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[54] DIFFUSION TRANSFER FILMS WITH ANTI-REFLECTION LAYERS AND PROCESSES

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[73] Assignee: **Polaroid Corporation**, Cambridge, Mass.

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[52] **U.S. Cl.** .... **96/3**, 96/29 D, 96/29 R, 96/67, 96/76 R, 96/77, 96/84 R, 96/87 R

[51] **Int. Cl.** **G03c 7/00**, G03c 5/54, G03c 1/76, G03c 1/48, G03c 1/40, G03c 1/84, G03c 1/78

[58] **Field of Search** ...... 96/87 R, 3, 29 R, 67, 76 R, 96/77, 84 R

[56] **References Cited**

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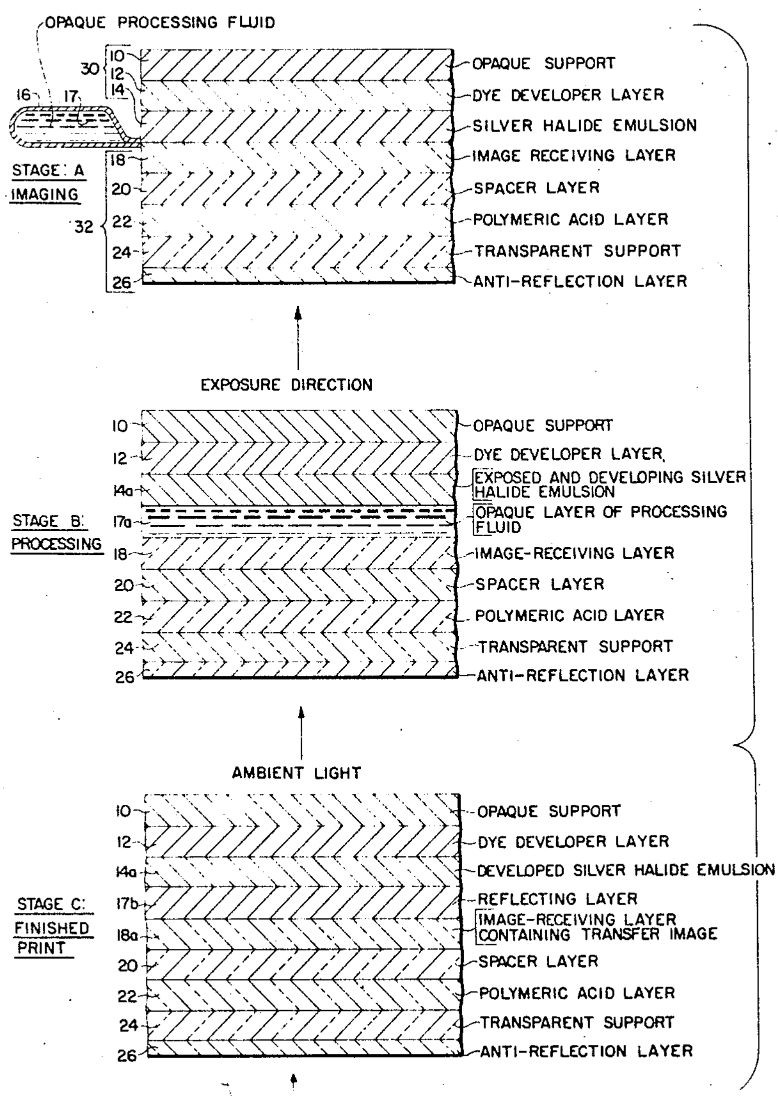
3,415,646	12/1968	Land	96/3
3,647,437	3/1972	Land	96/3
3,617,354	11/1971	Carnahan	117/76 P
2,536,764	1/1951	Moulton	117/69
3,697,277	10/1972	King	96/67

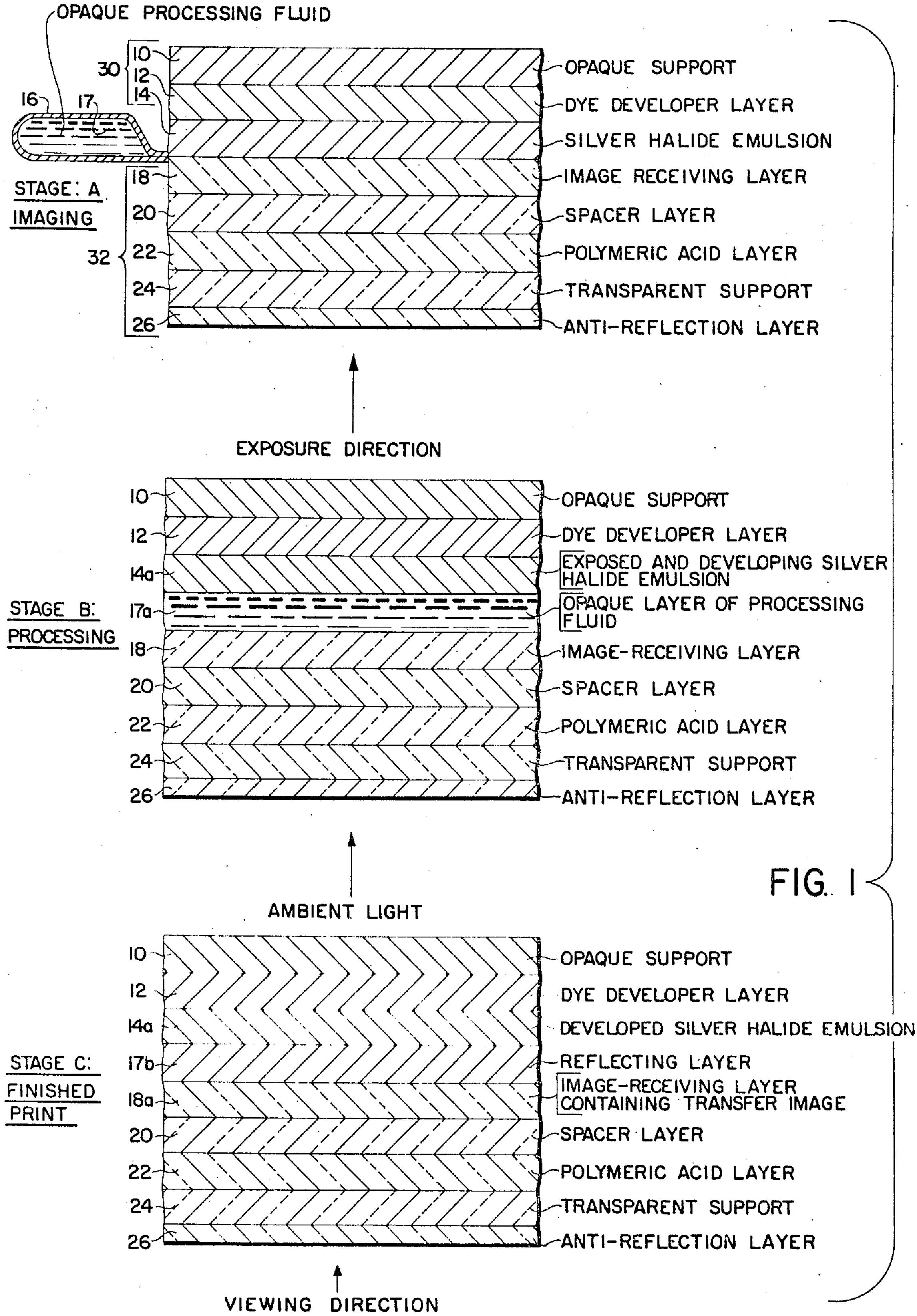
Primary Examiner—J. Travis Brown
Assistant Examiner—Richard L. Schilling
Attorney, Agent, or Firm—Stanley H. Mervis

[57] **ABSTRACT**

Photographic images, particularly multicolor images, viewed through a transparent support have an anti-reflection coating on the outer surface of said support. The images may be formed by multicolor diffusion transfer processes using dye developers or other image dye-providing materials. In the preferred embodiments, the photographic image is an integral negative-positive reflection print. Where photoexposure is effected through a transparent support, e.g., the transparent support through which the final image is viewed, provision of an anti-reflection coating and effecting photoexposure therethrough will permit more effective recording of light passing through the camera lens. The transparent support preferably has an index of refraction of at least 1.6.

95 Claims, 3 Drawing Figures




OPAQUE PROCESSING FLUID
30
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12
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17
STAGE: A
IMAGING
18
20
32
22
24
26
OPAQUE SUPPORT
DYE DEVELOPER LAYER
SILVER HALIDE EMULSION
IMAGE RECEIVING LAYER
SPACER LAYER
POLYMERIC ACID LAYER
TRANSPARENT SUPPORT
ANTI-REFLECTION LAYER
EXPOSURE DIRECTION
10
12
14a
STAGE B:
PROCESSING
17a
18
20
22
24
26
OPAQUE SUPPORT
DYE DEVELOPER LAYER
EXPOSED AND DEVELOPING SILVER HALIDE EMULSION
OPAQUE LAYER OF PROCESSING FLUID
IMAGE-RECEIVING LAYER
SPACER LAYER
POLYMERIC ACID LAYER
TRANSPARENT SUPPORT
ANTI-REFLECTION LAYER
AMBIENT LIGHT
10
12
14a
STAGE C:
FINISHED
PRINT
17b
18a
20
22
24
26
OPAQUE SUPPORT
DYE DEVELOPER LAYER
DEVELOPED SILVER HALIDE EMULSION
REFLECTING LAYER
IMAGE-RECEIVING LAYER CONTAINING TRANSFER IMAGE
SPACER LAYER
POLYMERIC ACID LAYER
TRANSPARENT SUPPORT
ANTI-REFLECTION LAYER
VIEWING DIRECTION

FIG. 1

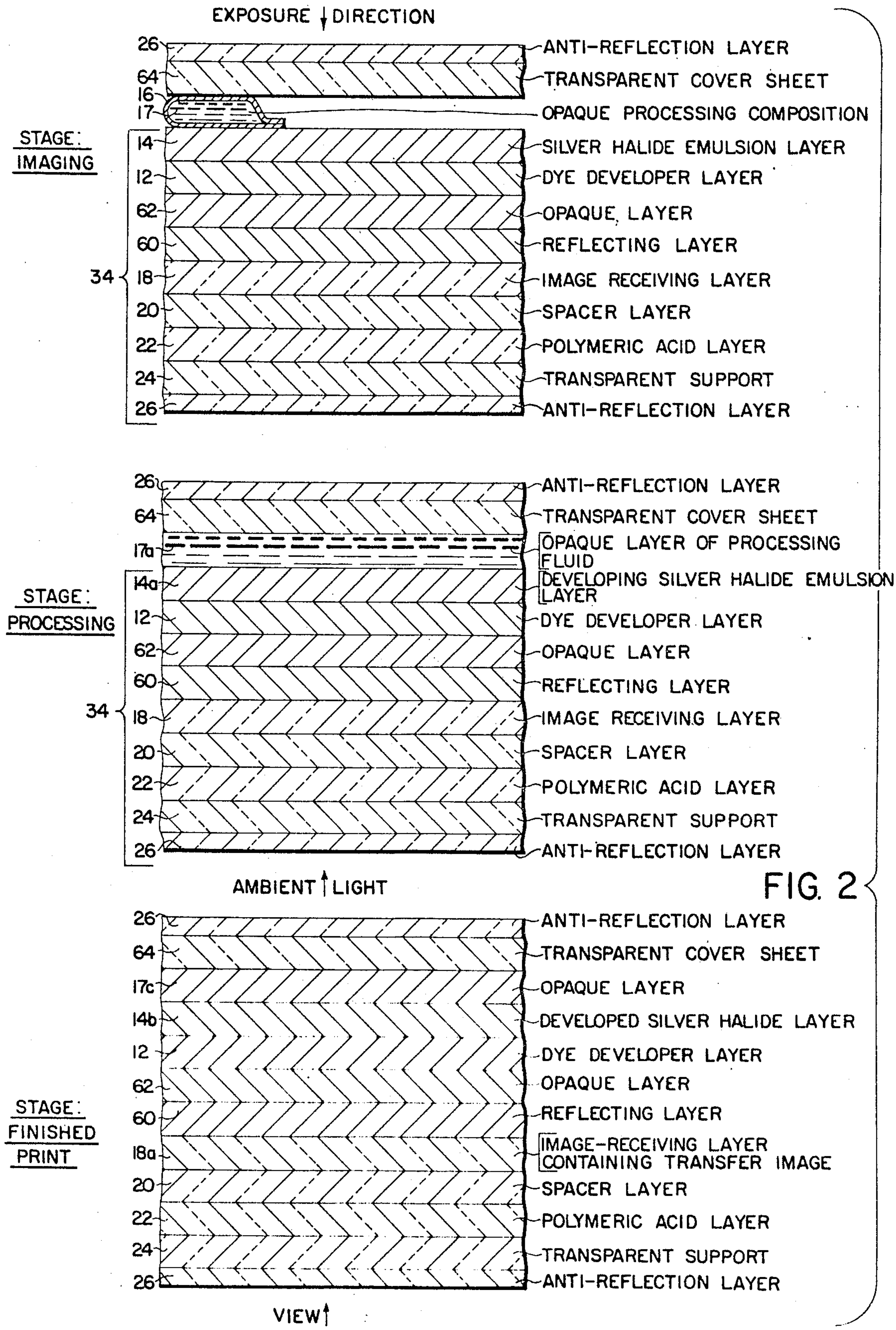
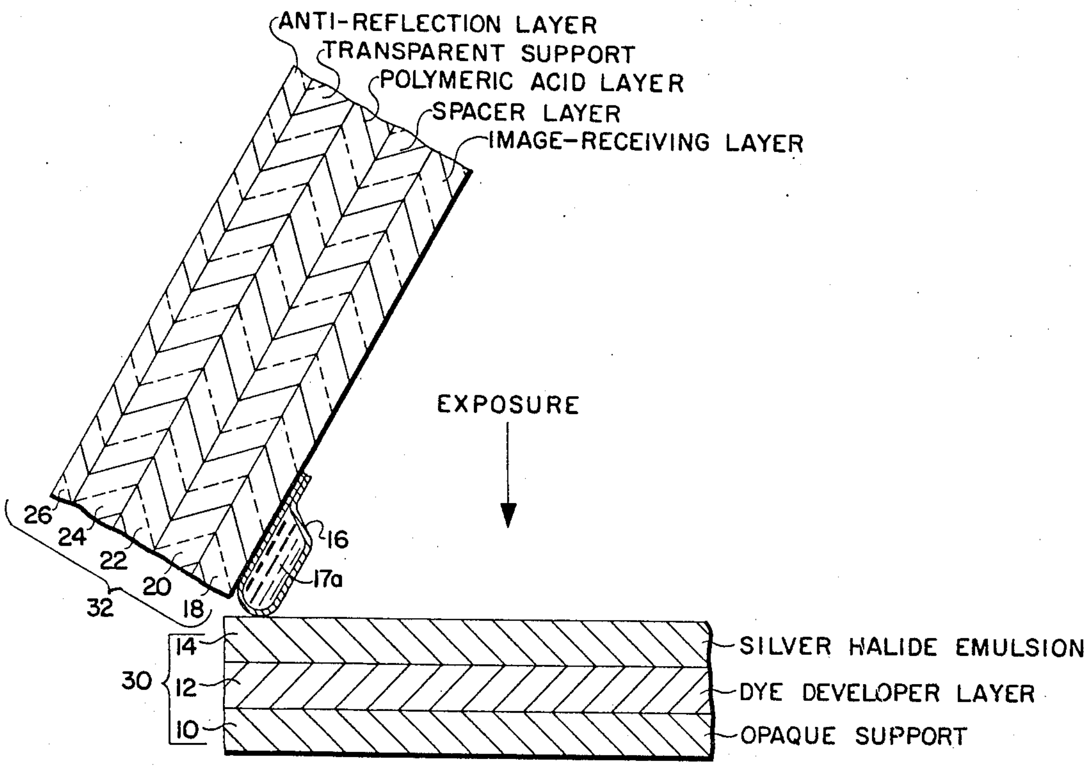

EXPOSURE DIRECTION
26 ANTI-REFLECTION LAYER
64 TRANSPARENT COVER SHEET
16
17 OPAQUE PROCESSING COMPOSITION
STAGE: IMAGING
14 SILVER HALIDE EMULSION LAYER
12 DYE DEVELOPER LAYER
62 OPAQUE LAYER
60 REFLECTING LAYER
34
18 IMAGE RECEIVING LAYER
20 SPACER LAYER
22 POLYMERIC ACID LAYER
24 TRANSPARENT SUPPORT
26 ANTI-REFLECTION LAYER
26 ANTI-REFLECTION LAYER
64 TRANSPARENT COVER SHEET
17a OPAQUE LAYER OF PROCESSING FLUID
STAGE: PROCESSING
14a DEVELOPING SILVER HALIDE EMULSION LAYER
12 DYE DEVELOPER LAYER
62 OPAQUE LAYER
60 REFLECTING LAYER
34
18 IMAGE RECEIVING LAYER
20 SPACER LAYER
22 POLYMERIC ACID LAYER
24 TRANSPARENT SUPPORT
26 ANTI-REFLECTION LAYER
AMBIENT LIGHT
26 ANTI-REFLECTION LAYER
64 TRANSPARENT COVER SHEET
17c OPAQUE LAYER
14b DEVELOPED SILVER HALIDE LAYER
12 DYE DEVELOPER LAYER
62 OPAQUE LAYER
STAGE: FINISHED PRINT
60 REFLECTING LAYER
18a IMAGE-RECEIVING LAYER CONTAINING TRANSFER IMAGE
20 SPACER LAYER
22 POLYMERIC ACID LAYER
24 TRANSPARENT SUPPORT
26 ANTI-REFLECTION LAYER
VIEW

FIG. 2


ANTI-REFLECTION LAYER
TRANSPARENT SUPPORT
POLYMERIC ACID LAYER
SPACER LAYER
IMAGE-RECEIVING LAYER
EXPOSURE
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17a
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SILVER HALIDE EMULSION
DYE DEVELOPER LAYER
OPAQUE SUPPORT

FIG. 3

DIFFUSION TRANSFER FILMS WITH ANTI-REFLECTION LAYERS AND PROCESSES

This invention is concerned with photography and, more particularly, with the formation of images in color or black-and-white by diffusion transfer processing.

A number of photographic processes have been proposed wherein the resulting photograph comprises the developed silver halide emulsion(s) retained as part of a permanent laminate, with the desired image being viewed through a transparent support. Of particular significance are those processes where the image is in color and is formed by a diffusion transfer process. If the image is to be viewed as a reflection print, the image-carrying layer is separated from the developed silver halide emulsion(s) in said laminate by a light-reflecting layer, preferably a layer containing titanium dioxide. Illustrative of patents describing such products and processes are U.S. Pat. No. 2,983,606 issued Mar. 9, 1961 to Howard G. Rogers, U.S. Pat. Nos. 3,415,644, 3,415,645 and 3,415,646 issued Dec. 10, 1968 to Edwin H. Land, U.S. Pat. Nos. 3,594,164 and 3,594,165 issued July 20, 1971 to Howard G. Rogers, and U.S. Pat. No. 3,647,347 issued Mar. 7, 1972 to Edwin H. Land.

Referring more specifically to the aforementioned U.S. pat. No. 3,415,644, said patent discloses photographic products and processes employing dye developers wherein a photosensitive element and an image-receiving layer are maintained in fixed relationship prior to photoexposure and this fixed relationship is maintained after processing and image formation to provide a laminate including the processed silver halide emulsions and the image-receiving layer. Photoexposure is made through a transparent (support) element and application of a processing composition provides a layer of light-reflecting material to provide a white background for viewing the image and to mask the developed silver halide emulsions. The desired color transfer image is viewed through said transparent support against said white background.

While such processes provide very useful and good quality images, it has been found that the full potential quality of the image is not obtained because the transparent support through which the image is viewed in fact reflects "white" light to the viewer's eyes. Furthermore, this property of reflecting some of the light incident on the surface of of the transparent support adversely affects the ability of the film to record a subject when photoexposure is effected through such a transparent support.

It is, threfore, a primary object of this invention to provide novel photographic products and processes which provide high quality color or black-and-white images as part of a permanent laminate, said laminate exhibiting substantially less surface reflection of incident light.

It is a further object of this invention to provide diffusion transfer images, particularly multicolor transfer images, which are viewed through a transparent element the outer surface of which carries an anti-reflection coating.

Yet another object of this invention is to provide diffusion transfer films which are exposed through a transparent support, the outer surface of which carries an anti-reflection coating.

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

The invention accordingly comprises the product possessing the features, properties and relation of components and the process involving the several steps and the relation and order of one or more of such steps with respect to each of the others 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 of the invention taken in conjunction with the accompanying drawings wherein:

FIGS. 1 and 2 are diagrammatic, enlarged cross-sectional views of two embodiments of film units embodying the present invention, illustrating the arrangement of layers during the three illustrated stages of a monochrome diffusion transfer process, i.e., exposure, processing and final image; and

FIG. 3 is a diagrammatic, enlarged cross-sectional view of another film unit embodying the present invention.

As noted above, this invention is particularly concerned with color diffusion transfer processes wherein the layer containing the diffusion transfer image, i.e., the image-receiving layer, is not separated from the developed photosensitive layers after processing but both components are retained together as part of a permanent laminate. Film units particularly adapted to provide such diffusion transfer images have frequently been referred to as "integral negative-positive" film units. The resulting image may be referred to as an "integral negative-positive reflection print" and as so used this expression is intended to refer to a reflection print wherein the developed photo-sensitive layers have not been separated from the image layer, i.e., the layer containing the transfer dye image. A light-reflecting layer between the developed photosensitive layer(s) and the image layer provides a white background for the dye image and masks the developed photosensitive layer(s). These layers are part of a permanent laminate which usually includes dimensionally stable outer or support layers, the transfer dye image being viewable through one of said supports. This invention is particularly concerned with improving the aesthetic qualities of such integral negative-positive reflection prints.

The present invention is applicable to a wide variety of diffusion transfer processes. The arrangement and order of the individual layers of the film used in such processes may vary in many ways as is known in the art, provided the final photograph is a laminate wherein the desired image is viewed through a transparent support, e.g., an integral negative-positive reflection print as described above. For convenience, however, the more specific descriptions of the invention hereinafter set forth may be by use of dye developer diffusion transfer color processes and of integral negative-positive film units of the type contemplated in the previously mentioned patents, particularly U.S. Pat. Nos. 3,415,644 and 3,594,164. It will be readily apparent from such descriptions that other image-forming reagents may be used, e.g., color couplers, coupling dyes or dyes (couplers) which release a dye or dye intermediate as a result of coupling or oxidation.

When such integral negative-positive reflection prints are viewed under ordinary lighting conditions, a small but significant amount of light is reflected from the external surface of the transparent support. The effect of this reflection of incident light is to limit the clarity with which the image may be seen except when the viewer's eyes are "just right," i.e., good viewing may be highly directional, in that the print may have to be "tilted" with respect to the viewer's line of vision to avoid obscuring image detail. This problem becomes more acute when several persons try to view the same image, as those not directly in front of the print will experience substantial glare, with the amount of glare increasing as the angle of view becomes more oblique. In addition, the color(s) of a color image may appear less saturated.

If photoexposure is effected through such a transparent support, reflection of light from the surface of the transparent support will, in effect, reduce the exposure index or "speed" of the film. This result follows from the fact that some of the light which has passed through the camera lens will be reflected before it can reach the photosensitive layer(s) and the thus reflected light will not participate in the recording of the photographed subject matter. Furthermore, such reflected light has a tendency to "bounce" within the camera, and may cause flare and reduced contrast and resolution in the final image.

It has now been found that such undesirable reflection from the transparent support may be substantially reduced, if not completely eliminated, by modifying the external surface of such transparent supports so as to provide a controlled change in the index of refraction to which incident light is subjected as it passes from air into the transparent support. This objective may be most readily achieved by providing an anti-reflection coating on the external surface of the transparent support.

The principles of physics by which anti-reflection coatings function are well known and may be used to special advantage in the present invention. Thus, it is well known that application of a single layer transparent coating will reduce surface reflection from a transparent layer (support) if the refractive index of said coating is less than that of the transparent layer to which it is applied and the coating is of appropriate optical thickness. In the photographic products with which this invention is concerned, the anti-reflection coating will normally be in optical contact with air. Under these circumstances, and because the index of refraction of air is 1, the applicable principles of physics give the following rule: if the index of refraction of the coating material (anti-reflection layer) is exactly equal to the square root of the index of refraction of the substrate (transparent support), then all surface reflection of light will be eliminated for that wavelength at which the product of the refractive index times thickness is equal to one-quarter of the wavelength. At other wavelengths the destructive interference between light reflected from the top and bottom surfaces of the anti-reflection coating is not complete but a substantial reduction in overall reflectivity is obtained. By selecting the optical thickness of the anti-reflection coating to be one-quarter of a wavelength for approximately the midpoint of the visible light wavelength range (i.e., one-quarter of 5,500 Angstroms or about 1,400 Angstroms), the reduction in reflectivity is optimized. The term "optical thickness" as used herein refers to the product of the physical thickness of the coating times the refractive index of the coating material.

The anti-reflection coating should be optically clear and provide an essentially uniform layer. In certain embodiments of this invention, the anti-reflection coating is also effective as an anti-abrasion coating. While the above discussion of the applicable principles of physics has concerned itself with a single layer anti-reflection coating, it is also within the scope of this invention to employ an anti-reflection coating comprising several layers, the index of refraction of each layer being selected in accordance with well known principles. In the latter situation, the reduced effectiveness of a single layer in eliminating reflections as the wavelength gets further from the midpoint of the visible light range may be compensated for by appropriate selection of a different wavelength as to which the optical thickness of a second layer should be related. The anti-reflection coating may be organic or inorganic in nature, and many suitable materials are known. Illustrative examples of useful anti-reflection coatings and their method of application will be described hereinafter.

Transparent supports used in integral negative-positive reflection prints include polyesters, polystyrene, cellulose acetate and similar art known polymeric film base materials. Polyester and polystyrene films have higher refractive indices than cellulose acetate, and the resultant greater incidence of surface reflected light as compared with cellulose acetate would normally be considered to be a disadvantage of using such materials in integral negative-positive reflection prints. (Indeed, the greater surface reflection resulting in greater glare, and the resultant need for more directional viewing, exhibited by polyester films as compared with cellulose acetate is well known from the commonly used protective transparent covers for notebook pages.) These higher indices of refraction are turned into an advantage by the present invention, for the high index of refraction makes it much more possible to provide anti-reflection coatings which practically eliminate all reflectivity, whereas reflectivity can only be reduced when using cellulose acetate.

Particularly useful transparent supports are films of polyethylene terephthalate, such as those commercially available under the trademarks "Mylar" (E.I.DuPont de Nemours & Co.) and "Estar" (Eastman Kodak Co.) Such polyester films have an index of refraction on the order of about 1.66. A number of materials suitable for anti-reflection coatings, e.g. fluorinated polymers, have indices of refraction of about 1.33, which is quite close to the 1.29 ideal index of refraction, i.e., the geometric mean of the indices of refraction of the polyethylene phthalate and the surrounding air, or, because the index of refraction of air is 1, the square root of the 1.66 index of refraction of polyethylene terephthalate. Furthermore, the fact that the difference of about 0.3 in the indices of refraction between air and the anti-reflection coating is close to the approximate 0.3 difference in the indices of refraction of the anti-reflection coating and the polyethylene terephthalate support means that maximum benefit will be obtained from the anti-reflection coating; the amplitude of the light entering the anti-reflection coating will more closely match the amplitude of the light reflected back from the interface of the polyethylene phthalate and the anti-reflection coating, and more effectively cancel out the thus reflected light.

Reference is now made to the accompanying drawings wherein a plurality of embodiments of this invention are illustrated and wherein like numbers, appearing in the various figures, refer to like components. For ease of understanding, these emboidments illustrate the formation of a monochrome image using a single dye developer. The illustrated embodiments include appropriate means of opacification to permit the processing of the film unit outside of a dark chamber, i.e., the film unit is intended to be removed from the camera prior to image completion and while the film is still photosensitive. Opacifying systems are described in the previously noted patents and per se form no part of the present invention which is equally applicable to film units intended to be processed within a dark chamber.

A particularly useful opacifying system for film units of the type shown in FIGS. 1 and 3 utilizes a color dischargeable reagent, preferably a pH-sensitive optical filter agent or dye, sometimes referred to as an indicator dye, as is described in detail in the aforementioned U.S. Pat. No. 3,647,437. In film units of the type shown in FIG. 2, photoexposure is effected from the side opposite the side from which the image is viewed. An opaque layer to protect the exposed silver halide from further exposure may be provided by including a light-absorbing opacifying agent, e.g., carbon black, in the processing composition which is distributed between the photosensitive layer(s) and a transparent support or spreader sheet. In such film units, it may be desirable to include a preformed opaque layer, e.g., a dispersion of carbon black in a polymer permeable to the processing composition, between a preformed light-reflecting layer and the silver halide emulsion(s). Such opacifying systems are shown and described in the aforementioned U.S. Pat. Nos. 3,594,164 and 3,594,165.

Referring to FIG. 1, Stages A, B, and C show in diagrammatic cross-section, respectively, imaging, processing, and the finished print in one embodiment of this invention. In Stage A, there is shown a photosensitive element **30** in superposed relationship with an image-receiving element **32**, with a rupturable container **16** (holding an opaque processing composition **17**) so positioned as to discharge its contents between said elements upon suitable application of pressure, as by passing through a pair of pressure applying rolls or other pressure means (not shown). Photosensitive element **30** comprises an opaque support **10** carrying a layer **12** of a dye developer over which has been coated a silver halide emulsion layer **14**. The image-receiving element **32** comprises a transparent support **24** carrying, in turn, a polymeric acid layer **22**, a spacer layer **20** and an image-receiving layer **18**. An anti-reflection coating **26** is present on the outer surface of the transparent support **24**. Photoexposure of the silver halide emulsion layer is effected through the anti-reflection coating **26** and the transparent support **24** and the layers carried thereon, i.e., the polymeric acid layer **22**, the spacer layer **20** and the image-receiving layer **18** which layers are also transparent, the film unit being so positioned within the camera that light admitted through the camera exposure or lens systems is incident upon the outer surface of the anti-reflection coating **26**. After exposure the film unit is advanced between suitable pressure-applying members, rupturing the container **16**, thereby releasing and distributing a layer **17*a*** of the opaque processing composition between the photosensitive element **30** and the image-receiving element **32**. The opaque processing composition contains a film-forming polymer, a white pigment and has an initial pH at which one or more optical filter agents contained therein are colored; the optical filter agent (agents) is (are) selected to exhibit light absorption over at least a portion of the wavelength range of light actinic to the silver halide emulsion. As a result, ambient or environmental light within that wavelength range incident upon transparent support **24** and transmitted through said transparent support and the transparent layers carried thereon in the direction of the photoexposed silver halide emulsion **14*a*** is absorbed thereby avoiding further exposure of the photoexposed and developing silver halide emulsion **14*a***. In exposed and developed areas, the dye developer is oxidized as a function of the silver halide development and immobilized. Unoxidized dye developer associated with undeveloped and partially developed areas remains mobile and is transferred imagewise to the image-receiving layer **18** to provide the desired positive image therein. Permeation of the alkaline processing composition through the image-receiving layer **18** and the spacer layer **20** to the polymeric acid layer **22** is so controlled that the process pH is maintained at a high enough level to effect the requisite development and image transfer and to retain the optical filter agent (agents) in colored form, after which pH reduction effected as a result of alkali permeation into the polymeric acid layer **22** is effective to reduce the pH to a level which "discharges" the optical filter agent, i.e., changes it to a colorless form. Absorption of the water from the applied layer **17*a*** of the processing composition results in a solidified film composed of the film-forming polymer and the white pigment dispersed therein, thus providing the reflecting layer **17*b*** which also serves to laminate together the photosensitive element **30** and the image-receiving element **32** to provide the final laminate (Stage C). The positive transfer image in dye developer present in the image-receiving layer **18*a*** is viewed through the transparent support **24** and the intermediate transparent layers against the reflecting layer **17*b*** which provides an essentially white background for the dye image and also effectively masks from view the developed silver halide emulsion **14*b*** and dye developer immobilized therein or remaining in the dye developer layer **12**.

The optical filter agent is retained within the final film unit laminate and is preferably colorless in its final form, i.e., exhibiting no visible absorption to degrade the transfer image or the white background therefor provided by the reflecting layer **17*b***. The optical filter agent may be retained in the reflecting layer under these conditions, and it may contain a suitable "anchor" or "ballast" group to prevent its diffusion into adjacent layers. Alternatively, if the optical filter agent is initially diffusible, it may be selectively immobilized on the silver halide emulsion side of the reflecting layer **17*b***, e.g., by a mordant coated on the surface of the silver halide emulsion layer **14**; in this embodiment the optical filter in its final state may be colorless or colored so long as any color exhibited by it is effectively masked by the reflecting layer **17*b***.

The reflecting layer provided in the embodiment of this invention shown in FIG. 1 is formed by solidification of a stratum of pigmented processing composition distributed after exposure. It is also within the scope of this invention to provide a preformed pigmented layer, e.g., coated over the image-receiving layer 18, and to effect photoexposure therethrough, in accordance with the teachings of U.S. Pat. No. 3,615,421 issued Oct. 26, 1971 to Edwin H. Land.

In the embodiment illustrated in FIG. 1, photoexposure is effected through the image-receiving element. While this is a particularly useful and preferred embodiment, it will be understood that the image-receiving element may be initially positioned out of the exposure path as illustrated in FIG. 3 and superposed upon the photosensitive element after photoexposure, in which event the processing and final image stages would be the same as in FIG. 1.

In the embodiment illustrated in FIG. 1, photoexposure and viewing of the final image both are effected through the transparent support 24. Accordingly, the advantages of the anti-reflection coating 26 are obtained twice, i.e., first, by minimizing failure of the film unit to record light passed by the camera lens and second, by minimizing glare during viewing.

It will be noted in the embodiment illustrated in FIG. 1 that the image-viewing layer 18 is temporarily bonded to the silver halide emulsion layer 14 prior to exposure. The rupturable container or pod 16 is so positioned that upon its rupture the processing composition 17 will delaminate the film unit and distribute itself between the image-receiving layer 18 and the silver halide emulsion layer 14. The distributed layer of processing composition 17*a* upon solidification forms a layer 17*b* which bonds the elements together to form the desired permanent laminate. Procedures for forming such prelaminated film units, i.e., film units in which the several elements are temporarily laminated together prior to exposure, are described, for example, in u.S. Pat. No 3,625,281 issued to Albert J. Bachelder and Frederick J. Bindar and in U.S. Pat. No. 3,652,282 to Edwin H. Land, both issued Mar. 28, 1972. A particularly useful and preferred prelamination utilizes a water-soluble polyethylene glycol as described and claimed in the copending application of Edwin H. Land, Ser. No. 247,023 filed Apr. 24, 1972.

The use of such temporarily laminated film units maximizes the beneficial effects obtained in the photoexposure stage from having the exposure effected through the anti-reflection coating 26, since the prelamination eliminates any other layer-to-air interface which could also reflect light and thus reduce the amount of light recorded by the photosensitive layer(s).

It will be recognized that the transfer image formed following exposure and processing of film units of the type illustrated in FIG. 1 will be geometrically reversed image of the subject. Accordingly, to provide geometrically nonreversed transfer images, exposure of such film units should be accomplished through an image reversing optical system, such as in a camera possessing an image reversing optical system utilizing mirror optics, e.g., as described in U.S. Pat. No. 3,447,437 issued June 3, 1969 to Douglas B. Tiffany.

If desired, the photosensitive element 30 may utilize a transparent support instead of the opaque support 10 shown in FIG. 1. In this alternative embodiment, the film unit should be processed in a dark chamber or an opaque layer, e.g., pressure-sensitive, should be superposed over said transparent support to avoid further exposure through the back of the film unit during processing outside of the camera.

FIG. 2 illustrates another film structure adapted to provide an integral negative-positive reflection print and wherein photoexposure and viewing are effected from opposite sides. In this embodiment, a photosensitive element 34 comprises a transparent support 24 carrying a layer 22 of a polymeric acid, a spacer 20, an image-receiving layer 18, a light-reflecting layer 60 (e.g., of titanium dixoide), an opaque layer 62 (e.g., of carbon black), a dye developer layer 12, and a silver halide emulsion layer 14. After photoexposure, a processing composition 17 is applied by rupturing a pod 16 and distributing the processing composition between a cover or spreader sheet 64 and silver halide emulsion layer 14. The cover sheet 64 may be transparent as illustrated in FIG. 2 and described in detail in the above noted U.S. Pat. No. 3,594,165, in which event photoexposure may be effected through it while it is held in place, e.g., by a binder tape around the edges of the film unit or by temporary lamination prior to photoexposure, as discussed above. In this embodiment, an anti-reflection coating 26 is provided on the outer or exposure surface of the transparent cover sheet 64. (Alternatively, cover sheet 64 may be opaque in which event it is positioned out of the exposure path prior to photoexposure, as described in detail in the above noted U.S. Pat. No. 3,594,164.) The opaque processing composition 17 contains suitable opacifying agents, e.g., carbon black, titanium dioxide, etc. The light-reflecting layer 60 preferably includes a white pigment, such as titanium dioxide, to provide a white background against which the transfer image may be viewed. The opaque layer 62, e.g., a layer of carbon black in gelatin, provides the requisite light protection while assuring an aesthically pleasing white background for the final image.

Processing of film units of the types described above is initiated by distributing the processing composition between predetermined layers of the film unit. In exposed and developed areas, the dye developer will be immobilized as a function of development. In unexposed and undeveloped areas, the dye developer is unreacted and diffusible, and this provides an imagewise distribution of unoxidized dye developer, diffusible in the processing composition, as a function of the point-to-point degree of exposure of the silver halide layer. The desired transfer image is obtained by the diffusion transfer to the image-receiving layer of at least part of this imagewise distribution of unoxidized dye developer. In the illustrated embodiments, the pH of the photographic system is controlled and reduced by the neutralization of alkali after a predetermined interval, in accordance with the teachings of the above noted U.S. Pat. No. 3,615,644, to reduce the alkalinity to a pH at which the unoxidized dye developer is substantially insoluble and non-diffusible. As will be readily recognized, the details of such processes form no part of the present invention but are well known; the previously noted U.S. patents may be referred to for more specific discussion of such processes.

The film units illustrated in FIGS. 1, 2, and 3 have, for convenience, been shown as monochrome films. Multicolor images may be obtained by providing the requisite number of differentially exposable silver halide emulsions, and said silver halide emulsions are most commonly provided as individual layers coated in superposed relationship. Film units intended to provide multicolor images comprise two or more selectively sensitized silver halide layers each having associated therewith an appropriate image dye-providing material providing an image dye having spectral absorption characteristics substantially complementary to the light by which the associated silver halide is exposed. The most commonly employed negative components for forming multicolor images are of the "tripack" structure and contain blue-, green-, and red-sensitive silver halide layers each having associated therewith in the same or in a contiguous layer a yellow, a magenta and a cyan image dye-providing material respectively. Interlayers or spacer layers may, if desired, be provided between the respective silver halide layers and associated image dye-providing materials or between other layers. Integral multicolor photosensitive elements of this general type are disclosed in U.S. Pat. No. 3,345,163 issued Oct. 3, 1967 to Edwin H. Land and Howard G. Rogers as well as in the previously noted U.S. Patents.

A number of modifications to the structures described in connection with the figures will readily suggest themselves to one skilled in the art. Thus, for example, the multicolor multilayer negative may be replaced by a screen-type negative as illustrated in U.S. Pat. No. 2,968,554 issued Jan. 17, 1961 to Edwin H. Land and in the aforementioned U.S. Pat. No. 2,983,606 particularly with respect to FIG. **9** thereof.

The image dye-providing materials which may be employed in such processes generally may be characterized as either (1) initially soluble or diffusible in the processing composition but are selectively rendered non-diffusible in an imagewise pattern as a function of development; or (2) initially insoluble or non-diffusible in the processing composition but which are selectively rendered diffusible or provide a diffusible product in an imagewise pattern as a function of development. These materials may be complete dyes or dye intermediates, e.g., color couplers. The requisite differential in mobility or solubility may, for example, be obtained by a chemical action such as a redox reaction or a coupling reaction.

As examples of initially soluble or diffusible materials and their application in color diffusion transfer, mention may be made of those disclosed, for example, in U.S. Pat. Nos. 2,774,668; 2,968,554; 2,983,606; 2,087,817; 3,185,567; 3,230,082; 3,345,163; and 3,443,943. As examples of initially non-diffusible materials and their use in color transfer systems, mention may be made of the materials and systems disclosed in U.S. Pat. Nos. 3,185,567; 3,443,939; 3,443,940; 3,227,550; and 3,227,552. Both types of image dye-providing substances and film units useful therewith also are discussed in the aforementioned U.S. Pat. No. 3,647,437 to which reference may be made.

It will be understood that dye transfer images which are neutral or black-and-white instead of monochrome or multicolor may be obtained by use of a single dye or a mixture of dyes of the appropriate colors in proper proportions, the transfer of which may be controlled by a single layer of silver halide, in accordance with known techniques. It is also to be understood that "direct positive" silver halide emulsions may also be used, depending upon the particular image dye-providing substances employed and whether a positive or negative color transfer image is desired.

It will also be understood that the present invention may be utilized with films wherein the final image is in silver, and photoexposure and/or viewing is effected through a transparent support which may be provided with an anti-reflection coating in accordance with the teachings of this disclosure. Indeed, the transfer of silver may be utilized to provide a silver image or to provide a dye image by silver dye bleach processing.

In the preferred embodiments, the layers comprising the individual film units are secured in fixed relationship prior to, during, and after photoexposure and processing to provide the desired integral negative-positive image. Film units of this type are well known in the art and are illustrated, for example, in the above cited U.S. Pat. Nos. 3,415,644; 3,467,437; and 3,594,165, as well as in other patents. In general, a binding member is provided extending around, for example, the edges of the composite structure and securing the elements thereof in fixed relationship. The binding member may comprise a pressure-sensitive tape securing and/or maintaining the layers of the structure together at its respective edges. If the edge tapes are also opaque, edge leakage of actinic radiation incident on the film unit will be prevented. The edge tapes also will act to prevent leakage of the processing composition from the laminate during and after processing. The rupturable pod is so positioned as to discharge its contents between predetermined layers; e.g., between the image-receiving layer **18** and the silver halide emulsion layer **14** of FIG. **1**; these layers may be temporarily bonded to each other with a bond strength less than that exhibited by the interface between the opposed surfaces of the remaining layers, as described above. The binding member may also serve to provide a white mask or border for the final image. The manufacture of such film units or packets is well described in the above-noted and other patents and need not be set forth in any detail here.

Rupturable container **16** may be of the type shown and described in any of U.S. Pat. Nos. 2,543,181; 2,634,886; 3,653,732; 2,723,051; 3,056,492; 3,056,491; 3,152,515; and the like. In general, such containers will comprise a rectangular blank of fluid- and air-impervious sheet material folded longitudinally upon itself to form two walls which are sealed to one another along their longitudinal and end margins to form a cavity in which processing composition **17** is retained. The longitudinal marginal seal is made weaker than the end seals so as to become unsealed in response to the hydraulic pressure generated within the fluid contents **17** of the container by the application of compressive pressure to the walls of the container, e.g., by passing the film unit between opposed pressure applying rollers.

The rupturable container **16** is so positioned as to effect unidirectional discharge of the processing composition **17** between predetermined layers, e.g., the image-receiving layer **18** and the silver halide layer **14** next adjacent thereto, upon application of compressive force to the rupturable container **16.** Thus, the rupturable container **16**, as illustrated in FIG. **1**, is fixedly positioned and extends transverse a leading edge of the prelaminated film unit with its longitudinal marginal seal directed toward the interface between the image-receiving layer **18** and the silver halide emulsion layer **14.** The rupturable container **16** is fixedly secured to this laminate by a tape extending over a portion of one wall of the container, in combination with a separate retaining member or tape extending over a portion of the laminate's surface generally equal in area to about that covered by said tape.

A preferred opacification system to be contained in the processing composition 17 to effect processing outside of a camera is that described in the above-mentioned U.S. Pat. No. 3,647,437, and comprises a dispersion of an inorganic light-reflecting pigment which also contains at least one light-absorbing agent, i.e., optical filter agent, at a pH above the pKa of the optical filter agent in a concentration effective when the processing composition is applied, to provide a layer exhibiting optical transmission density > than about 6.0 density units with respect to incident radiation actinic to the photosensitive silver halide and optical reflection density < than about 1.0 density units with respect to incident visible radiation.

In lieu of having the light-reflecting pigment in the processing composition, the light-reflecting pigment used to mask the photosensitive strata and to provide the background for viewing the color transfer image formed in the receiving layer may be present initially in whole or in part as a preformed layer in the film unit. As an example of such a preformed layer, mention may be made of that disclosed in U.S. Pat. No. 3,615,421 issued Oct. 26, 1971 and in U.S. Pat. No. 3,620,724 issued Nov. 16, 1971, both in the name of Edwin H. Land. The reflecting agent may be generated in situ as is disclosed in U.S. Pat. Nos. 3,647,434 and 3,647,435, both issued Mar. 7, 1972 to Edwin H. Land.

The dye developers (or other image dye-providing substances) are preferably selected for their ability to provide colors that are useful in carrying out subtractive color photography, that is, the previously mentioned cyan, magenta and yellow. They may be incorporated in the respective silver halide emulsion or, in the preferred embodiment, in a separate layer behind the respective silver halide emulsion. Thus a dye developer may, for example, be in a coating or layer behind the respective silver halide emulsion and such a layer of dye developer may be applied by use of a coating solution containing the respective dye developer distributed, in a concentration calculated to give the desired coverage of dye developer per unit area, in a film-forming natural, or synthetic, polymer, for example, gelatin, polyvinyl alcohol, and the like, adapted to be permeated by the processing composition.

Dye developers, as noted above, are compounds which contain the chromophoric system of a dye and also a silver halide developing function. By "a silver halide developing function" is meant a grouping adapted to develop exposed silver halide. A preferred silver halide development function is a hydroquinonyl group. Other suitable developing functions include ortho-dihydroxyphenyl and ortho- and para-amino substituted hydroxyphenyl groups. In general, the development function includes a benzenoid developing function, that is, an aromatic developing group which forms quinonoid or quinone substances when oxidized.

The image-receiving layer may comprise one of the materials known in the art, such as polyvinyl alcohol, gelatin, etc. It may contain agents adapted to mordant or otherwise fix the transferred images dye(s). Preferred materials comprise polyvinyl alcohol or gelatin containing a dye mordant such as poly-4-vinylpyridine, as disclosed in U.S. Pat. No. 3,148,061, issued Sept. 8, 1964 to Howard C. Haas.

In the various color diffusion transfer systems which have previously been described, and which employ an aqueous alkaline processing fluid, it is well known to employ an acid-reacting reagent in a layer of the film unit to lower the environmental pH following substantial dye transfer in order to increase the image stability and/or to adjust the pH from the first pH at which the image dyes are diffusible to a second (lower) pH at which they are not. For example, the previously mentioned U.S. Pat. No. 3,415,644 discloses systems wherein the desired pH reduction may be effected by providing a polymeric acid layer adjacent the dyeable stratum. These polymeric acids may be polymers which contain acid groups, e.g., carboxylic acid and sulfonic acid groups, which are capable of forming salts with alkali metals or with organic bases; or potentially acid-yielding groups such as anhydrides or lactones. Preferably the acid polymer contains free carboxyl groups. Alternatively, the acid-reflecting reagent may be in a layer adjacent to the silver halide most distant from the image-receiving layer, as disclosed in U.S. Pat. No. 3,573,043 issued Mar. 30, 1971 to Edwin H. Land. Another system for providing an acid-reacting reagent is disclosed in U.S. Pat. No. 3,576,625 issued Apr. 27, 1971 to Edwin H. Land.

An inert interlayer or spacer layer may be and is preferably disposed between the polymeric acid layer and the dyeable stratum in order to control or "time" the pH reduction so that it is not premature and interferes with the development process. Suitable spacer or "timing" layers for this purpose are described with particularity in U.S. Pat. Nos. 3,362,819; 3,419,389; 3,421,893; 3,455,686; and 3,575,701.

While the acid layer and associated spacer layer are preferably contained in the positive component employed in systems wherein the dyeable stratum and photosensitive strata are contained on separate supports, e.g., between the support for the receiving element and the dyeable stratum; or associated with the dyeable stratum in those integral film units, e.g., on the side of the dyeable stratum opposed from the negative components, they may, if desired, be associated with the photosensitive strata, as is disclosed, for example, in U.S. Pat. Nos. 3,362,821 and 3,573,043. In film units such as those described in the aforementioned U.S. Pat. Nos. 3,594,164 and 3,594,165, they also may be contained on the spreader sheet employed to facilitate application of the processing fluid.

As is now well known and illustrated, for example, in the previously cited patents, the liquid processing composition referred to for effecting multicolor diffusion transfer processes comprises at least an aqueous solution of an alkaline material, for example sodium hydroxide, potassium hydroxide, and the like, and preferably possessing a pH in excess of 12, and most preferably includes a viscosity-increasing compound constituting a film-forming material of the type which, when the composition is spread and dried, forms a relatively firm and relatively stable film. The preferred film-forming materials disclosed comprise high molecular weight polymers such as polymeric, water-soluble ethers which are inert to an alkaline solution such as, for example, a hydroxyethyl cellulose or sodium carboxymethyl cellulose. Additionally, film-forming materials or thickening agents whose ability to increase viscosity is substantially unaffected if left in solution for a long period of time are so disclosed to be capable of utilization. As stated, the film-forming material is preferably contained in the processing composition in such suitable quantities as to impart to the composition a viscosity in excess of 100 cps, at a temperature of approximately 24° C. and preferably in the order of 100,000 cps. to 200,000 cps. at that temperature.

In particularly useful embodiments of this invention, the transparent support contains a small quantity of a pigment, e.g., carbon black, to prevent fog formation due to light-piping by internal reflection within the transparent support of actinic light incident upon an edge thereof; such elements are described and claimed in the copending application of Edwin H. Land Ser. No. 194,407 filed Nov. 1, 1971. Similarly, fog from such light-piping may be avoided by incorporating an alkali-dischargeable dye in a suitable layer, e.g., the image-receiving layer, in accordance with the disclosure of the copending application of Howard G. Rogers, Ser. No. 194,406 filed Nov. 1, 1971.

The above discussion of anti-reflection coatings has been in terms of coatings a quarter wavelength thick. It should be understood that coatings having a thickness equal to an odd multiple of a quarter wavelength also will provide anti-reflection properties, but the minimum thickness of one-quarter wavelength is preferred. Generally speaking, the anti-reflection coating will have an optical thickness in the range of from about 0.08 to about 0.2 micron and more preferably from about 0.12 to about 0.15 micron, or a preferred physical thickness of about 0.09 to about 0.11 micron.

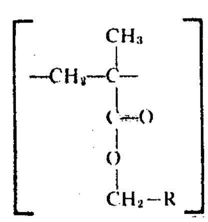
In the above discussion and in the drawings, the anti-reflection properties have been imparted by a separate coating. The invention is not limited to the use of separate coatings, but contemplates the conversion of a thin surface portion of the transparent support itself to a material having a desired lower index of refraction. One such technique is to fluorinate the "outer" surface of a polyethylene terephthalate film base to a depth of a quarter wave, the resulting stratum of fluorinated polyester exhibiting a lower index of refraction. Since the fluorinated surface stratum is integral with the film base, problems of adhesion, such as may be present with separate coatings, are reduced if not eliminated. Accordingly, it will be understood that reference herein to an "anti-reflection coating" or "anti-reflection layer" are intended to include separately applied coatings or layers as well as strata obtained by treatment of a transparent element to provide a surface stratum having the requisite lower index of refraction.

Many materials suitable for use as anti-reflection coatings are known in the art, and such materials may be used in the practice of the present invention. It is only necessary that such materials be compatible with and exhibit sufficient adhesion to the transparent support to withstand the anticipated handling of the film unit, and this may be determined by routine testings. While it is generally desirable to provide the anti-reflection coating as part of the transparent support prior to applying the photographically used layers and subsequent assembly of the film unit, it is within the scope of this invention to apply the anti-reflection coating at any stage of the manufacture process that is best suited for the particular materials and components, including applying the anti-reflection coating after final assembly of the individual film unit.

As discussed above, the anti-reflection coating or stratum should comprise a material having an index of refraction less than that of the transparent support. The optimum index of refraction to be exhibited by the anti-reflection coating may be readily calculated by the principles of physics previously discussed, but it is not essential that such optimum value be used in order to obtain very beneficial results. In the preferred embodiments of this invention, the transparent support is formed of a polymer having a high index of refraction, e.g., of about 1.6 or higher. The anti-reflection coating preferably has an index of refraction at least 0.20 less than, and more preferably at least 0.35 to 0.3 less than, the index of refraction of the transparent support. Since the preferred transparent supports will have an index of refraction of about 1.6 or higher, the preferred anti-reflection coatings will exhibit an index of refraction of about 1.3 to 1.4.

As noted above, particularly useful materials for anti-reflection coatings are fluorinated polymers. Examples of such fluorinated polymers include perfluorinated polyolefins having an index of refraction of about 1.35 to about 1.45, e.g., polytetrafluoethylene, such disclosed in U.S. Pat. No. 3,617,354. As pointed out in said patent, such anti-reflection coatings may be applied by coating from a solvent, by vacuum deposition of the polymer, by polymerization in place of the corresponding monomer, etc.

Other fluorinated polymers which provide anti-reflection coatings include poly-(1,1-dihydropentadecafluorooctyl acrylate) with an index of refraction of about 1.38; poly - (1,1-dihydropentadecafluro-octyl methacrylate) with an index of refraction of about 1.38; and



wherein R is perfluoro-cyclohexyl ($-C_6F_{11}$).

Inorganic materials such as vacuum deposisited magnesium fluoride (index of refraction about 1.38) may also be used. Various silicates [index of refraction about 1.41]) may also be used and may be particularly useful for the relative hardness of the resulting anti-reflection coating.

By way of illustration, an integral negative-positive multicolor reflection print was prepared in accordance with the procedure described in Example 2 of the copending application of Edwin H. Land, Stanley M. Bloom, and Howard G. Rogers, Ser. No. 246,669 filed Apr. 24, 1972 The general format of the integral negative-positive reflection print was similar to that shown in FIG. 1 of the above-mentioned U.S. Pat. No. 3,415,644. The transparent support through which photoexposure was effected and through which the multicolor transfer image was viewed was a transparent polyethylene terephthalate film base containing a small quantity of carbon black to prevent light-piping by internal reflection, as described and claimed in the above-mentioned application of Edwin H. Land, Ser. No. 194,407 filed Nov. 1, 1971. A coating solution was prepared by dissolving 0.8 g. of poly - (1,1-dihydropentadecafluorooctyl methacrylate) and 2.0 cc. of methyl cellosolve in 40 cc. of 1.4 - di- (trifluoromethyl)- benzene. The print was placed on a rotating turntable and a small quantity of the above coating solution was centrally placed on the outer surface of the polyethylene terephthalate film base. The continual rotation of the print on the turntable was effective to cause the coating solution to spread substantially uniformly over the outer surface of the polyethylene terephthalate film base. (This coating technique is sometimes referred to as "spin coating," and is particularly suited for applying substantially uniform coatings using extremely small quantities of coating solution. The thickness of the coating may be controlled by the viscosity of the coating solution and the speed of the turntable.) The resulting layer of fluorinated polymer was an effective anti-reflection coating and adhered well to the polyethylene terephthalate unless roughly handled. The sharply reduced surface reflection, while not complete, greatly increased the angle through which the print could be viewed without disturbing glare as compared with a print which did not have such an anti-reflection coating. The difference in viewing ease and image quality was almost what one would have expected if one were not viewing through a sheet of polyethylene terephthalate. In addition, it was observed that the anti-reflection coating was effective to reduce the minimum reflection densities of the print as measured on an integral densitometer, and this result was confirmed on a second print prepared and coated in the same manner:

	Reflection Density		
	Red	Green	Blue
Print No. 1: Before Coating	0.17	0.17	0.19
After Coating	0.13	0.14	0.17
Print No. 2: Before Coating	0.18	0.20	0.20
After Coating	0.15	0.17	0.18

A third test print was processed in the same manner, but without first being photoexposed, to give a "black spread," i.e., an integral negative positive reflection print which appeared to be uniformly black and obtained by maximum overall transfer of all three dye developers. The outer surface of the polyethylene terephthalate transparent support of this "black spread" was spin coated with poly- (1,1-dihydropentadecafluoro-octyl methacrylate in the manner just described to provide an anti-reflection coating. The reflection densities of this print, before and after coating, as measured on an integral densitometer were:

	Reflection Density		
	Red	Green	Blue
Print No. 3: Before Coating	2.18	2.27	2.14
After Coating	2.31	2.41	2.21

It will therefore be seen that application of an anti-reflection coating has increased the visual maximum density and decreased the visual minimum density.

Other solvents found useful in coating such fluorinated polymers include Freon TF, trifluorobenzene and hexafluoro paraxylene. In general, it has been found useful to use coating solutions containing about 2 percent by weight of the polymer. It will be recognized by those skilled in the art that the solvent of choice for a particular polymer, and the concentration of the polymer in the coating solution, may be readily determined by routine experimentation. Obviously the solvent should be one which will not adversely affect, mechanically or optically, the transparent support upon which it is coated.

The transparent support advantageously has a moisture permeability rate adapted to accelerate "drying" of the layers forming the integral negative-positive reflection prints of the preferred embodiments. Reference may be made to U.S. Pat. No. 3,573,044 issued Mar. 30, 1971 to Edwin H. Land for a detailed description of dimensionally stable, transparent supports, e.g., microporous polyesters, having suitable permeability rates, and said description is hereby incorporated herein for convenience. It will be understood that selection of an anti-reflection coating should not adversely affect the desired moisture transmission rate of the transparent support(s).

While the image dye-providing material is generally carried on the same support as the photosensitive silver halide, it will be understood that this initial location is not essential, as in forming monochromes the image dye-providing material may initially be contained in the processing composition or in a layer of the image-receiving element as is taught, for example, in the use of dye developers in the previously mentioned U.S. Pat. No. 2,983,606.

The provision of an anti-reflection coating provides a number of advantages. In the absence of the anti-reflection coating provided in accordance with this invention, the optimum angle for viewing an image through the transparent support is very specific and limited, if the viewer is to avoid to the maximum possible extent seeing specular reflection from the surface of the transparent support of light from the illumination source. The anti-reflection coating has been found to substantially reduce or prevent such specular reflection, thus greatly improving viewing. The resulting images exhibit, as shown above, increased color saturation and density and "cleaner" whites, i.e., reduced minimum densities. The avoidance of light loss during photoexposure is useful also in films wherein exposure is effected through a transparent support but the final image is separated and not viewed through a transparent support. The reduction in surface reflection (glare) simplifies copying integral negative-positive reflection prints of the type with which this invention is primarily concerned and aids in obtaining truer copy prints; light polarizers are customarily used to eliminate surface glare during copying. The anti-reflection coating may also provide anti-abrasion protection and, depending upon the polymer or other material used, desirable anti-friction properties to facilitate transport during manufacture and/or processing.

It is recognized that anti-reflection coatings have been used on photographic prints previously, e.g., U.S. Pat. No. 3,617,354 referred to above proposes to apply a layer of a polymerized perfluorinated olefin over the image-bearing photographic emulsion layer of a photographic print. The "photographic emulsion layer" referred to is customarily gelatin, and that patent acknowledges that only limited reduction of surface reflection is possible because such perfluorinated polyolefins do not have indices of refraction low enough to equal the ideal low index of about 1.23 required in view of gelatin's typical index of about 1.5. In contrast, the preferred and most useful embodiments of the present invention apply the anti-reflection coating to a polymeric layer having a much higher index of refraction; the seeming disadvantage of such high indices of refraction as about 1.66 for a polyester transparent layer thus becomes a distinct advantage as the resulting "ideal" index of refraction for an anti-reflection coating becomes more practical to provide. For this reason, an anti-reflection coating of a given "low" index of refraction will provide a greater reduction in glare and surface reflection from a high index polyester than from a lower index polymer such as cellulose acetate. (It will be understood, however, that the present invention expressly includes the use of cellulose acetate as well as polyester and other high index transparent films.)

Furthermore, the teachings of the prior art as illustrated by said U.S. Pat. No. 3,617,354 require that the anti-reflection coating be applied after the final image is formed, to avoid interference with processing solutions or chemicals, e.g., by virtue of impermeability or low permeability to aqueous solutions as would be true of perfluorinated polyolefin coatings. Other efforts to provide anti-reflection coatings by aftertreatment have resulted in coatings which reduce glare but also reduce density by virtue of a coating which is not optically continuous and/or not optically clear.

Where the expression "positive image" has been used, this expression should not be interpreted in a restrictive sense since it is used primarily for purposes of illustration, in that it defines the image produced on the image-carrying layer as being reversed, in the positive-negative sense, with respect to the image in the photosensitive emulsion layers. As an example of an alternative meaning for "positive image," assume that the photosensitive element is exposed to actinic light through a negative transparency. In this case, the latent image in the photosensitive emulsion layers will be a positive and the dye image produced on the image-carrying layer will be a negative. The expression "positive image" is intended to cover such an image produced on the image-carrying layer.

Since certain changes may be made in the above product and process 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 for use in diffusion transfer processes comprising a transparent support carrying on one side thereof an image-receiving layer, the other side of said transparent support carrying an anti-reflection coating.

2. A photographic product as defined in claim 1, including at least one layer containing photosensitive silver halide carried on said first side.

3. A photographic product as defined in claim 2, including an image dye-providing material in a layer contiguous to said silver halide containing layer.

4. A photographic product as defined in claim 1 wherein said image-receiving layer includes a mordant for a dye.

5. A photographic product as defined in claim 1 wherein said image-receiving layer is a silver receptive layer containing a silver precipitant.

6. A photographic product as defined in claim 4 wherein said dye is a dye developer.

7. A photographic product as defined in claim 1 wherein said transparent support has an index of refraction of at least about 1.6.

8. A photographic product as defined in claim 7 wherein said transparent support is a polyester.

9. A photographic product as defined in claim 8 wherein said polyester is polyethylene terephthalate.

10. A photographic product as defined in claim 7 wherein said transparent support is polystyrene.

11. A photographic product as defined in claim 1 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

12. A photographic product as defined in claim 1 wherein said anti-reflection coating has an index of refraction of about 0.25 to 0.3 less than said transparent support.

13. A photographic product as defined in claim 7 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

14. A photographic product as defined in claim 13 wherein said anti-reflection coating has an index of refraction at least 0.25 to 0.3 less than said transparent support.

15. A photographic product as defined in claim 7 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

16. A photographic product as defined in claim 1 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

17. A photographic product as defined in claim 1 wherein said transparent support is cellulose acetate.

18. A photographic product as defined in claim 1 wherein said anti-reflection coating comprises a fluorinated polymer.

19. A photographic product comprising a transparent support carrying on one side thereof a layer containing a photosensitive silver halide, said silver halide layer being exposable through said transparent support, the other side of said transparent support carrying an anti-reflection coating.

20. A photographic product as defined in claim 19, including an image dye-providing material in a layer contiguous to said silver halide containing layer.

21. A photographic product as defined in claim 20 wherein said image dye-providing material is a dye developer.

22. A photographic product as defined in claim 20 wherein said image dye-providing material is a compound which provides a diffusible dye as a function of oxidation or color coupling.

23. A photographic product as defined in claim 19 including an image-receiving layer, said layer of silver halide being positioned between said support and said image-receiving layer.

24. A photographic product as defined in claim 19 wherein said transparent support has an index of refraction of at least about 1.6.

25. A photographic product as defined in claim 24 wherein said transparent support is a polyester.

26. A photographic product as defined in claim 25 wherein said polyester is polyethylene terephthalate.

27. A photographic product as defined in claim 24 wherein said transparent support is polystyrene.

28. A photographic product as defined in claim 19 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

29. A photographic product as defined in claim 19 wherein said anti-reflection coating has an index of refraction of about 0.25 to 0.3 less than said transparent support.

30. A photographic product as defined in claim 24 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

31. A photographic product as defined in claim 30 wherein said anti-reflection coating has an index of refraction at least 0.25 to 0.3 less than said transparent support.

32. A photographic product as defined in claim 24 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

33. A photographic product as defined in claim 19 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

34. A photographic product as defined in claim 19 wherein said transparent support is cellulose acetate.

35. A photographic product as defined in claim 19 wherein said anti-reflection coating comprises a fluorinated polymer.

36. A photographic film product comprising a first support and a second support, at least one of said supports being transparent, a plurality of layers including a photosensitive layer carried on one of said supports, and a rupturable container releasably holding a processing composition adapted, when distributed between a pair of predetermined layers carried by said supports, to develop said photosensitve layer and provide an image viewable through said transparent support, the external surface of said transparent support carrying an anti-reflection coating.

37. A photographic product as defined in claim 36, wherein both of said supports are transparent and each said transparent support carries an anti-reflection coating on the external surface thereof.

38. A photographic product as defined in claim 36, including an image-receiving layer and means adapted to provide a masking layer between said photosensitive layer and said image-receiving layer to mask the developed photosensitive layer when the image in said image-receiving layer is viewed through said transparent support.

39. A photographic product as defined in claim 38 wherein said product includes a silver halide solvent and said image is a silver transfer image.

40. A photographic product for forming a diffusion transfer image in dye within a permanent laminate including at least one developed silver halide layer, said photographic product comprising, in combination, an image-receiving layer; at least one silver halide emulsion, each said silver halide emulsion having associated therewith an image dye-providing substance selected from the group consisting of image dyes and image dye intermediates; means providing a light-reflecting layer between said image-receiving layer and said silver halide emulsion(s) to mask said silver halide emulsion(s) after development thereof and to provide a white background for viewing a dye image in said image-receiving layer; a transparent support through which image-receiving layer may be viewed; means providing a processing composition for developing said silver halide emulsion(s) after photoexposure and for forming a transfer image in at least one dye in said image-receiving layer; said image in at least one dye in said image-receiving layer; said product including an anti-reflection coating on the outer surface of said transparent support.

41. A photographic film as defined in claim 40 wherein each said image dye-providing substance is a dye.

42. A photographic film as defined in claim 41 wherein each said dye is a dye developer.

43. A photographic film as defined in claim 40 wherein each said image dye-providing substance is an intermediate for an image dye.

44. A photographic product as defined in claim 40 wherein said silver halide emulsion(s) are adapted to be exposed through said transparent support.

45. A photographic product as defined in claim 40 including a second transparent support, said silver halide emulsion(s) being adapted to be exposed through said second transparent support.

46. A photographic product as defined in claim 45 wherein said second transparent support also carries an anti-reflection coating on the outer surface thereof.

47. A photographic product as defined in claim 40 wherein said means providing a light-reflecting layer comprise a white pigment dispersed in said processing composition, and said processing composition is contained in a rupturable container positioned to distribute said processing composition containing said pigment between said image-receiving layer and said silver halide emulsion(s).

48. A photographic product as defined in claim 40 comprising a temporary laminate including said layers confined between two dimensionally stable supports, at least one of said supports being transparent, the bond between a predetermined pair of layers being weaker than the bond between other pairs of layers, and including a rupturable container releasably holding said processing composition, said rupturable container being so positioned as to distribute said processing composition between said predetermined layers, said processing composition being adapted to provide said permanent laminate following distribution and drying.

49. A photographic product as defined in claim 40 wherein said transparent support has an index of refraction of at least about 1.6.

50. A photographic product as defined in claim 49 wherein said transparent support is a polyester.

51. A photographic product as defined in claim 50 wherein said polyester is polyethylene terephthalate.

52. A photographic product as defined in claim 49 wherein said transparent support is polystyrene.

53. A photographic product as defined in claim 40 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

54. A photographic product as defined in claim 40 wherein said anti-reflection coating has an index of refraction of about 0.25 to 0.3 less than said transparent support.

55. A photographic product as defined in claim 49 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

56. A photographic product as defined in claim 55 wherein said anti-reflection coating has an index of refraction at least 0.25 to 0.3 less than said transparent support.

57. A photographic product as defined in claim 49 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

58. A photographic product as defined in claim 40 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

59. A photographic product as defined in claim 40 wherein said transparent support is cellulose acetate.

60. A photographic product as defined in claim 40 wherein said anti-reflection coating comprises a fluorinated polymer.

61. A photographic product comprising a first support; a red-sensitive silver halide emulsion; a green-sensitive silver halide emulsion; and a blue-sensitive silver halide emulsion; said silver halide emulsions having associated therewith, respectively, a cyan dye developer, a magenta dye developer and a yellow dye developer; an image-receiving layer for receiving image dyes transferred thereto by diffusion as a function of exposure and development of said silver halide emulsion layers, a second support which is transparent and through which said image-receiving layer may be viewed; a rupturable container releasably holding a processing composition adapted, upon distribution between predetermined layers of said film to develop said silver halide emulsions and to effect the formation of a transfer image in dye in said image-receiving layer, said processing composition also being adapted to provide a permanent laminate including said developed silver halide emulsions and said image-receiving layer; and means providing a light-reflecting layer between said image-receiving layer and said silver halide emulsions effective to provide a white background for viewing said transfer image and for masking said developed silver halide emulsions; said product including an anti-reflection coating on the outer surface of said transparent support.

62. A photographic product as defined in claim 61 wherein said means for providing a light-reflecting layer comprises a white pigment dispersed in said processing composition.

63. A photographic product as defined in claim 61 wherein said first support is opaque.

64. A photographic product as defined in claim 61 wherein said transparent support has an index of refraction of at least about 1.6.

65. A photographic product as defined in claim 64 wherein said transparent support is a polyester.

66. A photographic product as defined in claim 65 wherein said polyester is polyethylene terephthalate.

67. A photographic product as defined in claim 64 wherein said transparent support is polystyrene.

68. A photographic product as defined in claim 61 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

69. A photographic product as defined in claim 61 wherein said anti-reflection coating has an index of refraction of about 0.25 to 0.3 less than said transparent support.

70. A photographic product as defined in claim 64 wherein said anti-reflection coating has an index of refraction at least 0.20 less than said transparent support.

71. A photographic product as defined in claim 70 wherein said anti-reflection coating has an index of refraction at least 0.25 to 0.3 less than said transparent support.

72. A photographic product as defined in claim 64 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

73. A photographic product as defined in claim 61 wherein said anti-reflection coating has an index of refraction of about 1.3 to about 1.4.

74. A photographic product as defined in claim 61 wherein said transparent support is cellulose acetate.

75. A photographic product as defined in claim 61 wherein said anti-reflection coating comprises a fluorinated polymer.

76. A photographic product as defined in claim 61 wherein said anti-reflection coating comprises an inorganic material.

77. A photographic product as defined in claim 61 wherein said transparent support and said image-receiving layer comprise a separate element adapted to be brought into superposed relationship with said silver halide emulsions.

78. A photographic product as defined in claim 61 wherein said layers are held in fixed relationship between said supports prior to and during exposure.

79. A photographic product as defined in claim 78 wherein said fixed relationship is provided by binder means along at least two parallel sides of said product.

80. A photographic product as defined in claim 78 wherein said product is a laminate of said layers between said first and said second supports, the bond between a pair of predetermined layers being weaker than the bonds between the other layers, said rupturable container being so positioned as to release said processing composition for distribution between said pair of layers.

81. A photographic product as defined in claim 61 wherein said silver halide emulsions are present as separate planar layers.

82. A photographic product as defined in claim 61 wherein said silver halide emulsions are present in the form of minute elements arranged in side-by-side relationship in a photosensitive screen pattern.

83. A photographic product as defined in claim 81 wherein said blue-sensitive silver halide emulsion layer is between said image-receiving layer and said other silver halide emulsion layers.

84. A photographic product as defined in claim 81 wherein said blue-sensitive silver halide emulsion layer is between said first support and said other silver halide emultion layers, and said first support is transparent.

85. A photographic product as defined in claim 84 wherein said transparent first support carries an anti-reflection coating on the outer surface thereof.

86. A method of forming a diffusion transfer dye image by developing an exposed silver halide emulsion, forming an imagewise distribution of a diffusible dye image-providing substance as a function of said development, and transferring at least a portion of said im-

agewise distribution of diffusible dye image-providing substance to an image-receiving layer in superposed relationship with said silver halide emulsion to provide said dye image, said image-receiving layer and said silver halide emulsion forming a permanent laminate including a light-reflecting layer positioned between said image-receiving layer and said silver halide emulsion, the step of said exposure of said silver halide emulsion being effected through a transparent support having an anti-reflection coating on the outer surface thereof.

87. A method as defined in claim **86** wherein said diffusion transfer dye image is viewed through said transparent support and said anti-reflection coating.

88. The method as defined in claim **86** wherein said diffusible dye image-providing substance is a dye developer.

89. The method as defined in claim **86** wherein a red-sensitive silver halide emulsion, a green-sensitive silver halide emulsion and a blue-sensitive silver halide emulsion are present, said silver halide emulsions having associated therewith, respectively, a cyan dye developer, a magenta dye developer, and a yellow dye developer, and said dye image is a multicolor image.

90. A method as defined in claim **86** wherein said exposure is effected in a camera having an image reversing optical system utilizing mirror optics.

91. A method of forming a photographic image comprising photoexposing a silver halide emulsion and thereafter developing said exposed silver halide emulsion, the step of said photoexposure being effected through a transparent support having an anti-reflection coating on the outer surface thereof.

92. A method as defined in claim **91** wherein said exposure is effected in a camera having an image reversing optical system utilizing mirror optics.

93. A method of forming a diffusion transfer image by developing an exposed silver halide emulsion, forming an imagewise distribution of a diffusible image-providing substance as a function of said development, and transferring at least a portion of said imagewise distribution of diffusible image-providing substance to an image-receiving layer in superposed relationship with said silver halide emulsion to provide said diffusion transfer image, said exposure of said silver halide emulsion being effected through a transparent support having an anti-reflection coating on the outer surface thereof.

94. A method as defined in claim **93** wherein said transparent support carries said image-receiving layer.

95. A method as defined in claim **93** wherein said transparent support carries said silver halide emulsion.

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