

Jan. 12, 1965

N. GOLD ET AL
PHOTOGRAPHIC PRODUCTS
Filed Dec. 7, 1960

3,165,408

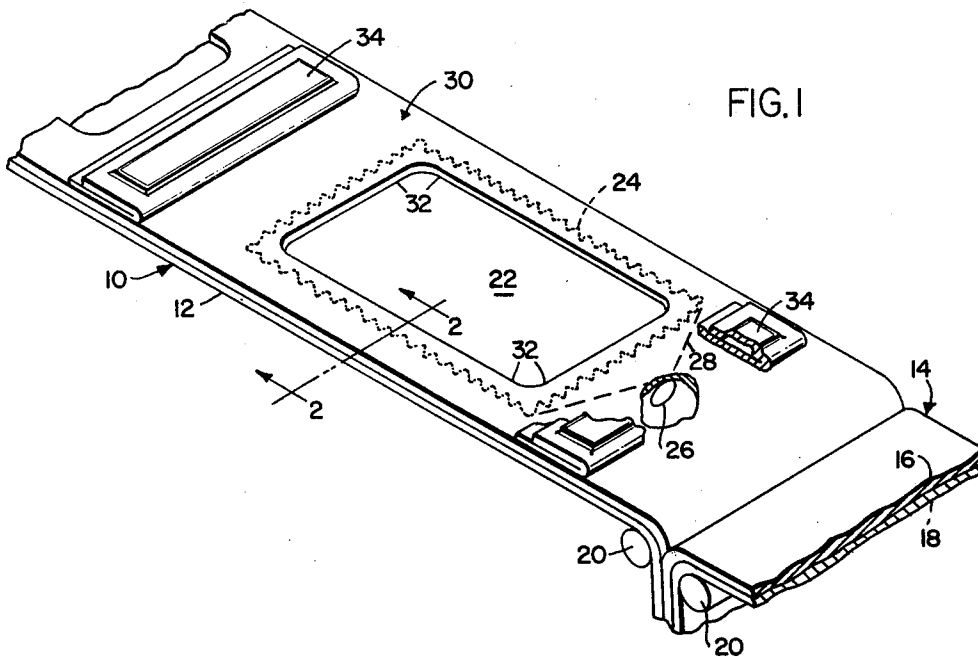


FIG. 2

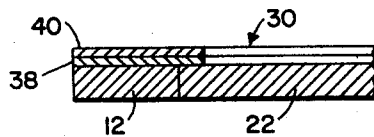
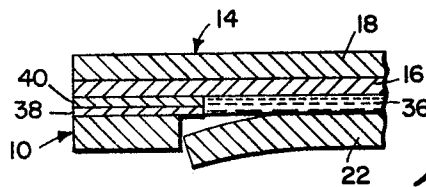


FIG. 3



Nicholas Gold
Frank H. Knight and
Arthur J. Sable
INVENTORS

BY Brown and Mikulka
and
Wesley J. Caranick
Attorneys

1

3,165,408

PHOTOGRAPHIC PRODUCTS

Nicholas Gold, Arlington, Mass., Frank W. Knight, Salem, N.H., and Arthur J. Sable, Boston, Mass., assignors to Polaroid Corporation, Cambridge, Mass., a corporation of Delaware

Filed Dec. 7, 1960, Ser. No. 74,384

1 Claim. (Cl. 96—76)

This invention relates to photography and more particularly to products for use in a photographic diffusion-transfer process.

An object of the invention is to provide an image-receptive element comprising an image-receptive material for receiving a photographic transfer image and having means thereon which frame the image.

Another object of the invention is to provide framing means in the form of a predeterminedly shaped mask which is substantially permanently secured to an appropriate image-receptive material.

Still another object of the invention is to provide framing means having sufficient strength so as to permit movement of a tensioned image-receptive element within camera apparatus without tearing or severance thereof.

A still further objective of the invention is to provide framing means which do not adhere to processing fluid, even when dried, or to a photosensitive element in superposed relation therewith.

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 elements which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claim.

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 drawing wherein:

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

FIG. 2 is a diagrammatic exaggerated sectional view along the line 2—2 of FIGURE 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 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 photosensitive element. By one practice, a transfer image may be effected by spreading a viscous, aqueous alkaline solution of a silver halide developer and a silver halide solvent between and in contact with an image-receiving material and an exposed silver halide photosensitive layer which are arranged in superposed relation. An imagewise distribution of image-forming components is provided as a result of the development of the latent image in the photosensitive layer. These image-forming components are transferred in solution, and without appreciably disturbing said imagewise distribution, from the photosensitive layer to the image-receiving material to provide the desired reverse image.

2

It has been desirable to provide framing means in the form of a mask, preferably of a relatively thin, flexible material, on the surface of the image-receiving material 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 portions of the mask which surround the aperture restrict contact of the processing fluid to the picture area and also confine the transfer image thereto. Heretofore, this mask was temporarily bonded or secured by a moisture-releasable material to the surface of the image-receiving material so that the image-receiving material during processing became entirely displaced from the mask in providing the finished positive print. The mask so detached from the image-receiving material generally became permanently adhered to the processed photosensitive element. In instances where it is desirable to recover the photosensitive element or negative in addition to the positive, it is essential that the mask not adhere to the negative. In the present invention, there is provided a mask of a composition which does not adversely adhere or become bonded to the negative by means of the processing fluid, and which still permits the removal of the portion of the image-receiving material bearing the positive image without laceration thereto. In one embodiment, the mask is substantially permanently secured to at least marginal edge portions of the image-receiving material.

In the copending application of Arthur J. Sable and Nicholas Gold, filed of even date herewith, there is described a camera apparatus adapted to permit not only the recovery of large numbers of usable negatives, but which also produces positive prints to verify at once the acceptability of such negatives. This self-developing camera apparatus is provided with mechanical means for advancing the film and image-receptive elements or materials through a plurality of predetermined positions within the camera and for actuating means for separating said elements after exposure and processing and for taking-up said separated elements. In such camera apparatus, the elements are maintained under appreciable tension and it is therefore necessary to insure that such elements, particularly the image-receptive element which is generally of a paper base, do not become severed within the camera so as to cause disruption of the camera operation. In the present invention, not only is there provided a mask which does not adversely adhere to the film element or negative, but which also possesses, whether wet or dry, sufficient strength alone or in conjunction with the image-receptive element so as to permit for the predetermined desired advancement or movement of tensioned elements within camera apparatus even after detachment of a removable, image-bearing portion of the image-receptive element without undesirable severance of, for example, portions of the image-receptive element and mask adjacent the mask aperture and removable print portion. In one embodiment the corners of the mask aperture or picture cutout are rounded so as to further aid or guard against tearing. One preferred mask comprises an organic plastic material such as, for example, polyethylene terephthalate. In another embodiment the mask also possesses a strong bonding or sealing capacity to the surface of the image-receptive element. One preferred mask possessing all of the above-described desired properties comprises a laminate of two organic plas-

tic materials such as, for example, polyethylene and a polyester, e.g., polyethylene terephthalate.

Referring now to FIGS. 1, 2 and 3, there is illustrated one preferred image-receptive element suitable for use in camera apparatus wherein such element is maintained or subjected to appreciable stress or tension. FIGURE 1 diagrammatically illustrates an image-receptive element 10 comprising a flexible image-receiving sheet or layer 12 ready for processing in conjunction with an exposed photosensitive film element 14 which comprises a photosensitive stratum or layer 16 carried on a suitable base or support 18. A picture frame portion of the film element 14 is assumed to have been exposed in suitable self-developing camera apparatus and FIGURE 1 includes a pair of pressure rollers 20 used in such camera apparatus for processing elements 10 and 14.

Elements 10 and 14, as shown, are in roll form and have a plurality of picture frame portions extending successively and substantially from end to end thereof. In the image-receiving sheet 12, each picture frame portion has a removable print section or portion 22 lying within the confines thereof and defined by perforations 24 which extend through the sheet and which permit each removable print section to be removed from the image-receiving sheet.

To facilitate removal of each print section 22, the image receiving sheet 12 is provided with a tear-out or thumb aperture or hole 26 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 20 during processing. In the embodiment illustrated in FIGURE 1, perforations 24 are in the shape of curved lines adapted to provide a deckle and are arranged to enclose a substantially rectangular shaped area. Adjacent the leading transverse edge of the deckled portion, perforations 28 are formed on the sheet 12 and extend from each corner of the deckle towards the tear-out hole 26. The thumb hole 26 and perforations 28 are arranged and designed to assist removal of the associated print section 22.

Each removable print section 22 is adapted to have a picture area which lies inside the margins or boundaries thereof as defined by the perforations 24 and within which the transfer image is adapted to be confined. To provide this picture area, a framing means in the form of a mask or frame 30 of flexible sheet material, which has a length substantially equal to the image-receiving sheet 12 and which is provided with an aperture for each removable print section 22 of sheet 12, is superposed on the front or image-receiving surface of sheet 12 with each aperture in registered relation to a print section 22 and is secured to sheet 12. Apertures in the mask 30, the edges of one of which are indicated in FIGURE 1 by reference numeral 32, are equal in number to the picture frame portions provided on the image-receiving sheet 12 and extend lengthwise of the mask 30 in a predetermined spaced relation. These apertures each have dimensions substantially equal to a picture area for the transfer area and consequently the edges 32 thereof will be within the boundaries 24 of each removable print section 22. As shown, these apertures are of substantially rectangular shape. Mask 30 may have an overall width substantially equal to or slightly less than the width of the image-receiving sheet 12.

A rupturable container 34, adapted to releasably hold a viscous liquid processing composition 36, shown spread as a uniform, thin layer in FIG. 3, is preferably associated with each picture frame portion of the image-receiving sheet 12, and containers of this character are shown mounted on the outer surface of the mask 30 to extend transversely of sheet 12 and mask 30 adjacent the leading edge of each picture frame portion thereof. These containers are made of 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 34 are secured in the mounted position by suitable means. The long edge seal of each container forms the trailing edge and is designed so that when the image-receiving sheet 12 is pulled through rollers 20, 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 12.

The image-receiving sheet 12 may comprise a single layer or sheet of any suitable image-receptive material or it may comprise a suitable base or support material carrying thereon a coating or layer of an image-receptive material. The image-receptive material may also contain various photographic agents or reagents such as, for example, one of the vigorous silver precipitating environments described in U.S. Patents Nos. 2,698,237 and 2,698,245. 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 for forming the image-receiving sheet. One preferred material for the image-receiving sheet comprises baryta paper.

With regard to the mask 30, it may comprise any suitable material or materials which possesses, whether wet or dry, sufficient strength alone or in conjunction with the image-receiving sheet 12 so as to permit advancement of tensioned elements within camera apparatus, particularly after detachment of print section 22, without undesirable severance of, for example, portions of the image-receiving sheet 12 and mask 30 adjacent the mask aperture. As indicated previously, tearing or breaking of the mask or image-receiving sheet, particularly at the corners of the aperture, is further prevented or guarded against by having the aperture corners rounded instead of square. Moreover, the mask or the surface thereof which is adjacent the film element 14 during processing must be of a composition which does not adversely adhere to the processing composition or the processed film element which is to be recovered so that clean separation of the processed film element or negative from the image-receiving element or positive assemblage is readily achieved. Preferably the mask or the surface of the image-receiving sheet adapted to receive a transfer image, comprises a composition which firmly bonds the mask to at least marginal edge portions of said image-receiving surface so that said mask and said portions of the image-receiving sheet remain substantially adhered together at all times.

The mask 30 may comprise a single thin sheet material which possesses the desired characteristics or it may comprise a plurality of thin sheet materials. In one embodiment the mask comprises a relatively thin, organic polymeric material which is resistant to tear and which is not deleteriously adhered by the processing composition to the film element, such as, for example, a polyester, e.g., Mylar (registered trademark of E. I. du Pont for a film of polyethylene terephthalate).

Such organic polymeric material may also be of a composition, for example, a heat-sealing thermoplastic, which forms a direct strong moisture-impermeable or impenetrable bond with the image-receiving sheet. Likewise, the mask may comprise a single sheet of organic polymeric material which is resistant to tear and nonadherent to processing fluid, and the image-receiving sheet, at least the marginal edge portions thereof, may comprise, for example, a heat-sealing thermoplastic which forms with the mask a strong moisture-impenetrable bond. The desired mask characteristics may also be obtained by employing a plurality of suitable organic polymeric materials. For example, in the embodiment illustrated in FIGS. 2 and 3, the mask is a laminate com-

prising a first organic polymeric material 38 which possesses a strong bonding or sealing capacity to the surface of the image-receiving sheet 12 and a second organic polymeric material 40 which is tear resistant and which does not adversely adhere to the processing composition 36 or the processed film element 14. One preferred mask construction of the above type comprises a laminate wherein said first organic polymeric material comprises a thermoplastic heat-sealing moisture-resistant material such as polyethylene and said second organic polymeric material comprises a polyester such as polyethylene terephthalate. The thickness of the mask may be varied considerably since it is dependent in large part upon the space or gap desired between superposed surfaces of the image-receptive element and the film element.

In one embodiment following the formation of the masking apertures, mask 30 is adapted to be directly bonded or sealed to image-receiving sheet 12 by thermal activation thereof. Thermal activation of the mask, for example, of the polyethylene layer of a mask as described above, may be accomplished by means of a contact, infrared and/or dielectric heating source, supplying sufficient thermal energy to at least temporarily raise the polyethylene layer to a temperature activating said layer for at least the time necessary to effect lamination of the image-receiving sheet 12 thereto. Mask 30 may be registered upon the image-receiving sheet 12 prior to, during, or subsequent to the thermal activation thereof.

In instances where the positive film or image-receiving element 10 is of a length which includes a plurality of picture frame portions, the mask 30 may be successively registered with the successive picture frame portions of the image-receiving element 10. In order to facilitate removal of print-receiving sections 22, the mask partially covering such sections is allowed to remain unsealed.

The photosensitive stratum 16 carried upon a suitable support 18 may comprise, for example, one or more of the silver halides dispersed in a suitable protective material such as gelatin. When the photosensitive stratum 16 comprises a silver halide, the liquid processing composition for forming a silver transfer image comprises a silver halide developer, a silver halide solvent, an alkaline material and a viscous solution of a film-forming material, such, for example, as sodium carboxymethyl cellulose.

In the use of the novel product of the invention, the photosensitive stratum 16 of film element 14 is suitably exposed in a camera. The exposed area of the photosensitive stratum and a removable print section 22 of a picture frame portion of image-receiving element 10, which corresponds to the exposed picture frame portion of the film element 14, are simultaneously advanced as by propelling the ends of elements 10 and 14 between the pressure rolls 20. As a result, sufficient hydraulic pressure is created within the container 34, associated with said picture frame portion, by rolls 20 to rupture the long edge seal and forcibly discharge processing composition 36 from the trailing edge of the container. Continued movement of the two elements causes the released composition to be spread in a uniform, thin layer between the image-receiving sheet 12 and the photosensitive stratum 16 which are brought into superposed relation as they pass between rolls 20.

Movement of the two sheets through the rolls 20 is arrested after a picture frame portion has been pulled therethrough and the superposed elements 10 and 14 in laminated condition, resulting from the action of the pressure rolls, are allowed to remain in such condition for a predetermined processing period. Thereafter, the print section can be removed by manual detachment, for example, by inserting a fingernail through the aperture 26 and tearing the image-carrying portion along the perforations 28 and 24. The negative can then be separated from the remnants of the image-receiving sheet 12 and mask 30 and recovered for further use. In the camera apparatus of the aforementioned copending application

filed of even date herewith, the negative, remnants of the image-receiving sheet and mask, in laminated form, after detachment of the print section are propelled under appreciable tension by advancing means, from the processing chamber, then separated and wound on suitable take-up spools; the negative being wound and stored on one spool and the remnants of the image-receiving sheet and mask being wound and stored on another spool.

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 drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

A composite photographic product for producing, in conjunction with photographic apparatus, a plurality of developed, reusable photographic negatives and a positive print associated with each of said negatives, said product comprising, in combination:

(a) a first web of flexible sheet material having on one surface thereof a layer of photosensitive material at least portions of which are adapted to be photoexposed to form latent images capable of being developed and fixed as photographic negatives lying in spaced relation along the length of said first web;

(b) a second web of baryta paper having on one surface thereof a layer of image-receiving material adapted to be superposed with said layer of photosensitive material and to form a positive transfer print from the associated, developed negative while superposed therewith;

(c) means facilitating removal from said second web of portions thereof lying in spaced relation along the length of said second web intermediate of relatively narrow marginal edge portions thereof;

(d) a plurality of container means holding a viscous processing liquid adapted to be released and spread between said first and second webs in a uniformly thin layer to effect development of a latent image in an exposed portion of said first web and to produce a positive transfer print in the superposed portion of said second web;

(e) a third web of flexible sheet material having a plurality of substantially rectangular apertures with rounded corners lying in spaced relation along the length thereof;

(f) a first surface of said third web being formed of a substantially continuous layer of polyethylene;

(g) means providing a substantially fixed bond, impenetrable by said processing liquid, between said first surface of said third web and said one surface of said second web in areas outside the limits of said removable portions of said second web, whereby said third web does not become separated from said second web, in the areas where the two are bonded, as a result of saturation by said processing liquid, while allowing removal of said portions of said second web without substantial adherence to said third web;

(h) said third web being arranged in such relation to said second web when bonded thereto that said apertures overlie said removable portions, the latter being slightly longer and wider than the former, whereby said apertures form a frame for areas of said one surfaces of said first and second webs wherein said negative and positive, respectively, are formed, and portions of said third web which bound said apertures overlie a border around the periphery of said removable portions; and

(i) a second surface of said third web being formed of a substantially continuous layer of polyethylene terephthalate, thereby preventing adherence of said third web to said first web as a result of said processing liquid being spread therebetween, said layer of polyethylene terephthalate being of sufficient thickness to impart a tensile strength to the combination of said second and third webs which is substantially greater than that of said second web alone, thereby permitting movement of said second

and third webs by tension-applying means after removal of said portions of said second web and separation therefrom of said first web.

References Cited in the file of this patent

UNITED STATES PATENTS

816,870	Markoff	Apr. 3, 1906	
1,250,099	Davis	Dec. 11, 1917	
2,495,111	Land	Jan. 17, 1950	
2,558,857	Land	July 3, 1951	10
2,572,357	Land	Oct. 23, 1951	
2,612,450	Land	Sept. 30, 1952	

5

2,612,452
2,639,254
2,659,673
2,740,714
2,778,269
2,898,208
2,943,937
3,003,875
3,079,849

McCune ----- Sept. 30, 1952
Smith ----- May 19, 1953
Rogers et al. ----- Nov. 17, 1953
Bachelder et al. ----- Apr. 3, 1956
Bartlett ----- Jan. 22, 1957
Land et al. ----- Aug. 14, 1959
Nadeau et al. ----- July 5, 1960
Ryan ----- Oct. 10, 1961
Wareham ----- Mar. 5, 1963

FOREIGN PATENTS

788,513 Great Britain ----- Jan. 2, 1958