description and claims. He determines the scope of the search which frequently will extend beyond his art. He searches the patents and other documents that are classified in his art and any others that are pertinent to find the most closely related documents. He develops a position with respect to each claim. His search may be generic or specific and includes a search for equivalent disclosures and disclosures that can be combined to meet the claims. Obviously the broader the claim the more likely that the search will produce an anticipatory reference. Then he writes an "office action" in which he clearly states his position with respect to each claim; either rejection or allowance. When a rejection of a claim is based on prior art, the examiner must distinctly point out how he has applied the prior art to the claim. The office action will also include a discussion of the statutes, court decisions and formal requirements that are germane to the case.

A copy of the office action is forwarded to the applicant who, under normal circumstances, has six months to reply. The typical reply will agree with the examiner in part and disagree in part, arguments will be pressed as to why certain claims should be allowed and the application will be amended by clarifying portions of the description and deleting, modifying or adding claims.

The case now is categorized as an amended application and is taken up in due course for further consideration by the examiner. The examiner considers the arguments of the applicant and the amendments and may conduct a further search of the prior art before preparing another office action. Again the applicant must reply in six months which may be followed by additional office actions and replies.

Through this process the examiner and applicant, or his attorney, negotiate until a resolution of the case is arrived at. This resolution can take several forms; the applicant may abandon his attempt to obtain a patent, or he may put it in a condition where the examiner allows all remaining claims and issues a patent or the two parties may

reach an impasse. In this latter case there will normally be some claims that are allowed and some that the examiner is not willing to allow. The examiner makes a final rejection of the claims he is not willing to allow and the applicant may then appeal to our Board of Appeals. No new issues can be raised on appeal and the Board will render its decision, based on the record, affirming, modifying or reversing the position of the examiner. The Board of Appeals is the final adjudicating authority in the Patent Office on matters going to the merits of the application. If, after appeal, the applicant still disagrees with the position of the Patent Office, he can appeal to the courts. Of course the final court decision, which may be one by the Supreme Court, is binding on both parties.

In processing applications many other problems arise and procedures exist for handling them. As an example it is not uncommon to have two or more applications which claim essentially the same subject matter. As technology progresses it is to be expected that the same solution to problems in a field will be arrived at independently by two or more people. In such cases, if claims are found patentable, the Patent Office institutes an Interference Proceeding and a Board of Interference Examiners determines priority based upon evidence given by the parties as to actual dates of invention, reduction to practice, etc. Again a decision by the Office can be appealed to the courts. Thus an application can be shunted along many different paths before a final disposition is made of the case.

The laws charge the Patent Office with maintaining a system which most will agree is one of the foundations of our economy. In view of this alone, it behooves us from time to time to consider how well we are performing our function. Unfortunately, in looking into our performance, we are forced to conclude that we can not be satisfied. We are in the midst of a crisis and the system is in jeopardy. Advancing technology has created problems which, if not solved, may well force abandonment of the system as we know it.

In the early days the Office had only a handful of examiners. It has been stated that it was not at all unusual then for an examiner to wait around for an application to come in so he would have something to do. Today we have more

than 1000 examiners and over 200,000 applications pending in the Office. Every examiner is deluged with a backlog of work and, in many arts, applications are not taken up for consideration until almost two years after filing or amendment. On the average it now takes more than three years to arrive at a final disposition of an application and it is not unusual for ten years to elapse between the date of filing and final disposition. The adverse effects of such delays are many; not the least significant of which are the denial of the proper protection of the patent laws to the inventor and the withholding from the public of new knowledge for an undue length of time. The dissemination of new knowledge is the quid pro quo on which the granting of the seventeen year patent monopoly is based. There are many causes of this backlog such as the increasing complexity of technology, the increasing volume of prior art that must be searched in each case. The net effect which causes us considerable concern is that the rate of disposals has been steadily decreasing - in the mid thirties the average examiner disposed of 160 cases per year; today his disposal rate is 80 cases per year.

When we look at the quality of our performance we are equally disturbed. Every issued patent is presumed to be valid and most are never challenged. However, a certain number are challenged in the courts - normally when someone other than the patent holder produces the item and is sued for infringement by the patent holder. In such cases, the percentage of patents held invalid, because of prior art brought forth by the alleged infringer, which the examiner apparently did not consider, has been increasing at an alarming rate. Admittedly patents and other issues do not usually get to the stage of court litigation unless there is a reasonable difference of opinion between reasonably competent groups of attorneys. However, our concern over our quality of performance is further strengthened as a result of recently instituted quality control procedures. Quality control of an operation such as patent examination is, at best, extremely difficult but we have attempted to set up means for rating the quality of performance on cases that have gone to final disposition. The review and rating of cases is done by our most highly skilled examiners and the factors rated extend from

routine records and housekeeping detail to fundamental points such as the proper application of legal decisions and prior art to the claims. A sample of cases was drawn and rated to determine the existing quality level for one of the operations. The results showed that, in a substantial percentage of the cases, at least one office action was defective enough as to raise doubts regarding the validity of the patent that subsequently issued. Unfortunately we have no true measure of quality in the past but, even if we had, we could not be satisfied with the present apparent level.

The problems of productivity have been with us for some time. The problems of quality are just now emerging. In the past productivity problems have, in general, been attacked by adding to the examining corps. This may have helped to keep the backlog from rising to even higher levels than it is today but it has not solved the problem. Much of the advantage that seemed inherent in expanding the examining corps proved to be illusory because of higher attrition, the need for training and the lowering of the average experience level.

It has been evident for some time that more drastic measures are necessary if we are to preserve the examining system as it exists today. Obviously, things can be done within the present framework of operations to improve our effectiveness and our present Commissioner has been conducting a dynamic program to wring the utmost from our current methods of conducting business. A complete reorganization of the Office has been implemented, more authority has been given to examiners of proven merit, compact prosecution practices have been introduced which are designed to reduce the number of office actions and applicant replies per application, quality and quantity norms are being established and a promotion policy based essentially on performance rather than seniority has been introduced. These steps have had and will have substantial effects on our productivity and quality but they can not, in themselves, solve the overall problem. The crux of our problem is the exponential proliferation of technical literature.

Any one, today, in any technical field can not help but be effected by the avalanche of technical literature. One can minimize this problem by increasing the specialization of his area of interest. One who does this can

rightfully say there is no information problem - if he is faced with a problem he can call one to a half dozen or so scientists who are working in his specialized field and quickly determine if there is a solution. Unfortunately the patent examiner can not do this. He is constantly faced with the problem of someone who claims he has found a unique solution to a problem. Much of the function of the examiner is a determination of whether the claimed unique solution is in fact new or whether it is anticipated by the prior art.

In theory, at least, the totality of the world's literature is subject to being searched for each application, for an anticipation may be found in many obscure places. Further nothing ever becomes too old to be of potential interest. Citations of patents more than 100 years old are not uncommon and the Old Testament has even been cited to reject claims. In practice, of course, we can not search everything. We do, however, maintain a technical file of over 3 million U. S. patents, more than 5 million foreign patents and uncounted books, journals, periodicals, etc. This file is constantly increasing in size and we are slowly being buried under the avalanche.

The problem of dealing with large amounts of technical information is not new; we have been living with it for many years. In order to deal with it we have devised a classification system which is probably the most sophisticated in the world. We have, at present, over 300 classes subdivided into some 62,000 subclasses into which documents are classified. A subclass may contain from a few to several thousand patents. There is a need for constant reclassification as technology develops and additional documents are added. For many years this system worked well in directing the examiner to a subset of documents which contained the most pertinent references. However with the growth in magnitude of the total file and the necessity of finer and finer distinctions in classification it is becoming less and less effective. We are facing a losing battle in trying to maintain a classification system for manual search of documents. Continued subdivision of files can in many cases only force the examiner to search in more subclasses - for the claimed concept may overlap many subclasses. Documents characteristically contain information about many things; equivalent or

analogous disclosures can exist in seemingly unrelated fields; two or more documents can be combined to anticipate an idea. For example claims drawn to as simple a device as the poppet beads worn by many women were searched in 15 subclasses covering such diverse arts as Ornamentation; Education and Amusement Devices; and Chain, Staple and Horse Shoe Making.

As the store of information grows, the time required to conduct a proper search grows despite anything that can be done through classification. Coupled with the growing search load there have been continual pressures to maintain or increase production because of the backlog and delays. In such a situation something has to give. It is characteristic of the system that the individual examiners can control production within wide limits by the time they devote to each case. We are concerned that the system is giving in the area of quality. If quality is suffering we are doing a disservice to the inventor and to the public which can cause substantial economic effects.

In view of the importance of the search aspects of examination and the fact that searching has been estimated to occupy the major portion of an examiner's time, it is evident that something must be done to make the searching time more effective and to minimize the necessity of examiners looking at numerous documents that have no bearing on the issue in question. Ideally the examiner should be able to quickly identify the documents which should be considered in order to properly develop his position with respect to the application at hand.

This need has been recognized for some time. In the late 40's a pilot project was undertaken to see if the advantages of automation could be brought to bear on the search problem. A group of chemical patents was selected and analyzed in detail to identify each bit of disclosed information that would be of potential interest to an examiner. Techniques for coding different kinds of information were developed and a card file containing these codes was established. Machine searches of typical examiner inquiries, using a simple sorting machine were demonstrated. This small project definitely showed the feasibility of mechanized searching as an aid to the examiner. By asking a question in code form he could quickly identify a small subset of patents which contained the

most pertinent disclosures.

For many reasons further effort was not conducted along this line until 1955. At that time a group was set up to again investigate the use of mechanization for searching. This group subsequently became the Office of Research and Development. Arrangements were made to conduct research jointly with the National Bureau of Standards because of its outstanding competence in computers and automation. That arrangement continues to this day.

Two courses of research have been followed. One took the path of the earlier project and was directed to the development of coding means for selected arts. The other was directed toward more basic research problems which have to be solved if the benefits of mechanization are to be extended to all the arts and all the search problems. It became evident at an early stage that existing technology would only permit extraction and coding of well organized and identifiable concepts in documents; for example the structure of a chemical compound. However documents are full of unorganized, vague and ambiguous concepts as well as those that only convey the intended meaning when read in context. So it was apparent that basic research had to be conducted in linguistics, self organizing and adaptive systems, machine analysis of documents, automatic derivation of concepts and the relationships between concepts in context, etc. A large part of our research in these areas is done jointly with the National Bureau of Standards. We feel that the eventual solution can only be achieved through basic research in the fundamental problems of information storage, manipulation and retrieval, but any further discussion of this would not be germane to this session.

The efforts along the pioneering path established in the earlier project were designed to give more immediate assistance to the examiners than could be expected from the basic research. In view of the inherent organization of certain aspects of chemical information most of these projects have been directed to various chemical arts. Arts in which the examiner's search is directed toward the structure of a compound were identified and methods for analyzing and coding the documents in the appropriate subclasses were developed. The first such system to be put on an operational basis was for the field of steroid chemistry. Steroid compounds are all related

through having a common structural nucleus. They differ from one another by the elements or functional chemical groups that are attached to this nucleus. The coding system is specifically linked to these features of steroids and is, therefore, not applicable to compounds in general. A more generalized coding scheme was then developed and applied to a group of patents in the organo phosphorus art. Later an even more generally applicable system was developed and applied to the organo metallic art. This latter system is the most recent to be put on an operational basis in the Office. Some work has also been done in fields other than chemistry.

In the organo-metallic system, as in the other chemical systems, the analysis and coding is directed to compounds only. Each patent is analyzed by a skilled chemist who determines the structure of each compound disclosed or implied. Each structure is decomposed into fragments which may be single elements or groups of elements and which are generally accepted by chemists as building blocks of compounds. The coding consists essentially of recording the fragments that are connected to each other and descriptive information about these fragments. It includes specific and generic information. This information is transferred to punched cards for searching with a multi-column sorter. For searching, the examiner specifies what fragments he wants connected together and what descriptive characteristics the fragments must have. The search produces a print out of the appropriate patent numbers. If there is an answer to his question it should be contained in this set of patents. However patents that do not satisfy his purpose may also be retrieved. For example, if an examiner wants fragments A, B, and C connected in sequence he can only ask for A connected to B and B connected to C. The search will retrieve, in addition to patents having the A,B,C connection, patents disclosing the A,B connection in one compound and the B,C connection in another compound and also patents disclosing a compound having two B fragments, one of which is connected to an A and the other to a C. So the examiner must still carefully review the retrieved patents to determine pertinency.

We now have over 12,000 documents in our various mechanized files. Similar systems could undoubtedly be derived for other arts, particularly chemical. There

has been good acceptance on the part of most examiners associated with these mechanized systems. There are drawbacks such as the fact that a search for a chemical process can only be conducted by searching for compounds that might have been made by similar processes. Despite the drawbacks, some are of the opinion that more effort should be directed to setting up such files. However, we are not content to proceed on the basis of opinions. We feel it is essential that we properly evaluate such systems before embarking on an extensive program of applying these techniques to other arts. Every mechanized file represents a capital investment - our direct labor costs for analysis have varied from \$5 to over \$100 per patent. Since we can not now code everything that is in a document, we must also continue the classification effort. Is the capital investment justified? Can we gain benefits in increased production or better quality? We know that after the introduction of the steroid system productivity rose markedly but it has since declined to levels comparable to the pre-

mechanization days. How long can we expect a mechanized file to operate effectively? Technical developments necessitated a revision in the steroid coding which effected some of the patents previously coded. It seems that the more specific a coding system is the more susceptible the file is to becoming obsolete as a result of developments. Unfortunately the difficulty and cost of analysis increases as the coding systems become more general. What is the optimum balance? With human analysis there are human errors. What effect does this have on retrieval? What accuracy or consistency of analysis can we expect or require? What is the effect of retrieving false answers? Do they obscure the true answers? These and many other similar questions, we feel, must be answered before we will know best how to proceed. A large part of our current program is directed towards experiments and tests which are designed to answer such questions. Some of the work that has been done in this area will be discussed in the subsequent papers.