Patents: Another way to publish

The four million patents issued since 1790 have helped "promote the progress of the useful arts," benefitting not only the inventors but also the public, by allowing useful inventions to come into general use.

C. Marshall Dann

Some scientists, including physicists, think that there is something rather crassly materialistic about being interested in patents, and that patents are usually given for clever trivialities. Edwin Land, the founder and chairman of Polaroid, who recently received his 500th patent and was at the same time inducted into the National Inventor's Hall of Fame, said on that occasion that "an inventor is thought of as an ingenious man who puts a date roller on the chicken so that each fresh egg will receive a date stamp."

In rebuttal it may be noted that some pretty good physicists have been patentees: Albert Einstein, Enrico Fermi and Charles Townes, to name just a few. (Einstein's patents are on refrigeration and a self-adjusting camera, a Fermi patent covers the "neutronic" reactor and Townes's laser patent of course is well known). While patents may be sources of financial reward to the inventors, their even more important function is often to make it possible for useful inventions to come into general use.

There is also a feeling that the patent literature is a remarkably unscientific literature. Of course patents are not intended to be scientific reports, but rather are legal instruments. They describe, exemplify and define the inventions for which protection is sought. They are not simple reports of experimentation, though they often contain examples based on experiments.

The patent system

Patents are granted for developments in applied technology; it is not possible to patent scientific principles as such. Only when the principles have been applied to the invention of a new or improved "process, machine, manufacture, or composition of matter," to quote the statute, may a patent be obtained.

Most of the technology described in patents is described nowhere else. One study concluded that only 6% of the patented technology considered in the study had been previously published elsewhere. If people review the literature in any field of applied technology, but neglect to look at the patents in that field, their survey may be very incomplete. The Public Search Room of the US Patent and Trademark Office, shown in figure 1, is used by about 800 people every day.

What is a patent? It is a Government grant of the right to exclude others from practicing the patented invention, given in return for a full written disclosure by the inventor of a new and useful invention. The period of protection in the United States is 17 years. When the patent is granted, the Patent and Trademark office publishes the description of the invention.

The patent system is one of the oldest institutions of the Federal Government. The first patent act was adopted in 1790. Figure 2 shows a bit of history. It is the drawing for a patent granted in 1880 to Thomas A. Edison, on the electric lamp. The patent model that Edison submitted now sits in a glass case in the office of the Commissioner of Patents and Trademarks. Edison is believed to be the all-time champion inventor with over 1000 patents. The patent illustrated is number 223 898. Patents have been numbered consecutively since 1836, and patent number 4 000 000 was granted at the end of 1976. Illustrating the changed format, figure 3 shows the cover page of a recent patent, issued to Arthur Kantrowitz.

According to the Constitution, the purpose of our patent system is to "promote the progress of the useful arts." It does this by providing a series of incentives. One of these is the incentive to invent, based on the inventor's hope of reward. It also gives the inventor an incentive to disclose the invention to the public in return for obtaining the patent grant. Patents also create incentives to invest in research and development and in productive facilities, and to commercialize the invention. The patent system promotes inventions at each stage from the laboratory to the manufacturing plant and ultimately to the consumer.

There are four main statutory requirements for patentability: The inventor must disclose his invention in writing in sufficient detail to enable a person skilled in the art to make and use the invention; the invention must be new, useful and what is called "unobvious." An unobvious invention is one that is sufficiently different from the prior art that it does not appear obvious to a person of ordinary skill in that field.

A properly granted patent takes nothing from the public. Actually it gives the public what it did not have before—the knowledge of an invention. This adds to the storehouse of technological knowledge and permits others to build on this broadened base to devise new inventions.

The US Patent and Trademark Office is located in a complex of office buildings known as "Crystal City," adjacent to Washington National Airport, in Arlington, Virginia. The Office, which occupies several buildings in this complex plus some other offices, has three primary functions:

- examining patent applications and granting patents;
- examining trademark applications, and

C. Marshall Dann served as US Commissioner of Patents and Trademarks, 1974–1977.

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The Public Search Room at the United States Patent and Trademark Office, used by some 800 people daily. These searches are made by or for inventors before they file an application, and by scientists and engineers seeking solutions to particular problems. The patents here are arranged by subject; at the depository libraries patents are in numerical order. Figure 1

▸ collecting, classifying and disseminating the technology disclosed in patents. This work is done by over 2800 employees in the Office, including more than 1000 professionals—persons with technical or legal training or both.

The Patent and Trademark Office handles a substantial volume of patent applications. Last year 102 000 patent applications were filed and a slightly larger number was examined and disposed of. Patents are issued on about 70 000 applications each year.

Patent literature

When a patent issues, it has a cover sheet containing the formal grant, with a ribbon, the official Patent and Trademark Office seal and a facsimile of the Commissioner's signature. It looks very handsome in a frame. The important part of the patent is inside the fancy cover, and this is what you get if you order a copy. The first page contains a representative drawing, an abstract of the invention and some bibliographic information. The narrative portion that follows describes and explains the invention; it is called the "specification." At the end of the specification there are one or more statements of the invention called "claims." These define the scope of protection afforded by the patent. The average printed patent document is about seven pages in length, although they vary widely, depending on the complexity of the technology.

Each year the Office sends out about 11 million copies of patents. The bulk of these go to the public. Many are sold at the statutory rate of 50 cents each. Copies also go to libraries, and others to foreign governments in exchange for copies of their patents. To overcome continuing problems with the quality and timeliness of the patent-reproduction service, new custom-built equipment was installed in 1977, significantly improving the service. Patent copies may be ordered by sending the patent number and a check for 50 cents per copy to: Commissioner of Patents and Trademarks, Washington, D.C. 20231.

The Office's weekly publication, the *Official Gazette*, contains a sample claim of each of the 1200–1500 patents issued that week. When the patent has drawings, one of these is reproduced. Many libraries, corporations and law firms throughout the country subscribe to the *Official Gazette*. Skimming through it is the way to tell whether any of the patents issued that week is of interest or concern; if so, a copy of the entire patent may be ordered.

Patent searches are made for various purposes: The Office's examiners, of course, have to conduct a search for each new application to determine whether the invention is new and unobvious. Many patent applicants make their own patent searches at the Patent and Trademark Office or hire someone to make them before they file an application. Scientists and engineers search the patent literature to determine the state of the art and to find solutions to particular problems.

The only complete collection of the US patent literature filed according to subject matter in the country is at the Patent and Trademark Office. One set of search files is used by the examiners, and another collection is in the Public Search Room, depicted in figure 1.

The patent search files are arranged by subject according to a highly developed classification system consisting of over 300 classes, further broken down into some 90 000 subclasses. The search files are massive; the collection used by the examiners contains 22 million documents. The 4 000 000 original US patents are cross-referenced into related subclasses, which adds 7.5 million documents. The files also have 9.5 million foreign patents and about 1 million copies of articles from professional journals and the like, which are filed according to the classification system. One of the more impressive sights at the Office is to walk into the stacks in the Public Search Room and look down one of the long, long aisles at the tons of paper that make up the search file.

Twenty-nine depository libraries throughout the United States maintain copies of some or all of the four million US patents. Except for a collection of patents since 1962 arranged by subject matter in Sunnyvale, California, all of the depository collections are arranged in numerical order. If you know the number of the patent you are interested in, you can locate it readily in a numerically arranged file, but it is otherwise difficult to conduct a search of a numerical file. One possibility is to order a list of all of the patents assigned to a given subclass and then go to one of the libraries to look at the individual patents. If you are going to do a lot of searching, however, the only satisfactory place at present is the Patent and Trademark Office.

The Office is currently working with the depository libraries to look for ways in which the libraries can supply additional services to the public. Seven new depository libraries have been named since January 1977. The table opposite lists all of the depository libraries.

Examination of applications

When a patent application is filed, it is assigned to an examiner specializing in the particular area of technology. He searches to determine whether the invention is new and unobvious, and then writes a letter to the applicant or his attorney setting forth his findings and conclusions. The applicant may respond with written arguments as to why the claims are patentable, or may amend the claims by narrowing or changing them so that they avoid the prior art cited by the examiner. The applicant then is entitled to a second action from the examiner. If dissatisfied with the examiner's findings after the second action, he may appeal to a quasi-judicial review board known as the Board of Appeals. From there an appeal can be taken to court. Patents ultimately issue on about two thirds of the applications that are filed.

The whole process, from the time of filing an application until the patent is issued or becomes abandoned, currently takes an average of 19 months. This is called the "application pendency period."

Pendency time has decreased dramatically over the last decade. In the 1950's and 60's one of the greatest problems facing the Patent and Trademark Office was the long time it took to get a patent—an average of 37 months in 1964. However, this time has been cut steadily, as figure 4 shows, and the Office is now almost at its goal of 18 months pendency. This is about the shortest practicable time to allow for correspondence back and forth between the examiner and the applicant, for various clerical processing steps in the Office and for the printing of the patent.

This reduction in pendency time is a very important achievement of the Office. Shorter pendency

- allows applicants and their competitors to know at an earlier date what kind of patent protection will be awarded, and
- makes the patent literature available to the public reasonably soon after inventions are made.

Of all the countries of the world where patent applications are examined substantively, the United States issues patents most rapidly.

Patents and inventors

While most independent inventors, and inventors employed in industrial companies, have always had reason to be conscious of patents, inventors in universities and government are increasingly finding a need for patent awareness. There are several reasons for this. Universities and government are now engaged in applied as well as basic research. Much research at universities is supported by grants from the government and contracts from private organizations.

The Federal Government has learned that permitting full and free public access to inventions arising from government-sponsored research is not always the best policy. In the absence of the protection afforded by patents, often no one in the private sector is willing to make the investment necessary to commercialize a government-funded invention and put it into public use. Universities also take out patents to provide recognition and reward for individual accomplishment, and to support further research within the institution with funds from patent licensing.

Although the Patent and Trademark Office permits inventors to file their applications without professional assistance and to deal directly with the Office's examiners during the examination proceedings, experience shows that most inventors fare better when they have assistance from a patent attorney or agent. Inventors employed by organizations almost always have available an attorney or agent to assist them. While the large majority of patents today are applied for by or on behalf of employed inventors, independent inventors have not by any means disappeared. It is advisable for independent inventors to use a patent attorney or agent too, when they can do so.

Even when inventors have help from a patent attorney or agent, they can and should be involved in the work of protecting the invention. The first thing to do after making an invention is to make a record of it. US law gives the patent to the inventor who can prove that he made the invention first. The best proof is a written description of the invention, including drawings and other data, which is properly witnessed and dated. The Box on page 28 lists the major steps necessary to protect your invention.

To determine whether an invention is patentable, it is best to make a search through the records of the Patent and Trademark Office before a patent application is prepared or filed. These searches usually are made by a patent attorney or professional searcher, but can very well be made by the inventor. Prefiling searches can help avoid the filing of unnecessary or useless applications.

If it appears that the invention may be patentable, a decision must be made on whether to file. The probable benefits to be derived from the patent must be weighed against the cost and effort involved. At the Spring 1977 meeting of The American Physical Society in Washington, Julius Tabin listed the following as some of the things that should be taken into account in deciding whether to file an application:

- The extent of protection a patent is likely to provide for the invention;
- the cost and time required for developing and commercializing it;
- the potential sales and profits that might be expected from the invention, and
- the possibility that it may become obsolete as a result of subsequent inventions.

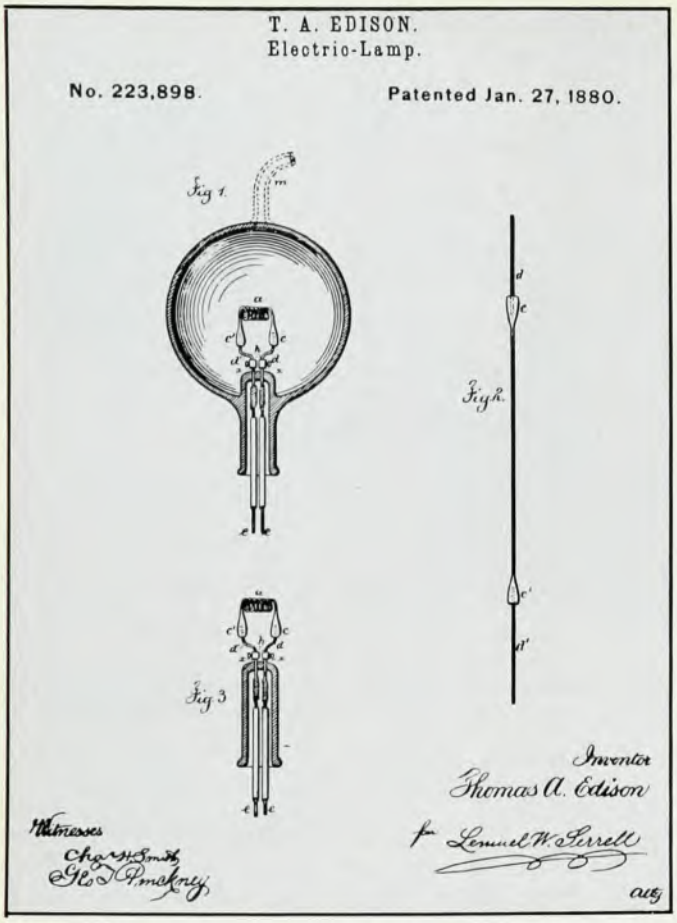
The patent attorney can advise on the extent of protection one is likely to be able to obtain. Industrial research and manufacturing experience is useful in judging the time and cost necessary to carry forward the further development. Often a preliminary marketing survey may be needed to assess the potential sales and profits. The decision on whether to file an application often must be made rather early to protect one's rights. In this country a patent must be applied for within one year after any publication, public use or sale of the invention.

If a decision is made to file a patent application on the invention, a written description must be prepared, along with a drawing if possible, and an oath must be made by the inventor. A filing fee must accompany application sent to the Patent and Trademark Office. The inventor should take care to give his attorney all of

Patent depository libraries

Albany, N.Y. N.Y. State Library
Atlanta, Ga. Price Gilbert Library, Georgia Institute of Technology
Birmingham, Ala. Public Library
Boston, Mass. Public Library
Buffalo, N.Y. Public Library
Chicago, Ill. Public Library
Cincinnati, Ohio Public Library
Cleveland, Ohio Public Library
Columbus, Ohio Ohio State University Library
Dallas, Texas Public Library
Denver, Colo. Public Library
Detroit, Mich. Public Library
Houston, Texas The Fondren Library, Rice University
Kansas City, Mo. Linda Hall Library
Lincoln, Neb. Love Library, University of Nebraska
Los Angeles, Calif. Public Library
Madison, Wis. Wendt Engineering Library, University of Wisconsin
Milwaukee, Wis. Public Library
Newark, N.J. Public Library
New York, N.Y. Public Library
Philadelphia, Pa. Franklin Institute Library
Pittsburgh, Pa. Carnegie Library
Providence, R.I. Public Library
Raleigh, N.C. D.H. Hill Library, N.C. State University
Seattle, Wash. Engineering Library, University of Washington
St. Louis, Mo. Public Library
Stillwater, Okla. Oklahoma State University Library
Sunnyvale, Calif. Sunnyvale Patent Library
Toledo, Ohio Public Library

Sizes of collections vary. The collection in Sunnyvale, California is arranged according to subject matter; all others are arranged in sequence according to patent number.


T. A. EDISON.
Electric-Lamp.

No. 223,898. Patented Jan. 27, 1880.

Fig 1.

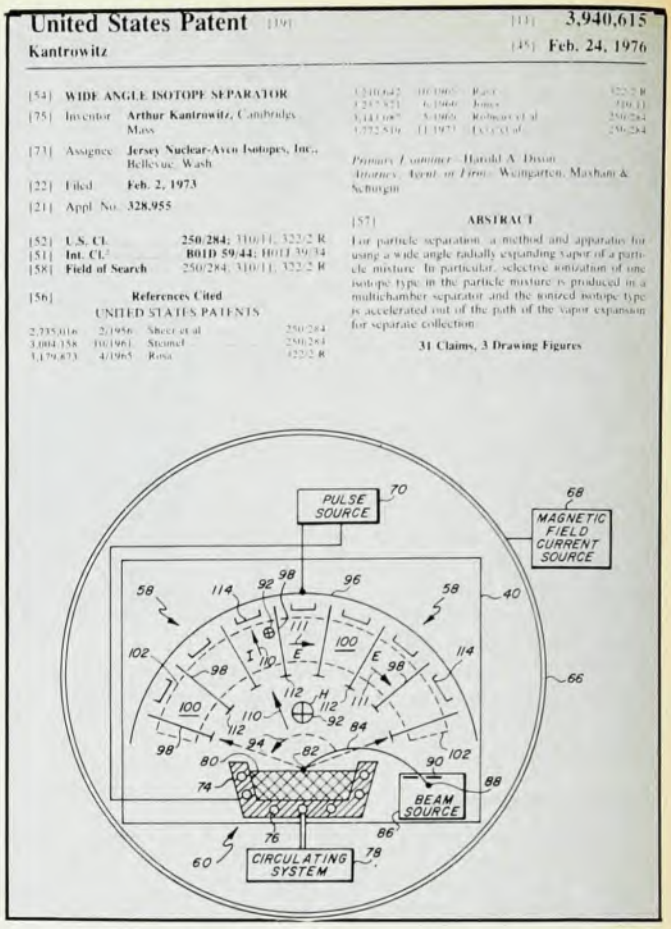
Fig 2.

Fig 3

Witnesses
Chas. H. Smith
Geo. P. Maloney

Inventor
Thomas A. Edison
by Lemuel W. Serrell
atty

The patent for the electric lamp, number 223 898, was one of more than a thousand patents issued to Thomas A. Edison. Figure 2


United States Patent [19]
Kantrowitz

[11] 3,940,615
[45] Feb. 24, 1976

[54] WIDE ANGLE ISOTOPE SEPARATOR
[75] Inventor: Arthur Kantrowitz, Cambridge, Mass.
[73] Assignee: Jersey Nuclear-Avco Isotopes, Inc., Bellevue, Wash.
[22] Filed: Feb. 2, 1973
[21] Appl. No.: 328,955
[52] U.S. Cl. 250/284; 310/11; 322/2 R
[51] Int. Cl.[2] B01D 59/44; H01J 39/34
[58] Field of Search 250/284; 310/11; 322/2 R

[56] References Cited
UNITED STATES PATENTS

2,735,016	2/1956	Sheer et al.	250/284
3,004,158	10/1961	Steinel	250/284
3,179,873	4/1965	Rosa	322/2 R
3,210,642	10/1965	Baer	322/2 R
3,257,871	6/1966	Jones	310/11
3,413,085	5/1968	Robinson et al.	250/284
3,772,516	11/1973	Lacey et al.	250/284

Primary Examiner—Harold A. Dixon
Attorney, Agent, or Firm—Weingarten, Maxham & Schurgin

[57] ABSTRACT

For particle separation, a method and apparatus for using a wide angle radially expanding vapor of a particle mixture. In particular, selective ionization of one isotope type in the particle mixture is produced in a multichamber separator and the ionized isotope type is accelerated out of the path of the vapor expansion for separate collection.

31 Claims, 3 Drawing Figures

A modern patent, Arthur Kantrowitz's isotope separator, exemplifies the growth in technical sophistication over a 100-year span. Figure 3

the necessary information regarding the invention. The attorney may not have the same technical background or knowledge as the inventor, so it is important for the inventor to discuss fully all aspects of his invention, including possible modifications and alternatives to the invention. The inventor should review the various drafts of the patent application carefully and look for technical errors or inadequacies.

After the application is filed, the Patent and Trademark Office examines it, as described above. During the examination process close communication between the inventor and the attorney is desirable. In particular, the attorney should be informed of continuing work on the invention after the application is filed. Additional steps may need to be taken to protect improvements that are made subsequent to the original filing of the application. In some cases continuing research will show that the original invention is not valuable. During the examination of the application by the Patent and Trademark Office it is sometimes helpful for the inventor—as well as the attorney—to attend a personal interview with the Office's examiner to discuss the examiner's objections.

As in the case of other property rights, it is sometimes necessary to fight in court to obtain or retain patent rights. The largest number of court suits are appeals from decisions of Patent and Trademark Office examiners refusing to issue patents. There are two alternative routes available, either to the US Court of Customs and Patent Appeals or to the US District Court for the District of Columbia. Ultimately one may take a patent case through either route to the Supreme Court of the United States, although the Supreme Court accepts very few of them—it has reviewed an average of less than one patent decision every two years.

Patents and the courts

Some patent litigation involves "interference" proceedings, instituted for the purpose of determining which of two or more parties claiming the same invention was the first inventor. These proceedings are conducted within the Patent and Trademark Office and can be appealed to any of the Federal District Courts throughout the United States or to the Court of Customs and Patent Appeals.

When a patent is issued by the Office, it is much more than "a right to litigate." Many patents are respected and licensed to numerous competitors without ever being tested in court. Of the approximately 70 000 patents issued each year, an average of less than 50 enter the courts annually. Patents that have already been issued enter the courts in a number of ways:

- The patent owner may sue a competitor for infringement.
- A manufacturer who has been threatened with infringement may bring a suit asking the court to declare the patent invalid or not infringed.
- The patent covered by a contract may be involved in a contract suit.

A patent may also enter the courts if it is employed as a part of a scheme to violate the antitrust laws.

After the plaintiff files a complaint and the defendant files an answer, there is a series of legal skirmishes before the trial known as "discovery." When a trial is held, the burden is on the patent owner to prove infringement of the claims of his patent. A device or process infringes patent claims if it is essentially the same thing used in essentially the same way to achieve essentially the same result. The alleged infringer may challenge the validity of the patent in court. The most common basis for alleging invalidity is that the invention would have been obvious at the time the invention was made to those skilled in the art.

Since litigation tends to cost a great deal of money, inventors and businesses must study the situation carefully before deciding whether to bring a suit in a particular case on a particular patent. They

need to take into account variables such as the equities of the case and the commercial success of the invention; whether it filled a long-felt and unsatisfied need; whether the accused infringing devices are direct copies; whether other segments of the industry have already taken a license under the patent, and what evidence there is to prove the case.

The litigation may take anywhere from months to years between the filing of the suit and the final decision. However, during the course of the litigation facts may be unearthed that make settlement of the case attractive to one side or the other.

It is difficult to predict the outcome of any litigation; patent litigation is no exception. Although you might hear it said that judges are "anti-patent," Chief Judge Markey of the Court of Customs and Patent Appeals has said, "I believe an objective observer would have to say that federal judges are no more anti-patent than they are anti-property, anti-management, anti-labor, anti-religion or anti-anything-else."

International matters

There is no such thing today as an international patent. All of the major countries of the world have their own separate patent laws. Anyone wishing patent protection in several countries must apply separately in each one. There are many differences in the various patent laws and procedures around the world. It is very expensive to obtain patent protection in any substantial number of different countries. There are, however, efforts underway to ease this situation.

The basic existing treaty on patents and trademarks, called the "Paris Convention," has been in force since 1883 and now has 87 members. These include all of the Western industrialized nations and many developing and socialist-bloc nations, including the Soviet Union. The Paris Convention provides for certain priority rights, and it guarantees that each member state will treat patent applicants from other member states on equal terms with its own nationals. The Paris Convention and other existing and proposed patent and trademark treaties are administered by a specialized agency of the United Nations, the World Intellectual Property Organization, which is headquartered in Geneva.

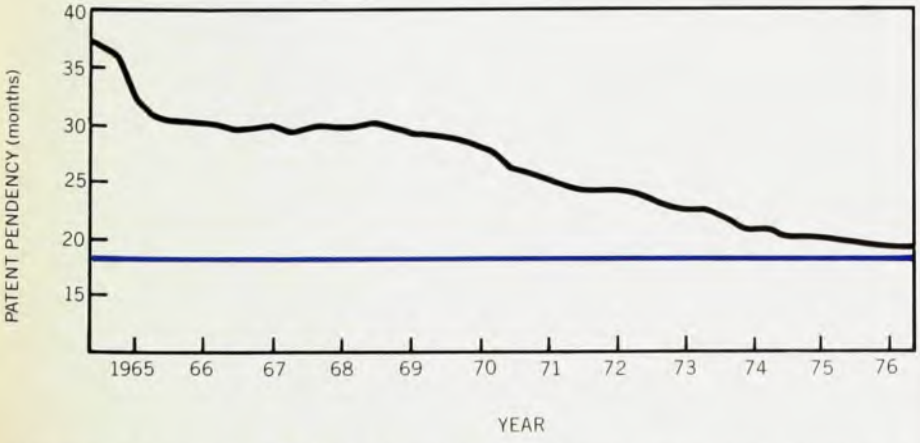
The Patent Cooperation Treaty is a new agreement, coming into force in 1978, which will permit the filing of a single international application in a uniform format, with designation of the countries where protection is desired. The application will receive a single, international search, but will still be examined separately by the different countries. This should reduce the expense when filing in a large number of countries. It also allows the patent applicant to wait until he has received the international search report before having to decide whether to pay the additional fees for examination in the various countries.

The Office is also working on an agreement called the Trademark Registration Treaty, which is an arrangement for trademarks somewhat similar to the Patent Cooperation Treaty. This treaty has been signed but may not come into effect for some time. In addition, the United States is working with other countries to improve patent-search systems and to aid the transfer of technology to developing countries.

Reliability of patents

The patent system is a voluntary one, based on confidence. If it is to provide the incentives to bring forth new technology, users of the system must continue to think they have a reasonable chance of obtaining the benefits and protection that the system is designed to offer. If it becomes too burdensome or expensive to obtain patents, or if the chances of successful enforcement become too low, people will simply stop using the system, to the public detriment.

At least half of the patents litigated are held invalid, suggesting to some that



The average time between the filing of an application and either the issuance of a patent or its abandonment has been decreasing toward the goal (in color) of 18 months. Figure 4

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Some steps in protecting your invention

* Prepare a written description of your idea as soon as possible.
* Have the description witnessed and dated, or file it as a "disclosure document" with the Patent and Trademark Office.
* Write the US Patent and Trademark Office, Washington, D.C. 20231, for free information on patents.
* Seek advice from a registered patent attorney or agent.
* Have a search made of earlier patents and literature.
* If you set out to make a working model or other physical embodiment, pursue it diligently and keep a witnessed and dated notebook.
* If you apply for a patent, file the application preferably before the invention is made public, and in no case later than one year after making public.

possibly the Patent and Trademark Office does not do as good a job of examining as it might. Actually this invalidity rate for the small number of patents litigated is to be expected, because only patents whose strength is reasonably debatable are litigated. It is true that the Office has a high volume of activity and a limited budget, so that an average examiner spends a little less than 20 hours on the examination of an average application. On the other hand, there is nowhere else in the world where as good a search can be made as at the US Patent and Trademark Office.

When a patent gets into litigation it is not uncommon to have one or two man-years devoted to additional searching to try to find a reference that will show that the patent should not have been granted. It is therefore not surprising that every so often this expenditure of effort turns up a better reference than the patent examiner found initially. While we would like to be perfect and never issue an invalid patent, this is not a realistic expectation. On the whole, it appears to be a desirable and cost-effective division of responsibility for the Patent and Trademark Office to perform a good but not perfect examination of all applications, and for the court to preside over a more exhaustive investigation of those patents that get into litigation.

Nevertheless, the Office has taken steps in recent years to raise the quality of examination. In 1976, for example, the examiners were given somewhat more time to complete the examination of each application. For the last three years the Office has been operating a quality-review program, in which a random sample of all of the allowed cases is reviewed by a group of experienced examiners. This helps to identify defects in examining procedures and to weed out some cases that do not deserve to issue, as well as giving some measure of the performance of the different examining groups.

The Office has conducted experiments in which nearly 2000 allowed applications were published, and members of the public were allowed to cite references showing that the patents should not be granted. Of these cases "published for protests," about 6.5% were protested. This experience should be valuable in helping Congress decide whether to provide a permanent reexamination procedure to consider new references.

In 1977 the Office made important changes in its Rules of Practice, aimed at producing more reliable patents. One change permits the patent owner to obtain a reexamination by the Office in light of additional prior art that was not considered by the examiner when the patent was originally issued. Another emphasizes the duty of applicants to advise the Office of any known prior art or other information that might affect the examination.

Improvements are also underway in the search files and in the way patent literature is disseminated. The Office is updating the subject-classification system to make it easier to find all the patents related to a given technology. It is experimenting with a computer-controlled search system in which microfilm replaces the cumbersome paper files. The state of the art of computer and microfilm technology is such that before too many years it may be possible to establish satellite search centers at various locations around the country. This would allow the same kind of patent search to be conducted in them as is now available at the Patent and Trademark Office.

The patent system remains vigorous and continues to play an important part in stimulating the development and introduction of new technology. If you want to know what has been done in any area of applied technology, you can not afford to neglect the patent literature. Finally, if you should develop a new technique or apparatus, you should at least consider the desirability of filing a patent application; it might be of benefit to society as well as to yourself.

* * *

This article is an adaptation of Dann's presentation at the Spring 1977 meeting of The American Physical Society in Washington, D. C. It also includes material presented at the same meeting by Chief Judge Howard I. Markey of the US Court of Customs and Patent Appeals and by Julius Tabin of the Chicago patent firm of Fitch, Even, Tabin and Luedeka. □