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⑤④ **Color diffusion transfer photographic film units.**

⑤⑦ A color diffusion transfer photographic film unit, comprising a support which is rendered light-shielding and light-reflective on and/or in the support, provided a photosensitive element containing (a) a layer having a neutralizing function, (b) a dye image receiving layer, (c) a peeling layer, and (d) at least one silver halide emulsion layer associated with at least one dye image forming substance, an alkali processing composition containing a light shielding agent, and a transparent cover sheet, wherein said cover sheet contains a dye trapping layer. The film unit can be quickly processed in a light room, possesses excellent handling properties and provides high quality color prints which can be viewed without having to look through a support.

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COLOR DIFFUSION TRANSFER PHOTOGRAPHIC FILM UNITS

FIELD OF THE INVENTION

This invention concerns color diffusion transfer photographic film units. More Particularly, it concerns
 5 color diffusion transfer photographic film units which can be processed in a light room and with which, after processing, the unified type film unit is peeled apart and the colored image is viewed without having look to through a support.

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BACKGROUND OF THE INVENTION

Conventional color diffusion transfer photographic film units can be generally classified as being of the peel-apart type or of the non-peeling type. The peel-apart type have the photosensitive layer and the dye
 15 image receiving layer coated onto separate supports and, after image exposure, the photosensitive element and the dye receiving element are brought together. A processing composition is spread between the elements, and a dye image subsequently transferred into the dye receiving layer is obtained by peeling off the dye image receiving element.

The distinguishing features of such an embodiment are that there is no loss of picture quality of the
 20 type which arises with the non-peeling type units described hereinafter, and excellent color reproduction is achieved because the dye image which is formed in the image receiving layer which has been established by coating on a support can be viewed directly. However, the operation of bringing the photosensitive element and the image receiving element together in the camera is inconvenient, and there are problems with handling the processed film in that it is covered with the alkaline processing fluid after peeling apart
 25 and this is liable to become attached to the surroundings.

On the other hand, with non-peeling type units the dye receiving layer and a silver halide emulsion layer are established by coating between a transparent support and another support. In this case, there are embodiments in which the image receiving layer and the silver halide layer are coated on the same transparent support and embodiments in which they are coated on separate supports.

30 In the former case, a white reflecting layer is established between the image receiving layer and the silver halide emulsion layer. In the latter case, the dye image which has been transferred to the image receiving layer can be viewed by reflected light by including a white pigment in the processing composition which is spread between the image receiving layer and the silver halide emulsion layer.

The distinguishing features of the non-peeling type units are that there is no covering with processing
 35 fluid of the type which occurs with the peel-apart type; there is none of the inconvenience in handling which accompanies the bringing together of the film sheets. In addition, they are very easy to deal with. However, the colored image is viewed through the transparent support; thus it is virtually impossible to avoid some loss of picture quality compared to that of the peel-apart type since the color saturation is diminished by surface reflection and the whiteness of the white base is inadequate because of the poor reflectance of the
 40 white reflecting layer. Furthermore, the prints obtained are excessively thick since the emulsion layer, the pod and the cover sheet etc. remain in place after use.

Color diffusion transfer photographic film units have been developed with the intention of resolving these problems, for example, a color diffusion transfer photographic film unit comprising a white support having provided sequentially thereon a photosensitive element containing at least (a) a layer which has a
 45 neutralizing function; (b) a dye image receiving layer; (c) a peeling layer and (d) at least one silver halide emulsion layer associated with dye image forming substances, an alkaline processing composition which contains a light shielding agent, and a transparent cover sheet is disclosed in Japanese Patent Application No. 231374/87.

In a preferred embodiment of the color diffusion transfer photographic film units described above, in
 50 which a light shielding function is provided on the opposite side of the emulsion layer to the side on which the processing composition is spread, the support is a white support, and the silver halide emulsion layer is a multi-layer, the distance (d) over which the dye formed from the dye image forming substances associated with the silver halide emulsion layer closest to the dye image receiving layer diffuses directly is comparatively very short and the distance (d') over which the dye formed from the dye image forming substance associated with the silver halide emulsion layer farthest from the dye image receiving layer

diffuses directly is comparatively very long. Thus, the value of the ratio d'/d is large. Consequently, the dyes formed close to the dye image receiving layer form a transfer colored image in a relatively short time while the dyes which are formed farther from the dye image receiving layer need more time to form a transfer colored image. Thus, the time required for the completion of the image as a whole is increased, causing adverse effect in color balance. In regard to photographic film units in which the picture cannot be seen until the unit is peeled apart, the delay in image formation and adverse changes in the color balance before and after completion of the picture are of major importance, and improvement therein is greatly desired.

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SUMMARY OF THE INVENTION

A first object of this invention is to provide a film unit which can be processed in a light room, which provides the high picture quality obtained with peel-apart type color diffusion transfer units, and which possesses excellent handling properties of a non-peeling type color diffusion transfer unit.

A second object of the invention is to provide high quality color diffusion transfer photographs which are not sticky after peeling apart.

A third object of the invention is to provide a diffusion transfer method of image formation wherein a high quality colored image which is not sticky can be obtained by processing in a light room.

Yet another object of the invention is to provide a film unit that can be processed in a light room and wherein the picture can be completed quickly.

These and other objects are realized providing a color diffusion transfer photographic film unit (hereinafter "film unit") comprising a support which has both a light shielding function and a light reflecting function on and/or in the support and which has established sequentially, on the support, a photosensitive element containing (a) a layer which has a neutralizing function, (b) a dye image receiving layer, (c) a peeling layer, and (d) at least one silver halide emulsion layer associated with at least one dye image forming substance, an alkali processing composition which contains a light shielding agent, and a transparent cover sheet, wherein said cover sheet contains a dye trapping layer.

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DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment of the present invention comprises a color diffusion transfer photographic film unit having a support which has a light shielding function and a light reflecting function on and/or in the support and which has provided sequentially thereon a photosensitive element containing (a) a layer which has a neutralizing function, (b) a dye image receiving layer, (c) a peeling layer and (d) at least one silver halide emulsion layer associated with dye image forming substances, and a transparent cover sheet which includes a dye trapping layer, and further provided that an alkaline processing composition, which contains a light shielding agent, is spread between the uppermost layer of the photosensitive element and the dye trapping layer of the cover sheet.

In the preferred embodiment of the present invention, the film unit is exposed from the side of the transparent cover sheet which has a dye trapping layer, after which it is treated with a pressing means whereby the alkaline processing composition is spread uniformly within the film unit, and development is started.

A print which has no used emulsion layer, pod and cover sheet attached, i.e., a so-called conventional print, is obtained by peeling the part which contains the support and the dye image receiving layer from the remaining part of the film unit at the position of the peeling layer after processing.

The following photosensitive elements which have the aforementioned light shielding function and light reflecting function can be used in this invention.

i) Photosensitive elements in which at least layers (a) to (d) are established by coating on a white support and at least one light shielding layer are established by coating on the other side of the support;

ii) Photosensitive elements in which at least layers (a) to (d) are established by coating on a black support and a light reflecting layer is established by coating between the support and the aforementioned dye image receiving layer;

iii) Photosensitive elements in which at least layers (a) to (d) are established by coating on a support, a light reflecting layer is established by coating between the support and the aforementioned dye image receiving layer, and wherein another light shielding layer is established by coating on the other side of the support;

iv) Photosensitive elements in which at least layers (a) to (d) are established by coating on a support, a light reflecting layer is established by coating between the support and the aforementioned dye image receiving layer (b) and a light shielding layer is established by coating between the support and the light reflecting layer.

v) Photosensitive elements in which the support itself has both a light shielding function and a light reflecting function, and wherein at least layers (a) to (d) are established by coating on the white, light reflecting side of the support;

vi) Photosensitive elements in which at least layers (a) to (d) are established by coating on a white support and which have a light shielding layer provided between (c) and (d); and

vii) Photosensitive elements in which at least layers (a) to (d) are established by coating on a support, in which a light reflecting layer is established by coating between the support and the aforementioned dye image receiving layer, and which also have a light shielding layer provided between (c) and (d).

The layer which has a light reflecting function is on the opposite side to the silver halide emulsion layer of the dye image receiving layer, and the layer which has a light shielding function is on the opposite side to the silver halide emulsion layer of the layer which has a light reflecting function or between the silver halide emulsion layer and the image receiving layer.

In the preferred embodiments, the distance between the dye image forming substance layer closest to the dye image receiving layer and the dye image receiving layer is not more than 5μ , and preferably not more than 3μ . This range allows for the time for the completion of the image to be reduced because the diffusion distance of the dyes formed from the dye image forming substances is shortened. Photosensitive elements in which there is no light shielding layer between the dye image receiving layer and the aforementioned dye image forming substance layers, such as for example aforementioned embodiments i), ii), iii) and v), are preferred.

The value of d'/d increases as the value of d becomes smaller as a result of a shortening of the distance between the dye image receiving layer and the aforementioned dye image forming layer.

The most preferred embodiment is that described under i) above.

The dye trapping layer is conceptually similar to the scavenger mordant layer disclosed in JP-A-50-142233, where the alkali processing composition and the emulsion layer are located on one side and the dye image receiving layer is located on the other side of both the aforementioned layers, and the scavenger mordant layer is located in a timing layer or behind the timing layer for the aforementioned alkali processing composition layer. (The term "JP-A" as used herein means an "unexamined published Japanese patent application".) The scavenger mordant layer described in JP-A-50-142233 is distinguished by being located in the timing layer or behind a timing layer for the alkali processing composition layer to scavenge essentially undesirable processing reaction products and excess dye after a prescribed time, preferably after about 20 to 30 seconds. This reduces fluctuations in $D_{\max}$ due to the processing temperature and reduces the variation in $D_{\max}$ up to about 4 weeks after the completion of processing. Moreover, in cases where a diffusible dye image providing substance, such as an oxychromic developing agent, is used from the start, this has the advantage of reducing excess dye formation in the image receiving layer without retarding the access time.

However, the scavenger mordant layers described in JP-A-50-142233 are such that, as can be seen from the preferred embodiments, the distance d for the direct diffusion of the dye, formed from the dye image forming substances associated with the silver halide emulsion layer which is closest to the dye image receiving layer, into the dye image receiving layer is comparatively long because of the presence of the titanium oxide layer and the carbon black layer. Thus, the value of d'/d is smaller than the value of d'/d in this invention. This difference is crucial in the examples of JP-A-50-142233, because a time of about 20 to 30 seconds is required before the appearance of the scavenger function. Moreover, dye diffusion into the image receiving layer is impeded in the absence of such a delay. In the present invention, the desired effect is not achieved if a timing layer is used, as is clear from the illustrative examples. The dye trapping layers of this invention are characterized in that they are in direct contact with the alkali processing composition which contains a light shielding agent. In this way, the sharpness of the image is increased, the time required to complete the image is shortened, and there is less change in the color balance of the picture. It is thought that such a pronounced effect is achieved without adverse effect because the value of d'/d is comparatively large.

On the other hand, color diffusion transfer photographic film units which have two dye image receiving layers or two layers which can be dyed have been disclosed in JP-B-57-58650 and U.S. Patent 3,620,731 as well as in JP-A-50-142233. (The term "JP-B" as used herein means an "examined Japanese patent publication".) Color diffusion transfer photographic film units in which layers which can be dyed are established on each of two transparent supports have been disclosed in JP-B 57-58650. However, as is clear from the illustrative examples, the photosensitive elements disclosed are structurally distinct from that of the present invention. For example, no peeling layer is present in the actual preferred embodiment, and white light reflecting layer and a light shielding layer are included between the first layer which can be dyed and the photosensitive silver halide layer with which dye image forming substances are associated which are established on the first support. Moreover, by the inclusion of a white pigment in the alkaline processing composition, both layers which can be dyed can be viewed as reflection prints through the supports.

Furthermore, color diffusion transfer photographic film units in which dye image forming substances which release dyes as a result of intramolecular ring closure and which have two dye image receiving layers for obtaining two color pictures have disclosed in U.S. Patent 3,620,731. However, in the aforementioned patent, means of stabilizing the image after peeling apart, for example, the establishment of a neutralizing layer and the method of light shielding, are not disclosed, and the dye image forming substances are different from those used in the present invention.

The dye trapping layer in this invention is provided on the opposite side of the dye image receiving layer and several dye image forming substances. It is difficult to appreciate color balance of the dye which is trapped by the dye trapping layer as a color image when matched with color balance of the image receiving layer, because the relative location of the dye trapping layer is also provided on the opposite side of each dye image forming substances as a matter of course. That is, the dye trapping layer has no function with respect to the second image receiving layer, unlike the aforementioned patent. The dye trapping layer in this invention only provides a very poor image so that a satisfactory image can be completed in the image receiving layer, which is to say so as to provide an adequate color density, the desired color balance, and an adequately low minimum density and the desired gradation. This layer essentially lacks the function of an image receiving layer but provides unexpected effects such as acceleration of development, shortening of the time required to complete the formation of the image, increase in sharpness and a smaller change in the color balance.

Moreover techniques in which the used emulsion layer and cover sheet etc., are removed using a peeling layer are known and are disclosed in the following patents.

Techniques in which an image receiving layer, a peeling layer and a photosensitive layer are established sequentially by coating on a support and in which the unwanted parts, such as the photosensitive layer, processing fluid and the cover sheet, are peeled away after processing in order to reduce the thickness of the print after processing, a disadvantage of the unified film units with which peeling apart is unnecessary, have been disclosed in JP-A-47-8237 (U.S. Patent 3,730,718), JP-A-59-220727 (U.S. Patent 4,499,174) and JP-A-59229555 (U.S. Patent 4,459,346). However, all of these involve film units in which the colored image on the image receiving layer is viewed through a transparent support; color saturation is reduced by surface reflections from the transparent support and the whiteness of the white reflecting layer is inadequate. Moreover, the prints obtained therefrom have a picture quality which is unsatisfactory when compared to prints of the present invention. Furthermore, techniques for obtaining prints in which a dye image receiving layer, a peeling layer and a photosensitive layer are established sequentially by coating on a support (including paper supports) and in which the photosensitive layer is peeled away after processing have been disclosed in JP-A-56-65133 (U.S. Patent 4,328,301), Research Disclosure, 16462 (published December 1977), U.S. Patent 3,658,534 and British Patent 641,355. However, these do not involve the concept of a unified film unit in which the processes from development to stabilization are carried out within the film unit. For example, in JP-A-56-65133, the photosensitive material is immersed in a processing bath and the photosensitive layer is peeled away in the wet state after processing. A technique in which a print is recovered by stripping in water after development by spreading a viscous processing fluid uniformly over the photosensitive element is disclosed in Research Disclosure, 16462 (published in December 1977). That is to say, these are all photosensitive materials with which the use of a processing bath is required. This is also clear from the fact that there are no layers which have a development stopping function or a neutralizing function included in the photosensitive materials. Stable color pictures cannot be obtained without stabilization in a processing bath with photosensitive materials in which there is no neutralizing function within the photosensitive material. The "instant" nature of the prints obtained with photosensitive material of this present invention would be lost if such a process has to be carried out.

Moreover, the materials disclosed in Research Disclosure, 16462 are processed in a dark room and they cannot be processed in a light room.

Furthermore, the use of a peeling layer in color diffusion transfer photosensitive materials in which color developing agents are used has been disclosed in JP-A-45-24075 (U.S. Patent 3,445,228), British Patent 642,355, and U.S. Patents 3,227,550 and 3,227,552. In JP-A-45-24075, it is disclosed that an acid neutralizing layer is established between the dye image receiving layer and the support. However, this method is quite different from the dye image forming method used in this present invention; moreover, the picture quality of the prints obtained therefrom is unsatisfactory.

In the present invention, a black and white developing agent (such as pyrazolidinone) is used as an electron transfer agent in combination with dye providing compounds which release a diffusible dye, or of which the diffusibility of the compound itself is changed by oxidation and reduction. On the other hand, in the methods of image formation disclosed in the patents listed immediately above a color developing agent is used to generate the dyes, whereby pronounced staining occurs as a result of the residual color developing agent in the dye image receiving layer. Thus it is impossible to obtain prints which have a clean white base. Moreover, there is no disclosure relating to processing in light room in U.S. Patent 3,227,550.

Film units of the unified type in which a dye image receiving layer, a peeling layer and a photosensitive layer are established sequentially on a support (including paper supports) and from which the unwanted photosensitive layer and processing fluid etc. are removed after processing have been disclosed in U.S. Patent 4,401,746 and it can be said that this disclosure suggests the establishment of an acid neutralization layer between a support and a dye image receiving layer. However, the units disclosed are processed in a dark room; there is no disclosure concerning a light shielding function. They are different from the units of the present invention which have a light shielding function and which can be processed in a light room, and they are also unsatisfactory in terms of their "instant" photographic properties.

Techniques in which unwanted parts are peeled away after processing using a peeling layer have been disclosed in JP-A-49-4653 (U.S. Patent 3,820,999), U.S. Patent 3,220,835, JP-A-49-4334, and U.S. Patents 2,759,825, 2,614,926, 2,543,181 and 3,409,430. However, all of these involve black and white photosensitive materials in which silver salt diffusion transfer is used and they are different from the color diffusion transfer photosensitive materials of the present invention. Furthermore, the use of peeling layers in additive color type color photosensitive materials in which silver salt diffusion transfer is used has been disclosed in U.S. Patents 4,359,518, 3,674,482 and 4,383,022, but not only are these quite different from the present invention in which dye providing compounds are used, but there is no suggestion of a layer which has a neutralizing function. Furthermore, there is no disclosure in these documents concerning processing in a light room.

Hence, the objects of the present invention cannot be achieved using conventional technology. That is to say, film units which can be processed in the light room to provide high quality prints which have no unwanted parts and excellent handling properties were first realized by means of this invention. According to the present invention, a dye image receiving layer is established on a support and a layer which has a neutralizing function is established between this dye image receiving layer and the support. It is possible in this way to prevent both the occurrence of undesirable fogging during image formation and the occurrence of staining and changes in color of the image dyes while the print is being stored. Furthermore, a light shielding function is provided on the opposite side of the photosensitive layer to that on which the processing composition is spread, and a light shielding agent is included in the processing composition which is spread over the upper part of the photosensitive layer during processing so that development process can be carried out in daylight.

A layer which contains a mordant in a hydrophilic colloid, similar to the dye image receiving layer described hereinafter, is used as the dye trapping layer. The mordants which can be used in the dye image receiving layer can also be used as mordants in the dye trapping layer. The mordants which can be used in the dye trapping layer may be the same as, or different from, the mordants which are used in the dye image receiving layer. It is possible to change the picture quality etc. of the color picture in the image receiving layer by adjusting the extent of dye entrapment by means of the mordanting strength. The sharing ratio of the dye formed in the dye image forming substance layer into the dye image receiving layer/the dye trapping layer is changed.

Hydrophilic colloids known in the industry, such as gelatin, poly(vinyl alcohol) and derivatives thereof, polyvinylpyrrolidone, polyacrylamide, etc., can be used as the hydrophilic colloid. The use of gelatin is preferred.

The coated weight of the dye trapping layer can be varied freely, according to the system, but generally the mordant is coated at a concentration of from 0.1 to 10 g/m², and preferably at a concentration of from 0.2 to 3 g/m², and the hydrophilic colloid is coated at a concentration of from 0.1 to 10 g/m², and preferably at a concentration from 0.2 to 3 g/m².

Each of these structural elements is described in order below.

A) The Support

The white support in this invention is a support where at least the side upon which the dye image receiving layer is coated is white. Any support which has adequate whiteness and smoothness can be used for this purpose. For example, polymer film which have been rendered white by the addition of white pigments such as titanium oxide, barium sulfate, zinc oxide etc. having a particle size of from 0.1 to 5 μ or by forming micro voids by stretching, for example films and synthetic papers made from polyethyleneterephthalate, polystyrene or polypropylene which have been formed into a film using a conventional method of successive biaxial stretching, or supports obtained by laminating polyethylene, polyethyleneterephthalate, or polypropylene, for example, which contains titanium white, onto both sides of a sheet of paper, are preferred. The thickness of the support is from 50 to 350 μ m, preferably from 70 to 210 μ m, and more preferably from 80 to 150 μ m. Furthermore, a light shielding layer can be provided in the support as required. For example, use can be made of a support obtained by laminating polyethylene which contains a light shielding agent, such as carbon black, on the back of a white support.

Any of the carbon blacks made using the channel method, the thermal method, or the furnace method, as described by Donnel Voet in "Carbon Black", Marcel Dekker Inc. (1976) for example, can be used for this purpose. No particular limits are imposed on the particle size of the carbon black, but those with a particle size of from 90 to 1800 Å are preferred. The amount of black pigment added as a light shielding agent may be adjusted according to the sensitivity of the photosensitive material which is being shielded, but an optical density of from 5 to 10 is desirable.

B) The Dye Image Receiving Layer

The dye image receiving layer used in the invention is a layer which contains a mordant in a hydrophilic colloid. This may take the form of a single layer or it may have a multi-layer construction obtained by coating mordants which have different mordanting strengths as a laminate. Such layers have been described, for example, in JP-A-61-252551. The use of polymeric mordants is preferred.

The polymeric mordants which can be used in the present invention include polymers which contain secondary or tertiary amino groups, polymers which have nitrogen containing heterocyclic portions, and polymers which contain quaternary ammonium cation groups of which the number molecular weight is at least 5,000, and preferably at least 10,000.

Examples include the vinylpyridine polymers and vinylpyridinium cationic polymers described, for example, in U.S. Patents 2,548,564, 2,484,430, 3,148,061 and 3,756,814; the vinylimidazolium cationic polymers described, for example in U.S. Patent 4,124,386; the polymer mordant which can crosslink with gelatin as described, for example, in U.S. Patents 3,625,694, 3,859,096 and 4,128,538, and British Patent 1,277,453; the aqueous sol type mordants described, for example, in U.S. Patents 3,958,995, 2,721,852 and 2,798,063, JP-A-54-115228, JP-A-54-145529, JP-A-54-126027, JP-A-54-155835 and JP-A-56-17352; the water-insoluble mordants described, for example, in U.S. Patent 3,898,088; the reactive mordants which can form covalent bonds with dyes as described, for example, in U.S. Patents 4,168,976 and 4,201,840; and the mordants described, for example, in U.S. Patents 3,709,690, 3,788,855, 3,642,482, 3,488,706, 3,557,066, 3,271,147 and 3,271,148, JP-A-53-30328, JP-A-52-155528, JP-A-53-125, JP-A-53-1024, JP-A-53-107855 and British Patent 2,064,802.

The mordants disclosed in U.S. Patents 2,675,316 and 2,882,156 can also be used for this purpose.

Among these, mordants which are not prone to migrate from the mordant layer into another layer are preferred. Water insoluble mordants which undergo a crosslinking reaction with a matrix such as gelatin for example, and the aqueous sol type mordants (including latex dispersions) are also preferred. The latex dispersion mordants are especially preferable, and those which have a particle size of from 0.01 to 2 μ , and preferably from 0.05 to 0.2 μ , are particularly useful.

The amount of mordant coated differs according to the type of mordant, the quaternary cation content, the type and amount of dye which is to be mordant, and the type of binder which is used etc., but an amount of from 0.5 to 10 g/m² is preferred, an amount of from 1.0 to 5.0 g/m² is more preferred, and an amount of from 2 to 4 g/m² is particularly preferred.

Gelatin, poly(vinyl alcohol), polyacrylamide, polyvinylpyrrolidone etc. can be used as the hydrophilic colloid which is used in the image receiving layer, but gelatin is preferred.

C) The Layer(s) which has/have a Neutralizing Function

The layer(s) which have a neutralizing function which are used in the present invention are layers which contain a sufficient quantity of an acidic substance to neutralize the alkali introduced from the processing composition. They may have a multi-layer structure incorporating a neutralization rate adjusting layer (timing layer) and an adhesion reinforcing layer, as required. The preferred acidic substances are substances which have acidic groups having a pKa value less than 9 (or precursor groups which provide such acidic groups on hydrolysis). Preferred substances include higher fatty acids such as oleic acid as disclosed in U.S. Patent 2,983,606; acrylic acid, methacrylic acid or maleic acid polymers and partial esters or acid anhydrides thereof, such as those described in U.S. Patent 3,362,819; acrylic acid/acrylate ester copolymers such those described in French Patent No. 2,290,699, and latex type acidic polymers such as those described, for example, in U.S. patent 4,139,383 and Research Disclosure, No. 16102 (1977).

The acidic substances described, for example, in U.S. Patent 4,088,493, JP-A-52-153739, JP-A-53-1023, JP-A-53-4540, JP-A-53-4541 and JP-A-53-4542 can also be used for this purpose.

Specific examples of acidic polymers include copolymers of vinyl monomers such ethylene, vinyl acetate and vinyl methyl ether, with maleic anhydride, and their n-butyl esters, copolymers of butyl acrylate and acrylic acid, and cellulose acetate hydrogenphthalate.

The aforementioned polymeric acids may be used in the form of mixtures with hydrophilic polymers. Examples of such polymers include polyacrylamide, polymethylpyrrolidone, poly(vinyl alcohol) including partially saponified forms thereof, carboxymethylcellulose, hydroxymethylcellulose, hydroxyethylcellulose and poly(methyl vinyl ether). Among these, poly(vinyl alcohol) is preferred.

Furthermore, polymers other than hydrophilic polymers, such as cellulose acetate, can be mixed with the aforementioned polymeric acids.

The amount of polymeric acid coated is varied according to the amount of alkali spread in the photosensitive elements. The equivalent ratio of polymeric acid to alkali per unit area is generally from 0.9 to 2.0. If the amount of polymeric acid is too low, this can result in changes in the hue of the transferred dyes and staining of the white background areas while the use of too much polymeric acid can result in changes in hue and other disadvantages such as reduced resistance to light. The preferred equivalent ratio is from 1.0 to 1.3. The admixture of too little or too much hydrophilic polymer lowers the quality of the photograph. The ratio by weight of hydrophilic polymer to polymeric acid is generally from 0.1 to 10, and preferably from 0.3 to 3.0.

Additives can be included for various purposes in the layers which have a neutralizing function in this invention. For example, film hardening agents well known in the industry can be included to harden the layers, and polyhydroxyl compounds, such as polyethyleneglycol, polypropyleneglycol and glycerine, can be added for improving the brittleness of these films. Other additives, such as antioxidants, fluorescent whiteners, dyes for providing a blueing effect, development inhibitors and precursors thereof, can also be added, as required.

The timing layers which are used in conjunction with neutralizing layers may consist of polymers which have a low alkali permeability, such as gelatin, poly(vinyl alcohol), partially acetylated poly(vinyl alcohol), cellulose acetate and partially hydrolyzed poly(vinyl acetate); latex polymers which have been made by copolymerization with small amounts of hydrophilic comonomers such as acrylic acid monomer and which have a high activation energy for alkali permeation; or polymers which have lactone rings.

Among these materials, the timing layers which comprise cellulose acetate as disclosed, for example, in JP-A-54-136328 and U.S. Patents 4,267,262, 4,009,030 and 4,029,849; the latex polymers obtained by copolymerization with small amount of a hydrophilic comonomer such as acrylic acid as disclosed, for example in JP-A-54-128335, JP-A-56-69629 and JP-A-57-6843, and U.S. Patents 4,056,394, 4,061,496, 4,199,362, 4,250,243, 4,256,827 and 4,268,640; the polymers which have lactone rings as described in U.S. Patent 4,229,516; and the other polymers described, for example, in JP-A-56-25735, JP-A-56-97346, JP-A-57-6842, and European Patents 31,957A1, 37,724A1 and 48,412A1 are especially useful.

Use can also be made of those disclosed in U.S. Patents 3,421,893, 3,455,686, 3,575,701, 3,778,265, 3,785,815, 3,847,615, 4,088,493, 4,123,275, 4,148,653, 4,201,587, 4,288,523 and 4,297,431; West German Patent Applications (OLS) 1,622,936 and 2,162,277, and Research Disclosure, 15162, No. 151 (1976).

The timing layers in which these materials are used can take the form of a single layer, or two or more layers may be used conjointly,

Development inhibitors and/or precursors thereof as described, for example, in U.S. Patent 4,009,029, West German Patent Applications (OLS) 2,913,164 and 3,014,672, and JP-A-54-155837 and JP-A-55-138745, and the hydroquinone precursors described in U.S. Patent 4,201,578, and other photographically useful additives or precursors thereof can be incorporated into the timing layer(s).

D) The Light Shielding Layer

In this invention, processing can be carried out in daylight because the photosensitive layer is completely shielded from external light during the development process by the light shielding layer in the photosensitive element and the light shielding properties of the processing fluid which is spread over the photosensitive element during processing. In practical terms, a layer which contains a light shielding agent can be established by coating on the back of the support, or between the emulsion layer and the support; alternatively, a layer which contains a light shielding agent may be established within the support. Any material which has a light shielding function can be used as a light shielding agent; the use of carbon black is preferred.

Any binder in which carbon black can be dispersed can be used as the light shielding agent. The use of gelatin is preferred.

E) The Peeling Layer

A peeling layer is established between the dye image receiving layer and the emulsion layer associated with the dye image forming substances in this invention, such that the emulsion layer can be peeled away after processing. Hence, the peeling layer must maintain the adhesion between the image forming layer and the emulsion layer in the unprocessed state and peel-away easily after processing. Examples of materials which can be used for this purpose include those disclosed, for example, in JP-A-47-8237, JP-A-59-220727, JP-A-59-229555, JP-A-49-4653, U.S. Patents 3,220,835 and 4,359,518, JP-A-49-4334, JP-A-56-65133, JP-A-45-24075 and U.S. Patents 3,227,550, 2,759,825, 4,401,746 and 4,366,227. Water soluble (or alkali soluble) cellulose derivatives provide one example of such materials. For example, use can be made of hydroxyethylcellulose, cellulose acetate phthalate, plasticized methylcellulose, ethylcellulose, cellulose nitrate, or carboxymethylcellulose etc. Use can also be made of various natural macromolecular materials such as alginic acid, pectin, gum arabic etc. Use can also be made of various modified gelatins, for example acetylated gelatin, phthalated gelatin etc. Moreover, as another example, use can be made of water-soluble synthetic polymers such as, for example, poly(vinyl alcohol), polyacrylate, poly(methyl methacrylate), butyl methacrylate or copolymers thereof.

The peeling layer may take the form of a single layer or it may consist of a plurality of layers as disclosed, for example, in JP-A-59-220727 and JP-A-60-60642.

F) The Photosensitive Layer

A photosensitive layer consisting of silver halide emulsion layer(s) with which dye image forming substances are associated is established above the aforementioned peeling layer in this invention. The structural elements of such a layer are described below.

(1) Dye Image Forming Substances

The dye image forming substances used in the invention are non-diffusible compounds which release diffusible dyes or dye precursors corresponding to the silver image, or compounds having diffusible properties which change in accordance with the silver image; these compounds have been described in the fourth edition of The Theory of the Photographic Process. These compounds can be represented by the general formula [I] below.

DYE-Y [1]

Here, DYE represents a dye or a dye precursor, and Y represents a component which provides a compound which has different diffusion properties from the compound under alkaline condition. The compounds can be broadly classified as negative type compounds which become diffusible in the silver image parts, or as positive type compounds which become diffusible in the non-developed parts, according to the function of Y.

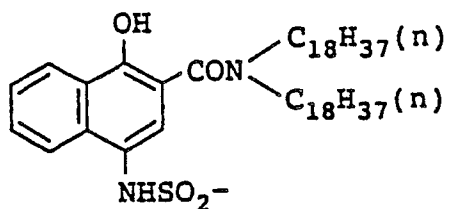
Specific examples of Y in compounds of the negative-type include those which are destroyed by oxidation as a result of development, and which thereby release a diffusible dye.

Specific examples of Y are disclosed in U.S. Patents 3,928,312, 3,993,638, 4,076,529, 4,152,153, 4,055,428, 4,053,312, 4,198,235, 4,179,291, 4,149,892, 3,844,785, 3,443,943, 3,751,406, 3,443,939,

3,443,940, 3,628,952, 3,980,479, 4,183,753, 4,142,891, 4,278,750, 4,139,379, 4,218,368, 3,421,964, 4,199,355, 4,199,354, 4,135,929, 4,336,322 and 4,139,389, JP-A-53-50736, JP-A-51-104343, JP-A-54-130122, JP-A-53-110827, JP-A-56-12642, JP-A-56-16131, JP-A-57-4043, JP-A-57-650, JP-A-57-20735, JP-A-53-69033, JP-A-54-130927, JP-A-56-164342 and JP-A-57-119345.

5 The N-substituted sulfamoyl groups, having groups derived from aromatic hydrocarbon rings or heterocyclic rings as the N-substituent group, are especially desirable as the Y group of negative-type dye releasing redox compounds. Examples of typical groups for Y are indicated below, but Y is not limited to these groups.

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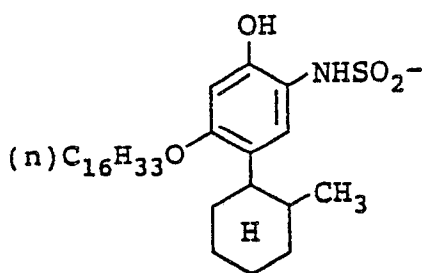
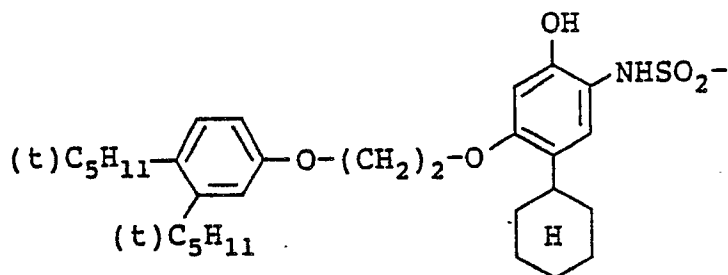
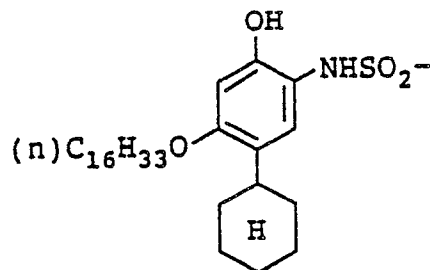
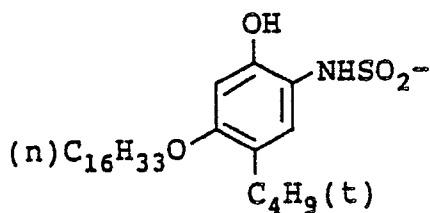
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45 Positive-type compounds are described in Angev. Chem., Inc. Ed., Engl., volume 22, page 191 (1982).

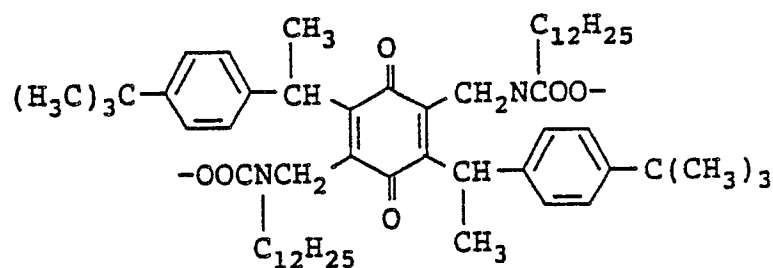
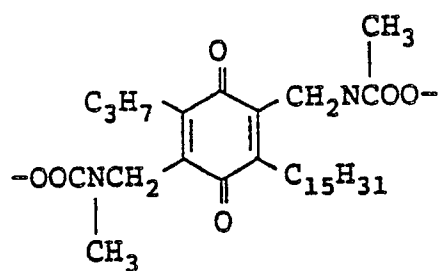
Specific examples include compounds (dye developing agents) which are diffusible under initial alkaline conditions but which are oxidized by development and become non-diffusible. Typical examples of Y which can be used in compounds of this type have been disclosed in U.S. Patent 2,983,606.

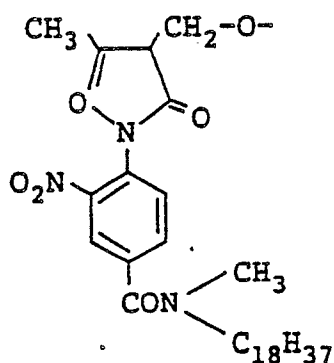
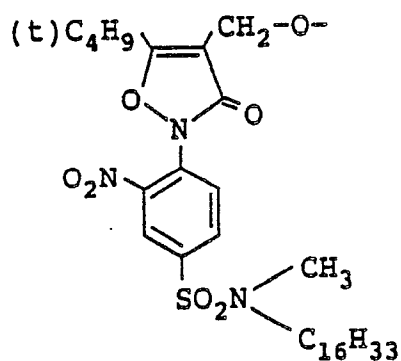
50 Furthermore, with another type of compound a diffusible dye is released as a result of spontaneous ring closure under alkaline conditions, but the release of the dye is essentially stopped when oxidation occurs with development. Specific examples of Y which have such a function have been disclosed, for example, JP-A-53-69033, JP-A-54-130927 and U.S. Patents 3,421,964, 4,199,355 and 3,980,479.

55 With another type of compound, the compound does not release a dye itself, but dye is released when reduction occurs. Compounds of this type are used in combination with electron donors, and the diffusible dye can be released in the form of the image by reaction with residual electron donor which has been oxidized in the form of the image by silver development. Atomic groups which have a function of this type have been disclosed, for example, in U.S. Patents 4,183,753, 4,142,891, 4,278,750, 4,139,379 and

4,218,368, JP-A-53-110827, U.S. Patents 4,356,249 and 4,358,525, JP-A-54-130927, JP-A-56-164342, Kokai Giho 87-6199, and European Patent No 220,746A2.

Specific examples are indicated below, but the present invention is not limited to just these examples.

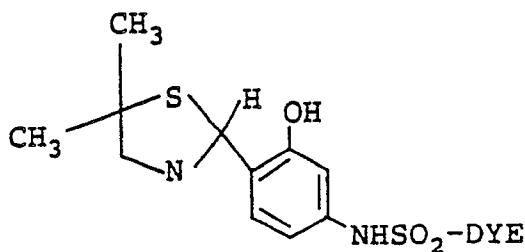
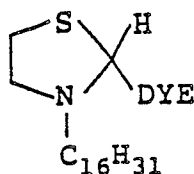




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Combination with non-diffusible electron donating compounds, commonly known as ED compounds, or precursors thereof is preferred when compounds of this type are being used in the present invention. Examples of ED compounds have been disclosed, for example, in U.S. Patents 4,263,393 and 4,278,750, and in JP-A-56-138736.

Compounds of the type indicated below can also be used as a dye image forming substance.



In these formulae, DYE represents a dye or a dye precursor as described earlier.

Details of these types of compounds have been disclosed, for example, in U.S. Patents 3,719,489 and 4,098,783.

On the other hand, specific examples of dyes which can be represented by DYE in the aforementioned

general formulae have been disclosed in the literature as indicated below.

Examples of yellow dyes have been disclosed in U.S. Patents 3,597,200, 3,309,199, 4,013,633, 4,245,028, 4,156,609, 4,139,383, 4,195,992, 4,148,641, 4,148,643 and 4,336,322; JP-A-52-114930, JP-A-56-71072; Research Disclosure 17630 (1978) and Research Disclosure 16475 (1977).

5 Examples of magenta dyes have been disclosed in U.S. Patents 3,453,107, 3,544,545, 3,932,380, 3,931,144, 3,932,308, 3,954,476, 4,233,237, 4,255,509, 4,250,246, 4,142,891, 4,207,104 and 4,287,292; JP-A-52-106727, JP-A-53-23628, JP-A-55-36804, JP-A-56-73057, JP-A-56-71060 and JP-A-55-134.

10 Examples of cyan have been disclosed in U.S. Patents 3,482,972, 3,929,760, 4,013,635, 4,268,625, 4,171,220, 4,242,435, 4,142,891, 4,195,994, 4,147,544 and 4,148,642; British Patent 1,551,138; JP-A-54-99431, JP-A-52-8827, JP-A-53-47823, JP-A-53-143323, JP-A-54-99431, JP-A-56-71061; European Patents 53,037 and 53,040, Research Disclosure, 17630 (1978) and Research Disclosure, 16475 (1977).

(2) Silver Halide Emulsions

15 The silver halide emulsions which are used in the present invention may be negative emulsions in which the latent image is formed principally on the surface of the silver halide grains, or internal latent image type direct positive emulsions in which the latent image is formed in the interior of the silver halide grains.

20 The internal latent image type direct positive emulsions are, for example, so-called "conversion" emulsions which have been made using differences in the solubilities of silver halides, or "core/shell" type emulsion in which at least the photosensitive sites of the internal (core) grains of a silver halide which has been doped with metal ions or chemically sensitized, or both doped with metal ions and chemically sensitized, are covered with an outer mantle (shell) of silver halide. These have been disclosed, for
25 example, in U.S. Patents 2,592,250 and 3,206,313, British Patent 1,027,146, U.S. Patents 3,761,276, 3,935,014, 3,447,927, 2,497,875, 2,563,785, 3,551,662 and 4,395,478, West German Patent 2,728, 108, and U.S. Patent 4,431,730.

Furthermore, when internal latent image type direct positive emulsions are used, it is necessary to introduce fogging nuclei onto the grain surface by means of an exposure to light after the imagewise
30 exposure, or by means of a nucleating agent.

Nucleating agents which can be used for this purpose include, for example, the hydrazines disclosed in U.S. Patents 2,563,785 and 2,588,982; the hydrazides and hydrazones disclosed in U.S. Patent 3,227,552; the heterocyclic quaternary salt compounds disclosed, for example, in British Patent 1,283,835, JP-A-52-69613, and U.S. Patents 3,615,615, 3,719,494, 3,734,738, 4,094,683 and 4,115,122; the sensitizing dyes
35 which have substituent groups which have a nucleating action within the dye molecule as disclosed in U.S. Patent 3,718,470; thiourea bond type acylhydrazine based compounds as disclosed, for example, in U.S. Patents 4,030,925, 4,031,127, 4,245,037, 4,255,511, 4,266,013 and 4,276,364, and British Patent 2,012,443, and the acylhydrazine based compounds which have a thioamido group, or a heterocyclic group, such as a triazole or a tetrazole, as an adsorption group as disclosed, for example, in U.S. Patents 4,080,270 and
40 4,278,748, and British Patent 2,011,391B.

Spectrally sensitizing dyes can be used in combination with these negative type emulsions and internal latent image type direct positive emulsions in this invention. Specific examples have been disclosed, for example, in JP-A-59-180550, JP-A-60-140335, Research Disclosure 17029, and U.S. Patents 1,846,300, 2,078,233, 2,089,129, 2,165,338, 2,231,658, 2,917,516, 3,352,857, 3,411,916, 2,295,276, 2,481,698,
45 2,688,545, 2,921,067, 3,282,933, 3,397,060, 3,660,103, 3,335,010, 3,352,680, 3,384,486, 3,623,881, 3,718,470 and 4,025,349.

(3) Structure of the Photosensitive Layer

50 At least two photosensitive layers in which silver halide emulsions, which have been spectrally sensitized with the above mentioned spectrally sensitizing dyes, are combined with the aforementioned dye image forming substances which provide dyes having a selective spectral absorbance in the same wavelength range are required to reproduce natural colors using the subtractive color method. The emulsion
55 and the dye image forming substance can be established by coating as separate laminated layers or they can be mixed together and established by coating as a single layer. In cases where, in the coated state, the dye image forming substance has an absorption in the spectrally sensitive region of the emulsion with which it is combined, the two are preferably coated in separate layers. Furthermore, the emulsion layer may

consist of a plurality of emulsion layers which have different speeds, and optional layers may be established between the emulsion layers and the dye image forming substance layer. For example, layers which contain nucleation development accelerating agents as disclosed in JP-A-60-173541 and separating layers as disclosed in JP-B-60-15267 may be established in order to increase the colored image density. Further, reflecting layers as disclosed in JP-A-60-91354 can be established in order to increase the sensitivity of the photosensitive element.

In the preferred laminated structure, the blue sensitive emulsion combination unit, the green sensitive emulsion combination unit and the red sensitive emulsion combination unit are established in this order from the side which is to be exposed to light.

Optional layers can be established, as required, between each of the emulsion layer units. The establishment of intermediate layers is especially desirable for preventing the effect of the development of a certain emulsion layer from having an unwanted effect (such as poor color reproductivity by color mixing) in another emulsion layer unit.

Intermediate layers which contain non-diffusible reducing agents are preferred in cases where developing agents are used in combination with non-diffusible dye image forming substances in order to prevent the diffusion of the oxidized form of the developing agent. Specific examples include non-diffusible hydroquinones sulfonamido phenols and sulfonamido naphthols. Examples have been disclosed in JP-B-50-21249, JP-B-50-23813, JP-A-49-106329, JP-A-49-129535, U.S. Patents 2,336,327, 2,360,290, 2,403,721, 2,544,640, 2,732,300, 2,782,659, 2,937,086, 3,637,393 and 3,700,453; British Patent 557,750; JP-A-57-24941 and JP-A-58-21249. Furthermore, methods for their dispersion have been disclosed in JP-A-60-238831 and JP-B-60-18978.

The inclusion in the intermediate layers of compounds which trap silver ions is desirable in cases where compounds with which the diffusible dye is released by silver ions, as disclosed in JP-B-55-7576, are being used.

Anti-irradiation layers, separating layers and protective layers, etc. can be established by coating, as required, in this invention.

G) The Processing Composition

The processing compositions used in the invention are spread uniformly over the photosensitive element after the photosensitive element has been exposed. Together with the light shielding layer, which has been established on the back of the support or on the opposite side of the photosensitive layer from the processing fluid, they completely shield the photo-sensitive layer from external light. At the same time, the photosensitive layer is developed by means of the components contained within the composition. For these purposes, the composition contains an alkali, a viscosity increasing agent, light shielding agent, developing agent and, moreover, development accelerators and development inhibitors for controlling development, and antioxidants, etc. for preventing the deterioration of the developing agent. A light shielding agent is always included in the composition.

The alkali is one which provides a fluid pH of 12 to 14, and examples include alkali metal hydroxides (for example, sodium hydroxide, potassium hydroxide, lithium hydroxide), alkali metal phosphates (for example, potassium phosphate), guanidines, and the hydroxides of quaternary amines (for example, tetramethylammonium hydroxide). Among these, the use of potassium hydroxide or sodium hydroxide is preferred.

The viscosity increasing agents are required to spread the processing fluid evenly and to maintain the adhesion between the photosensitive layer and cover sheet when the used photosensitive layer is peeled away together with the cover sheet. For example, use can be made of poly(vinyl alcohol), hydroxyethylcellulose and alkali metal salts of carboxymethylcellulose. Hydroxy ethylcellulose and sodium carboxymethylcellulose are preferred.

Any dyes or pigments or combinations thereof, can be used as the light shielding agent provided that they diffuse into the dye image receiving layer and do not cause staining. Carbon black is typical of the materials used for this purpose, but combinations of dyes and titanium white can also be used. Temporary light shielding dyes which become colorless a fixed time after processing can also be used as dyes for this purpose.

The preferred developing agents are any of those which undergo cross oxidation of the dye image forming substance and which cause essentially no staining even when oxidized. Developing agents of this type can be used individually or two or more types can be used in combination. Precursors of developing agents can also be used. These developing agents may be included in an appropriate layer of the

photosensitive element or in the alkaline processing fluid. Aminophenols and pyrazolidinones are examples of such compounds, but among these, the use of the pyrazolidinones is preferred because of the lower degree of staining.

For example, use can be made of 1-phenyl-3-pyrazolidinone, 1-p-tolyl-4,4-dihydroxymethyl-3-pyrazolidinone, 1-(3'-methylphenyl)-4-methyl-4-hydroxymethyl-3-pyrazolidinone, 1-phenyl-4-methyl-4-hydroxymethyl-3-pyrazolidinone or 1-p-tolyl-4-methyl-4-hydroxymethyl-3-pyrazolidinone.

H) The Cover Sheet, etc

A transparent cover sheet is used for spreading the processing fluid uniformly over the photosensitive element in this invention, and a dye trapping layer is provided as the outermost layer on the side of the cover sheet on which the processing fluid is spread.

Any smooth, transparent support normally used in photographic materials can be used as the cover sheet which is used in the invention. Materials such as cellulose acetate, polystyrene, polyethyleneterephthalate and polycarbonate can be used for this purpose, and they may be provided with an under-layer.

The cover sheet is peeled away together with the processing fluid and the used photosensitive layer after processing. The cover sheet can be provided with a neutralizing function in order to control the supplementary neutralization rate and/or to increase the safety of the waste part. When a neutralizing function is provided, it is preferably established by coating a layer which has a neutralizing function on the support side of the dye trapping layer. Furthermore, filter dyes may be included in the cover sheet to adjust the sensitivity of the photosensitive layer. The filter dyes may be added directly into the cover sheet support, or they can be established by coating a separate layer.

The film units of this invention can be finished as mono-sheets using masking materials, spacer rails, excess fluid trapping materials, etc. as disclosed in JP-B-48-33697, JP-A-48-43317, JP-A-50-153628, JP-A-52-11027 and JP-A-56-48629.

The introduction of slits as disclosed in Research Disclosure No. 23026 (1983) is especially effective for facilitating peeling after processing. The form and depth of the slits is selected in accordance with the properties of the support which is being used.

It is necessary to produce a mirror image of the subject being photographed on the film in order to take a photograph using film units of this invention. It is necessary to use a mirror for this purpose.

Cameras of this type are disclosed in U.S. Patent 3,447,437.

The present invention is described in greater detail with reference to the following examples. Unless otherwise indicate, all parts, percents, ratios, etc. are by weight.

EXAMPLE 1

The Image Receiving Photosensitive Sheet (1)

The Layers (A) and (B) indicated below were established by coating on one side of a PET support which contained titanium white pigment, after which the layers (1) to (26) indicated below were established sequentially by coating on the other side of the support to provide an image receiving photosensitive sheet (1).

(A) A light shielding layer containing 3.0 g/m² of carbon black and 4.5 g/m² of gelatin.

(B) A white layer containing 3.0 g/m² of titanium white and 1.0 g/m² of gelatin.

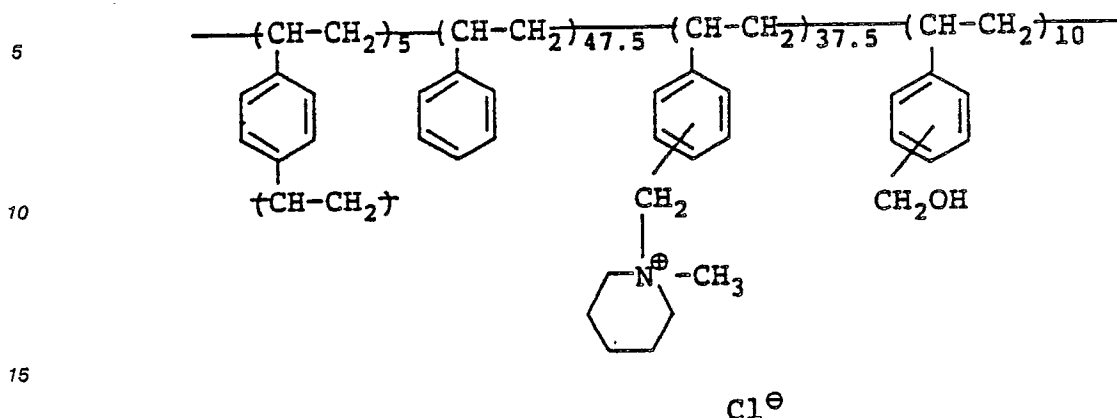
(1) A neutralizing layer containing 4.0 g/m² of poly(acrylic acid), 4.0 g/m² of poly(vinyl alcohol) and 0.04 g/m² of 1,4-bis(2,3-epoxypropoxy)butane.

(2) A timing layer containing 6 g/m² of a 95:5 (by weight) mixture of 55% acetylated cellulose acetate and the methyl half esters of a methyl vinyl ether/maleic anhydride (mol ratio 1:1) copolymer.

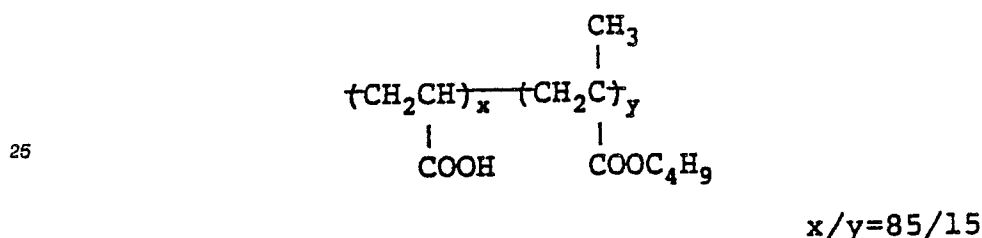
(3) An adhesion reinforcing layer containing 0.4 g/m² of hydroxyethyl methacrylate.

(4) A layer containing 2.5 g/m² total solid fraction of a mixture blended in the proportions of solid fraction 6:4 of a polymer latex obtained by the emulsion polymerization of styrene/butyl acrylate/acrylic acid/N-methylolacrylic acid amide in the proportions by weight of 49.7/42.3/4/4 and a polymer latex obtained by the emulsion polymerization of methyl methacrylate/acrylic acid/N-methylolacrylamide in the proportions by weight of 93/3/4.

(5) A mordanting layer containing 3 g/m² of the polymer latex mordant indicated below and 3 g/m² of gelatin.



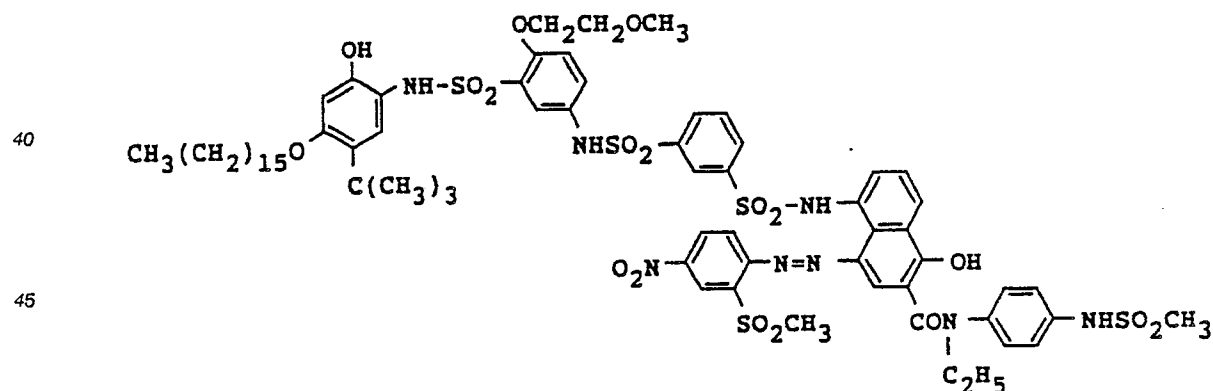
(6) A first peeling layer containing 0.1 g/m² of the compound indicated below.



(7) A second peeling layer containing 0.7 g/m² of 51% acetylated cellulose acetate.

(8) A layer containing 1 g/m² of ethyl acrylate latex and 2.5 g/m² of gelatin.

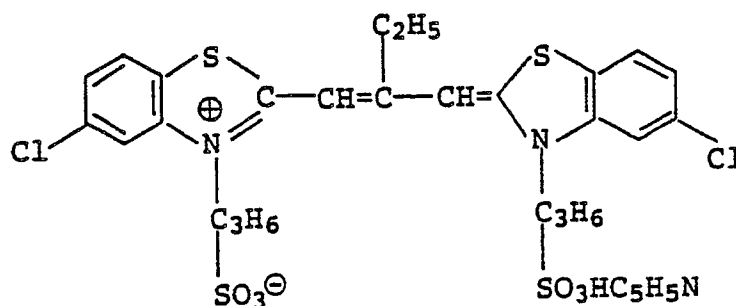
(9) A layer containing 0.44 g/m² of the cyan dye releasing redox compound indicated below, 0.09 g/m² of tricyclohexyl phosphate, 0.008 g/m² of 2,5-di-tert-pentadecylhydroquinone and 0.05 g/m² of carbon black and 0.8 g/m² of gelatin.



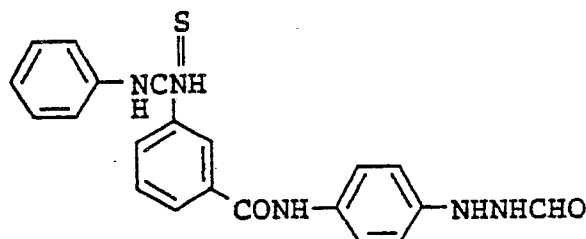
(10) A light reflecting layer containing 2 g/m² of titanium oxide and 0.5 g/m² of gelatin.

(11) A low speed red sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size 1.0 μm (0.15 g/m² as silver), 1.4 mg/g as silver of the red sensitive sensitizing dye indicated below, 0.4 g/m² of gelatin, 1.1 μg/m² of the nucleating agent (NA) indicated below, and 0.02 g/m² of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.

Red Sensitive Sensitizing Dye



NA

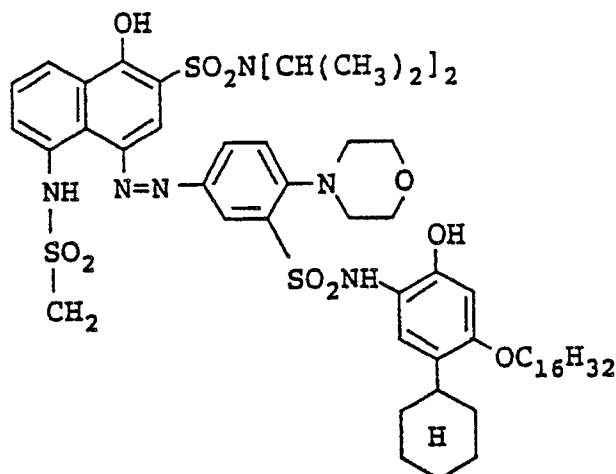


(12) A high speed red sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size $1.6 \mu\text{m}$ (0.5 g/m^2 as silver), the same amount of the red sensitive sensitizing dye as in layer (11), 0.8 g/m^2 of gelatin, $3.0 \mu\text{g/m}^2$ of the same nucleating agent (NA) as in layer (11), and 0.04 g/m^2 of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.

(13) An anti-color mixing layer containing 1.2 g/m^2 of 2,5-di-tert-pentadecylhydroquinone, 1.2 g/m^2 of poly(methyl methacrylate) and 0.7 g/m^2 of gelatin.

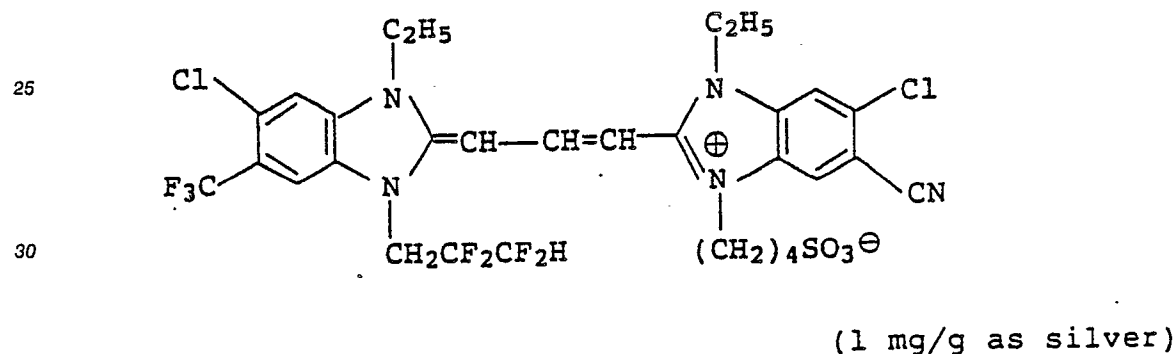
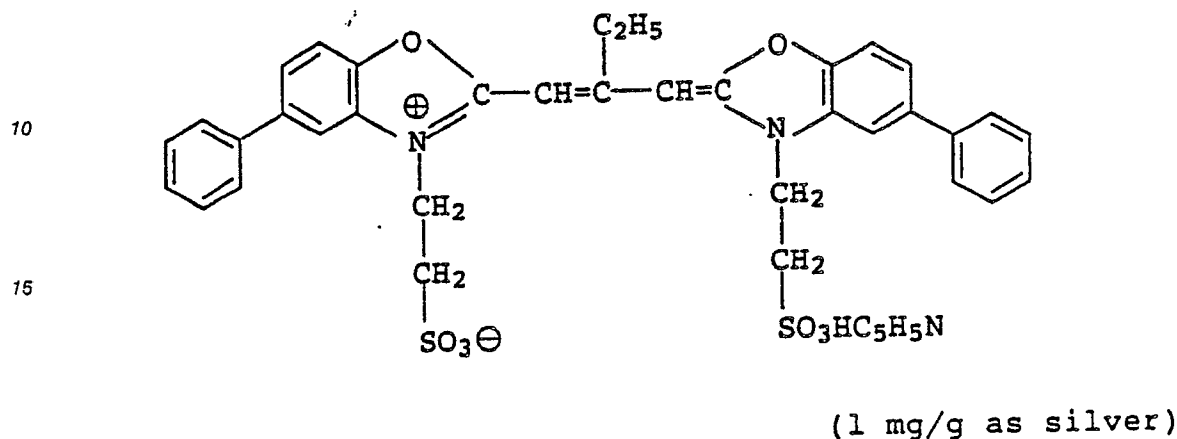
(14) A layer containing 0.3 g/m^2 of gelatin.

(15) A layer containing 0.15 g/m^2 of the magenta dye releasing redox compound indicated below, 0.1 g/m^2 of tricyclohexyl phosphate, 0.009 g/m^2 of 2,5-di-tert-pentadecylhydroquinone and 0.9 g/m^2 of gelatin



(16) A light reflecting layer containing 1 g/m² of titanium oxide and 0.2 g/m² of gelatin.

(17) A low speed green sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size 1.0 μm (0.12 g/m² as silver), the mixture of the green sensitive sensitizing dyes indicated below, 0.25 g/m² of gelatin, 1.1 μg/m² of the same nucleating agent (NA) as used in layer (11), and 0.02 g/m² of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.

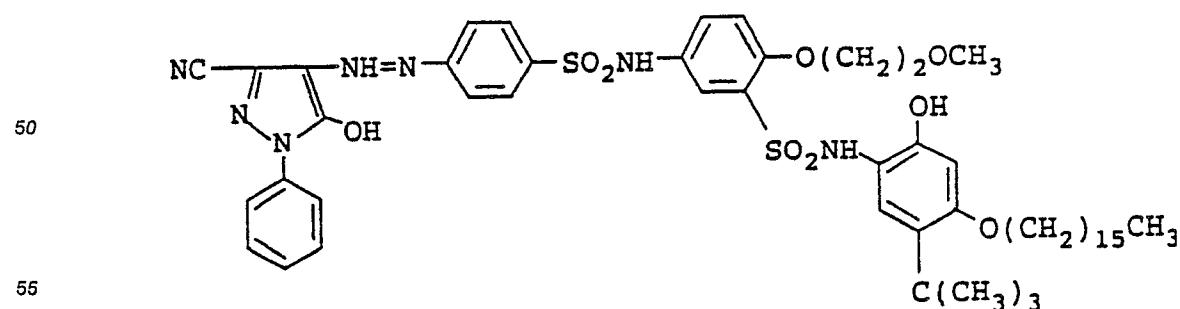


(18) A high speed green sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size 1.6 μm (0.35 g/m² as silver), the same amount of the green sensitive sensitizing dye mixture as in layer (17), 0.7 g/m² of gelatin, 1.7 μg/m² of the same nucleating agent (NA) as used in layer (11), and 0.04 g/m² of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.

(19) An anti-color mixing layer containing 0.8 g/m² of 2,5-di-tert-pentadecylhydroquinone, 0.8 g/m² of poly(methyl methacrylate) and 0.45 g/m² of gelatin.

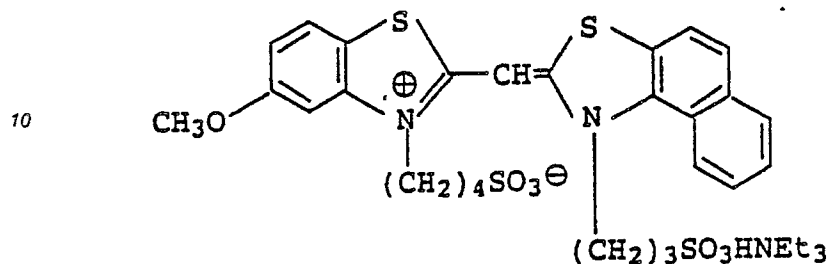
(20) A layer containing 0.3 g/m² of gelatin.

(21) A layer containing 0.53 g/m² of the yellow dye releasing redox compound indicated below, 0.13 g/m² of tricyclohexyl phosphate, 0.014 g/m² of 2,5-di-tert-pentadecylhydroquinone and 0.7 g/m² of gelatin.

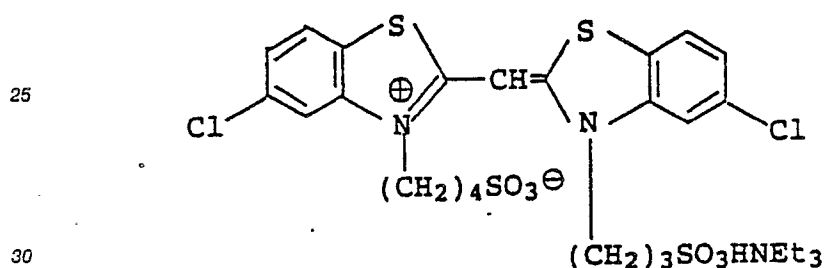


(22) A light reflecting layer containing 0.7 g/m² of titanium oxide and 0.18 g/m² of gelatin.

(23) A low speed blue sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size 1.1 μm (0.25 g/m² as silver), the mixture of the blue sensitive sensitizing dyes indicated below, 0.4 g/m² of gelatin, 2 μg/m² of the same nucleating agent (NA) as used in layer (11), and 0.045 g/m² of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.



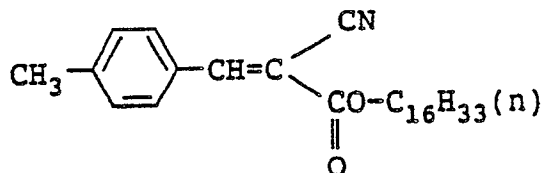
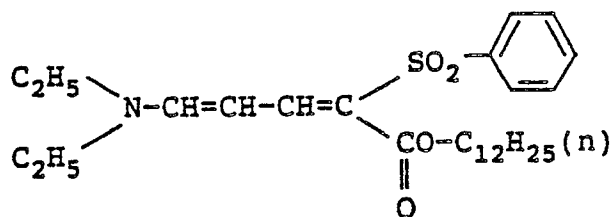
(0.4 mg/g as silver)



(0.8 mg/g as silver)

(24) A high speed blue sensitive emulsion layer containing an octahedral internal latent image type direct positive silver bromide emulsion of grain size 1.7 μm (0.42 g/m² as silver), the same amount of the blue sensitive sensitizing dye mixture as in layer (23), 0.45 g/m² of gelatin, 3.3 μg/m² of the same nucleating agent (NA) as used in layer (11), and 0.025 g/m² of the sodium salt of 2-sulfo-5-n-pentadecylhydroquinone.

(25) An ultraviolet absorbing layer containing 4x10⁻⁴ mol/m² of each of the ultraviolet absorbers indicated below, and 0.5 g/m² of gelatin.



(26) A protective layer containing a matting agent and 1.0 g/m² of gelatin.

The Cover Sheets

The cover sheets (A) to (F) indicated below were each prepared using a transparent polyethylene terephthalate support which had 0.05 g/m² of a gelatin under-layer and which contained dyes for preventing light piping.

Cover Sheet (A)

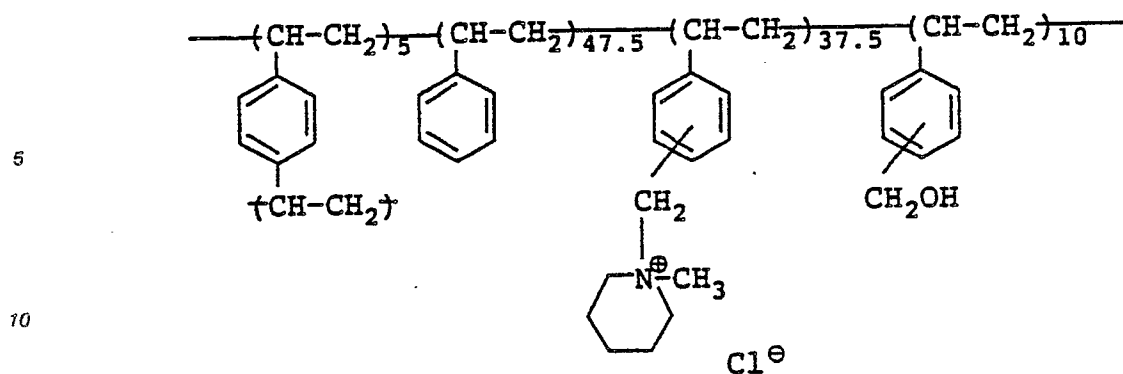
The aforementioned support was used without further treatment.

Cover Sheet (B)

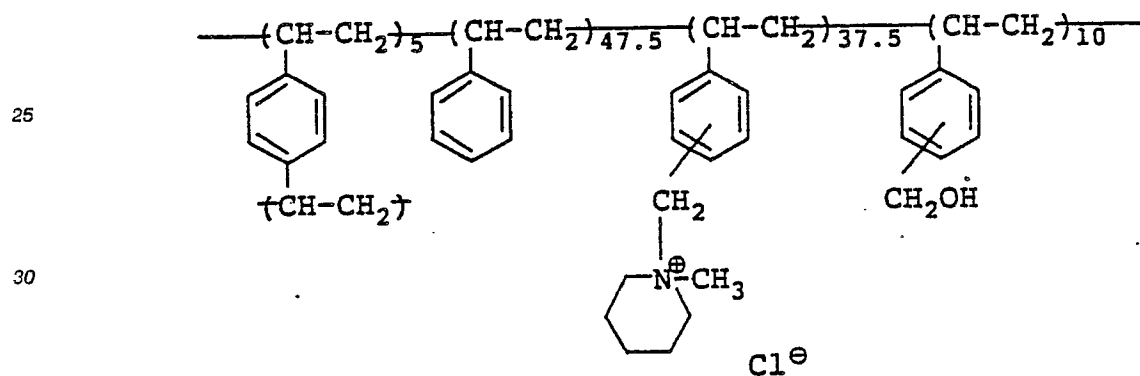
A cover sheet prepared by establishing by coating a layer containing 3 g/m² of gelatin on the aforementioned support.

Cover Sheet (C)

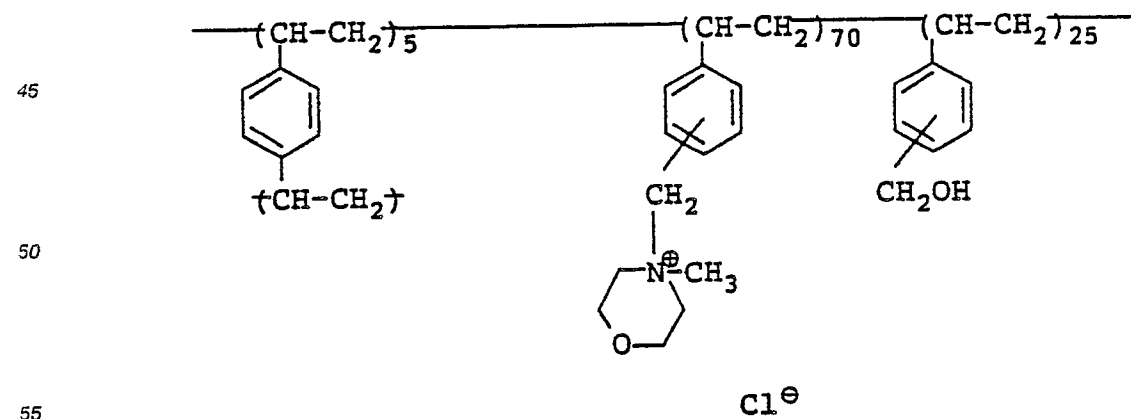
A dye trapping layer containing 1 g/m² of the polymer latex mordant indicated below and 1 g/m² of gelatin was established by coating on the aforementioned support.

Cover Sheet (D)

20 A dye trapping layer containing 3 g/m² of the polymer latex mordant indicated below and 3 g/m² of gelatin was established by coating on the above-mentioned support.

Cover Sheet (E)

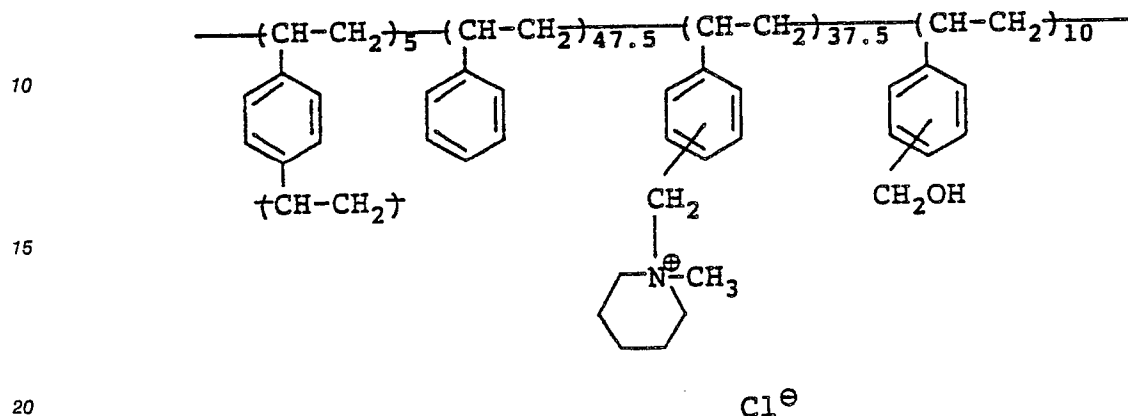
40 A dye trapping layer containing 1 g/m² of the polymer latex mordant indicated below and 1 g/m² of gelatin was established by coating on the above-mentioned support.



Cover Sheet (F) (For-Comparison)

Cover sheet (F) was prepared by establishing by coating the layers (1) and (2) indicated below on the aforementioned support.

- 5 (1) A trapping mordant which contained 1 g/m² of the polymer latex mordant indicated below and 1 g/m² of gelatin.



- (2) A layer containing 1 g/m² of 55% acetylated acetylcellulose.

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Cover Sheet (G)

- 30 A trapping mordant layer which contained 2 g/m² of 55% acetylated acetylcellulose and 1 g/m² of poly-(vinylbenzylammonium chloride) was established by coating on the aforementioned support.

Cover Sheet (H)

- 35 The layers (1) to (3) indicated below were established by coating on the aforementioned support.

(1) A neutralizing layer containing 3 g/m² of cellulose acetate (55.5% acetylated) and 2 g/m² of a methyl vinyl ether/maleic anhydride copolymer.

- 40 (2) A layer containing 3.9 g/m² as total solid fraction of a 5:5, as solid fractions, a blend of a polymer latex obtained by the emulsion polymerization of styrene/butyl acrylate/acrylic acid/N-methylolacrylamide in the proportions, by weight, of 49.7/42.3/4/4, and a polymer latex obtained by the emulsion polymerization of methyl methacrylate/acrylic acid/N-methylolacrylamide in the proportions, by weight, of 93/3/4.

(3) A similar dye trapping layer to that used for cover sheet (C).

- 45 The aforementioned image receiving photo-sensitive sheet was exposed through a color test chart and then laminated with aforementioned cover sheets (A) to (G) and the processing fluid described blow was spread to a thickness of 80μ between the two sheets in each case (the spreading of the fluid was achieved with the assistance of a pressing roller). Processing was carried out at 25° C and the units were peeled apart after processing for 2 minutes 30 seconds or 10 minutes.

- 50 Peeling took place at the peeling layer within the photosensitive sheet, and the color picture could be viewed directly.

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Processing Fluid	
1-m-Tolyl-4-hydroxymethyl-4-methyl-3-pyrazolidone	10 g
1-Phenyl-4-hydroxymethyl-4-methyl-3-pyrazolidone	4 g
5-Methylbenzotriazole	5.4 g
Benzotriazole	6 g
Potassium sulfite	8 g
Hydroxyethylcellulose	45 g
Potassium hydroxide	64 g
Benzyl alcohol	3.4 g
Carbon black	150 g
Water to make up to total weight of	1 kg

The maximum densities at each peeling time and the ratio (%) of the density observed at 2 minutes 30 seconds to that observed on peeling after 10 minutes were measured, and the results obtained are shown in Table 1. The density was measured by TCD of Fuji Photo Film Co., Ltd.

The cases in which a cover sheet having a dye trapping layer in accordance with this invention were compared with those in which there was no dye trapping layer, those in which the mordant layer was on the opposite side from the processing fluid of a neutralization timing layer as a trapping mordant layer, and those in which the mordant was contained in a neutralization timing layer. Although the maximum density after 10 minutes was reduced, the B density in particular was higher after 2 minutes 30 seconds and development was accelerated.

The transfer density ratio at 2 minutes 30 seconds was also especially good for B, and consequently the tricolor transfer balance held and this was excellent. In the comparative cover sheets, there were marked changes in the color balance from 2 minutes 30 seconds to 10 minutes, causing them to be unsatisfactory for commercial use.

Table 1

Cover Sheet	Maximum Density						Density Ratio (%)		
	Peeled after 2.5 minutes			Peeled after 10 minutes			B	G	R
	B	G	R	B	G	R			
(A) Comparative Example	0.82	1.65	2.04	2.10	2.20	2.39	39	75	85
(B) Comparative Example	0.85	1.65	1.96	2.13	2.08	2.29	40	78	86
(C) This Invention	1.13	1.50	1.75	1.60	1.85	2.10	71	81	83
(D) This Invention	1.14	1.46	1.74	1.61	1.80	2.08	71	81	84
(E) This Invention	1.11	1.48	1.72	1.63	1.85	2.10	68	80	82
(F) Comparative Example	0.83	1.55	1.92	2.04	2.10	2.25	41	74	85
(G) Comparative Example	0.79	1.60	1.95	1.91	2.04	2.27	41	78	86
(H) This Invention	1.14	1.46	1.77	1.60	1.82	2.12	71	80	83
B: Reflective optical density determined through a blue filter									
G: Reflective optical density determined through a green filter									
R: Reflective optical density determined through a red filter									

EXAMPLE 2

The image receiving photosensitive sheet of Example 1 was exposed through a fine line wedge for the evaluation of sharpness and then processed in the same way as in Example 1 using the cover sheets and processing fluid used in Example 1. The units were peeled apart after 10 minutes.

The results obtained are shown in Table 2. In comparison with the comparative cover sheets, the cover sheets of this invention were such that the spatial frequency at which the CTF became 0.5 was high, and

the sharpness was clearly very good.

Table 2

Cover Sheet	Spatial Frequency (G) at which the CTF became 0.5 (1/mm)
(A) For Comparison	2.3
(B) For Comparison	2.5
(C) This Invention	3.2
(D) This Invention	3.3
(E) This Invention	3.2
(F) For Comparison	2.5
(G) For Comparison	2.4
(H) This Invention	3.3

EXAMPLE 3

An image receiving photosensitive sheet (2) was prepared in the same way as in Example 1 except that the coated weights of various layers in the image receiving photosensitive sheet in Example 1 were increased as indicated below:

Layer (12) by 1.3 times
 Layer (15) by 1.3 times
 Layer (17) by 1.3 times
 Layer (18) by 1.5 times
 Layer (21) by 1.5 times
 Layer (23) by 1.5 times
 Layer (34) by 1.7 times

The results obtained on processing in the same way as in Example 1 using the cover sheet (C) and the processing fluid used in Example 1 are shown in Table 3.

Table 3

	Maximum Density		
	B	G	R
Peeled after 2.5 minutes	1.41	1.63	1.82
Peeled after 10 minutes	2.03	2.02	2.15

This shows that an increase in the coated weights is effective as a means of restoring the lowering of density which results from the presence of the dye trapping layer. The results also show that it is possible to obtain, by means of this invention, color diffusion transfer photographic materials which have a high transfer density, little change in color balance, and with which a picture is formed rapidly.

EXAMPLE 4

Processing was carried out in the same way as in Example 1 using the image receiving photosensitive sheet, cover sheets and processing fluid used in Example 1, and the image was viewed from the cover sheet side 2 minutes after spreading the processing fluid.

Table 4

Cover Sheet	
(A)	No image to be seen.
(B)	A faint image was observed but this faded gradually.
(C)	A faint image was observed.
(D)	A faint image was observed.
(E)	A faint image was observed.
(F)	Virtually no image to be seen.
(G)	Virtually no image to be seen.
(H)	A faint image was observed.

A faint image was seen from the cover sheet side when the invention is used, but this was far obtaining a colored image with a minimum density of 2.05.

EXAMPLE 5

The processed film units (C), (D) and (E) in Example 4 were peeled apart after 60 minutes and washed with water to leave just the dye trapping layer, and the image was observed. The density, however, was very low, there was a yellow balance and it could not be said that color pictures were obtained.

Table 5

Cover Sheet	Transmission Optical Density		
	B	G	R
(C)	0.82	0.49	0.35
(D)	0.98	0.55	0.39
(E)	0.86	0.50	0.37

EXAMPLE 6

Processing was carried out in the same way as in Example 1 using the image receiving photosensitive sheet (1) of Example 1 and the image receiving photosensitive sheet (3) which was prepared in the same way except that the layers (1) to (4) in the image receiving photosensitive sheet in Example 1 were omitted, and the cover sheet (D) and processing fluid used in Example 1, and the minimum densities were measured on peeling apart after 60 minutes.

Table 6

Image Receiving Photosensitive Sheet	Minimum Density		
	B	G	R
(1) This Invention	0.16	0.09	0.18
(3) For Comparison	0.28	0.25	0.42

In the comparative image receiving photo-sensitive sheet with no neutralizing function, the minimum

density was markedly increased and a satisfactory image was not obtained. Moreover, the processing fluid components precipitated after peeling and drying; the surface had no luster and only prints which had a poor finish were obtained. Moreover, the sharpnesses were compared on peeling after 60 minutes of processing in the same way as in Example 2.

Table 7

Image Receiving Photosensitive Sheet	Spatial Frequency (G) at which the CTF became 0.5 (1/mm)
(1) This Invention	3.0
(3) Comparative Example	2.2

The neutralizing function is clearly also essential from the point of view of sharpness.

EXAMPLE 7

Image receiving photosensitive sheets were prepared by changing the support in Example 1.

Image Receiving Photosensitive Sheet (4)

The layers (1) to (26) and the layers (A) and (B) used for the image receiving photosensitive sheet (1) were established by coating on a support obtained by providing an under-layer of gelatin on a 135 g/m² weight paper support which had been laminated with polyethylene.

Image Receiving Photosensitive Sheet (5)

The layers (A) and (B) and the layers (1) to (4) of the image receiving photosensitive sheet (1), a white reflecting layer (4') containing 2 g/m² of gelatin and 18 g/m² of titanium oxide, and the layers (5) to (26) were established by sequentially coating them on a transparent polyethyleneterephthalate support which had been provided with a gelatin under-layer.

Combinations of the image receiving photo-sensitive sheets (1), (4) and (5) with the cover sheet (D) and the processing fluid used in Example 1 were spread and processed in the same way as in Example 1 and immediately illuminated with white light, and then peeled apart after 4 minutes. In both cases, beautiful color pictures like those obtained with the image receiving photosensitive sheet (1) were obtained.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

Claims

1. A color diffusion transfer photographic film unit, comprising a support which is rendered both light shielding and light reflecting on and/or in the support, provided thereon a photosensitive element containing (a) a layer which has a neutralizing function, (b) a dye image receiving layer, (c) a peeling layer, and (d) at least one silver halide emulsion layer associated with at least one dye image forming substance, an alkali processing composition which contains a light shielding agent, and a transparent cover sheet, wherein said cover sheet contains a dye trapping layer.

2. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is a white support and is rendered light-shielding by providing a light-shielding layer on either surface of said support.

3. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is a black support and is rendered light-reflecting by providing a light-reflecting layer between said support and said dye image receiving layer.

4. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is rendered light-reflecting by providing a light- reflection layer between said support and said dye image receiving layer and wherein said support is rendered light-shielding by providing a light-shielding layer between said support and said light-reflecting layer.

5 5. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is a white support which is rendered light-shielding by providing a light-shielding layer between said peeling layer and said at least one silver halide emulsion layer.

6. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is rendered light-reflecting by providing a light-reflection layer between said support and said dye image receiving layer and which is rendered light-shielding by providing a light-shielding layer between said peeling layer and said at least one silver halide emulsion layer.

7. A color diffusion transfer photographic film unit as recited in Claim 1, wherein said support is rendered light-reflecting by providing a light-reflecting layer on the side of said dye image receiving layer opposite to said at least one silver halide emulsion layer.

15 8. A color diffusion transfer photographic film unit as recited in Claim 1, wherein the distance between the dye image forming substance layer closest to the dye image receiving layer and the dye image receiving layer is not more than 5 μm .

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