United States Patent

Merk et al.

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[54] PROCESS FOR FORMING A MICROFICHE

[72] Inventors: **Fritz Merk**, Wiesbaden; **Gerhard Debus**, Assmannshausen; **Herbert Ewald Muller**, Wiesbaden, all of Germany

[73] Assignee: **Kalle Aktiengesellschaft**, Wiesbaden-Biebrich, Germany

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[51] **Int. Cl.** **B32b 7/06**

[58] **Field of Search** 235/61.12; 156/247, 299, 332, 156/333, 344

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Primary Examiner—Carl D. Quarforth
Assistant Examiner—E. A. Miller
Attorney—J. Russell Juten, Peter F. Willig, Lionel N. White and Milford A. Juten

[57] **ABSTRACT**

A microfiche is formed by coating a transparent support sheet with a layer of transparent potentially adhesive thermoplastic composition exhibiting low adhesive tackiness at ambient conditions, but which is heat-activatable to adhesive tackiness, positioning microfilm image elements on the layer under a sufficient pressure to superficially adhere the elements to the layer, and bringing the thermoplastic composition to adhesive tackiness in the areas of the microfilm elements. Reheating the thermoplastic composition in the areas of the microfilm elements renders the elements removable from the sheet, thus providing for replacement of microfilm elements to revise or update the microfiche.

6 Claims, 3 Drawing Figures

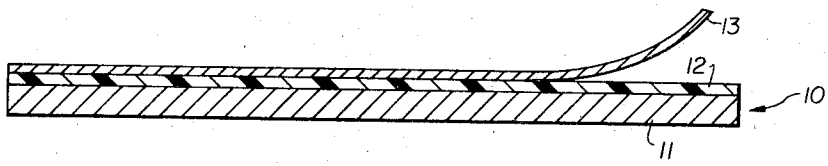

FIG. 1

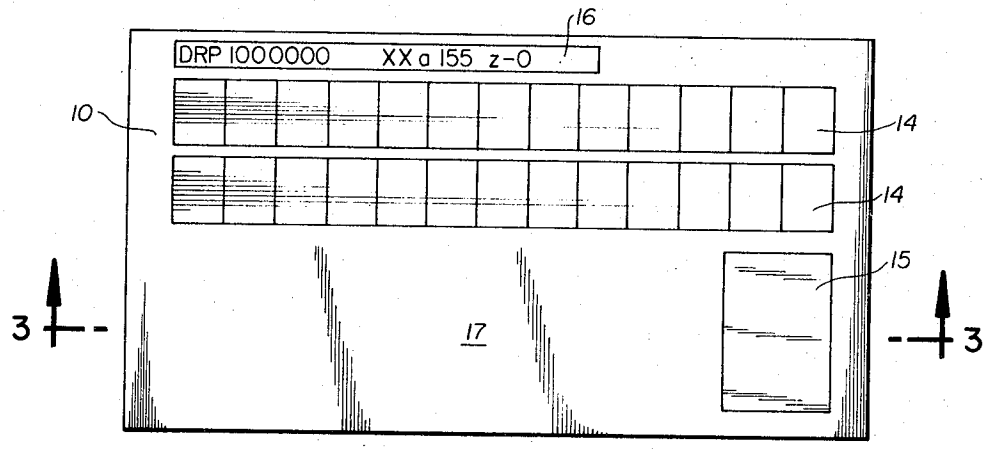

FIG. 2

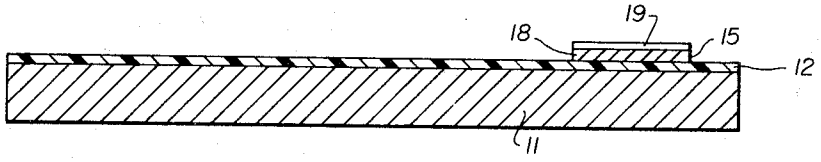

FIG. 3

INVENTORS:
FRITZ MERK
GERHARD DEBUS
HERBERT E. MÜLLER
BY Lionel H. White
ATTORNEY

PROCESS FOR FORMING A MICROFICHE

BACKGROUND OF THE INVENTION

For better card-indexing and organization, it is known to make microfilm images of documents, drawings, and written information on sheet films having approximately the size on file cards or to copy them from film strips. Utilizing as much as possible of the light-sensitive surface of the sheet microfilm, individual documents, for example, are copied side-by-side and line-by-line in consecutive steps onto the sheet microfilm. The process has the disadvantage that it always requires a relatively slowly working step and repeat camera. Another known method consists in that the arrangement of the documents in the form of strips on the sheet microfilm is achieved by line-by-line copying of rollfilm strips onto light-sensitive material. The two mentioned cases require relatively slowing working optical devices, and furthermore, the microfiches do not allow subsequent changes or insertions.

In order to overcome these disadvantages, it has been suggested to keep strips of microfilm images in correspondingly measured transparent bags which can be sorted in the form of a card index. The individual strips can easily be replaced by others or, if desired, supplemented. For the preparations of reenlargements or duplicates of the microfilm images, it is either necessary to take the film strip out of the bag every time or to expose it through the bag. In the latter case, a loss of sharpness is unavoidable. Another disadvantage of this process resides in that the bags can contain only strips of a limited width.

According to another known process, the film strips are bonded onto a transparent film support by means of an adhesive. The process is comparatively complicated and usually requires a special device for covering the backside of the film with an adhesive, for cutting the film into suitable strips, and for bonding these strips in the desired position onto a transparent support. According to this process, only the marginal portions of the film are coated with the adhesive so that the central parts of the image are not always plane when being pressed onto the reproduction material during the preparation of further copies. This results in a lack of sharpness, of course. Changes or insertions in the mounted card are not readily possible since the hardened bonded assembly generally cannot be separated without damaging the support or the bonded film. The remaining adhesive residues impair the transparency and interfere with the application of the new microfilm image.

It has been found that the above disadvantages can be overcome in a simple manner by employing a new mounting process and a new mounting film for microfilm images.

SUMMARY

The present invention provides a process for mounting microfilm elements onto a transparent support, thereby forming a microfiche, which comprises coating the surface of the support entirely or partially with a thermoplastic layer which is only slightly adhesive at ambient temperature, but is heat-activatable to adhesive tackiness, laying the microfilm image element or elements onto the desired area of the support, preferably with the back of the element in contact with the thermoplastic layer, pressing the elements in position, and briefly heating the thermoplastic layer in the area occupied by the microfilm elements.

According to an embodiment of the process, the microfilm images and the support are heated only to such an extent that they can be separated again after cooling without being damaged.

The present invention further provides a mounting film for the performance of the process of the invention which consists of a dimensionally stable transparent support with a thin coating of thermoplastic substance which is adhesive in the heat in a temperature range in which the dimensional stability of the support is substantially maintained.

The thermoplastic layer preferably is so selected that it superficially adheres to a microfilm element at normal temperature under pressure.

DRAWING

The drawing shows a preferred embodiment of the mounting film of the invention.

FIG. 1 is a cross section through a mounting film of the invention.

FIG. 2 is a plan view of such a mounting film provided with microfilm images and text.

FIG. 3 is a cross section through the mounted assembly of FIG. 2 along the line 3—3.

Referring to FIG. 1, the mounting film **10** comprises the support **11** and the thermoplastic layer **12**. For storage, the thermoplastic layer **12** is covered with an easily removable cover film **13**.

FIG. 2 shows a microfiche assembly comprising mounting film **10** bearing microfilm strips **14** and a microimage of another size **15** mounted onto the thermoplastic layer. The unused surface of the mounting film may be covered at a later date with further microfilm elements. The upper margin of the film has a legible text **16** with sorting characteristics.

FIG. 3 is a cross section of the microfiche showing a microfilm element **15** comprising the film base **18** and the image layer **19** adhered to support sheet **11** by means of thermoplastic adhesive layer **12**.

DESCRIPTION

By means of the process of the invention, it is possible by simple means to mount microfilm images of different number and size onto a support. For mounting, the microfilm image to be fastened is laid onto the desired place of the support, compressed therewith and heated. Heating may be performed in the simplest way under a heated platen, for example. It is also advantageous to pass the mounting film with the microfilm image thereon between two heated rollers. It is particularly advantageous when the thermoplastic layer of the mounting film, as mentioned above, adheres slightly to the film support at normal temperature and pressure. By means of this often undesirable phenomenon known in technology as "blocking." it is possible to fasten the film image by slightly pressing it to such an extent that it can no longer slide on the surface of the mounting film. The simultaneous mounting of several images or strips is thus considerably facilitated because the sheet microfilm card superficially mounted in this manner can be passed through a heated pair of rollers, for example, without the risk of a displacement of the images.

When using the mounting film in countries with a high normal temperature or when it is intended to print it or to provide it with sorting perforations, it may be advantageous, however, to select an adhesive which begins to adhere to the film only at higher temperatures, e.g., above 50° C.

The sheet microfilm mounted in accordance with the invention can be supplemented at any time by adding further images in the above-described manner. A change, i.e., a replacement of images by others, is also possible but care should be taken that bonding with the thermoplastic layer is performed at a temperature at which the assembly becomes not so firm that it cannot be separated again after cooling without damaging the film or the support. The bonding temperature depends on the nature of the thermoplastic layer used and and be determined by simple tests. In the case of the usual thermoplastic adhesives suitable for the use in accordance with the invention, bonds are generally made at temperatures in a range from about 40° to 70° C., which can easily be separated again by pulling the film image and the support apart. When making a permanent bond, bonding preferably is performed at higher temperatures the upper limit of which is determined by the decomposition temperature of the film layer or the softening or deformation temperature of the mounting film. Although it is usually not necessary, it is possible, for example, to briefly heat without danger images on silver halide or diazo film to temperatures from 120° to 130° C. For the desired bond, temperatures of 100° C. or below generally are entirely sufficient with the usual heat-activatable adhesives. The bond achieved therewith is very firm and sta-

ble. If required, it can only be separated again after previous heating of the mounted assembly to a suitable temperature.

The microfiches obtained according to the mounting process of the invention can be used for the preparation of duplicates and reenlargements in the usual manner. Since the image layer preferably is outside, the reproduction procedure is not connected with a loss of sharpness. For protecting the image layer, the microfiches may be kept in transparent bags and then be sorted in the form of a card index.

In addition to the microfilm images, there may be mounted text parts, sorting marks and the like on the support, which are legible without magnification and facilitate card-indexing and sorting.

The microfilm images to be mounted may be originals (e.g., on silver halide film) or duplicates (e.g., on diazo film). The bases of these film materials generally consist of cellulose acetate, nowadays sometimes also of polyester or other plastics. All such materials can easily be mounted according to the process of the invention. Although mounting with the layer outside is preferable, it is also possible to mount films having the layer inside. This may be the case with very thin bases without considerable sharpness losses occurring during the preparation of further copies. When no further copies are to be made this mounting method may even be of particular advantage.

As in the case of the known sheet microfilms, the base of the mounting film consists of a transparent dimensionally stable flexible material. Plastics films, e.g., of cellulose acetate or other cellulose esters, polyesters, polycarbonates, and the like are suitable for this purpose. When using films of synthetic plastics materials with a low adhesiveness, e.g., of polyethylene terephthalate, a known pretreatment for increasing the surface adhesion is advantageous.

The base of the mounting film may be coated entirely or partially with a layer of a known thermoplastic adhesive. Suitable heat-activatable adhesives are, for example, polyvinyl acetate, vinyl acetate copolymers, acrylic acid ester homopolymers and copolymers, polybutenes and styrene, and the like, natural resins, such as mastic, copal, etc. Adhesives with a suitable melting range are particularly obtained in known manner by mixing such constituents with one another and with other additives, such as plasticizers, silicone resins, polyethylene, coumarone indene resins, pentaerythrite ester resins, etc. Vinyl acetate homopolymers and copolymers, e.g., maleic acid alkyl esters, acrylic acid ester, and the like, in the form of solutions or dispersions have proved particularly suitable.

Partial coating of the support with thermoplastic adhesive may be performed in such a manner, for example, that a portion is left uncoated at the upper margin of the support and, instead, is so treated that, for example, indications or sorting characteristics allowing mechanical sorting can be written or printed thereon.

Coating with an adhesive may also be performed in the form of strips or in certain patterns so that the film strip is bonded only at the margins or, for certain purposes, only spotwise.

For avoiding adhesion of the mounting films to one another during storage in large stacks over a relatively long time, the thermoplastic layer may also be covered with a thin cover film or an appropriately treated paper, e.g., silicone paper, which is removed before mounting. It is also possible to coat the back side of the mounting film with an antiadhesive layer, e.g., of polytetrafluoroethylene. The cover film may also be printed, for example, with lines or squares and, during mounting, be placed under the film as an orientation auxiliary.

PREFERRED EMBODIMENTS

Example 1

An approximately 0.2 mm. thick cellulose acetate film was coated on one side with a thin layer of an approximately 50 percent aqueous dispersion of a copolymer from about 60 percent of vinyl acetate and 40 percent of dibutyl maleate, which contained about 1 percent of anionic and nonionic wetting agents as stabilizer, and the coating was dried. The film was highly transparent and, on the coated surface, smooth and no more tacky. The coated film was cut to sizes of 105 × 148 mm. Two strips **14** of a 16 mm. microfilm were laid with the backside downward onto the desired place of such a film card **10**, as shown in FIG. **2**, and provisionally fastened by slightly pressing them by hand. The film strips were safe from displacement and did not separate by themselves during handling of the card. A strip of transparent paper was typewritten with numbers and signs serving for classifying the contents of the microfilm photos and the written strip **16** was inserted at the upper margin of the mounting card. The assembly was then heated for some seconds to about 50° C. by means of a flatiron. After cooling, the film strips firmly adhered to the card and did not separate even when being bended to and fro. But the film strips could be separated at the corners with the fingernail and then be pulled down from the support without being damaged.

In another test, the mounted assembly was heated to about 90° C. instead of heating it to 50° C. For protecting the film gelatin layer, a glass fiber fabric coated with polytetrafluoroethylene was placed between the film and the heated surface. The achieved bond was so firm that it could not be separated without damaging the film or the thermoplastic layer.

Similar results were achieved when, for coating the support, a mixture was used consisting of 70 parts by weight of a 53 percent aqueous dispersion of a copolymer of vinyl acetate and butyl acrylate and 30 parts by weight of a 52 percent aqueous polyvinyl acetate dispersion which contained 10 percent of plasticizer, calculated on the polyvinyl acetate.

For storage, the obtained microfiches were put into transparent film bags and sorted in filing boxes. For the preparation of duplicates, the card was placed with the layer side of the film onto the light-sensitive layer of the reproduction material and exposed to light. Duplicates of the sharpness of the original were obtained.

Example 2

A cellulose acetate film as that of Example 1 was coated with a thin layer of a solution of the following composition and dried:

25 parts by weight of a copolymer from 86 percent of vinyl chloride, 13 percent of vinyl acetate, and about 1 percent of an unsaturated dicarboxylic acid,
25 parts by weight of methyl ethyl ketone,
10 parts by weight of ethyl acetate
10 parts by weight of butyl acetate,
30 parts by weight of toluene,
25 parts by weight of hydrogenated methyl abietate (Hercolyn D, registered trademark of Hercules Incorporated, USA)

As in Example 1, microfilm strips were sealed at 50° C. onto suitable pieces of the coated mounting film. The micro-images could be separated again from the mounting film without damage. In a reenlargement device, very sharp enlargements of the mounted microfilm images were obtained.

The above examples have been presented for the purpose of illustration and should not be taken to limit the scope of the present invention. It will be apparent that the described examples are capable of many variations and modifications which are likewise to be included within the scope of the present invention as set forth in the appended claims.

What is claimed is:

1. A process for forming a microfiche of a plurality of microfilm elements which comprises:

a. providing a transparent sheet having coated thereon over substantially the whole of its surface a layer consisting essentially of a transparent potentially adhesive thermoplastic composition exhibiting a low initial adhesive tackiness at ambient temperature, but activatable to substantial adhesive tackiness at a temperature above about 50° C;

b. assembling said plurality of microfilm elements at said ambient temperature in contact with said thermoplastic composition layer and under sufficient pressure to superficially adhere said elements to said layer; and

c. heating said thermoplastic composition layer in areas contacted by said microfilm elements to a temperature between about 50° C. and the deformation temperature of said elements, thereby effecting substantial adhesive bonding between said sheet and said elements by virtue of the heat-activated tackiness of said thermoplastic composition.

2. The process according to claim 1 wherein said thermoplastic composition consists essentially of a blend of about equal parts of a 86:13:1 copolymer of vinyl chloride: vinyl acetate: unsaturated dicarboxylic acid, and hydrogenated methyl abietate.

3. The process according to claim 1 wherein said thermoplastic composition consists essentially of a 60:40 copolymer of vinyl acetate: dibutyl maleate.

4. The process according to claim 1 wherein said thermoplastic composition consists essentially of a mixture of about 37 parts of a copolymer of vinyl acetate: butyl acrylate, about 15 parts of polyvinyl acetate, and about 2 parts of a polyvinyl acetate plasticizer.

5. A process of revising or updating a microfiche prepared according to the process of claim 1 which comprises:

a. heating the thermoplastic composition of said microfiche in the area occupied by a selected microfilm element to a temperature between about 50° C. and the deformation temperature of said element; and

b. removing said selected element from said microfiche thermoplastic composition layer while said composition is in said heated condition.

6. A process according to claim 5 which additionally comprises replacing the thus removed microfilm element with a different microfilm element and reheating said thermoplastic composition to within said temperature range, thereby bonding said different element to the microfiche sheet.

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