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A Modern Approach to the Problems of Space and Accessibility

AMFIS—The Automatic Microfilm Information System

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EVERY library and information center faces the problems of limited space and physical accessibility to books and documents. In the average special library where careful book selection can minimize space requirements, *quick* physical accessibility still may be vitally important.

To date microreproduction of printed materials is the only reasonable solution available for reducing space requirements. Microfilm in all its forms is widely used but rarely is it the preferred choice. The microfilm reel does save space; however, its unidimensional character creates new problems of accessibility. You can't thumb through frames of microfilm as you can the pages of a book. Microcards, though they overcome some of the objections to microfilm reels, have further shortcomings, among which are: the necessity of manually locating desired microcards, physically removing them from a file, locating the desired frame in a viewer and refiling after use. Both books and microrecordings of books have a common fault which is best described by "the book is in use but I'll be glad to put it on reserve for you."

Thus, the difficulties of using the modern library may be expressed in engineering terms as "lack of quick random access." It is not a coincidence that the scientists who are developing faster and more efficient electronic computers have this same problem of attaining fast "random access."

How one determines which call number or "address" is the one desired can be solved by conventional or other more sophisticated indexing. In the Automatic Microfilm Information System (AMFIS), it is assumed that one knows what document he is seeking and what its call number is. AMFIS is a fast system of retrieving documents—but only in the physical sense, not in the sense of literature "searching." Regardless of how he determines the great volume of documents he must inspect, the researcher today must have immediate access to these documents. AMFIS provides just that.

Indeed, access to any one of several million documents is now possible in a matter of seconds with a minimum of physical effort. Furthermore, it is actually possible with this system not merely to edit groups of microfilm frames but also to physically delete or add within seconds single frames or groups of frames of microfilm. This ability to edit with ease makes AMFIS an open system as contrasted to closed systems, such as microfilm reels or the Rapid Selector.

AMFIS employs a mechanism that can store as many as several million frames of microfilm. Simply by dialing a call or accession number the operator can project a legible image on a viewing screen; a possible version of an AMFIS viewing station is depicted in Figure 1. The viewing screens may be located locally or at remote points.

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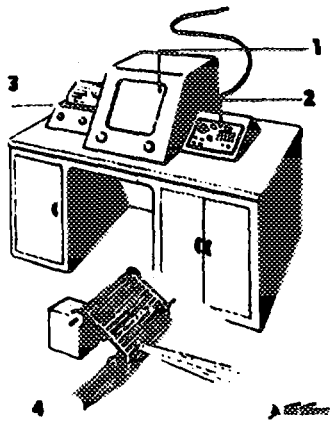

Figure 1—AMFIS Viewing Station
1—Viewing screen
2—Operator's keyboard and dial
3—Facsimile printer
4—View of single scroll. Light is projected through one of the frames

Documents may then be inspected by one or more users or they may be reproduced by standard photocopy, facsimile or xeographic techniques.

Any type of standard microfilm widths may be employed or intermixed. In AMFIS the conventional microfilm reel is replaced by either single microfilm frames or strips of microfilm. With the use of the basic AMFIS positioning mechanism, it is no longer necessary to scan manually long footages of film.

The AMFIS positioning mechanism consists of a hollowed drum which rides horizontally on rails and contains on its outer circumference a series of scroll mechanisms. The individual frames of film or strips are contained in these scrolls. Fixed at the center of the drum is either a standard light projector or raster, *i.e.*, a television tube used as a scanner. The projected light is passed through the film and the transmitted light is projected on a viewing screen by means of a standard optical system for direct viewing of the document.

For remote viewing a photo tube is used to receive the transmitted light from the raster, and standard television circuits would be employed. For reception within the same building, the equipment required for each viewing station is comparable to a standard commercial TV set. The projected image may be viewed simultaneously by all receiving sets in the circuit. Reproduction may also take place at remote stations by the installation of individual copying devices.

Where there is more than one viewing station it is possible to store an image locally by various electronic techniques such as TV tape or storage tubes. Tape systems will allow the remote viewer to store one or more images for later use. In this way, the positioning mechanism is free to supply other viewers with the same or other document images. Thus, the central microfilm file is not held up by individual viewers for more than a few seconds.

The scroll positioning mechanism is described in detail in U. S. Patent No. 2,610,791. Briefly, when a document number is dialed, horizontal motion is

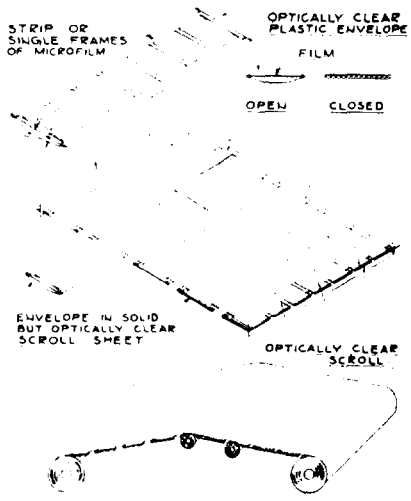

Figure 2
Filmstrip holder, section of scroll with filmstrip holders and entire scroll

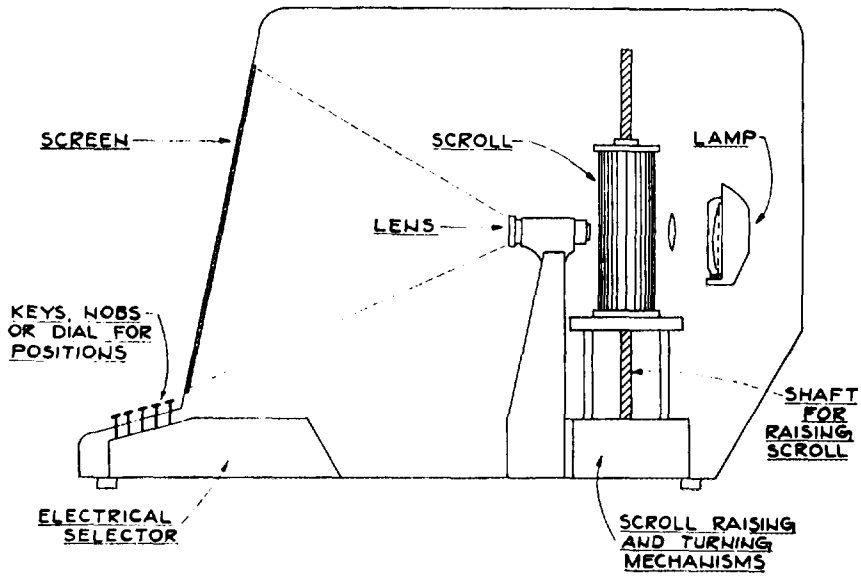

Figure 3
Personalized AMFIS unit containing one scroll

imparted to the drum, the amount of motion depending upon the location of the particular area of film. At the same time the drum is vertically rotated about its axis to locate the appropriate scroll mechanism, in which the frame of film is located.

Each scroll contains a multiplicity of film container units made of transparent plastic and each container holds as much as 20 inches of film either in strips or individual frames (Figure 2). The separate film containers are removed or replaced in a fashion comparable to sliding a hair comb into its carrying case. Scrolls can be made to accommodate any size or combination of film sizes.

With three simultaneous movements —the horizontal movement of the entire drum on its track, the Ferris Wheel-like rotation of the drum to locate the proper scroll and the unwinding of the scroll—the desired area of film is located and positioned between the light source and the optical system.

The preparation of materials for AMFIS can be achieved by a variety of standard microphotographic systems including transparent microfilm or opaque microprint. If standard microfilming equipment is presently in use or contemplated, it is only necessary to use the existing reels of film, cutting the film into desired lengths for insertion in the film retainers. These in turn may be immediately placed on the appropriate scroll or stored for future use. It is of course possible to duplicate existing reels of microlm for use in AMFIS, without destroying the originals.

Opaque microprints may likewise be scissored for insertion into the retainers. In the latter case the light source is placed on the same side of the scroll as the light transmitting apparatus, since the image would then be obtained by reflected light rather than transmtited light.

The storage capacity of AMFIS is a function of the number of scrolls employed, as well as the particular reduc-

tion ratio of the microfilming and viewing units. Using reduction ratios of 25 to one, one 20 inch strip would accommodate approximately 150 8 x 11 inch pages, giving a total capacity of 150,000 documents per scroll and over three million to a 20 scroll AMFIS.

While the foregoing description visualizes a large central installation using millions of microfilm frames, the same basic techniques can be employed in a smaller AMFIS unit which could handle thousands of microfilm frames in individual viewers. This type of unit is shown in Figure 3. Each researcher could then have his own AMFIS unit. Such quick access to documents would be a boon to the scholar who must collect and store hundreds of reprints and other data.

AMFIS should not be compared or confused with systems such as Minicard or Filmorex which are essentially "searching" systems rather than random access storage devices. When the reader knows the document desired, a "searching" system is superfluous and time consuming.

AMFIS was designed primarily to make quickly accessible one or more documents in large files. At present, the potential user is frequently discouraged, if not unable, to examine and reproduce information in such files because of the time necessary to obtain individual documents.

The practical development of AMFIS could help realize Vannevar Bush's Memex, a dream which research workers and librarians also share. The means of approach to this dream involve components and techniques which have been developed during the past few years. AMFIS points a way of building a system with these components and techniques. Its final realization merely awaits concrete financial assistance. We earnestly hope that this paper will stimulate the discussion and criticism necessary for the fulfillment of this dream.

EDITOR'S NOTE: Mr. Avakian is the inventor of AMFIS while Mr. Garfield has helped develop and clarify the ideas on which the Automatic Microfilm Information System are based. Mr. Avakian has also worked out a means of typing for people who cannot use their hands and has invented a number of gadgets to aid persons with cerebral palsy and other severe handicaps.