NBS TECHNICAL NOTE 834

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

Information Handling Needs Within the U.S. Patent Office

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Information Handling Needs Within the U.S. Patent Office

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PREFACE

The U.S. Patent Office presents a unique challenge to current information handling technology. Under present law, the Patent Office must examine every patent application to corroborate the applicant's claim to the invention of a useful and non-obvious machine, process, or composition of matter. To aid its examiners in this highly intellectual, almost judicial, task, the Patent Office maintains a file of technical documents representing the citable corpus of the "prior art."

To assist the Patent Office in their objective, the Institute for Computer Sciences and Technology recently analyzed the Patent Office's requirements and the current state of the art in information handling technology pertinent to these requirements. This paper examines aspects of the Patent Office's needs that make it different from other existing information retrieval systems. The paper then reviews current technology and assesses its ability to provide effective and economical tools to aid the Patent Office.

The basic information in this paper was presented in a seminar to the Assistant Secretary of Commerce for Science and Technology, Dr. Betsy Ancker-Johnson, during the NBS-in-Action series on June 26, 1973.

INFORMATION HANDLING NEEDS WITHIN THE U.S. PATENT OFFICE

S. Jeffery

ABSTRACT

This paper examines aspects of the Patent Office's needs that make it different from other existing information retrieval systems. The paper then reviews current technology and assesses its ability to provide effective and economical tools to aid the Patent Office.

Key Words: Administrative operations; data handling; data storage and retrieval; information handling technology; information processing; intellectual process; patent examination; Patent Office; patent storage; production statistics.

The United States Patent Office ranks among the world's large information processing organizations. Each day it performs banking functions--including demand-deposit accounting--the functions of a post office, a major mail order organization, a large printer, a large manufacturer with significant inventory control, a recorder of deeds, and a technical library of unique size in almost any dimensions by which one measures libraries. This entire system of diverse functions exists to support the intellectual--almost judicial--process of awarding patents.

Challenge to Information Handling Technology

The tasks of the Patent Office present a challenge to current information handling technology, and include examination of the applications, determining patentability, issuing valid patents, maintaining a library, and disseminating teachings. The Patent Office annually processes about 110,000 applications, which include 1.2 million claims. An average patent is about six pages in length and contains approximately 25,000 characters of text, plus drawings.

A staff of 1200 examiners using a reference file estimated to include 20 million multi-page documents, conducts the examination process. Applications in process number 218,000. Over 13 million printed copies are produced yearly.

These numbers should be viewed in the context of a complex system of information transfer, from the inventor who presents his teachings, through the patent process, to the general public, as a contribution to the state of the art.

Taken in composite, the process represents a major challenge to current information handling technology.

Processing Flow

The process can be sub-divided into smaller components that indicate some of the physical aspects of the process. (See Figure 1.)

PATENT OFFICE PROCESSING FLOW

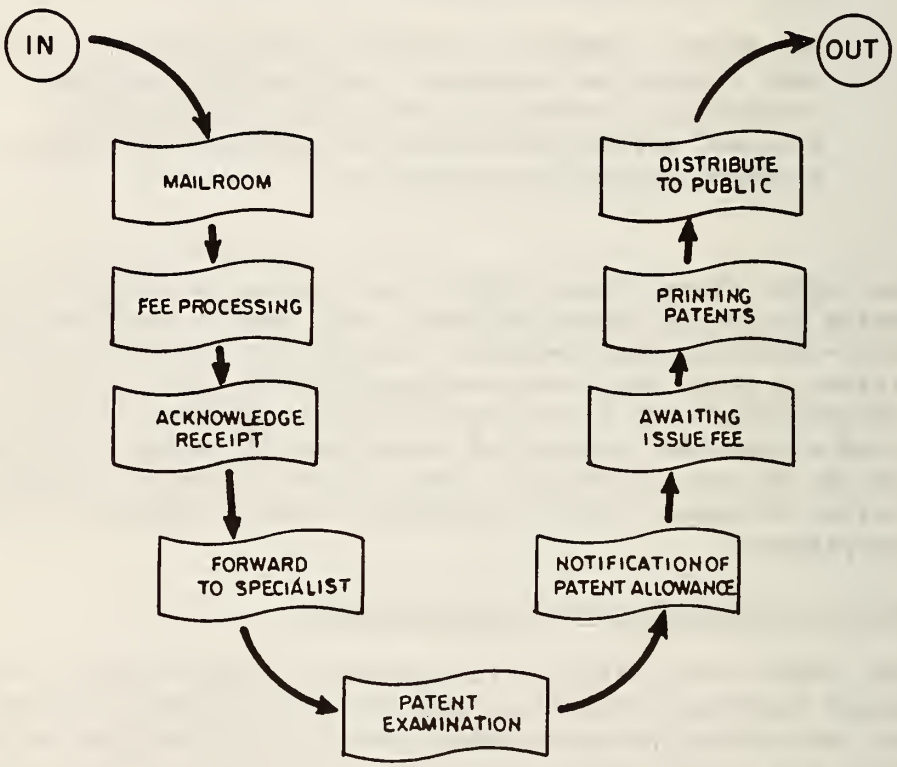

Figure 1.

The arrows can be considered the administrative or process flow. To be complete, the figure should show a small feedback loop from "Printing" back to the patent examiners' library, an integral part of the patent examination process.

The Data Handling Problem

One basic problem is the handling of data -- the management and control of a massive paper flow and the maintenance of large bodies of reference material.

The incoming correspondence (82,000 pieces per week) must be sorted, checked, and routed to the appropriate area for processing. This correspondence includes such diverse entitites as:

- *2075 patent applications must be checked for form and adherence to statutory and office requirements;*

- *$400-500,000 in fees per week in the form of checks and coupons associated with filing fees and orders for patent copies;*

- *Applications for certificates of correction;*

- *Requests for patent copies;*

- *Correspondence relating to an application being processed.*

1650 patents are issued each week. This results in the distribution of a quarter million documents or one and one-half million pages per week. In addition, 150,000 copies of previously issued patents are distributed weekly, which include requests for copies from window sales, standing orders, and examiners.

In the examination process itself, even the data base has immense proportions. The examiners' file constitutes the bulk of the prior art which is considered during the examination process. It consists of an estimated 19 1/2 million documents -- including U.S. and foreign patents and a half million pieces of non-patent literature. It is also worth noting that there are approximately 6.6 million duplicate and cross reference copies of U.S. patents.

The public search file contains 9.1 million U.S. patents.*

Over many years, the Patent Office has structured its file according to the U.S. Patent Classification System into more than 300 classes which are further sub-divided into over 90,000 sub-classes. This file grows continuously and the classification system must be revised to reflect changing needs of technology.

These structured files are subject to many problems associated with maintaining their accuracy and completeness. Reference copies are often removed for detailed examination, and if not refiled correctly, are effectively lost.

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* *There are 3.75 million original U.S. Patents on file. The number 9.1 million is based on statistical samples of the public search file.*

A number of inter-related processes are associated with managing the massive paper flow and thousands of daily transactions. These include both managerial and support functions as indicated in Figure 2.

DATA HANDLING PROBLEM

MANAGERIAL	*SUPPORT*
Scheduling Resources	*Document Handling*
Record Keeping	*File Storage & Maintenance*
Fiscal Transactions	*Patent Publication and Distribution*
Formal Correspondence	*Library Services*

Figure 2.

Applications of Technology

The application of data processing and automation to the data handling problems represents not an innovative challenge but rather an engineering task to optimize the application of available manpower, financial and technological resources. As examples of these applications, consider those performed by the Patent Office to date.

To reduce storage space requirements and to increase file integrity, the Patent Office has provided microform systems to support archival files, public search room needs, and patent copy preparation. Photocomposition techniques provided by the Government Printing Office are now used to produce patents and other Patent Office publications. In addition, this approach produces machine-readable tapes of issued patents as a by-product.

To ease the problem of gathering management statistics and of locating individual patents, a card processing "Patent Application Locator and Monitoring" (P.A.L.M.) system has been installed.

Improvements such as these do help the paper flow and provide basic support, but they are not really central to the key problem--that of aiding the patent examination process. Improvement in paper flow will simply move things into the examination queue faster; an application now spends seven months in this queue before being assigned to an examiner.

Patent Examination -- Input/Output

The Patent Office operates in an environment conditioned by the goals of reducing pendency while maintaining and improving the quality of issued patents and public services. These goals must be achieved under the constraints imposed by a relatively fixed staff and an increasing number of applications, while also adapting to changing technology on a worldwide basis.

This high volume of input combined with a relatively fixed staff, constrains the time available for the prosecution of an individual case. Currently this amounts to an average of 20 hours per application.

As Figure 3 indicates, in addition to demand, the reference data base is growing. The ever-increasing size of the examiners' files -- that is, the prior art -- and increasing complexity of inventions in many art areas, make maintaining a given level of quality difficult.

PATENT EXAMINATION

- *GOALS*
  - *DECREASE PENDENCY TIME*
  - *MAINTAIN/IMPROVE QUALITY*
- *OFFICE CONSTRAINTS*
  - *INCREASING DEMANDS*
  - *FIXED STAFF*
  - *CHANGING TECHNOLOGY*
- *EXAMINER ENVIRONMENT*
  - *TIME PRESSURES*
  - *INCREASED COMPLEXITY OF INVENTION*
  - *RAPID GROWTH OF RELEVANT PRIOR ART*

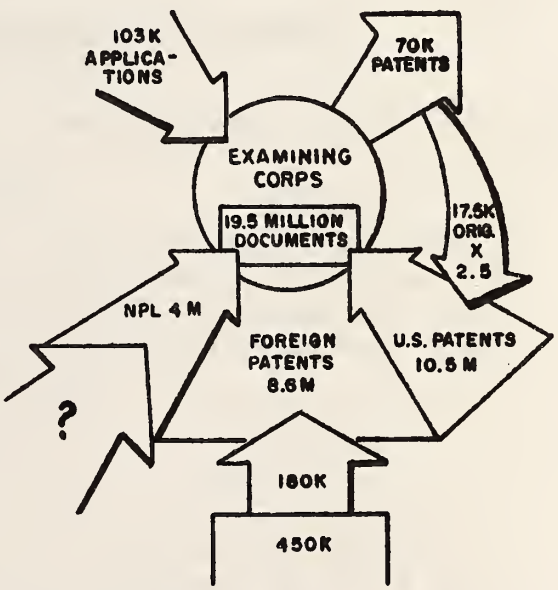

Figure 3.

Examination--An Intellectual Process

Patent examination is a complex intellectual process involving a search for concepts. It includes the conceptualization of the inventive point disclosed in the patent application and must precede any search through the prior art. This conceptualization process requires intellectual effort, and the examiner must understand exactly what the invention is and what is claimed. While the inventor has the obligation to reveal his inventive concepts in the specification and drawings of the application, he usually states his claims in terms which permit the widest possible interpretation.

Patent Examination -- Presearch Activity

The first step is to develop an understanding of the concept of the claimed invention. Once understood, the examiner must depict the concept in terms that permit him to access the collection of prior art. This means he must choose words or phrases to describe the concept which relate to the manual classification scheme or to the indices of mechanized search systems.

Figure 4 represents the intellectual process -- the understanding of the "non-obvious" on the left, and the need for basic reference material in the rectangle on the right.

PATENT EXAMINATION--PRESEARCH ACTIVITY

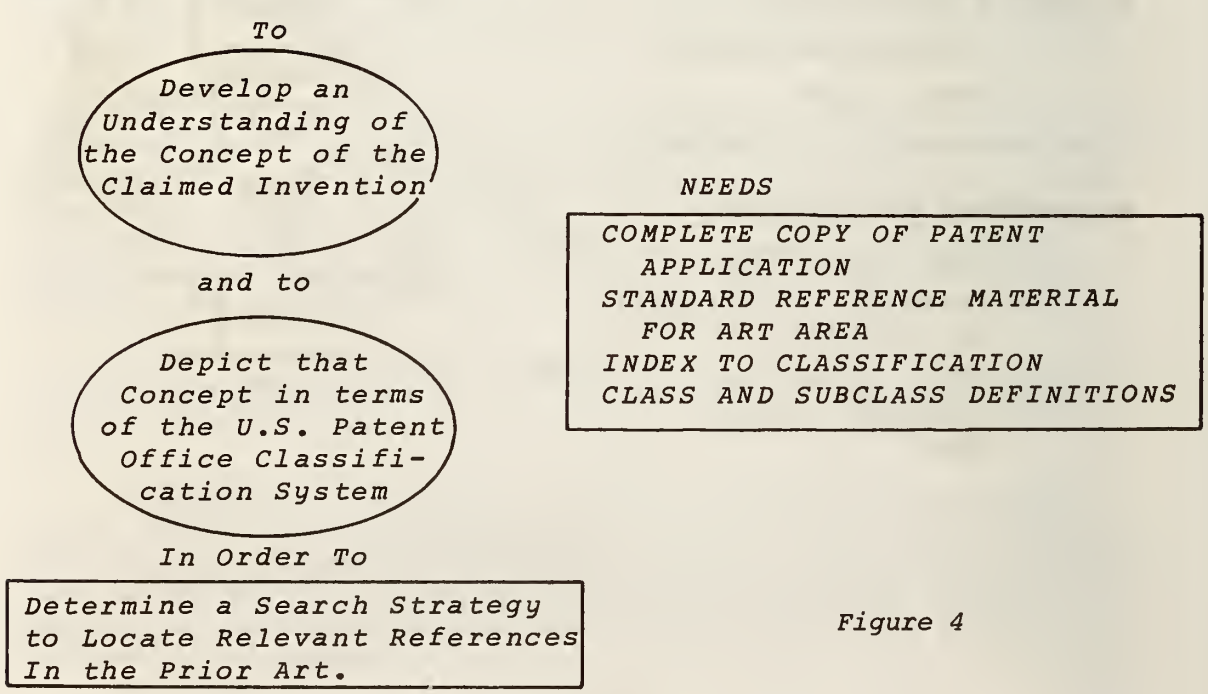

Figure 4

Patent Examination -- Search Activity

The search activity itself is an iterative and interactive process (See Figure 5). Given a search strategy, the examiner is interested in sub-setting the prior art to that portion offering the greatest promise of relevance. This is a screening or scanning task. Both images and text are involved. In many cases the drawings or equations are used as an initial key since the associated elements of the "concept" may all be present and discernible.

PATENT EXAMINATION -- SEARCH ACTIVITY

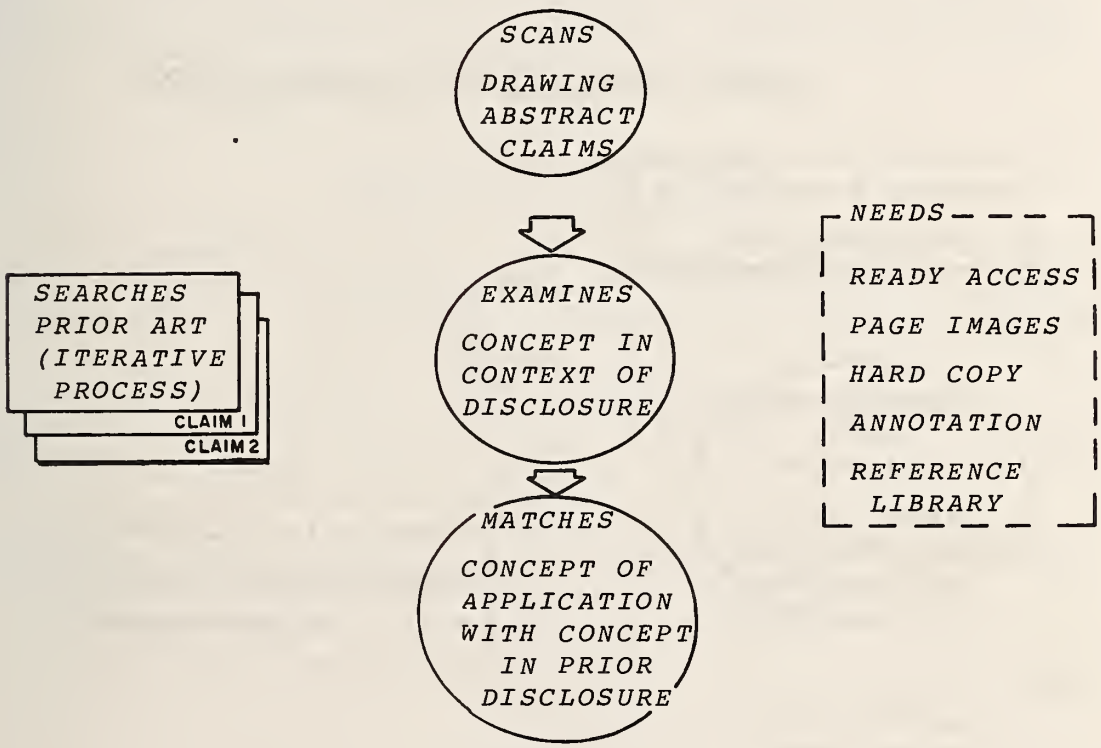

Figure 5.

The claims of the application must stand against the full disclosures contained in the prior art. This limits the capability to use the results of a search based only on abstracts or claims as criteria for judgment.

The scanning and screening processes appear more tractable to automated solutions than the detailed examination and matching, which are

more intellectual in nature. Examiners have identified the need for ready access to relevant page images in order to have a continuum from conceptualization to comparison.

Page images provide the elements of a concept in the context of the entire disclosure. Hard copy of the prior art allows simultaneous comparison of a reference set, permits annotation which sets up a clue path for later iterations, and also allows an analyst to work on a case basis, at his desk over extended time cycles.

Patent Examination -- Official Action

The theme of the previous two figures continues in Figure 6 with the addition of people-to-people communication.

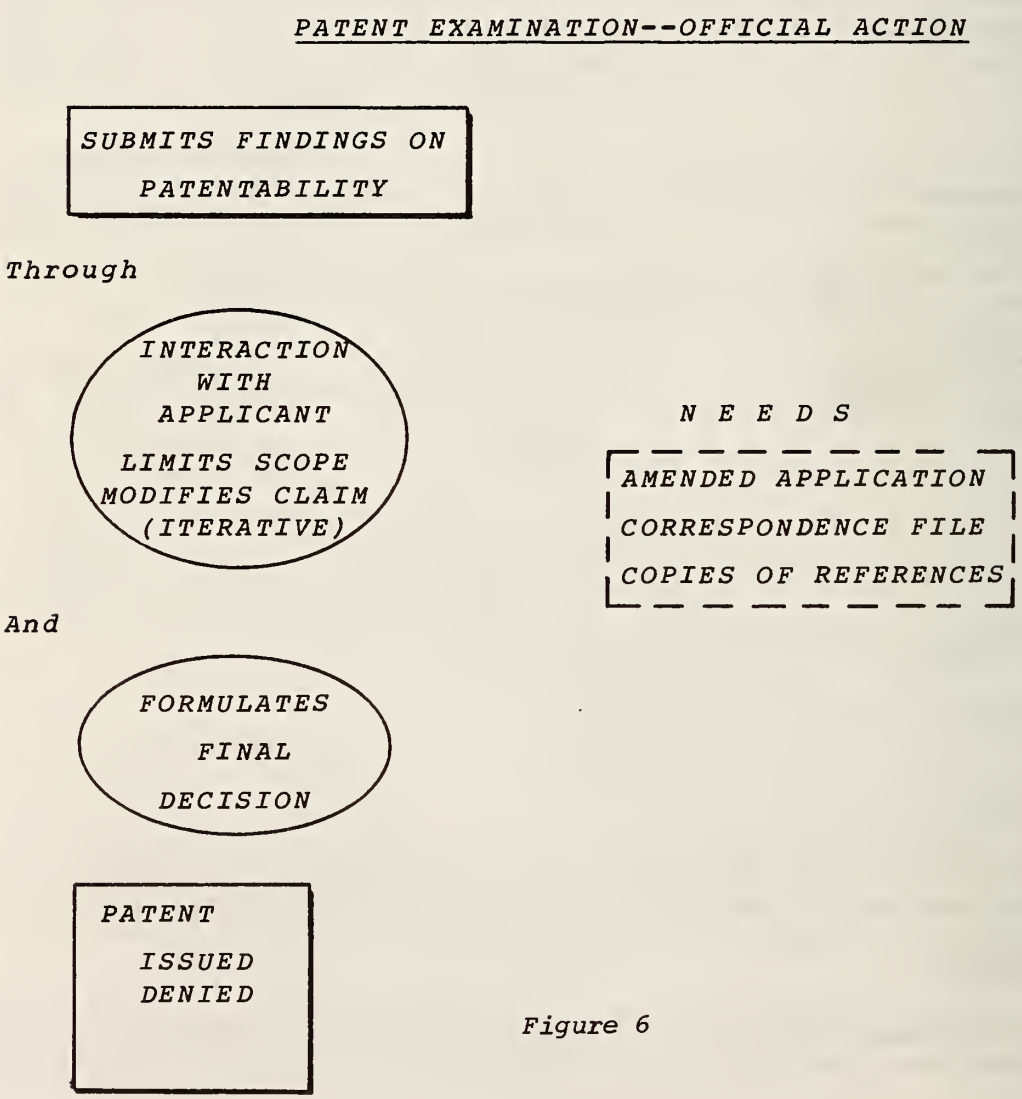

Figure 6

When the examiner determines his search complete -- which is a difficult decision per se -- he must complete his conceptualization by making the judicial-like decision on whether the claimed invention is new and "non-obvious." The examiner must communicate these findings to the applicant's representative and through iterations, find a mutually satisfactory agreement.

Relevance of Technology

As has been seen, the patent examination process includes two facets. One facet, shown in the rectangle on the right (See Figure 7) represents mechanical data handling considerations which may be satisfied by aspects of data processing technology similar to that which is suitable for the Office's administrative and data handling problems. However, there will be significant system design problems, even at this level. The other facet is the intellectual process, which requires advanced application of techniques in the arena called Artificial Intelligence.

RELEVANCE OF TECHNOLOGY

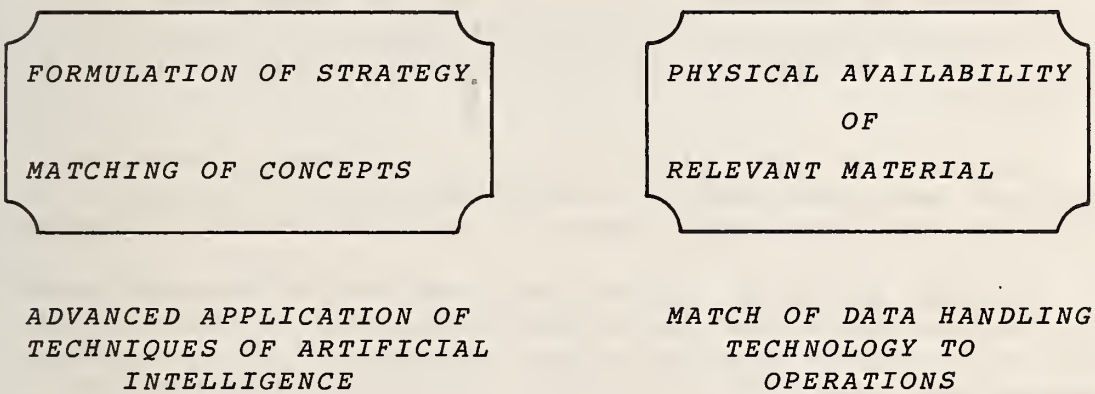

Figure 7.

Application of Technology

Examining the progress made in research on pattern recognition, semantic analysis, theorem proving, problem solving and other techniques related to artificial intelligence indicates that this class of technology is not ready for application to the patent process.

None of the automatic indexing and automatic classification techniques is proven for the Patent Office requirements -- particularly in light of the massive and changing data base.

Automatic "natural language understanding" is still not feasible. The query language systems of today have problems in providing suitable response times for very large data bases and also place a burden on the examiner to express concepts in a way which will subset the prior art without missing obviously relevant material.

Digital processing of images has a long road to travel before it reaches practical or economic utility.

In specialized areas, information science and data processing technology can aid the patent examiner. Examples include coordinate indexing systems which have proven particularly useful in the computer art area, structure searching in the chemical art area, and human assisted computer aided indexing, specialized data retrieval systems such as Chemical Abstracts and mini-computers in support of administrative and search tasks.

Machine readable and machine viewable patents are now available and provide basic support to some applications. In addition, they will facilitate further research and experimentation in adapting techniques to the patent process, which could eventually become operational.

Although the entire search problem can't currently be solved, there are techniques which can be of direct aid to the examiner, in particular art areas. Two examples of such aids currently in use are:

Chemical Abstracts. In the specialized area of chemical searching, one such aid is the Chemical Abstracts Service. Professional abstracters prepare highly structured information to form a machine-readable data base. This computerized data base contains not only bibliographic information, but also a very sophisticated chemical compound registry system with which it is possible to do chemical structure searching.

It is anticipated that professional abstracters, using terminals, will be able to use such a system to edit and modify structural diagrams in the process of chemical subject indexing and searching.

New York Times. In another specialized area -- that of searching newspaper morgue clippings -- the New York Times Information Bank also used professional indexers and abstracters to support automated information retrieval functions on interactive terminals.

At the core of patent examination is a complex and little understood intellectual process for which current data processing offers little promise. Around this core of intellectual tasks is a diversified array of support functions, characterized by massive data handling and process control functions. It is here that data processing technology can assist in managing the support functions. The Patent examiner can be provided with special purpose tools and aids that can increase the availability of the resources he needs.

Summary

In summary, although technology is not ready to solve the whole patent examination problem, there are specialized areas in which automation capabilities are applicable. A word of caution, though -- There is no one solution likely to satisfy the diverse requirements of the Patent Office.

The information processing and data handling needs of the U.S. Patent Office would be best satisfied by a complex of systems which are embedded in the examining, documentation and administrative operations of the office.

Many have suggested schema that would provide enhanced or even novel public services. Though in many instances current technology would support such services, these services would not provide direct or measurable assistance to examination production.

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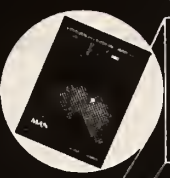

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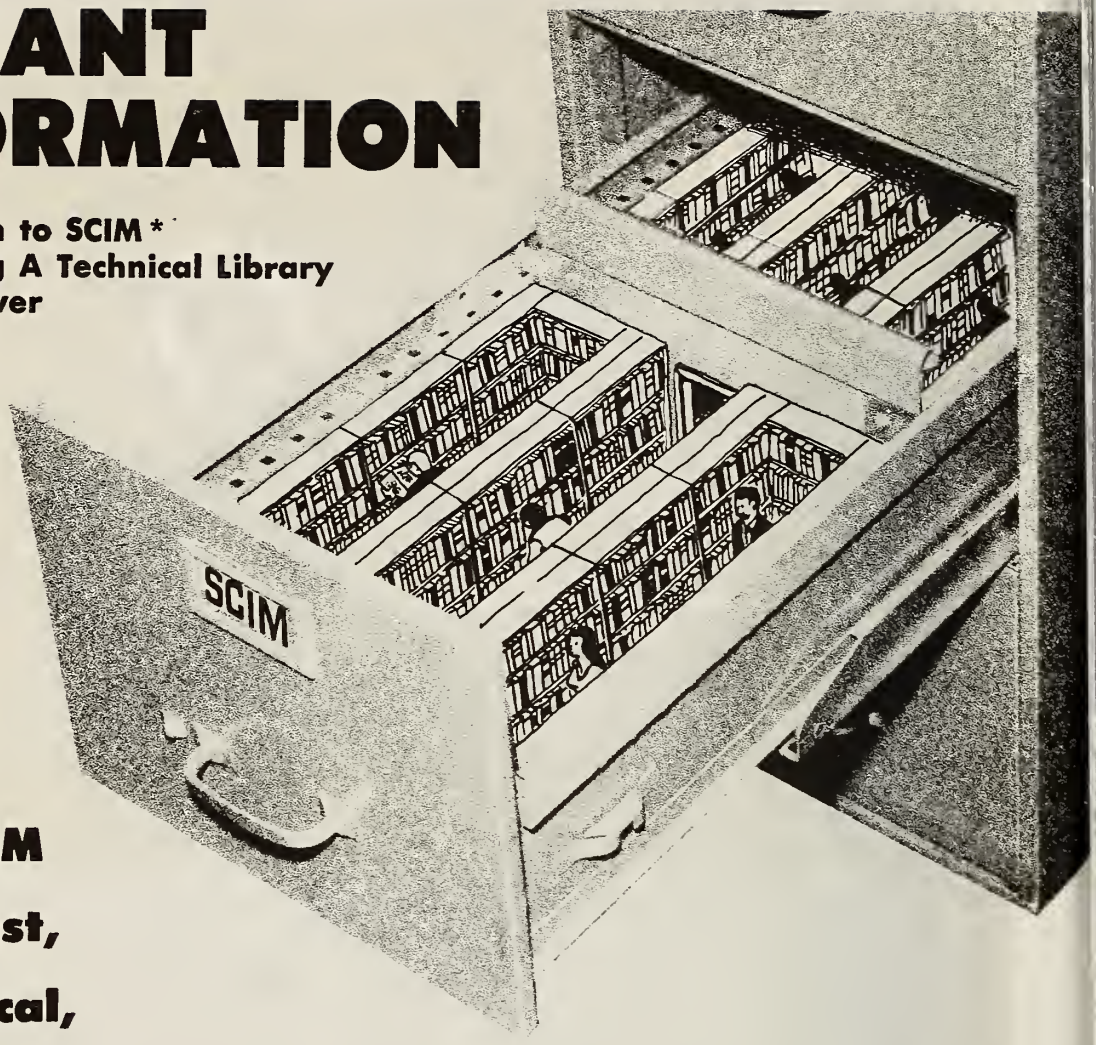

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