

methane, and all three were relevant. The other 16 were indexed by methane and one additional term. Of these, six were relevant, four were marginal, and six were not relevant.

The conversion of our classified abstract files of about 2,000,000 cards to microfilm allowed the removal of many space-consuming cabinets from our library. However, microfilmed files such as this are not ideal for the user, since they are by nature browsing files. Microfilm is well-adapted to use for look-up of identifiable abstracts, much less so for browsing through abstracts as they move by sideways; this leads to considerable eyestrain.

It would be incorrect to assume that all of the problems relating to the use of microfilm for secondary journals have been solved. The image on the screen is quite good in the equipment that we use, but leaves room for better resolution and brilliance. More important, the focus is not always uniform over the whole screen. This problem became especially noticeable in our tests with the *CA* indexes, though it is not a major problem with *CA* abstracts themselves.

As noted above, the Kodamatic lines on the microfilm make possible relatively rapid look-up, although expensive equipment such as IC-4 keyboards or Miracode apparatus can probably speed this somewhat. It would obviously be desirable to have less-expensive equipment to do this, but again, the problem is certainly not acute.

We often find that microfilm quality is variable. In particular, there can be substantial variation from cartridge to cartridge in the film exposure and contrast, and this requires considerable adjustment of print controls. It is often difficult to obtain a set of prints with consistent quality, and this poses a problem when one wants to make second-generation xerox copies. Cartridges substan-

tially off the norm are returned and replaced, but in practice one tends to live with moderate variation. Nevertheless, more-uniform film quality would certainly be desirable.

Occasionally, the page image on the film is so high that the top of a *CA* page is cut off in the print. This can cause the loss of column numbers and volume number, and a control which would allow the image to be raised or lowered on the screen would help here. Zoom lenses, not available on Kodak or 3M reader-printers, would probably help in handling very small print such as is found in *CA* indexes. Finally, the Kodak machines produce a damp copy that curls badly if it is not placed face down until it dries, and is hard to write on while damp. The 3M machines are less objectionable in this respect, but their prints have less contrast, which makes them less adaptable to the preparation of xerox copies. There is certainly room for a cartridge machine which would produce a completely dry copy with good contrast, on uncoated paper which is easy to write on.

But while these problems do exist they are, as I have indicated, relatively minor ones. They are far outweighed by the various user benefits associated with microfilm, and the whole pot is sweetened by various economic advantages. It is certainly reasonable to expect considerable expansion in the use of microfilmed editions of secondary journals.

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Patents and Patent Guides on Microforms*

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To those of you concerned with or responsible for patent activities in your organization, it is no secret that the U. S. Patent Office issues around 70,000 patents each year.⁶ Unless the scope of your technical interests is rather narrow, chances are that someone in your organization has to scan more than 1300 patent abstracts or main claims in the *Official Gazette* of the U. S. Patent Office each week. By April 1970, the number of U.S. patents issued is expected to be at least 1600 per week. This rate is expected to continue for about two years into fiscal 1972, until an accumulated printing backlog is exhausted. The rate

will then fall to about 1450 per week, with subsequent increases in keeping with increased filings.¹²

If your organization has any sales or manufacturing activities outside the United States, someone in your organization probably maintains a current knowledge of the patent situation with respect to your products in those countries. Around the world, almost three-quarters of a million patent applications are filed each year. Of these, just under half a million issue as patents.¹ Several countries publish patent applications before patents are granted, and these published applications constitute part of the "prior art" that patent people must be concerned with.

To make matters worse, changes in the patent laws in Germany, France, and Japan now, or will soon, provide

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With the total number of U.S. and foreign patent copies accumulating in the files of the examiners in the U.S. Patent Office approaching 15 million, and rising rapidly, and with the number of patents and patent applications published around the world expected to exceed half a million per year for the next few years, it is desirable, even imperative, that microstorage methods be utilized for the patent literature. Plans and progress toward the provision of patents on microforms by patent offices and documentation services are discussed and evaluated. Indexes on microform to the subject matter in patents are also described, including Du Pont's internal Central Patent Index, printed on microfilm directly from computer files.

for the publication of unexamined applications eighteen months after filing. Thousands of previously unpublished applications will thus have to be published over the course of the next few years, in addition to the publication of currently-issuing patents, until the backlog is worked off.

The U.S. Patent Office forecasts that by the end of fiscal 1970, about 15 million patents will have accumulated in patent examiners' files.¹² This number will be near 21 million by the end of fiscal 1975.

It is obvious that, confronted with these large numbers of patent documents, the patent offices around the world, as well as academic, industrial, and documentation organizations concerned with the patent literature, should be looking for microform storage techniques to alleviate their problems. Let us therefore examine the uses which these organizations make of the patent literature in relation to the microform formats best suited to each use.

ACCESS TO THE PATENT DOCUMENT

The inventor, the patent agent, and the research man seeking technical information require access to the patent literature by subject. The traditional approach to provide this search capability is to file the patents themselves by class. The classification may be that used by the U.S. Patent Office, or it may be a more specific classification developed by individual companies to meet their particular needs. A company's patent library usually contains only patents on subjects of interest to that particular company.

Patents are usually filed in more than one class, in order to permit retrieval by searches from different viewpoints. In the U.S. Patent Office, the complete patent document itself is filed; in the industrial community, a more common practice is to file abstracts of the patent in several classes. Depending on the adequacy of the abstract, a search through the abstract cards may or may not locate all relevant documents. If the information on the abstract is not adequate to determine whether or not the patent is relevant, the searcher may have to refer to the complete patent itself, filed elsewhere by number.

The development work at the U.S. Patent Office, described below, has the objective of providing search capability with the complete document itself, using patents in microform—in this case, aperture cards. These can be reproduced and distributed more inexpensively than patent paper copies. Within a few years, therefore, we can expect to find centers located throughout the country for searching the patent literature by means of aperture cards, and indeed in many industrial and academic organizations.

If the microform documents are to be filed by class, it is highly desirable that they be in unit record form—i.e., microfiche or aperture cards—to permit the refiling of the cards as a consequence of the continual reclassification which must take place if the file is to remain a viable, up-to-date search tool.

On the other hand, it is frequently necessary to have access to the patent literature by patent number. This occurs when a reference is made in the literature to a patent document, or when the searcher uses a coordinate index or other search tool which provides an answer in the form of patent numbers. Here the patents may be filed in a serial form by number, and the need for a unit record probably no longer exists. Copies of all U.S. patents from 1966 to date in numerical order are available on 16-mm microfilm from the Clearinghouse for Federal Scientific and Technical Information, or from the 3M Company. Other patent offices around the world have announced their intent to provide patent copies on microfilm, in both 16-mm form and on aperture cards. Austrian, Swedish, and Hungarian patents are available on 16-mm microfilm, and 16-mm films of the Dutch patents are in preparation. The patents listed in the Chemical Section of the U.S. Patent Office's *Official Gazette* are available on negative microfiche from Microcard Editions in Washington, D. C. The complete patents included in the "Uniterm Index to Chemical Patents" from 1959 to date are available on microfilm reels from IFI/Plenum Data Corp. in Washington, D. C.; the patents from 1959 through 1963 are on 35-mm reels, while the patents from 1964 on are on 16-mm reels. There may be other sources of patents on microfilm of which I am not aware.

We find that the microfilm copies of patents are useful for quick reference, and for supplying copies of patents in response to rush requests. The use of 16-mm roll film insures file integrity—the patent is always in the file when it is wanted. Our experience parallels that of Esso Research and Engineering Co. as determined in a study conducted by Margaret H. Graham.⁷ Mrs. Graham pointed up the advantages of purchasing the complete set of U.S. patents on microfilm, over the previous practice of ordering paper copies selectively but extensively. Many of these paper copies were not being used. Rush requests for patent copies can be filled very quickly by printout from microfilm. Other (nonrush) orders, especially those for longer patents, can still be filled by ordering from the U.S. Patent Office.

WORK AT THE U.S. PATENT OFFICE ON MICROFILM SYSTEMS

The Eastman Kodak Co., under contract from the U.S. Patent Office, completed in July 1969 the first phase—

namely, the initial microfilming of the over 3.4 million patents issued by the U.S. Patent Office through June 1969—of a project which will provide:

1. Means for producing paper copies of patents from microfilm, and
2. Multiple sets of patents on aperture cards, filed according to the U.S. Patent Office classification. This will permit the establishment of satellite search centers throughout the United States and possibly elsewhere in the world, and in industrial organizations, where searches will be made through patent classes using aperture cards as the storage medium.

This project has been described in detail by Hurd.⁸ The patents have been microfilmed using a reduction ratio of 11-to-1 onto 35-mm single perforated film. From this master film, film cards have been prepared which are being used to fill requests for paper copies of patents, using modified Xerox Corp. "Copyflo" machines. The film cards are segments of 70-mm film which are 6 inches long. Each has a contact print of the 35-mm master file and an enlarged eye-readable patent number printed on the top half of the 70-mm film. The two "Copyflo" machines are capable of producing up to 7500 patent copies per day, operating on two shifts; two additional modified machines have been ordered to double this capacity, if two shifts are used. The Patent Office, incidentally, sells almost 25,000 patent copies per day, of which more than 18,000 are paper copies from first print stock.

The preparation of aperture cards began in July 1969. This is accomplished by a composing reduction printer which will optically reduce the 11-to-1 image to a reduction of 22-to-1 and reformat the original, serially recorded patent images into two rows of four images each, to fit a 35-mm aperture card. These films are mounted onto aperture cards containing punched and interpreted data regarding the patent number and patent classification. It is anticipated that the production of the aperture cards serially by patent number will be completed by April 1970. The duplication of the aperture cards to produce multiple copies for sorting into Patent Office classes is expected to begin about February 1970 and to continue for about 15 months. The production of about 9 million aperture cards during this time is anticipated.⁹

At present, a separate microfilming by the Patent Office is made of each newly issued patent in order to provide the microfilm in the 16-mm format. Eventually, the Patent Office will produce the 16-mm film by optical reduction of the 11-to-1 photography, to avoid the duplicate microfilming.

Related work at the Patent Office is concerned with the development of an aperture card reader to be used for making patent searches by class. Four prototype readers have been built by the Eastman Kodak Co. in accordance with specifications developed in a study with the Patent Office and the National Bureau of Standards. Aperture cards for use with this reader will be provided in Patent Office class order, and in patent number order within each class. Two hoppers are provided on the reader, so that the user can search either forward or backward through the class by patent number. On depression of the feed button, the first frame of the first (or next) aperture card is projected on the screen in three seconds. Eight pushbuttons are provided for the selection of the frame of the aperture card; to move from one frame

to any other requires 0.6 second. Patents may be bypassed quickly from one hopper to the other without being projected on the screen. Controls are provided to adjust the brightness and focus, to provide 90° image rotation, to center the image, to tilt the screen 25° forward or backward, and to move the entire reading device up and down from 30 inches to 48 inches. There is no zoom feature to magnify detail on the screen. The aperture card image is a 22× reduction from the original patent; blowback on the reader is 26×. A retractable hood is provided. It is anticipated that the production model of the final version of the reader will cost between \$2000 and \$3000, and the higher figure may even permit the provision of a printer.

Positive microfilm is being used in the aperture cards. This is the result of a recommendation made in a study⁵ conducted for the U.S. Patent Office by Gail A. Bloch *et al.*, of the National Bureau of Standards. This study showed that the patent examiners in the test preferred positive microfilm over negative microfilm. No statistically significant difference was found between positive and negative film in objective tests, such as comparison of the average times needed by examiners to locate reference numbers in drawings, or the average number of aperture cards scanned by examiners in a predetermined time interval. The conclusions, therefore, were primarily the subjective judgment of the examiners. Opportunities were given for such judgments a total of 588 times, and of this total, positive film was preferred 495 times. Resolution of the positive and negative films was also described subjectively: "the over-all sharpness of the image was judged by the examiners to be better on positive film." Developmental work is still under way to perfect the printer which will produce a positive printout from a positive aperture card.

Recommendations for the design of the reader also came from the Bloch study. Even with the "pine box" early prototype, the test concluded that there "seemed to be no strong examiner bias against the use of a microfilm viewer for reference search."

INTERNATIONAL PATENT MICROFILM ACTIVITIES

The Committee for the International Cooperation in Information Retrieval Among Examining Patent Offices (ICIREPAT) has studied the question of use of microforms in patent documentation activities for some years.^{3,4} The German Patent Office, in particular, recognizes the importance of microforms in patent documentation activities, and is actively planning to incorporate these techniques in its future operations.^{2,10}

COORDINATE INDEXES TO THE PATENT LITERATURE

While the traditional, and still the most important, method for making patent searches is through the use of classification, much attention has recently been given to the use of coordinate indexes, particularly in the chemical areas. Coordinate indexes to the plastics, pharmaceutical, and agricultural patent literature are published by Derwent Publications, Ltd., in London, which is planning to undertake the abstracting and indexing of about half of the patent literature of 14 major industrial countries, beginning in January 1970. Coordinate indexes to

specialized areas of the patent literature are being developed experimentally and are being used in the major patent offices around the world. This research and development work is being coordinated by ICIREPAT; descriptions of the individual projects can be found in proceedings of its annual meetings.

Information for Industry (now IFI/Plenum Data Corp.) publishes the "Uniterm Index to Chemical Patents," covering patents issued from 1950 to date which are classified as chemical or chemically related. This is a coordinate index which gives the result of the search in the form of accession numbers. IFI also provides the main claim or abstract which appeared in the *Official Gazette*, listed in accession number order so the searcher can screen the results of the search using the claims or abstracts. All patents in the "Uniterm Index" are available on microfilm from IFI/Plenum, as noted earlier.

The American Petroleum Institute's Abstracting and Indexing Service publishes an "Index to Abstracts of Refining Patents," and provides the abstracts themselves both on cards and in microform on 16-mm film.

A search of a coordinate index to the patent literature usually results in an accession number, or the patent number itself for those patents nominated as relevant by the index. I believe that there would be a market for hardware which would accept a list of document numbers, and then display these documents, or abstracts thereof, on a screen; or alternatively would print out the document or surrogate for the inquirer to scan. Such hardware would be based on microfilm image storage, and would be superior, I believe, to the printout of abstracts by computer, where the storage is digital. Drawings and chemical and mathematical formulas cannot readily be stored in digital form, nor as quickly and economically printed out as they can from microimages.

In Du Pont, our Central Patent Index makes use of Computer Output Microfilm (COM) for printing out the patent indexes which we generate.¹¹ The microfilm coordinate indexes are far more convenient than the large volume of computer printouts on paper, and considerably less expensive to generate.

CURRENT AWARENESS

Patents are a source of technical information only too infrequently used by the research man. Most abstracting services include patents among the documents which they cover in their secondary journals. The research man uses these to keep abreast of the latest developments in his fields of interest. While desirable, it is not necessary for the secondary journals to guarantee complete patent coverage of the areas of technology, nor to make unusual efforts to report new developments to the research man with any degree of promptness. For the patent man, however, complete coverage and promptness of notification are essential. Here the interest lies in determining whether the company is free to make or sell a composition of matter or apparatus, or to use a certain process without infringing the patent rights of others, and also to determine whether or not a discovery or invention is indeed new—i.e., whether or not it has been anticipated in the patent literature.

Can we expect microforms to play a part in current awareness? The classified alerting bulletins will be with us for a long time, and I cannot think of circumstances which would suggest the substitution of rolls of microfilm for these bulletins. On the other hand, in these days of the specialized information centers and international exchange of information, an SDI service might be most effective by providing aperture cards or microfiche of documents responding to the clients' profiles of interest, rather than just abstracts or citations of the articles. The microforms would be particularly desirable if the clients were at some distance from the SDI service, requiring airmail delivery, or if the client had limited access to the literature; with a microform, the full document would be delivered to him.

Publishers of alerting bulletins with large overseas distribution may want to compare the economics of shipping tons of paper air-freight (for promptness of delivery—an essential in patent alerting) with that of air-mailing a microfilm reel of the bulletin, and reproducing the bulletin from the microfilm at a location closer to the subscribers.

The additional advantage of microfilm—i.e., the saving of storage space—also enters here. For example, the volume of paper which is represented by the yearly production of only the *Official Gazette* of the U.S. Patent Office makes it desirable to have this journal in microform for storage. The *Official Gazette* is available on microfiche from Microcard Editions in Washington, D.C., and from the Patent Data Corp. in Portland, Ore. The Patent Data Corp. also sells the complete set of indexes to patents and to trademarks on microfiche.

CONCLUSIONS

We have seen in the past few years a tremendous increase in the use of microforms for the storage of the patent documents around the world, abstract journals relating to the patent literature, indexes to the patent subject matter and to the inventor/assignee, and the use of microforms for reproducing patent paper copies on demand. Development work will soon permit patent searches to be made by means of aperture cards. The increase in the issuance rate of patents around the world is expected to continue, and the physical volume of the documents involved makes microstorage highly desirable, if not mandatory. International cooperation among the patent offices, especially in the field of information retrieval and documentation related to the patent literature, has already resulted in the provision of new techniques for subject matter searches and information retrieval in the patent literature, in which microforms play an important part. International exchange of the patent literature among patent offices using microforms is becoming increasingly important and necessary. I believe we can look forward to continuing research and development work among users of the patent literature and microform equipment manufacturers to produce new equipment and develop new techniques to handle the burgeoning volume of the patent literature more efficiently, effectively, and economically in the future.

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Microfiche 1969—A User Survey*

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An informal survey of microfiche users was conducted by correspondence with individual users and librarians, resulting in over 300 letters. Industrial libraries led all others in their acceptance of fiche, with a ratio of 2 to 1 in favor. Half of the individual users despised fiche; 25% liked it with some reservations, and 25% were strongly in favor. Half of those who liked fiche had found it useful in handling personal reprint collections, primarily because it saved storage space, but also because it was easy to retrieve and manipulate, and inexpensive. The chief reason for disliking fiche was the unavailability of readers, either on the job or at home; a close second was the poor optical and mechanical quality of the readers currently available. The author offers three alternative strategies for dealing with microfiche: (A) Ignore it and it will go away; (B) Drive it underground, and (C) Learn to live with it until something better comes along. In pursuit of (C), practical suggestions are offered for format of reports to be reproduced on microfiche.

"The good and bad points of microfilm, microcards, and microfiche are too familiar to require extensive discussion here."

SATCOM Report, June 1969

I am not now, nor have I ever pretended to be, an expert on microfiche. Nevertheless, when I was invited to address the Third Annual Northeastern DDC/Industry Users Conference in Waltham, Mass., in April of 1968, I had the temerity to attempt to describe what I as a user would like to have in a microfiche reader.¹

My proposed design has been greeted with enthusiasm

by users and with massive apathy by manufacturers. It has had two real effects: 1. The adjective "cuddly" has almost become a term of the art. 2. I was asked by Col. Andrew A. Aines, USA (Ret), Chairman of COSATI, the Committee on Scientific and Technical Information of the Federal Council for Science and Technology, in a letter dated 6 June 1968, to "head a small two- or three-month effort . . . to come up with an appraisal (of user acceptance of microfiche) and recommendations for action, if warranted."

A very proper study would have determined as a necessary first step what percentage of the user population had been exposed to microfiche and only then gone on to find out what those who had been exposed thought

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