

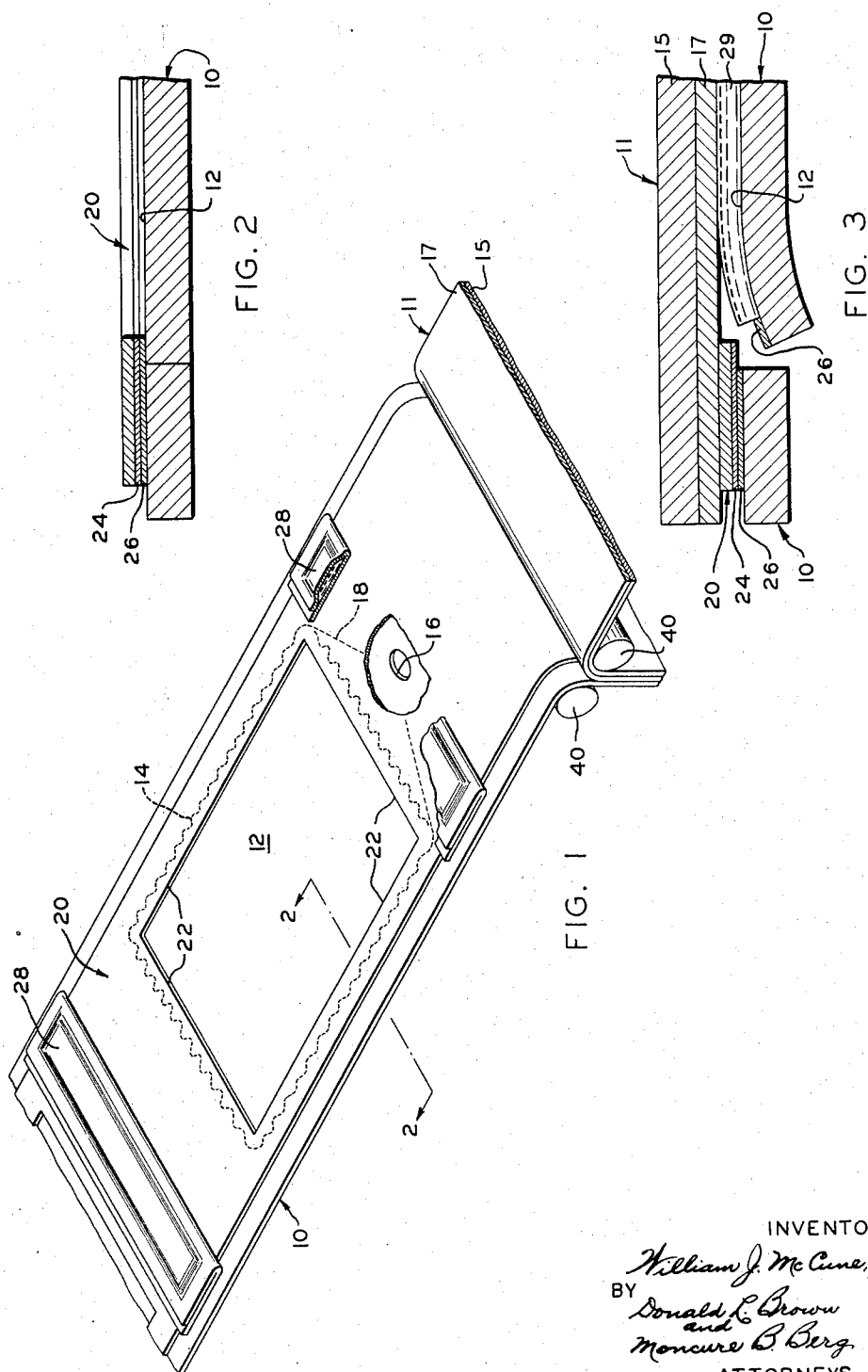
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PHOTOGRAPHIC IMAGE RECEIVING SHEET

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PHOTOGRAPHIC IMAGE RECEIVING SHEET

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1

This invention relates to photography and more particularly is concerned with a photographic product for use in a photographic transfer process.

Objects of the present invention are to provide a sheet of image-receptive material for receiving a photographic transfer image and having means thereon which frame the image and which are bonded to said image-receiving sheet, and especially to provide framing means in the form of a mask which is secured to the image-receiving sheet by an improved strippable bond; to provide a stripping bond between an image-receptive material and a mask superposed thereon and comprising a coating of zein over the surface of the masking sheet adapted to be secured to the image-receiving sheet and a coating comprising ethyl cellulose applied over said zein coating and adhered to the image-receiving sheet; and to provide products of the character described wherein said zein and ethyl cellulose adhesive coatings each includes an appropriate plasticizer and wherein said image-receptive material comprises baryta paper and the masking sheet comprises condenser or tissue paper.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the product possessing the features, properties and the relation of components which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

Figure 1 is a diagrammatic perspective view of one embodiment of the invention and illustrates the use thereof in conjunction with photosensitive sheet material;

Fig. 2 is a diagrammatic exaggerated sectional view along the line 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic exaggerated sectional view similar to Fig. 2 wherein the operation of removing the processed transfer image is shown.

As it is understood to the art, a photographic transfer process may be carried out to form in an image-receptive material a reverse image of a latent image contained in an exposed silver halide photosensitive sheet material. By one practice, a transfer process may be effected by spreading a viscous liquid composition between and in contact with an image-receiving layer or sheet and

2

an exposed silver halide photosensitive layer which are arranged in superposed relation. The processing composition employed is one which is capable of developing a latent image in the photosensitive layer and of providing an imagewise distribution of image-forming components therein as a result of said development. These image-forming components are transferred in solution, and without appreciably disturbing said imagewise distribution, from the photosensitive layer to the image-receiving material where they are reacted or developed to provide the desired reverse image.

In a practical embodiment of the invention, it is desirable to provide framing means in the form of a mask of a relatively thin flexible material on the surface of the image-receiving sheet or film which is adapted to receive the transfer image. This mask is provided with an aperture adapted to define the picture area on the image-receptive material while the portions of the mask which surround the aperture restrict contact of the processing composition to the picture area and also confine the transfer image thereto. It is necessary to temporarily bond or adhere this mask to the surface of the image-receiving sheet so that the image-receiving sheet may be stripped from the mask in providing the finished positive print. At the same time the bond between the mask and the image-receiving sheet must have a sufficient strength to hold the mask on the sheet during handling, storage and use of the film.

The present invention is directed to these framing means in the form of a mask and to an improved bond for securing the mask to the image-receiving sheet.

With reference to the drawings, Fig. 1 diagrammatically illustrates image-receptive material in the form of a flexible image-receiving sheet or layer or positive film 10 ready for processing in conjunction with an exposed silver halide photosensitive sheet material or negative film 11 which comprises an emulsion layer 17 carried on conventional film base 15. A picture frame portion of the negative film 11 is assumed to have been exposed to a subject in suitable camera apparatus and Fig. 1 includes a pair of pressure rolls 40 used in camera apparatus for processing films 10 and 11. Positive film 10 and negative film 11, as shown, are in roll form although it will be appreciated that the invention may be carried out with cut film or film packs. A camera for use with roll film of the type illustrated is described in United States Patent No. 2,455,111, issued to Joseph F.

Carbone and Murry N. Fairbank on November 30, 1948, for Self-developing Camera.

Roll film, such as that illustrated, has a plurality of picture frame portions extending successively and substantially from end to end thereof. In the image-receiving layer 10, each picture frame portion has a removable print section 12 lying within the confines thereof and defined by perforations 14 which extend through the layer and which permit each removable print section to be removed from the image-receiving sheet.

To facilitate removal of each print section 12, the image-receiving layer 10 is provided with a tear-out or thumb hole 16 located adjacent the leading edge of the removable print section, i. e., the transverse edge of a print section which first passes between the rolls 40 during processing. In the embodiment illustrated in Fig. 1, perforations 14 are in the shape of curved lines adapted to provide a deckle and are arranged to enclose a rectangularly shaped area. Adjacent the leading transverse edge of the deckled portion, straight line perforations 18 are formed in the sheet 10 and extend from each corner of the deckle towards the tear-out hole 16. The thumb hole 16 and straight line perforations 18 are arranged and designed to assist removal of their associated print section 12.

Each removable print section 12 is adapted to have a picture area which lies inside of the margins or boundaries thereof as defined by the perforations 14 and within which the transfer image is adapted to be confined. To provide this picture area, a mask or frame 20 of a flexible sheet material, which has a length substantially equal to the image-receiving layer 10 and which is provided with an aperture for each removable print section of layer 10, is superposed on the front or image-receiving surface of said layer with each aperture in registered relation to a print section 12 and is secured to the image-receiving layer 10 by a strippable bond. Apertures in the mask 20, the edges of one of which are indicated in Fig. 1 by reference numeral 22, are equal in number to the picture frame portions provided on the image-receiving sheet and extend lengthwise of the masking sheet 20 in spaced relation so that the apertures are separated center-to-center by a distance equal to the length of a picture frame portion. These apertures each have dimensions substantially equal to a picture area for the transfer image and consequently the edges 22 thereof will be within the boundaries 14 of each removable print section. Mask 20 has an overall width slightly less than the width of the image-receiving sheet or layer 10.

Preferred materials for the image-receiving layer 10 and the mask 20 are, respectively, baryta paper and sulfate kraft condenser paper or tissue, the latter having a thickness of from 0.001 inch to 0.003 inch. However, other flexible sheet materials may be employed and will be subsequently set forth.

As previously mentioned, the mask 20 is adapted to be bonded to the image-receiving layer 10 by a strippable bond, the reasons for which will hereinafter more fully appear. Image-receiving sheet 10 and the mask 20 are secured together by heat and/or pressure-sensitive adhesive coatings or layers 24 and 26 interposed therebetween. For use with a combination of baryta and condenser tissue, coating 24 is a plastic composition comprising zein and is applied onto the surface of the mask 20 which is located closest to the image-receiving sheet 10,

while coating 26 is a plastic composition comprising ethyl cellulose applied to the outer surface of the coating 24.

Adhesive coatings 24 and 26 are incompatible plastics, that is to say, the coatings 24 and 26 will adhere more strongly to their adjacent paper layers than they adhere to each other and will thus attach the mask 20 to the receiving sheet by a strippable bond. In fact, the bond between coating 24 and mask 20 and the bond between coating 26 and sheet 10 may be treated as substantially permanent bonds. The combination of a subcoat 24 comprising zein and an overcoat 26 comprising ethyl cellulose has been found to give a highly efficient means for strippably securing the mask to the image-receiving layer 10 in that this combination provides a substantially uniform bond over and between the contacting faces of these coatings. Consequently, the receiving sheet 10 and coating 26 permanently attached thereto may be evenly pulled away from the mask 20 and its permanently attached coating 24. At the same time, the bond between coatings 24 and 26 possesses sufficient strength to hold the mask 20 flat and smooth on the surface of the image-receiving layer during the manufacture, storage and use of the product until the mask 20 and sheet 10 are to be separated.

The zein coating composition includes an appropriate zein solvent and a suitable plasticizer. One example of a solvent is isopropyl alcohol and water, while one example of a plasticizer is triethylene glycol. Numerous solvents and plasticizers possessing the desired characteristics are known to the art and need no detailed discussion. A successful zein coating composition for coat 24 contains about 10% solids in the solvent and about 10% of the solid content of the zein coat is plasticizer.

The coating 26 of ethyl cellulose is made up of ethyl cellulose in an appropriate solvent to which a plasticizer is added. One example of a solvent for the ethyl cellulose is isopropyl acetate, while a plasticizer usable with the coating 26 is diethyl phthalate. Numerous solvents and plasticizers possessing the desired characteristics are known to the art and need no detailed discussion. A successful ethyl cellulose coating composition for the coat 26 contains about 10% solids in the solvent and about 20% of the solid content of this composition is plasticizer.

The ethyl cellulose coating 26 is applied directly over the zein coating 24 after the latter has thoroughly dried. Since it is practical to coat the mask 20 before cutting the apertures therein, both coatings 24 and 26 may be applied by any conventional method. A preferred practice is to apply coatings 24 and 26 by roll coating procedures. However, coats 24 and 26 may be applied by spreading the coating compositions over a surface of the mask with a doctor blade or by moving one surface of the mask in contact with a reservoir of coating composition or by immersing the mask in the composition. Application of the coatings 24 and 26 may be carried out at usually encountered room temperatures. Drying and curing of the coatings are facilitated by heat treatment and for this purpose the mask sheet, after the application of a coating thereon, may be passed through a zone of air heated to a temperature of about 200° F.

Variation in the adhesion between the zein coat 24 and the ethyl cellulose coat 26 is obtainable by variation in the quantity of plasticizer included in the zein coating composition or by

the addition thereto of an appropriate resin as well as by the inclusion of both of these materials in said composition. A suitable resin for this purpose is an aryl sulfonamide-formaldehyde resin of which that made by Monsanto Chemical Co. under the name of Santolite MHP is an example.

Following the coating operations and the formation of the masking apertures therein, mask 20 is registered upon the image-receiving layer 10 and is sealed thereto by the application of heat and/or pressure. Preferably, this sealing is carried out by the use of a heated platen having a width dimension somewhat greater than the masking sheet and a length dimension approximating the length of a picture frame portion.

The image-receiving sheet with the mask superposed thereon in registered relation is placed upon a flat support and the heated platen is pressed onto the outer surface of the mask 20. With a platen having dimensions of seven by three and five-eighths inches, a total load of 400 pounds with a surface temperature for the platen of 140° C. has proved satisfactory for sealing the mask 20 to the image-receiving layer 10. In instances where the image-receiving sheet 10 is of a length which includes a plurality of picture frame portions, the mask 20 may be successively registered with the successive picture frame portions of the image-receiving sheet 10 and a heat sealing operation performed after each successive registration. Preferably, in order to facilitate removal of the print sections 12, the mask is allowed to remain unsealed over a small portion of the image-receiving sheet in surrounding relation to the thumb hole 16.

A rupturable container 28, adapted to releasably hold a viscous liquid photographic processing composition, is associated with each picture frame portion of the positive film or image-receiving sheet 10, and containers of this character are shown as mounted on the outer surface of the mask sheet 20 to extend transversely of the sheet 10 and mask 20 adjacent the leading edge of each picture frame portion thereof. These containers are made of a flexible, substantially liquid-impermeable sheet material which is folded over upon itself and sealed at its ends and along the adjacent long edges thereof which are brought together by folding. Complete sealing of the containers takes place after they are filled. Containers 28 are secured in their mounted position by suitable adhesive means. The long edge seal of each container forms the trailing edge and is designed so that when the image-receiving sheet 10 is pulled through the rollers 40, hydraulic pressure will rupture the container at this long seal to cause its contents to be discharged therefrom for spreading over the surface of the image-receiving sheet.

A liquid processing composition for forming a silver transfer image comprises a silver halide developer and a silver halide solvent in an aqueous viscous solution of a film-forming material, such for example as sodium carboxymethyl cellulose.

While the containers 28 and the liquid processing composition are not a part of the present invention, illustration thereof has been made to facilitate understanding the invention and especially the manner in which the removable print section 12 is stripped from its bond with the mask 20.

In the use of the novel product of the invention, the photosensitive emulsion 17 of the nega-

tive film 11 is suitably exposed in a camera. The exposed area of the photosensitive layer and a removable print section 12 of a picture frame portion of the positive film 10, which corresponds to the exposed picture frame portion of the negative film 11, are simultaneously advanced as by pulling the ends of the films 10 and 11 between the pressure rolls 40. As a result, sufficient hydraulic pressure is created within the container, associated with said picture frame portion, by rolls 40 to rupture the long edge seal and forcibly discharge processing composition 29 from the trailing edge of the container. Continued movement of the two layers causes the released liquid to be spread in a uniform thin layer between and in contact with the image-receiving and the photosensitive sheet materials 10 and 11 which are brought into superposed relation as they pass between rolls 40. This layer of spread processing liquid 29 is shown in Fig. 3. Liquid spread outside of the picture area of the removable print section 12 is adapted to be trapped by appropriate trapping means (not shown).

Movement of the two sheets through the rolls 40 is arrested after a picture frame portion has been pulled therethrough and the superposed sheets 10 and 11 in laminated condition, resulting from the action of the pressure rolls, are allowed to remain in the dark for about one minute. A door provided in the camera may then be opened and the processed print section can be removed by inserting a fingernail through the hole 16 and tearing the image-carrying layer along the perforations 18 and 14.

It is to be particularly observed that the print section 12 is removed from the back surface of the image-receiving sheet 10, i. e., the surface most removed from the image-receiving face of the sheet 10. As the removable print section 12 is pulled away from the image-receiving sheet 10 by breaking the unperforated marginal portions which join the marginal perforations thereof, stripping of the image-receiving layer from the mask occurs at the same time.

As may be seen in Fig. 3, that portion of the ethyl cellulose layer 26 which extends within the margins of the removable print section 12 is stripped away from its adjacent zein coating 24. A portion of the ethyl cellulose 26 adheres to the removable print section 12 and forms a border for the positive image which is carried in or under the film formed by the liquid processing composition 29. Since the ethyl cellulose is substantially transparent, this border will remain substantially unobservable. It has been found that a combination of the zein and ethyl cellulose coatings 24 and 26 gives a remarkably clean separation between these coatings when a print section 12 is removed from the image-receiving sheet. This may be attributed to the uniform adhesion between the coats 24 and 26 and avoids tearing or other harmful effects to the removable print section, as well as to the remaining portions of the image-receiving sheet 10.

It should be pointed out in connection with the diagrammatic representation of Fig. 3, that the layer of spread liquid, both during and after the photographic processing, dries rapidly to form a thin film. Thus, when imbibition time has been completed and the removable print section is ready to be pulled from the image-receiving sheet 10, the film formed by the spread liquid 29 is considerably thinner than shown, although it is usually not completely dry within a minute of spreading. Drying is completed by evaporation of

the water from the surface of the composition 29 which is exposed as a result of removal of the print section 12. The film formed by the spread liquid 29 is shown in Fig. 3 as adhered to the image-receiving sheet 10 and as being removed therewith when the image-receiving sheet is stripped from the composite film unit, although it will be understood that the film formed by the spread liquid 29 may be caused to adhere to the emulsion layer 17 of the negative photosensitive element 11 when the image-receiving sheet is stripped from the composite film.

As heretofore pointed out, the image-receiving sheet 10 may comprise any suitable image-receptive material. A wide choice of materials is available from the fields of organic plastics, papers, reversible film-forming colloids, proteins such as gelatin, albumen and the like and carbohydrates such as starch and the like, as well as mixtures of such materials where they are compatible. Baryta paper, previously referred to, is a preferred material. It is to be noted that ethyl cellulose may be successfully bonded to any of the materials just mentioned as being suitable for use as the image-receiving sheet 10.

With regard to the mask sheet 20, any relatively thin material which may be secured to the image-receiving sheet 10 by a zein coating composition may be employed. As heretofore mentioned, a preferred material is condenser paper or tissue. As it is well known to the art, condenser tissue is a paper employed as insulation in the manufacture of electrical condensers. In addition, many other materials named as suitable for image-receptive layers, if made sufficiently thin, are usable for the masking material 20.

Since certain changes may be made in the above product without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A photographic product comprising an elongated flexible image-receiving sheet material for use in a photographic transfer process as image-receptive material for receiving a transfer image, an elongated flexible sheet in superposed relation to a surface of said image-receiving sheet and providing a mask over portions of said image-receiving sheet, said mask having at least one aperture therein which defines a picture area on said image-receiving sheet when said mask is superposed thereon, and two layers of adhesive interposed between said mask and said surface of said image-receiving sheet and bonding said mask and image-receiving sheet together, one layer of adhesive comprising a coating of zein covering the surface of said mask which is closest to the image-receiving sheet when the image-receiving sheet and mask are in superposed relation and the second layer of adhesive comprising a coat-

ing of ethyl cellulose covering the surface of said layer of zein which is furthest removed from said mask, said layer of ethyl cellulose being adhered to said surface of said image-receiving sheet.

2. A photographic product of the character defined in claim 1 wherein said image-receiving sheet and said mask both comprise paper.

3. In a positive film of the character defined in claim 1, an image-receiving sheet which comprises baryta paper and a mask which comprises tissue paper.

4. A photographic product of the character set forth in claim 1 wherein said zein coating includes a plasticizer and said ethyl cellulose coating includes a plasticizer.

5. A photographic product of the character set forth in claim 1 wherein said coating of zein contains triethylene glycol as a plasticizer and said coating of ethyl cellulose contains diethyl phthalate as a plasticizer.

6. In a positive film of the character employed with a photographic transfer process wherein said film comprises an elongated flexible image-receiving sheet material adapted to receive a transfer image and a flexible sheet which provides a mask over portions of one surface of said image-receiving sheet and which is arranged in superposed relation to said image-receiving sheet and is bonded thereto and wherein said mask is provided with at least one aperture which defines a picture area on said image-receiving sheet, in combination, image-receiving sheet material comprising baryta paper and masking sheet material comprising tissue paper, and a bond for securing said image-receiving sheet and said mask together comprising two layers of adhesive superposed between said mask and said surface of said image-receiving sheet and bonding said mask and image-receiving sheet together, one layer of adhesive comprising a coating of zein, plasticized with triethylene glycol, and covering the surface of said mask which is closest to the image-receiving sheet when the image-receiving sheet and mask are in superposed relation and the second layer of adhesive comprising a coating of ethyl cellulose, plasticized with diethyl phthalate, and covering as an overcoat the surface of said layer of zein which is furthest removed from said mask, said layer of ethyl cellulose being adhered to said image-receiving sheet.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
763,024	Schmid	June 21, 1904
1,212,447	Brown	Jan. 16, 1917
1,312,052	Sartorius	Aug. 5, 1919
2,136,176	Hammond	Nov. 8, 1938