The Future of Microfilming

By ERNEST P. TAUBES [1]

Photo Devices, Inc.

THE age we live in is commonly called the Atomic Age, but there is probably just as much justification to call it the Age of Recordkeeping. More and more records, kept on more and more subjects, confront the archivist with the problem of finding space in which to store all that are to be permanently preserved.

Microfilming in its various forms is primarily a means of reducing and condensing records in order to save space, and therefore it should be of vital importance to the archivist. As a matter of fact, the first large-scale microfilm project in this country involved the copying of archival material. The Library of Congress in the years 1927 to 1932 had a project that required two million microfilm exposures of manuscripts relating to American history in archives throughout Europe, but mainly in England, France, and Spain.

Microfilm has made tremendous strides in the past 10 years, particularly in broadening its applications. The new applications have resulted largely from the fact that microfilm has been taken out of the roll in which it was confined these many years and has been placed as an individual image or a connected strip in a jacket card or an aperture card. This unitizing of microfilm has made it possible to find a single document in a matter of seconds, by automatic sorting machines instead of by visual search among thousands of images in a roll of microfilm.

Entirely new photoduplicating methods, employing new principles of photography, will make it possible to use unitized microfilm or microfilm in rolls and produce readable prints from it in a matter of seconds, without the use of dark rooms and at a reasonable price. The new methods include Xerox, Electrofax, and Projection Verifax.

The Armed Forces at present are developing, in conjunction with their program of unitized microfilm for engineering drawings, pieces of equipment called reader reproducers. These are conventional microfilm readers equipped to handle aperture cards, and in some instances microfilm in roll form, and at the same time, at the

[1] This paper was read at the annual meeting of the Society of American Archivists in Columbus, Ohio, Oct. 4, 1957. Dr. Taubes is president of Photo Devices, Inc., of Rochester, N. Y.

option of the operator, to produce images of readable size by means of one of the above-mentioned photographic reproduction processes in a matter of seconds.

Another device being developed, similar to the reader reproducer, will produce either paper prints of readable size or lithographic plates or transparencies. A lithographic plate produced by means of Xerox, Electrofax, or Projection Verifax can be taken from the reproducer and put directly on a lithographic press, such as Addressograph Multigraph; it will produce up to a thousand or more prints without any deterioration of image. A transparency produced by the above methods can be used in Diazo printers for the reproduction of a limited number of prints.

A completely new system developed by Eastman Kodak, called Kodak Minicard, combines the high reproductivity of punchcard systems with the high information content of microfilm applications. The Minicard is a piece of photographic film 16 x 32 mm. Near one end of the Minicard is a slot that permits the card to be handled by means of a metal stick. The Minicard carries digital information in the form of clear or opaque dots, and in addition it may carry images of documents. The readable area of the Minicard can be used for code or images in any desired proportion. A single Minicard may have up to 12 image areas. Each image area may carry the image of a legal-size page, 8½ x 14 inches.

With 12 images on a Minicard, there is still space for coded information for purposes of manipulation. Should a document require more record space than is available on a single Minicard, the additional information, either code or image, can be put on a second, a third, and more Minicards as required. Provision has been made to handle a group of Minicards together in the operation of the system. The maximum amount of digital information that can be carried on the present Minicard, if it carries no photographic images, is 65 columns of 42 bits each or a total of 2,730 bits. In the present coding system used for Minicards, 6 bits are required to designate a single alpha-numeric character; thus, 7 alpha-numeric characters may be designated by one column of bits.

Minicards are handled not manually but on metal sticks. These sticks serve as a means of handling cards between machines, and of inserting them in or removing them from the files. A standard stick has a capacity of 2,000 Minicards. For operations such as sorting and selecting, a handling speed of 1,800 cards per minute can be readily attained in the Minicard system.

The cost of Minicards compares very favorably with conventional forms of punchcards or microfilm. Minicards are in the same cost range, card for card, as punchcards and have a great cost advantage over punchcards on the basis of digits or bits per card. Similarly on a cost per area basis, Minicards have a considerable advantage over conventional microfilm since a greater image reduction has been achieved with Minicard.

The following pieces of equipment have been developed in the Eastman Kodak laboratories for the purpose of handling and preparing Minicards. For preparing the Minicards there are typewriter tape-punch machines, cameras, duplicators, film processors, and film cutters. For manipulating Minicards there are fine sorters, block sorters, and selectors. For using Minicards there are viewers, code printers, enlargers, and print processors. The system is still in its experimental stages, and when and how it will become available for the public has not yet been announced.

For making Minicards, a camera is required to photograph code patterns and the documents. The film in the camera, in roll form, is then processed. The Minicard film processor is entirely automatic, very compact, and speedy in operation. After drying, the processed film can be passed immediately through a device called the film chopper. This device cuts the film into individual Minicards and stacks them on a Minicard stick. The Minicards can then be used at once in the various machines of the system.

The duplicating of Minicards is essentially the straightforward operation of making a contact print from a Minicard to roll film. In the duplicator, however, provision has been made for adding code to the Minicard. This capability is of great importance and makes the duplicator a key piece of equipment in the system rather than just a useful accessory. Included in the Minicard system are machines to perform various sorting operations; the sorting is carried out on the same principle as in conventional punchcard machines.

Two types of viewers will be made available, one portable and one stationary. The portable viewer will be low in cost. The stationary viewer will combine a projection viewing system with a semiautomatic mechanism for feeding Minicards from standard-size sticks.

The Minicard enlarger is an automatic device, which can be set to supply either enlargements of all the frames on a Minicard or an enlargement of the first image frame only. This option is convenient when the first image frame on the Minicard is an abstract of the record images that follow it.

The entire Minicard system was made possible by the development of exceptionally high resolving film emulsions and special lenses that permit the reproduction of documents at a 60 to 1 reduction ratio.

Microcards, Microtape, Microtak, Microprint, Micropaper — all these names refer to "micro-opaques," in which the image is produced on opaque paper. This process has been developed and has had considerable distribution during the last 10 years. It is important in the archival field since the records in this field are mostly complete and therefore can be reproduced in a Microcard form.

A Microprint card is a combination of a series of opaque microfilm images in card form so that all the pages of the document can be combined into one card, which can be easily filed and found. Various kinds of these cards are being produced today. One kind, by means of tape that has been treated with a pressure-sensitive adhesive, permits the production of various-size cards to conform to the length of the document. That is, a card (3 x 5, 5 x 8, or 6 x 6) can be put together by simply pasting the tape (either 16 mm. or 35 mm. wide) on a card backing.

Most of the masters for printing opaque cards are produced today on roll film either 16 mm. or 35 mm. wide. The film is then stripped on a glass plate, and the plate is used for duplicating purposes.

An automatic step-and-repeat camera has now been developed, however, which permits the production of Microprint masters directly in the camera in the form of a sheet of film, 3 x 5 or 5 x 8 inches in size, so that no stripping is necessary.

This camera has a variable reduction ratio so that documents of different size can be reduced to the same size and thus permit the quick and easy production of uniform negative print masters. Additional equipment is being developed in conjunction with the step-and-repeat camera that will make it possible to print from the negative master either Microcards or positive transparencies. In addition, new Microcard readers will be developed that can use either opaque or transparent materials for reading purposes. Another unit is being developed that will permit the use of the Microcard masters for automatic enlargements on roll paper. The various pieces of equipment I have mentioned will provide for a completely new system built on the film master.

Some companies that up to now have been only slightly engaged in microfilm work have recently decided to enlarge their microfilm operations. For instance, the Ozalid Corp. is at present marketing a

whole new line of microfilm equipment imported from Germany; this includes cameras, readers, reproducers, and enlargers, and it might also include microfilm. Bell & Howell is investigating every aspect of the microfilm business and will probably offer new equipment in the future. The Haloid Co. is establishing new production facilities primarily for its Xerox process for enlarging microfilm. Some other companies, such as Eugene Dietzgen, expect to enter the microfilm business or certain of its specific phases in the near future. Photo Devices, Inc., is new in the industry even though the people in it are not. The company is only a year old, but already it has a whole new line of equipment available — cameras, enlargers, readers, positive printers, and even processors — for various film sizes from 16 mm. to 105 mm.

One activity in the microfilm field, the effort to standardize various phases of the microfilm business, has made considerable progress under the American Standards Association. Of specific interest to archivists is the excellent standard for the storage of microfilm, which is now up for final vote and should be accepted as an American standard within the next 2 or 3 months. Another proposed standard of general practice for 16 mm. and 35 mm. microfilm is now nearing its final draft and should also be accepted within the year.

One of the most controversial proposed standards is a standard of quality for microtransparencies. Here the first problem facing the standard committee was to define the various components making up the total concept of quality in microfilm since up to this time the only guide available for the layman has been the antiquated definition of the Bureau of Standards, requiring microfilm to have a minimum resolution of 68 lines per millimeter. Actually the quality of microtransparencies cannot be measured by lines per millimeter but has to be defined in terms of legibility, which is not directly dependent on resolution. To help define the limits of legibility of microfilm transparencies, resultant enlargements of these transparencies, and contact prints from the enlargements, a set of exhibits has been prepared by the Eastman Kodak research department; and now four other sets of control exhibits are being prepared, one each by Bell & Howell, the Ford Motor Co., Remington Rand, and the United States Navy. Once all these exhibits have been properly examined and evaluated, it will be possible to write a set of quality standards that will be accepted by the American Standards Association.

Other proposed standards for microtransparencies and microopaques are being worked on and will cover practically every phase

of equipment and service, so that within the next 2 or 3 years we should have standards to guide the public, the manufacturer, and service organizations.

To sum up, there is great activity in the microfilm industry, particularly in finding new applications for microfilm. And every time a new application is found, a new method or a new piece of equipment is required to make the new application easier, simpler, and more automatic.