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Anderson

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[54] **FILM RECORD CARD SYSTEM**

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[73] Assignee: **Microseal Corporation, Skokie, Ill.**

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Related U.S. Application Data

[62] Division of Ser. No. 866,306, Oct. 14, 1969, Pat. No. 3,604,779.

[52] **U.S. Cl.** **40/158**

[51] **Int. Cl.** **G09f 1/10**

[58] **Field of Search** ..... 40/158, 158 B; 355/79, 122

[56] **References Cited**

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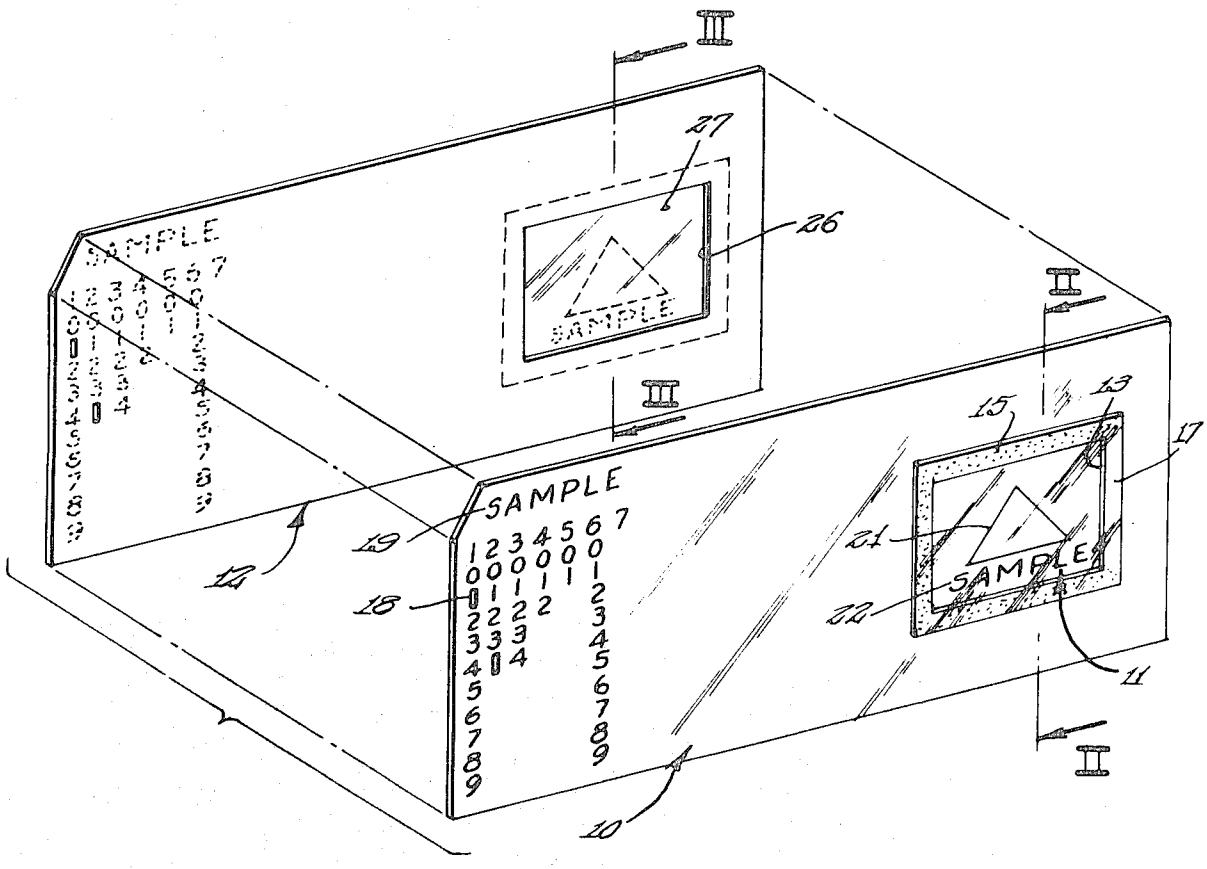
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Primary Examiner—Robert W. Michell
Assistant Examiner—Wenceslao J. Contreras
Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

An information storage system comprises a diazo reproducible film record card and a receptor or copying card treated with diazo compounds and carrying a strip of blank film also treated with diazo compounds. The reproducible film record card may be of the type adapted to be processed at high speeds by automatic tabulating or sorting machines and may comprise a sheet form card composed of transparentized paper stock having at least one cutout or aperture formed therein for receiving a strip of film containing a micro-image and means for retaining the film within the cut-out. The transparentized paper stock has an actinic transmission percentage enabling simultaneous diazo reproduction of both data printed on the card and the micro-image contained on the film. The receptor or copying card may include a card capable of being machine processed in automatic sorting machines and has an aperture or cutout located coincidentally with the cutout of the reproducible card and mounts a film having a side or face surface thereof coated with diazo compounds and exposed.

9 Claims, 3 Drawing Figures



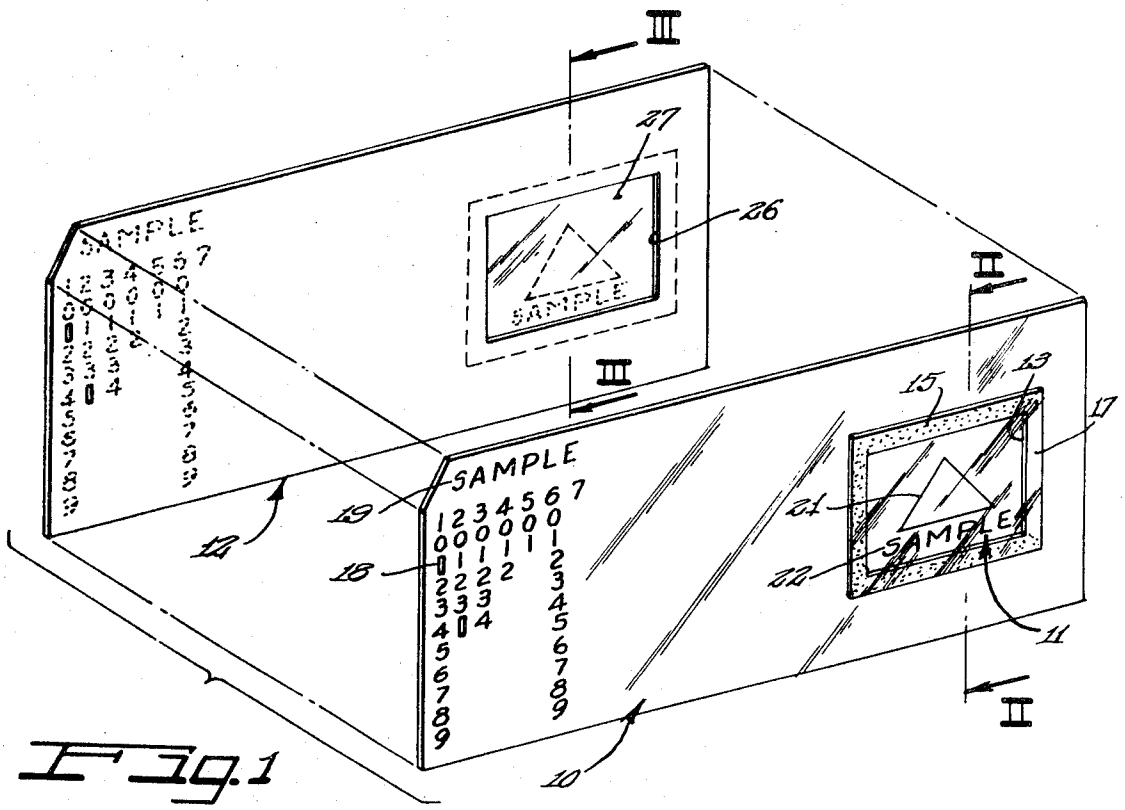


Fig. 1

Fig. 2

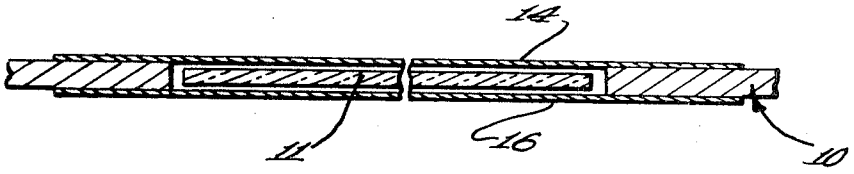
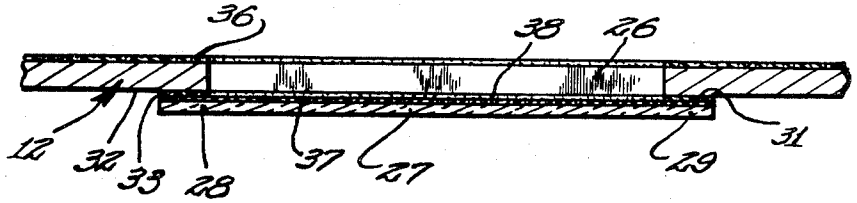


Fig. 3



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FILM RECORD CARD SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a division of my copending application entitled "FILM RECORD CARD SYSTEM," Ser. No. 866,306, filed Oct. 14, 1960 now U.S. Pat. No. 3,604,799.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to micro-imagery and diazo reproduction and more specfically refers to a diazo reproducible film record card and a copying card for use with the reproducible card to enable diazo reproduction of data and images contained on both the reproducible card and a film strip carried thereby.

2. Description of the Prior Art

Ever increasing use of microfilm records and statistical cards in conjunction with one another has resulted in a widespread acceptance of statistical tabulating cards containing pockets for receiving strips or pieces of microfilm as a means of information storage.

Herefore, film record cards of that type have not been inexpensively reproduced by known and readily available processes. Most reproducible film record cards or jeckets and copying or receptor cards have been composed entirely of expensive plastic films. Furthermore, film record cards composed of plastic film do not accept ordinary writing means, for example, inks of the type used for typewriter ribbon, carbon paper, ball point pens, ink pens, felt tip pens or lead pencils.

Since film record cardS are generally used in very large quantities running oftentimes into the tens of thousands, it is necessary that the card have some sort of indicia carried in or over all or a portion of one or both sides of the card. The indicia may comprise both machine readable indicia such as punched holes or magnetic ink impressions and visible indicia such as type or hand written words, numbers, etc. While the series of punched holes or series of ink impressions facilitate automatic sorting of the cards by automatic machines, the typed or hand written visible information is necessary for visible, human identification of the card. Thus, if the reproducible card does not have ink receptivity, such as for example, a plastic film, it is difficult to mark the card in a manner to be visibly identified.

SUMMARY OF THE INVENTION

The present invention contemplates an information storage system including an inexpensive, master or reproducible film record card composed of material having ink receptivity and being capable of processing at high speeds by automatic sorting machines and a receptor or copying card for use with the reproducible card in a manner enabling simultaneous diazo reproduction of data and information contained on both the reproducible card and a strip of microfilm carried thereon.

The reproducible film record card includes a sheet form card having an appropriate configuration to permit automatic machine processing including a proper thickness and vertical rigidity and defining at least one cutout or aperture for receiving a strip of microfilm containing a micro-image. Means such as enveloping members are mounted on the card for retaining the strip of film within the cutouts or apertures. To enable

simultaneous diazo reproduction of data contained on both the card and the strip of microfilm, the card is composed of a material having an actinic transmission rate greater than 25 percent. One such material which also has the necessary characteristics of ink receptivity and rigidity includes transparentized paper stock.

The receptor or copying card includes a statistical tabulating card having a cutout or aperture disposed on the card in a manner to be coincidentally disposed on the card relative to a location of the aperture on the reproducible or master card. A blank strip of film is mounted into the aperture of the copying card with at least one face surface thereof exposed. Both one exposed surface of the strip of blank film and a similarily facing surface of the copying card are treated or coated with diazo type compounds, thereby permitting diazo reproduction of the reproducible card on the copying card.

By utilizing film record cards of the present invention, a reproducible master set of film record cards containing strips or pieces of microfilm having microimages thereon may be produced, and that master set of cards including information contained on both the cards and the microfilm may be reproduced by inexpensive diazo reproduction processes. Also, punched or magnetic automatic sorting indicia may be reproduced from the master card to the copying card by simultaneously passing both cards through known key punch machines or magnetic ink printers. Thus, with the present invention a master set of micro-image records may be inexpensively reproduced for use at distant satelite locations.

Thus, it is a primary object of the present invention to provide an information storage system including a reproducible film record card capable of being machine processed and reproduced by diazo reproduction processes onto another film record card.

Another object of the invention is directed to providing a film record card having at least one aperture formed therein and means mounted on the card for cooperating with the aperture to define a pocket for receiving a film strip containing the micro-image and wherein the film record card has a configuration permitting automatic machine sorting thereof and is composed of a transparentized paper stock having ink receptivity, slow aging properties, and an actinic transmission rate enabling simultaneous diazo reproduction of data contained on both the card and the microfilm.

Still another object of the invention resides in the provision of an aperture or film record card carrying a blank strip of film wherein similarly facing surfaces of both the card and the strip of film are treated or coated with diazo compounds enabling copying thereon of data contained on a diazo reproducible film record card.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, forming a part of this specification and in which like reference characters are employed to designate like parts throughout the same:

FIG. 1 is an exploded, isometric view illustrating both a master, reproducible film record card and a copying card embodying the principles of the present invention and also schematically illustrating a copying method contemplated by the present invention;

FIG. 2 is an enlarged sectional view of a master or reproducible card taken generally along line II—II of FIG. 1; and

FIG. 3 is an enlarged sectional view of a copying card taken generally along line III—III of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, an information storage and retrieval system embodying the principles of the present invention comprises a master or reproducible film card **10** mounting a strip of film **11** containing a micro-image and a copying or receptor card **12.**

It is contemplated by the present invention that the reproducible card **10** be copied onto the copying card by a gas or heat type diazo copying process. The diazo process is based on the fact that exposure causes diazonium salts to undergo photo-chemical changes which affect their capacity to form dyes. Dyes are formed when diazonium compounds, or diazotized amines, couple with phenols or aromatic amines in a neutral or alkaline medium. During exposure the diazonium compound undergoes decomposition and is thus rendered incapable of coupling in dye formation. The undecomposed diazo-compound may be developed by immersing the paper in an alkaline solution containing a coupler. The decomposed diazo-compound resulting from expsoure couples with the undecomposed compound when the paper is made alkaline. Both the diazo-compound and the coupler are coated together on a copying medium but are prevented from reacting due to the presence of an organic acid. Copying mediums or papers of this type are dry-developed by contact with ammonia fumes or gases. In another process use is made of diazo-anhydrides in a neutral medium because these do not couple until they are made alkaline.

Further, heat sensitive compounds may be employed to permit development of a copy by subjecting an exposed sheet to a sufficient heat source.

One important advantage in utilizing the diazo process for reproducing machine processible film record cards such as the card **10** resides in the fact that the copying or receptor card **12** may be handled in subdued daylight and conveniently stored in a cabinet.

As illustrated in FIGS. **1** and **2,** one example of the reproducible film record card **10** comprises a sheet form card configured identical to the usual statistical card and having a rectangular film strip receiving aperture **13** formed therein. Transparent enveloping members or sheets **14** and **16** having a rectangular configuration are mounted on front and rear surfaces, respectively, of the card **10** so that they overlie the aperture **13.** The enveloping members **14** and **16** are transparent films having a thickness in the range of about 0.25 mil to about 0.5 mil. It has been found that polyethylene terephthalate films such as "Mylar" (produced by Du Pont de Nemours & Co. of Wilmington, Del. U.S.A.) are ideally suited for use in forming the enveloping members.

The rear enveloping member **16** may be secured to the rear wall or surface of the card **10** around the aperture **13** and about the entire periphery thereof by means of a suitable adhesive coating.

In order to provide an opening for insertion of the strip of film **11** into a pocket formed between the enveloping members **14** and **16,** the enveloping member **14** has a rectangular configuration and is mounted over the aperture **13** so that edges thereof overlie portions of the card defining the aperture, but only three edges of the enveloping member **14** are secured to the front surface of the card by a suitable adhesive as at **15.** An unsecured edge as at **17** of the enveloping member **14** overlies the card, and a slight gap may be formed between the enveloping member **14** and the record card **10** at the unsecured edge **17.** The slight gap is very small and may not exist at all, depending upon the manner in which the enveloping member is mounted on the card and whether or not the record card is disposed in a completely flat plane.

The unsecured edge **17** of the enveloping member **14** lies parallel to the ends of the card so that when the record card is passed sideways through an automatic sorting machine the sensing fingers, rollers and the like will not catch on any portion or part of the enveloping member. Although the film record cards **10** and **12,** as illustrated in the drawings, include only one aperture as at **13,** it should be understood that additional apertures may be formed on the card to receive differently sized strips of microfilm. If additional apertures are provided on the reproducible film record card **10,** those apertures would be covered by enveloping members similar to films **14** and **16** with at least one end edge of the enveloping members being unsecured, thereby enabling insertion of a strip of film into pockets formed by the additional apertures and enveloping members.

The film record card **10,** as illustrated in FIG. **1,** has a series of punched holes as at **18** formed by an appropriate key punch machine. The series of punched holes depict a code which is readable by automatic sorting equipment, thereby enabling the film record card **10** to be automatically sorted and automatically retrieved by statistical tabulating equipment. Also, the film record card **10** includes a typed or otherwise written word or symbol as at **19** to enable visual identification of the film record card and the information or intelligence contained in the form of a micro-image on the strip of film **11.** By way of example, the micro-image on the film **11** is depicted as a triangle **21** and the written word "sample" as at **22** and the visible identification includes the word "sample" as shown at **19.** It should be understood, that the series of punched holes as at **18** may be replaced by magnetic ink impressions for use with automatic sorting machines capable of reading magnetic ink impressions.

In order to prevent jamming in card sorting machines, the film record card must haVe certain physical characteristics and must not present any projecting edge which may catch on sensing fingers generally employed in sorting machines. Such automatic sorting equipment generally includes friction rollers or the like which engage each end of a card and pull that card through the sorting machine. If the thickness of the card at one end thereof is greater than that at another end thereof the friction rollers may tend to grab one end of the card and pivot the card about that end, thereby jamming the sorting machine with a resultant stoppage of work flow. Also, tabulator cards generally have a total thickness in a range of about 6.6 to 7.4 mils to enable proper processing by automatic equipment. Since tabulator cards are moved through the machines in a sideways manner as opposed to an endwise manner, it is also necessary that the film record card **10** have a sufficient rigidity in a vertical direction, i.e., top

to bottom to prevent buckling of the card as it moves through the automatic sorting machine.

In summary, a card capable of accepting automatic machine processing should have a sufficient rigidity in a vertical plane to prevent buckling, a proper configuration to be processed by the machine, and be capable of carrying and duplicating machine readable identification, such as a series of punched holes or a series of magnetic link impressions, as well as visible identification to permit a person unskilled in reading the machine code identify an unsorted card.

In accordance with the principles of the present invention, the master film record card 10 has a sufficient transparency or actinic transmission precentage for permitting simultaneous diazo reproduction of visible identification matter as at 19 carried on the card and a micro-image as at 21 and 22 contained on the film strip 11 and additionally satisfies all of the above-mentioned requirements to enable automatic machine sorting at high speeds. In a diazo reproduction process, the material to be copied, such as the master or reproducible card 10, is placed directly over a copying medium, such as the copying or receptor card 12, and actinic light, i.e., light in the visible and ultraviolet spectral ranges by which chemical changes are produced, is passed through the reproducible card to photochemically affect the diazo-compound on the copying card, as schematically illustrated in FIG. 1 by dashed lines on the copying card 12.

For any given diazo copying machine, the length of time that the copying medium is exposed to the actinic light produced by the machine, the actinic transmission percentage of the reproducible card and the sensitivity of the coating on the copying card determine the amount of photochemical action and consequently, the sharpness and quality of the copy. The National Association of Blueprint and Diazotype Coaters, Inc., (NABDC) 1925 K Street N.W. Washington, D. C. 20206, has established certain standard units for describing the above-mentioned parameters, as follows:

a. Actinic transmission is expressed as a percentage representing a ratio of a reprint speed of "GP" bond to a maximum print speed of a given material;

b. Sensitivity of the copying medium is expressed as a speed rate or percentage ascertained by comparing a given coated paper to a standard copying paper having a known sensitivity; and

c. Exposure time is expressed in terms of feet per minute indicating a machine speed at which the reproducible and copying medium are simultaneously passed through commercial diazo printing equipment.

It should be noted that microfilm or film containing micro-images has an actinic transmission percentage normally exceeding 75 percent whereas statistical tabulating cards in normal use today have an actinic transmission percentage of approximately 3 percent. Furthermore, overexposure in an attempt to burn cut paper grain of the card or through films which do not directly abut the copying medium will result in diffusion of the light and consequently a blurred or faded copy. On the other hand, underexposure causes the printed matter contained on the reproducible card and copied onto the copying medium to be undiscernible from the reproduced paper grain forming the background of the copy.

In accordance with the principles of the present invention, the reproducible card 10 should have an actinic transmission percentage of at least 25 percent. That percentage is the minimum which will permit simultaneous reproduction of visible matter contained on both the card portion 10 and the enveloped microfilm 11, which has a high actinic transmission percentage oftentimes exceeding 75 percent. Additionally, the card material for the reproducible card 10 must have ink and pencil receptivity to permit writing or printing visible identification thereon and should be capable of machine processing One such material having the requisite actinic transmission percentage, ink and pencil receptivity, vertical rigidity, thickness and other characteristics permitting processing by automatic sorting machines is transparentized paper stock.

Transparentized paper stock may be produced by treating a paper sheet with a liquid composition consisting essentially of synthetic, thermosetting curable resin and a curing agent for the resin in a manner similar to that described in Vaurio U.S. Pat. No. 3,140,959, issued on July 14, 1964 and assigned by mesne assignment to Customark Corporation, Appleton, Wis., a corporation of Wisconsin. That patent describes a process for forming chemical water marks on otherwise finished paper sheets, and it has been found that applying that process to paper stock material having sufficient rigidity characteristics for statistical tabulating cards results in a transparentized paper stock having ink and pencil receptivity and the requisite actinic transmission percentage or transparency to permit simultaneous diazo reproduction of data contained on both the card and the strip of microfilm carried or mounted on the card.

One example of transparentized card stock material utilized in an experiment possessed the following properties as compared to that same sheet prior to the transparentizing process:

	Base Sheet	Transparentized Sheet
Basis weight		
17 × 22 – 500	36.8 lb.	46.9 lb.
Mullen psi	43	50
Tear CD	154	168
MD	172	152
Caliper mls	6.8	6.9
Fold CD	117	154
MD	158	98
Density secs.	48	272
Brightness %	87.9	75.8
Opacity %	90.0	67.8
Actinic Transmission %	8.3	33.3
Taber stiffness CD	13.5	13.5
MD	4.5	6.0

It should be noted, that the actinic transmission percentage increased from 8.3 to 33.3 subsequent to the base sheet being transparentized. Further, the transparentized card stock described hereinabove has a caliper or thickness of 6.9 mils, thereby satisfying the thickness requirements for a material capable of accepting automatic machine sorting.

An actinic transmission percentage of the film strip area of the master or reproducible card 10 may be varied, to a small degree, by varying the thickness of the transparent enveloping members 14 and 16.

In accordance with the principles of the present invention, the copying card 12, as illustrated in FIGS. 1 and 3, comprises a card having a configuration similar to that of the reproducible card 10 and formed with an aperture 26 positioned on the card 12 to directly underlie the aperture 13 on the card 10 whenever the reproducible card is positioned directly over and aligned with the copying card 12.

A blank strip of film 27 having peripheral edge portions as at 28 and 29 overlapping peripheral edges as at 31 of the aperture 26 is adhered to a rear surface 32 of the copying card 12 by a suitable adhesive coating 33. The rectangularly configured film strip 27 may be adhered to the rear surface 32 of the card 12 around all four peripheral edges thereof, but for machine processing purposes it may only be necessary to adhere upper and lower edge portions of the film strip to the card.

The copying card 12 is treated or coated with diazo-compounds to form a layer of photochemical material as indicated at 36 extending entirely over a face or front surface thereof. Also, the blank film strip 27 carried within the aperture 26 is coated as at 37 on the exposed front surface 38 thereof with diazo-compounds. Thus, both the copying card 12 and the film strip 27 carried therewithin form a copying medium enabling diazo reproduction of information or data contained on both the reproducible card 10 and its strip of film 11. In that manner, an exact duplicate of the reproducible card 10 may be produced by diazo printing processes.

To obtain acceptable copies, the diazo-coupound or photo-chemical coatings 36 and 37 formed on the copying card 12 and the film strip 27, respectively, should have a sensitivity, as expressed in terms of speed rate or percentage, in a range of about 35 percent to 200 percent (NABDC speed rate reproducible percentage). Through experimentation, it has been found that an optimum NABDC speed rate or percentage for both of the coatings 36 and 37 is about 125 percent.

Furthermore, the separate coating 36 on the copying card 12 may have a speed rate, within the acceptable range, different from that of the coating 37 on the exposed front surface 38 of the film strip 27.

The copying card 12 may be conveniently handled in subdued sunlight and stored in normal filing-type cabinets without special precautions being taken to protect the card. Furthermore, the card is composed of relatively inexpensive material compared to cards composed entirely of photographic film or plastic film and commercial diazo printing equipment is readily available. Thus, the copying card 12 when used in conjunction with the reproducible card 10, provides an economical and convenient means for reproducing a master set of microfilm records.

Although an image of the series of punched holes as at 18 formed on the master or reproducible card 10 will be copied onto the copying card 12 by the diazo process, the reproduced copying card may be conveniently punched in a manner to form a series of machine readable holes corresponding to those in the master card by simultaneously passing both the master card and the copying card through key punch machines which will form an identical series of punched holes on the copying card 12. A similar process will also automatically reproduce magnetic ink impressions onto the copying card 12.

Experiments utilizing master or reproducible cards and copying cards, both of which were produced in accordance with the principles of the present invention, resulted in acceptable copies at dial indicated, linear machine speeds in a range of about 9 to 16 feet per minute. In particular, the master or reproducible card utilized in one experiment, had 40 percent actinic transmission in the card portions, composed of transparentized card stock, and 75 percent actinic transmission through the pair of enveloping members and image containing film strip disposed between the enveloping members, whereas the copying card utilized in that series of experiments had a speed rate of 55 for the coating on the card portion and a speed rate of 40 for the film strip coating. In that experiment, an Ozamatic model 4300 machine sold by Ozalid Company, a subsidiary of General Analine, was utilized, and acceptable copies were produced at dial indicated machine speeds in a range of about 9 to 16 feet per minute, with the most acceptable copy of data contained on both the master or reproducible card and a film strip carried thereby being obtained at an indicated linear machine speed of approximately 12 to 13 feet per minute.

From the foregoing description, it should be noted that the present invention provides a master film record card having ink and pencil receptivity and a sufficient actinic transmission percentage enabling simultaneous diazo reproduction of data contained on both the card and a piece of microfilm carried thereby. The information storage and retrieval system of the present invention is completed by a copying card comprising a card treated with diazo compounds, preferably having characteristics enabling automatic machine processing and sorting and mounting a blank strip of film coated with diazo compounds and positioned to underlie strips of microfilm carried by the master or reproducible card. Thus, a master set of microfilm records may be maintained on the reproducible film record cards of the present invention and duplicate copies of the master set of cards may be economically reproduced by diazo copying processes including simultaneous reproduction of data contained on both the cards and the micro-images contained on the strips of film in the master set of cards.

Although minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A reproducible film record card comprising:
   - a card having at least one aperture therein for receiving a strip of film having a micro-image thereon;
   - means for retaining the strip of film within the apertures; and
   - wherein said card is composed of a card stock material having an actinic transmission percentage relative to an actinic transmission percentage of the film for enabling simultaneous diazo reproduction of both data contained on the card and the micro-image on the film.

2. A film record card as defined in claim 1 and further characterized by:
   - said card having side and end edges defining the perimeter of one said aperture; and
   - said means for retaining the strip of film within the aperture including an adhesive coating extending around two of said sides and one of said end edges and enveloping members entirely covering said aperture and said coating and secured to said card by said adhesive coating.

3. A reproducible film record card as defined in claim 1 and further characterized by said card having a configuration and stiffness in a vertical plane enabling

automatic sorting thereof by statistical tabulating equipment.

4. A film record card as defined in claim 1 and further characterized by said card stock material having ink and pencil receptivity similar to that of paper.

5. A reproducible film record card as defined in claim 1 and further characterized by said card material having an actinic transmission percentage of at least 25 percent.

6. A film record card as defined in claim 1 and further characterized by said card being composed of transparentized paper stock material having an actinic transmission percentage of at least 25 percent.

7. In a film record card including a card having edges defining at least one generally rectangular aperture and substantially transparent means mounted on the card and overlying the aperture to define with the edges at least one film pocket for receiving a strip of film containing a micro-image, the improvement of the card being composed essentially of a card stock material having an actinic transmission percentage relative to an actinic transmission percentage of said substantially transparent means together with a strip of film contained in the film pocket enabling simultaneous diazo reproduction of both data contained on the card and the micro-image contained on the film.

8. In a film record card as defined in claim 7 and further characterized by said card having a configuration, thickness and requisite vertical rigidity enabling automatic machine processing thereof by statistical tabulating machines.

9. In a film record card as defined in claim 7 and further characterized by said card stock material having an actinic transmission percentage of at least 25 percent.

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