

[54] **DIFFUSIBLE COLOR COUPLER
MOIETIES ARE RELEASED FROM
NONDIFFUSIBLE M-
SULFOAMIDOANILINES OR M-
SULFOAMIDOPHENOLS IN DIFFUSION
TRANSFER PHOTOGRAPHIC
PRODUCTS AND PROCESSES**

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96/55, 77, 74, 99, 100

[56] **References Cited**

UNITED STATES PATENTS

2,543,338 2/1951 Schmidt et al.....96/100 X

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and Harold E. Cole

[57] **ABSTRACT**

Color, diffusion transfer photographic elements, film units and processes are described which employ a nondiffusible, substantially colorless m-sulfonamidoaniline or m-sulfonamidophenol which reacts with oxidized color developing agent to release a coupler moiety which couples with oxidized color developing agent to produce a diffusible dye which diffuses to a dye image-receiving layer.

20 Claims, No Drawings

**DIFFUSIBLE COLOR COUPLER MOIETIES ARE
RELEASED FROM NONDIFFUSIBLE
M-SULFOAMIDOANILINES OR
M-SULFONAMIDOPHENOLS IN DIFFUSION
TRANSFER PHOTOGRAPHIC PRODUCTS AND
PROCESSES**

This invention relates to photography and more particularly to color, diffusion transfer photography employing dye image-providing materials which are m-sulfonamidoanilines or m-sulfonamidophenols which produce a diffusible dye upon reaction with a color developing agent.

Color, diffusion transfer processes of the prior art such as U.S. Pat. No. 2,983,606 generally involve the use of a photographic element comprising a support, at least one silver halide emulsion layer, and contained therein or contiguous thereto, a dye developer. A liquid processing composition is applied to the photosensitive element and permeates the emulsion to provide a solution of the dye developer substantially uniformly distributed therein. As the exposed silver halide emulsion is developed, the oxidation product of the dye developer is immobilized or precipitated in situ with the developed silver, thereby providing an imagewise distribution of unoxidized dye developer dissolved in the liquid processing composition. This immobilization is apparently due, at least in part, to a change in the solubility characteristics of the dye developer upon oxidation, and particularly as regards its solubility in alkaline solutions. At least part of this imagewise distribution of unoxidized dye-developer is transferred to a superposed image-receiving layer to provide the transfer image.

In these prior art systems, the developer moiety of the dye developer is transferred with the dye to the image-receiving layer. In the absence of some further treatment, such as pH reduction with an acid, the developer moiety can undergo aerial oxidation which will have a substantial effect upon the stability to light of the resulting dye developer image. Accordingly, it would be highly desirable to provide a transfer system in which only the desired chemical entity, i.e., the dye, is transferred to the receiver.

U.S. Pat. No. 2,543,338 describes how an azine dye image may be obtained by coupling oxidized color developing agent with m-sulfonamidoaniline derivatives. These compounds do not contain a second coupler moiety, however, which is capable of producing a diffusible dye imagewise.

In U.S. Pats. Nos. 3,443,939, 3,443,940, 3,443,943, and 3,498,785 and Belgian Patent 718,505, "splittable" ring-closing compounds such as dye developers are described wherein a diffusible dye moiety is split off the compound and transferred to provide the desired image while the remainder of the compound undergoes an internal cyclization or ring-closing reaction. Since a preformed dye is employed in these compounds, however, the location of these compounds in a photographic element is restricted in order to avoid speed loss. Thus, they must be placed in a layer underneath, with respect to exposure direction, the emulsion layer with which they are associated. It would be desirable to provide compounds which could be incorporated anywhere in the photographic element such as in the emulsion layer, as desired, in order to take advantage of quicker access time to the developer, fewer number of layers to be coated, etc.

It is therefore an object of this invention to provide photographic elements, film units and processes for producing a photographic transfer image in color wherein a substantially colorless dye image-providing material is employed.

It is another object of this invention to provide a photographic system wherein the dye image-providing material can be located in or above its associated emulsion layer with respect to the exposure direction.

It is still a further object of this invention to provide photographic systems for producing photographic transfer images in color in which the dye image-receiving layer can either be located on a separate support or can be located integral with the photosensitive element.

These and other objects are achieved by our invention which is described hereinafter.

A photographic film unit according to our invention which is adapted to be processed by passing the unit between a pair of juxtaposed pressure-applying members comprises:

a. a photosensitive element comprising a support having thereon at least one photosensitive silver halide emulsion layer, each silver halide emulsion layer having associated therewith a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of coupling with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;

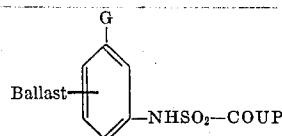
b. a dye image-receiving layer; and

c. means for discharging an alkaline processing composition within said film unit, preferably a rupturable container which is adapted to be positioned during processing of said film unit so that a compressive force applied to said container by the pressure-applying members will effect a discharge of the container's contents within said film unit;

the film unit containing an aromatic, primary amino color developing agent.

A photosensitive element according to our invention is set forth in a) in the film unit described above.

The above-described sulfonamido compounds may be represented by the following formula:



wherein:

1. COUP is a photographic coupler capable of reacting with oxidized aromatic primary amino color developing agent to produce a diffusible dye,
2. Ballast is an organic ballasting radical of such molecular size and configuration as to render the compound nondiffusible during development in an alkaline processing composition; and
3. G is OR or NR₁R₂ wherein R is hydrogen or a hydrolyzable moiety and R₁ and R₂ are each hydrogen or an alkyl group.

A process for producing a photographic transfer image in color according to our invention comprises:

a. treating the above-described photosensitive element with an alkaline processing composition in the presence of said silver halide developing agent to effect

development of each of the exposed silver halide emulsion layers, thereby oxidizing the developing agent;

b. the oxidized developing agent thereby reacting with each sulfonamido compound to release the coupler moiety, which couples with oxidized color developing agent to form an image-wise distribution of diffusible dye as a function of the imagewise exposure of each of the silver halide emulsion layers; and

c. at least a portion of each of the imagewise distributions of diffusible dye diffusing to a dye image-receiving layer to provide a positive image.

The photosensitive element in the above-described process can be treated with an alkaline processing composition to effect or initiate development in any manner. A preferred method for applying processing composition is by use of a rupturable container or pod which contains the composition. In general, the processing composition employed in our system contains the developing agent for development although the composition could also just be an alkaline solution where the developer is incorporated in the photosensitive element, in which case the alkaline solution serves to activate the incorporated developer.

The dye image-receiving layer in the above-described film unit can be located on a separate support adapted to be superposed on the photosensitive element after exposure thereof. Such image-receiving elements are generally disclosed, for example, in U.S. Pat. No. 3,362,819. A rupturable container is employed and is positioned in relation to the photosensitive element and the image-receiving element so that a compressive force applied to the container by pressure-applying members, such as would be found in a typical camera used for in-camera processing, will effect a discharge of the container's contents between the image-receiving element and the outermost layer of the photosensitive element. After processing, the dye image-receiving element is separated from the photosensitive element.

The dye image-receiving layer in the above-described film unit can also be located integral with the photosensitive element between the support and the lowermost photosensitive silver halide emulsion layer. A general format for integral receiver-negative photosensitive elements is disclosed in copending U.S. application Ser. No. 115,459 of Barr, Bush and Thomas filed Feb. 16, 1971 and now abandoned. In such an embodiment, the support for the photosensitive element is transparent and is coated with an image-receiving layer, a substantially opaque light-reflective layer, e.g., TiO_2 , and then the photosensitive layer or layers described above. After exposure of the photosensitive element, a rupturable container containing an alkaline processing composition and an opaque process sheet are brought into superposed position. Pressure-applying members in the camera rupture the container and spread processing composition over the photosensitive element as the film unit is withdrawn from the camera. The processing composition develops each exposed silver halide emulsion layer and dye images are formed as a function of development which diffuse to the image-receiving layer to provide a positive, right reading image which is viewed through the transparent support on the opaque reflecting layer background. For other details concerning the format of this particular integral film unit, reference is made to the above-mentioned Barr, Bush and Thomas U.S. application Ser. No. 115,459.

Another format for integral negative-receiver photosensitive elements in which the present invention can be employed is disclosed in Cole U.S. application Ser. No. 115,552 filed Feb. 16, 1971 and now abandoned.

In this embodiment, the support for the photosensitive element is transparent and is coated with the image-receiving layer, a substantially opaque, light-reflective layer, the photosensitive layer or layers described above, and a top transparent sheet. A rupturable container containing an alkaline processing composition and an opacifier is positioned adjacent to the top layer and sheet. The film unit is placed in a camera, exposed through the top transparent sheet and then passed through a pair of pressure-applying members in the camera as it is being removed therefrom. The pressure-applying members rupture the container and spread processing composition and opacifier over the negative portion of the film unit to render it light-sensitive. The processing composition develops each silver halide layer and dye images are formed as a result of development which diffuse to the image-receiving layer to provide a positive, right-reading image which is viewed through the transparent support on the opaque reflecting layer background. For further details concerning the format of this particular integral film unit, reference is made to the above-mentioned Cole U.S. application Ser. No. 115,552.

In the formula listed above for our compounds which are alkali-cleavable upon oxidation, R is preferably hydrogen, although it could be any hydrolyzable entity well known to those skilled in the art, e.g., acetyl, mono-, di- or trichloroacetyl radicals, perfluoracyl, pyruvyl, alkoxyacyl, nitrobenzoyl, cyanobenzoyl, sulfonyl, sulfinyl, etc.

In the above formula describing our compounds, R_1 and R_2 are each preferably hydrogen although one or both could be an alkyl group of from one to 22 carbon atoms which could serve as the Ballast group indirectly attached to the ring as defined below.

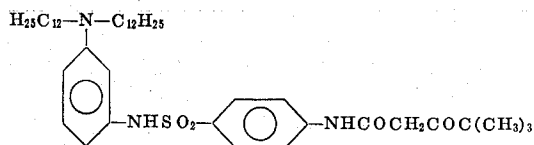
The nature of the ballast group in the formula for the compounds described above (Ballast) is not critical as long as it confers nondiffusibility to the compounds. Typical ballast groups include long-chain alkyl radicals linked directly or indirectly to the compound as well as aromatic radicals of the benzene and naphthalene series indirectly attached or fused directly to the benzene nucleus, etc. Useful ballast groups generally have at least 8 carbon atoms.

In addition to Ballast, the benzene nucleus in the above formula may have groups attached thereto such as the halogens, alkyl, aryl, alkoxy, aryloxy, nitro, amino, alkylamino, arylamino, amido, cyano, alkylmercapto, keto, carboalkoxy, etc. In addition, such groups may combine together with the carbon atoms to which they are attached on the ring to form another ring which may be saturated or unsaturated including a carbocyclic ring, a heterocyclic ring, etc.

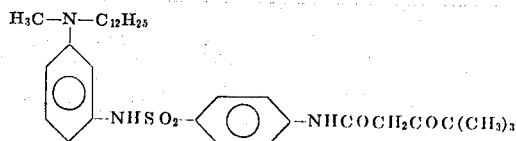
As previously mentioned, Coup in the above formula represents a photographic coupler. Coupler compounds are well known to those skilled in the art and include a phenol, naphthol, indazolone, open-chain benzoyl acetanilide, pivalylacetanilide, malonamide, malonanilide, cyanoacetyl, coumarone, pyrazolone, compounds described in U.S. Patent 2,756,142, etc. These compounds may contain a solubilizing group if desired.

Compounds within the scope of our invention include the following:

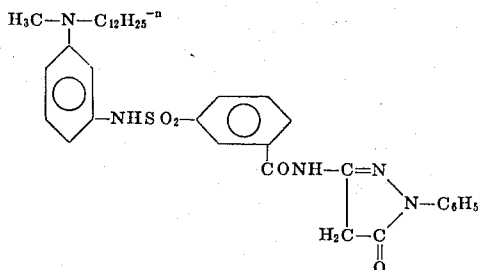
Compounds No. 1 Yellow dye-forming compounds



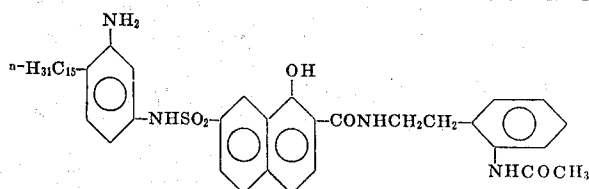
Compound No. 2 Yellow dye-forming compound



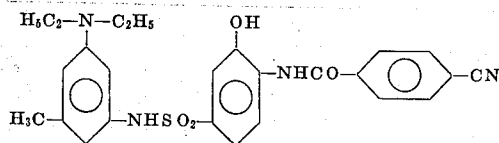
Compound No. 3 Magenta dye-forming compound



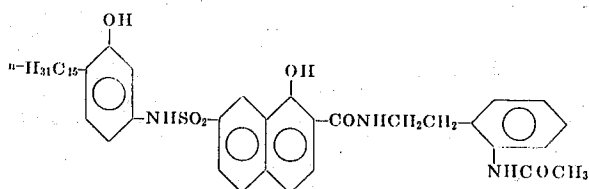
Compound No. 4 Cyan dye-forming compound



Compound No. 5 Cyan dye-forming compound



Compound No. 6 Cyan dye-forming compound



Of the above compounds, especially good results are obtained with Compound Nos. 1, 2 and 3.

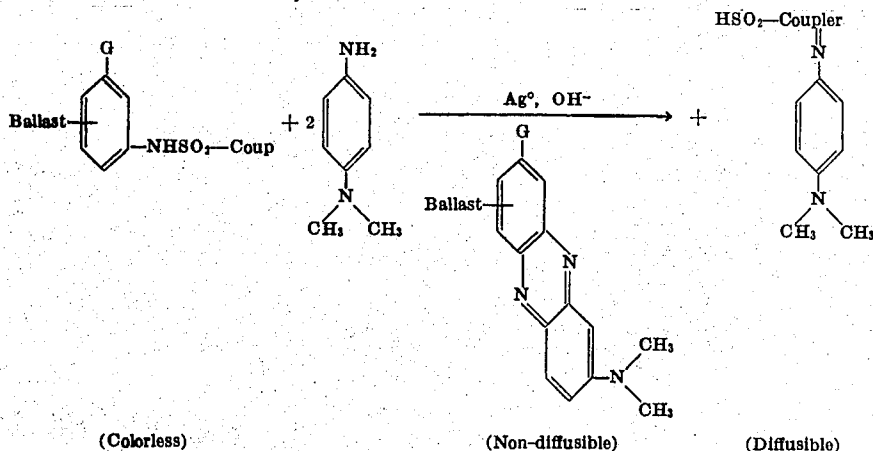
The film unit or assembly of the present invention may be used to produce positive images in single- or multicolors. In a three-color system, each silver halide emulsion layer of the film assembly will have associated therewith a dye image-providing material possessing a spectral absorption range substantially complementary to the predominant sensitivity range of its associated emulsion, i.e., the blue-sensitive silver halide emulsion layer will have a yellow dye image-providing material associated therewith, the green-sensitive silver halide emulsion layer will have a magenta dye image-providing material associated therewith, and the red-sensitive silver halide emulsion layer will have a cyan dye image-providing material associated therewith. The dye image-providing material associated with each silver halide emulsion layer may be contained either in the silver halide emulsion layer itself or in a layer contiguous to the silver halide emulsion layer. Since our dye image-providing materials are substantially colorless, they are preferably located in the silver halide emulsion itself without loss of photographic speed. This is advantageous since a separate layer for the dye image-providing material is not required.

The concentration of the dye image-providing compounds that are employed in the present invention may be varied over a wide range depending upon the particular compound employed and the results which are desired. For example, the compounds of the present invention may be coated in layers by using coating solutions containing between about 0.5 and about 8 percent by weight, of the dye image-providing compound distributed in a hydrophilic film-forming natural material or synthetic polymer, such as gelatin, polyvinyl alcohol, etc., which is adapted to be permeated by aqueous alkaline processing composition.

As previously mentioned, the aromatic primary amino color developing agent employed in our invention is preferably present in the alkaline processing composition in the rupturable pod. The color developing agent can also be incorporated into the photosensitive element as a separate layer, e.g., by employing a Schiff base derivative of an aromatic primary amino color developing agent such as that formed by reacting o-sulfobenzaldehyde and N,N-diethyl-3-methyl-4-aminoaniline. Such incorporated developing agent will be activated by the alkaline processing composition. While the incorporated developing agent can be positioned in any layer of the photosensitive element from which it can be readily made available for development upon activation with alkaline processing composition, it is generally either incorporated in the light-sensitive silver halide emulsion layers or in layers contiguous thereto. The aromatic primary amino color developing agents employed in this invention are preferably p-phenylenediamine or p-aminophenol color developing agents. These developing agents are well known to those skilled in the art.

Although it is not intended to limit the present invention to any particular theory or reaction mechanism, it is believed that the following chemical reactions take place according to a particular process of the invention:

In using the dye image-providing compounds according to our invention, the production of diffusible dye images is a function of the reduction of developable sil-



ver halide images which may involve direct or reversal development of the silver halide emulsions with a silver halide developing agent. If the silver halide emulsion employed is a direct-positive silver halide emulsion, such as an internal-image emulsion or a solarizing emulsion, which is developable in unexposed areas, a positive image can be obtained on the dye image-receiving layer. After exposure of the film unit, the alkaline processing composition permeates the various layers to initiate development of the exposed photosensitive silver halide emulsion layers. The developing agent present in the film unit develops each of the silver halide emulsion layers in the unexposed areas (since the silver halide emulsions are direct-positive ones), thus causing the developing agent to become oxidized imagewise corresponding to the unexposed areas of the direct-positive silver halide emulsion layers. The oxidized developing agent then reacts with the dye image-providing compounds to release a coupler moiety which in turn couples with oxidized color developing agent to form diffusible dyes imagewise as a function of the imagewise exposure of each of the silver halide emulsion layers. At least a portion of the imagewise distributions of diffusible dyes diffuses to the image-receiving layer to form a positive image of the original subject. After being contacted by the alkaline processing composition, a pH-lowering layer in the film unit or image-receiving unit (if such a layer is needed) lowers the pH of the film unit or image-receiver to stabilize the image.

Internal image silver halide emulsions useful in the above-described embodiment are direct positive emulsions that form latent images predominantly inside the silver halide grains, as distinguished from silver halide grains that form latent images predominantly on the surface thereof. Such internal image emulsions were described by Davey et al in U.S. Pat. No. 2,592,250 issued Apr. 8, 1952, and elsewhere in the literature. Internal image silver halide emulsions can be defined in terms of the increased maximum density obtained when developed with "internal-type" developers over that obtained when developed with "surface-type" developers. Suitable internal image emulsions are those which, when measured according to normal photographic techniques by coating a test portion of the silver halide emulsion on a transparent support, exposing to a light intensity scale having a fixed time between 0.01 and 1 second, and developing for 3 minutes at 20°C. in Developer A below (internal-type developer), have a maximum density at least five times the maximum density obtained when an equally exposed silver

halide emulsion is developed for 4 minutes at 20°C. in Developer B described below (surface-type developer). Preferably, the maximum density in Developer A is at least 0.5 density unit greater than the maximum density in Developer B.

DEVELOPER A

Hydroquinone	15 g.
Monomethyl-p-aminophenol sulfate	15 g.
Sodium sulfite (desiccated)	50 g.
Potassium bromide	10 g.
Sodium hydroxide	25 g.
Sodium thiosulfate	20 g.
Water to make one liter.	

DEVELOPER B

P-hydroxyphenylglycine	10 g.
Sodium carbonate	100 g.
Water to make 1 liter	

The solarizing direct positive silver halide emulsions useful in the above-described embodiment are well-known silver halide emulsions which have been effectively fogged either chemically or by radiation to a point which corresponds approximately to the maximum density of the reversal curve as shown by Mees, *The Theory of the Photographic Process*, published by the Macmillan Co., New York, New York, 1942, pages 261-297. Typical methods for the preparation of solarizing emulsions are shown by Groves British Patent 443,245, Feb. 25, 1936, who subjected emulsions to Roentgen rays "until an emulsion layer formed therefrom, when developed without preliminary exposure, is blackened up to the apex of its graduation curve;" Szaz British Patent 462,730, Mar. 15, 1937, the use of either light or chemicals such as silver nitrate, organic sulfur compounds and dyes to convert ordinary silver halide emulsions to solarizing direct positive emulsions; and Arens U.S. Pat. No. 2,005,837, June 25, 1935, the use of silver nitrate and other compounds in conjunction with heat to effect solarization. Kendall and Hill U.S. Pat. No. 2,541,472, Feb. 13, 1951, shows useful solarized emulsions particularly susceptible to exposure with long wavelength light and initial development to produce the Herschel effect described by Mees above, produced by adding benzothiazoles and other compounds to the emulsions which are fogged either chemically or with white light. In using the emulsions a sufficient reversal image exposure is employed using minus blue light of from about 500-700 mμ wavelength preferably 520-554 mμ, to substantially destroy the latent image in the silver halide grains in the region of the

image exposure. Particularly useful are the fogged direct-positive emulsions of Berriman U.S. Pat. No. 3,367,778; Illingsworth U.S. Pats. Nos. 3,501,305, 3,501,306 and 3,501,307; and combinations thereof.

Internal image silver halide emulsions which contain or which are processed in the presence of fogging or nucleating agents are particularly useful in the above-described embodiment since the use of fogging agents is a convenient way to inject electrons into the silver halide grains. Suitable fogging agents include the hydrazines disclosed in Ives U.S. Pats. Nos. 2,588,982 issued Mar. 11, 1952 and 2,563,785 issued Aug. 7, 1951; the hydrazides and hydrazones disclosed in Whitmore U.S. Pat. No. 3,227,552 issued Jan. 4, 1966; hydrazone quaternary salts described in Lincoln and Heseltine application Ser. No. 828,064 filed Apr. 28, 1969; or mixtures thereof. The quantity of fogging agent employed can be widely varied depending upon the results desired. Generally, the concentration of fogging agent is from about 1 to about 20 mg. per square foot of photosensitive layer in the photosensitive element or from about 0.1 to about 2 grams per liter of developer if it is located in the developer.

Other embodiments in which our imaging chemistry can be employed include the techniques described in U.S. Pats. Nos. 3,227,550; 3,227,551; 3,227,552; and in British Patent 904,364, p. 19, lines 1-41, wherein our dye image-providing materials are substituted for the nondiffusible couplers described therein. For example, a film unit using development inhibitor-releasing couplers as described in U.S. Pat. No. 3,227,551 may be employed in conjunction with the dye image-providing materials described herein.

Another embodiment of our invention uses the image-reversing technique disclosed in British Patent 904,364, page 19, lines 1-41. In this system our alkali-cleavable compounds are used in combination with physical development nuclei in a nuclei layer contiguous to the photosensitive silver halide emulsion layer. The film unit contains a silver halide solvent, preferably in a rupturable container with the alkaline processing composition, and the photosensitive element contains an immobilizing coupler, which is capable of reacting with oxidized developer to form an immobile product.

Spectral sensitizing dyes can be used conveniently to confer additional sensitivity to the light sensitive silver halide emulsion of the multilayer photographic elements of the invention. For instance, additional spectral sensitization can be obtained by treating the emulsion with a solution of a sensitizing dye in an organic solvent or the dye may be added in the form of a dispersion as described in Owens et al British Patent 1,154,781 issued June 11, 1969. For optimum results, the dye can either be added to the emulsion as a final step or at some earlier stage.

Sensitizing dyes useful in sensitizing such emulsions are described, for example, in Brooker et al, U.S. Pat. No. 2,526,632, issued Oct. 24, 1950; Sprague U.S. Pat. No. 2,503,776, issued Apr. 11, 1950; Brooker et al U.S. Pat. No. 2,493,748, issued Jan. 10, 1950; and Taber et al, U.S. Pat. No. 3,384,486 issued May 21, 1968. Spectral sensitizers which can be used include the cyanines, merocyanines, complex (tri or tetranuclear) merocyanines, complex (tri or tetranuclear) cyanines, holopolar cyanines, styryls, hemicyanines (e.g. enamine hemicyanines), oxonols and hemioxonols. Dyes of the cyanine classes can contain such basic nuclei as the thi-

azolines, oxazolines, pyrrolines, pyridines, oxazoles, thiazoles, selenazoles and imidazoles. Such nuclei can contain alkyl, alkylene, hydroxyalkyl, sulfoalkyl, carboxyalkyl, aminoalkyl and enamine groups and can be fused to carbocyclic or heterocyclic ring systems either unsubstituted or substituted with halogen, phenyl, alkyl, haloalkyl, cyano, or alkoxy groups. The dyes can be symmetrical or unsymmetrical and can contain alkyl, phenyl, enamine or heterocyclic substituents on the methine or polymethine chain. The merocyanine dyes can contain the basic nuclei mentioned above as well as acid nuclei such as thiohydantoin, rhodanines, oxazolidenediones, thiazolidenediones, barbituric acids, thiazolineones, and malononitrile. These acid nuclei can be substituted with alkyl, alkylene, phenyl, carboxyalkyl, sulfoalkyl, hydroxyalkyl, alkoxyalkyl, alkylamino groups, or heterocyclic nuclei. Combinations of these dyes can be used, if desired. In addition, super-sensitizing addenda which do not absorb visible light can be included, for instance, ascorbic acid derivatives, azaindenes, cadmium salts, and organic sulfonic acids as described in McFall et al U.S. Pat. No. 2,933,390 issued Apr. 19, 1960 and Jones et al U.S. Pat. No. 2,937,089 issued May 17, 1960.

The various silver halide emulsion layers of a color film assembly of the invention can be disposed in the usual order, i.e., the blue-sensitive silver halide emulsion layer first with respect to the exposure side, followed by the green-sensitive and red-sensitive silver halide emulsion layers. If desired, a yellow dye layer or a Carey Lea silver layer can be present between the blue-sensitive and green-sensitive silver halide emulsion layer for absorbing or filtering blue radiation that may be transmitted through the blue-sensitive layer. If desired, the selectively sensitized silver halide emulsion layers can be disposed in a different order, e.g., the blue-sensitive layer first with respect to the exposure side, followed by the red-sensitive and green-sensitive layers.

The silver halide emulsions used in this invention can comprise, for example, silver chloride, silver bromide, silver chlorobromide, silver bromiodide, silver chlorobromiodide or mixtures thereof. The emulsions can be coarse or fine grain and can be prepared by any of the well-known procedures, e.g., single jet emulsions such as those described in Trivelli and Smith, *The Photographic Journal*, Vol. LXXIX, May, 1939 (pp 330-338), double jet emulsions, such as Lippmann emulsions, ammoniacal emulsions, thiocyanate or thioether ripened emulsions such as those described in Nietz et al U.S. Pat. No. 2,222,264 issued Nov. 19, 1940; Illingsworth U.S. Pat. No. 3,320,069 issued May 16, 1967; and McBride U.S. Pat. No. 3,271,157 issued Sept. 6, 1966. Surface image emulsions can be used or internal image emulsions can be used such as those described in Davey et al U.S. Pat. No. 2,592,250 issued May 8, 1952; Porter et al U.S. Pat. No. 3,206,313 issued Sept. 14, 1965; Berriman U.S. Pat. No. 3,367,778 issued Feb. 6, 1968; and Bacon et al U.S. Pat. No. 3,447,927 issued June 3, 1969. The emulsions may be regular grain emulsions such as the type described in Klein and Moisar, *J. Phot. Sci.*, Vol. 12, No. 5, Sept./Oct., 1964, (pp. 242-251). Negative type emulsions may be used or direct positive emulsions may be used such as those described in Leermakers U.S. Pat. No. 2,184,013 issued Dec. 19, 1939; Kendall et al U.S. Pat.

No. 2,541,472 issued Feb. 13, 1951; Berriman U.S. Pat. No. 3,367,778 issued Feb. 6, 1968; Schouwenaars British Patent 723,019 issued Feb. 2, 1955; Illingsworth et al French Patent 1,520,821 issued Mar. 4, 1968; Illingsworth U.S. Pat. No. 3,501,307 issued Mar. 17, 1970; Ives U.S. Pat. No. 2,563,785 issued Aug. 7, 1951; Knott et al U.S. Pat. No. 2,456,953 issued Dec. 21, 1948; and Land U.S. Pat. No. 2,861,885 issued Nov. 25, 1958.

The emulsions used with this invention may be sensitized with chemical sensitizers, such as with reducing agents; sulfur, selenium or tellurium compounds; gold, platinum or palladium compounds; or combinations of these. Suitable procedures are described in Sheppard et al U.S. Pat. No. 1,623,499 issued Apr. 5, 1927; Waller et al U.S. Pat. No. 2,399,083 issued Apr. 23, 1946; McVeigh U.S. Pat. No. 3,297,447 issued Jan. 10, 1967; and Dunn U.S. Pat. No. 3,297,446 issued Jan. 10, 1967.

The silver halide emulsions used with this invention may contain speed increasing compounds such as polyalkylene glycols, cationic surface active agents and thioethers or combinations of these as described in Piper U.S. Pat. No. 2,886,437 issued May 12, 1959; Dann et al U.S. Pat. No. 3,046,134 issued July 24, 1962; Carroll et al U.S. Pat. No. 2,944,900 issued July 12, 1960; and Goffe U.S. Pat. No. 3,294,540 issued Dec. 27, 1966.

The silver halide emulsions used in the practice of this invention can be protected against the production of fog and can be stabilized against loss of sensitivity during keeping. Suitable antifoggants and stabilizers each used alone or in combination include thiazolium salts described in Brooker et al U.S. Pat. No. 2,131,038 issued Sept. 27, 1938; and Allen et al U.S. Pat. No. 2,694,716 issued Nov. 16, 1954; the azaindenes described in Piper U.S. Pat. No. 2,886,437 issued May 12, 1959; and Heimbach et al U.S. Pat. No. 2,444,605 issued July 6, 1948; the mercury salts as described in Allen et al U.S. Pat. No. 2,728,663 issued Dec. 27, 1955; the urazoles described in Anderson et al U.S. Pat. No. 3,287,135 issued Nov. 22, 1966; the sulfocatechols described in Kennard et al U.S. Pat. No. 3,236,652 issued Feb. 22, 1966; the oximes described in Carroll et al British Patent 623,448 issued May 18, 1949; nitron; nitroindazoles; the mercaptotetrazoles described in Kendall et al U.S. Pat. No. 2,403,927 issued July 16, 1946; Kennard et al U.S. Pat. No. 3,266,897 issued Aug. 16, 1966; and Luckey et al U.S. Pat. No. 3,397,987 issued Aug. 20, 1968; the polyvalent metal salts described in Jones U.S. Pat. No. 2,839,405 issued June 17, 1958; the thiuronium salts described in Herz et al U.S. Pat. No. 3,220,839 issued Nov. 30, 1965; the palladium, platinum and gold salts described in Trivelli et al U.S. Pat. No. 2,566,263 issued Aug. 28, 1951; and Yutzy et al U.S. Pat. No. 2,597,915 issued May 27, 1952.

The rupturable container employed in this invention can be of the type disclosed in U.S. Pat. Nos. 2,543,181; 2,643,886; 2,653,732; 2,723,051; 3,056,492; 3,056,491 and 3,152,515. In general, such containers comprise a rectangular sheet of fluid and air-impervious 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 solution is contained.

In a color film unit according to this invention, each silver halide emulsion layer containing a dye image-providing material or having the dye image-providing material present in a contiguous layer may be separated from the other silver halide emulsion layers in the negative portion of the film unit by materials including gelatin, calcium alginate, or any of those disclosed in U.S. Pat. No. 3,384,483, polymeric materials such as polyvinylamides as disclosed in U.S. Pat. No. 3,421,892, or any of those disclosed in French Patent 2,028,236 or U.S. Pat. Nos. 2,992,104; 3,043,692; 3,044,873; 3,061,428; 3,069,263; 3,069,264; 3,121,011; and 3,427,158.

Generally speaking, except where noted otherwise, the silver halide emulsion layers in the invention comprise photosensitive silver halide dispersed in gelatin and are about 0.6 to 6 microns in thickness and the alkaline solution-permeable polymeric interlayers, e.g., gelatin, are about 1 to 5 microns in thickness. Of course these thicknesses are approximate only and can be modified according to the product desired. In addition to gelatin, other suitable hydrophilic materials which can be employed include both naturally occurring substances such as proteins, e.g., gelatin derivatives, cellulose derivatives, polysaccharides such as dextran, gum arabic and the like; and synthetic polymeric substances such as water soluble polyvinyl compounds like poly(vinylpyrrolidone), acrylamide polymers and the like.

The photographic emulsion layers and other layers of a photographic element employed in the practice of this invention can also contain alone or in combination with hydrophilic, water-permeable colloids, other synthetic polymeric compounds such as dispersed vinyl compounds such as in latex form and particularly those which increase the dimensional stability of the photographic materials. Suitable synthetic polymers include those described for example, in Nottorf U.S. Pat. No. 3,142,568 issued July 28, 1964; White U.S. Pat. No. 3,193,386 issued July 6, 1965; Houck et al U.S. Pat. No. 3,062,674 issued Nov. 6, 1962; Houck et al U.S. Pat. No. 3,220,844 issued Nov. 30, 1965; Ream et al U.S. Pat. No. 3,287,289 issued Nov. 22, 1966; and Dykstra U.S. Pat. No. 3,411,911 issued Nov. 19, 1968. Particularly effective are those water-insoluble polymers of alkyl acrylates and methacrylates, acrylic acid, sulfoalkyl acrylates or methacrylates, those which have cross-linking sites which facilitate hardening or curing described in Smith U.S. Pat. No. 3,488,708 issued Jan. 6, 1970, and those having recurring sulfobetaine units as described in Dykstra Canadian Patent 774,054.

Any material can be employed as the image-receiving layer in this invention as long as the desired function of mordanting or otherwise fixing the dye images will be obtained. The particular material chosen will, of course, depend upon the dye to be mordanted. If acid dyes are to be mordanted, the image-receiving layer can contain basic polymeric mordants such as polymers of amino guanidine derivatives of vinyl methyl ketone such as described in Minsk U.S. Pat. No. 2,882,156 issued Apr. 14, 1959, and basic polymeric mordants such as described in copending U.S. application Ser. No. 100,491 of Cohen et al filed Dec. 21, 1970. Other mordants useful in our invention include poly-4-vinylpyridine, the 2-vinyl pyridine polymer metho-p-toluene sulfonate and similar compounds described in Sprague et al U.S. Pat. No. 2,484,430 issued Oct. 11, 1949, and cetyl trimethylammonium bromide, etc. Ef-

fective mordanting compositions are also described in Whitmore U.S. Pat. No. 3,271,148 and Bush U.S. Pat. No. 3,271,147, both issued Sept. 6, 1966.

Furthermore, the image-receiving layer can be sufficient by itself to mordant the dye as in the case of use of an alkaline solution-permeable polymeric layer such as N-methoxymethyl polyhexylmethyle adipamide; partially hydrolyzed polyvinyl acetate; polyvinyl alcohol with or without plasticizers; cellulose acetate; gelatin; and other materials of a similar nature. Generally, good results are obtained when the image-receiving layer, preferably alkaline solution-permeable, is transparent and about 0.25 to about 0.40 mil in thickness. This thickness, of course, can be modified depending upon the result desired. The image-receiving layer can also contain ultraviolet absorbing materials to protect the mordanted dye images from fading due to ultraviolet light, brightening agents such as the stilbenes, coumarins, triazines, oxazoles, dye stabilizers such as the chromanols, alkylphenols, etc.

Use of a pH-lowering material in the dye image-receiving element of a film unit according to the invention will usually increase the stability of the transferred image. Generally, the pH-lowering material will effect a reduction in the pH of the image layer from about 13 or 14 to at least 11 and preferably 5-8 within a short time after imbibition. For example, polymeric acids as disclosed in U.S. Pat. No. 3,362,819 or solid acids or metallic salts, e.g., zinc acetate, zinc sulfate, magnesium acetate, etc., as disclosed in U.S. Pat. No. 2,584,030 may be employed with good results. Such pH-lowering materials reduce the pH of the film unit after development to terminate development and substantially reduce further dye transfer and thus stabilize the dye image.

An inert timing or spacer layer can be employed in the practice of our invention over the pH-lowering layer which "times" or controls the pH reduction as a function of the rate at which alkali diffuses through the inert spacer layer. Examples of such timing layers include gelatin, polyvinyl alcohol or any of those disclosed in U.S. Pat. No. 3,455,686. The timing layer is also effective in evening out the various reaction rates over a wide range of temperatures, e.g., premature pH reduction is prevented when imbibition is effected at temperatures above room temperature, for example, at 95° to 100°F. The timing layer is usually about 0.1 to about 0.7 mil in thickness. Especially good results are obtained when the timing layer comprises a hydrolyzable polymer or a mixture of such polymers which are slowly hydrolyzed by the processing composition. Examples of such hydrolyzable polymers include polyvinyl acetate, polyamides, cellulose esters, etc.

The alkaline processing composition employed in this invention is the conventional aqueous solution of an alkaline material, e.g., sodium hydroxide, sodium carbonate or an amine such as diethylamine, preferably possessing a pH in excess of 11, and preferably containing a developing agent as described previously. The solution also preferably contains a viscosity-increasing compound such as a high-molecular-weight polymer, e.g., a water-soluble ether inert to alkaline solutions such as hydroxyethyl cellulose or alkali metal salts of carboxymethyl cellulose such as sodium carboxymethyl cellulose. A concentration of viscosity-increasing compound of about 1 to about 5 percent by weight of the processing composition is preferred which will impart

thereto a viscosity of about 100 cps. to about 200,000 cps. In certain embodiments of our invention, an opacifying agent, e.g., TiO_2 , carbon black, etc., may be added to the processing composition.

While the alkaline processing composition used in this invention can be employed in a rupturable container, as described previously, to conveniently facilitate the introduction of processing composition into the film unit, other methods of inserting processing composition into the film unit could also be employed, e.g., interjecting processing solution with communicating members similar to hypodermic syringes which are attached either to a camera or camera cartridge.

The alkaline solution-permeable, substantially opaque, light-reflective layer employed in certain embodiments of photographic film units of our invention can generally comprise any opacifier dispersed in a binder as long as it has the desired properties. Particularly desirable are white light-reflective layers since they would be esthetically pleasing backgrounds on which to view a transferred dye image and would also possess the optical properties desired for reflection of incident radiation. Suitable opacifying agents include titanium dioxide, barium sulfate, zinc oxide, barium stearate, silver flake, silicates, alumina, zirconium oxide, zirconium acetyl acetate, sodium zirconium sulfate, kaolin, mica, or mixtures thereof in widely varying amounts depending upon the degree of opacity desired. The opacifying agents may be dispersed in any binder such as an alkaline solution-permeable polymeric matrix such as, for example, gelatin, polyvinyl alcohol, and the like. Brightening agents such as the stilbenes, coumarins, triazines and oxazoles can also be added to the light-reflective layer, if desired. When it is desired to increase the opacifying capacity of the light-reflective layer, dark-colored opacifying agents, e.g., carbon black, nigrosine dyes, etc., may be added to it, or coated in a separate layer adjacent to the light-reflective layer.

The supports for the photographic elements of this invention can be any material as long as it does not deleteriously effect the photographic properties of the film unit and is dimensionally stable. Typical flexible sheet materials include cellulose nitrate film, cellulose acetate film, poly(vinyl acetal) film, polystyrene film, poly(ethyleneterephthalate) film, polycarbonate film, poly- α -olefins such as polyethylene and polypropylene film, and related films or resinous materials as well as glass, paper, metal, etc. The support is usually about 2 to 6 mils in thickness.

While the invention has been described with reference to layers of silver halide emulsions and dye image-providing materials, dotwise coating, such as would be obtained using a gravure printing technique, could also be employed. In this technique, small dots of blue, green and red-sensitive emulsions have associated therewith, respectively, dots of yellow, magenta and cyan color-providing substances. After development, the transferred dyes would tend to fuse together into a continuous tone.

The photographic layers employed in the practice of this invention may contain surfactants such as saponin; anionic compounds such as the alkyl aryl sulfonates described in Baldsiefen, U.S. Pat. No. 2,600,831 issued June 17, 1952; amphoteric compounds such as those described in Ben-Ezra, U.S. Pat. No. 3,133,816 issued May 19, 1964; and water-soluble adducts of glycidol

and an alkyl phenol such as those described in Olin Mathieson, British Patent 1,022,878 issued Mar. 16, 1966; and Knox, U.S. Pat. No. 3,514,293 issued May 26, 1970.

The various layers, including the photographic layers, employed in the practice of this invention can contain light-absorbing materials and filter dyes such as those described in Sawdey, U.S. Pat. No. 3,253,921 issued May 31, 1966; Gaspar, U.S. Pat. No. 2,274,782 issued Mar. 3, 1942; Silberstein et al, U.S. Pat. No. 2,527,583 issued Oct. 31, 1950; and VanCampen, U.S. Pat. No. 2,956,879 issued Oct. 18, 1960.

The sensitizing dyes and other addenda used in the practice of this invention can be added from water solutions or suitable organic solvent solutions may be used. The compounds can be added during various procedures including those described in Collins et al U.S. Pat. No. 2,912,343 issued Nov. 10, 1959; McCrossen et al U.S. Pat. No. 3,342,605 issued Sept. 19, 1967; Audran U.S. Pat. No. 2,996,287 issued Aug. 15, 1961 and Johnson et al U.S. Pat. No. 3,425,835 issued Feb. 4, 1969.

The photographic layers used in the practice of this invention may be coated by various coating procedures including dip coating, air knife coating, curtain coating, or extrusion coating using hoppers of the type described in Beguin U.S. Pat. No. 2,681,294 issued June 15, 1954. If desired, two or more layers may be coated simultaneously by the procedures described in Russell U.S. Pat. No. 2,761,791 issued Sept. 4, 1956; Hughes U.S. Pat. No. 3,508,947 issued Apr. 28, 1970; and Wynn British Patent 837,095 issued June 9, 1960. This invention also can be used for silver halide layers coated by vacuum evaporation as described in British Patent 968,453 issued Sept. 2, 1964 and LuValle et al U.S. Pat. No. 3,219,451 issued Nov. 23, 1965.

The photographic and other hardenable layers used in the practice of this invention can be hardened by various organic or inorganic hardeners, alone or in combination, such as the aldehydes, and blocked aldehydes as described in Allen et al U.S. Pat. No. 3,232,764 issued Feb. 1, 1966; ketones, carboxylic and carbonic acid derivatives, sulfonate esters, sulfonyl halides and vinyl sulfonyl ethers as described in Burness et al U.S. Pat. No. 3,539,644 issued Nov. 10, 1970; active halogen compounds, epoxy compounds, aziridines, active olefins, isocyanates, carbodiimides, polymeric hardeners such as oxidized polysaccharides like dialdehyde starch and oxyguargum and the like.

The following examples further illustrate the invention.

EXAMPLE 1

A single layer supported gelatinous silver halide (cubic bromide) emulsion coating is prepared which contains per square foot of coating 82 mg of Compound No. 2, 82 mg of di-n-butylphthalate, 150 mg of silver and 500 mg of gelatin. A sample of the photosensitive element is exposed to a graduated-density multi-color test object. A processing composition comprising:

$\text{Na}_2\text{CO}_3 - \text{H}_2\text{O}$	22.0 g
4-Amino-N-ethyl-N- β -hydroxyethylaniline Sulfate	11.0 g
Ascorbic acid	0.385 g
KBr	0.825 g
Na_2SO_3	2.0 g
Water to 1 liter	2.0 g

is employed in a pod and is spread between the exposed surface of the photosensitive element and a superposed dye image-receiving element comprising a support coated with 700 mg/ft² of gelatin and 230 mg/ft² of the mordant

N-N-dimethyl-N- β -hydroxyethyl-N- γ -stearamidopropyl-ammonium dihydrogen phosphate, by passing the transfer "sandwich" between a pair of juxtaposed pressure rollers.

After 7 minutes at about 27°C, the film unit is separated. A negative yellow dye image is observed on the dye image-receiving sheet.

EXAMPLE 2

Example 1 is repeated except that the coating contains per square foot of coating 82 mg of Compound No. 1. A negative yellow dye image is again obtained on the dye image-receiving sheet.

EXAMPLE 3

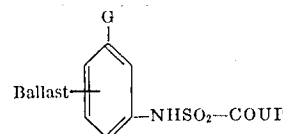
The procedure of Example 1 is repeated with a sample of a coating containing 82 mg of Compound No. 3 per square foot of coating dissolved in tricresyl phosphate. A negative magenta dye image is obtained on the dye image-receiving sheet.

The invention has been described with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. A photosensitive element comprising a support having thereon at least one photosensitive silver halide emulsion layer, each said silver halide emulsion layer having associated therewith a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye.

2. The photosensitive element of claim 1 wherein said sulfonamido compound has the formula:



wherein:

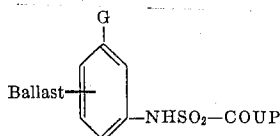
- COUP is a photographic coupler capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;
- Ballast is an organic ballasting radical of such molecular size and configuration as to render said alkali-cleavable compound nondiffusible during development in an alkaline processing composition; and
- G is OR or NR_1R_2 wherein R is hydrogen or a hydrolyzable moiety and R_1 and R_2 are each hydrogen or an alkyl group.

3. The photosensitive element of claim 2 wherein G is NR_1R_2 wherein R_1 and R_2 are alkyl groups having eight to 22 carbon atoms.

4. The photosensitive element of claim 1 wherein said sulfonamido compound is present in said silver halide emulsion layer.

5. A photosensitive element comprising a support having thereon a red-sensitive silver halide emulsion layer having associated therewith a cyan dye image-providing material, a green-sensitive silver halide emulsion layer having associated therewith a magenta dye image-providing material, and a blue-sensitive silver halide emulsion layer having associated therewith a yellow dye image-providing material, at least one of said dye image-providing materials being a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye.

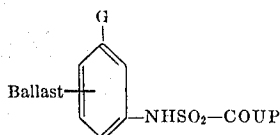
6. The photosensitive element of claim 5 wherein said sulfonamido compound has the formula:



wherein:

1. COUP is a photographic coupler capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;
 2. Ballast is an organic ballasting radical of such molecular size and configuration as to render said alkali-cleavable compound nondiffusible during development in an alkaline processing composition; and
 3. G is OR or NR_1R_2 wherein R is hydrogen or a hydrolyzable moiety and R_1 and R_2 are each hydrogen or an alkyl group.
 7. A photographic film unit which is adapted to be processed by passing said unit between a pair of juxtaposed pressure-applying members comprising:
 - a. a photosensitive element comprising a support having thereon at least one photosensitive silver halide emulsion layer, each said silver halide emulsion layer having associated therewith a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;
 - b. a dye image-receiving layer; and
 - c. means for discharging an alkaline processing composition within said film unit;
- said film unit containing an aromatic primary amino color developing agent.

8. The film unit of claim 7 wherein said sulfonamido compound has the formula:



wherein:

1. COUP is a photographic coupler capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;
2. Ballast is an organic ballasting radical of such molecular size and configuration as to render said al-

kali-cleavable compound nondiffusible during development in an alkaline processing composition; and

3. G is OR or NR_1R_2 wherein R is hydrogen or a hydrolyzable moiety and R_1 and R_2 are each hydrogen or an alkyl group.

9. The film unit of claim 8 wherein G is NR_1R_2 wherein R_1 and R_2 are alkyl groups having eight to 22 carbon atoms.

10. The film unit of claim 7 wherein said sulfonamido compound is present in said silver halide emulsion layer.

11. The film unit of claim 7 wherein said dye image-receiving layer is located in said photosensitive element between said support and the lowermost photosensitive silver halide emulsion layer.

12. The film unit of claim 7 wherein said dye image-receiving layer is coated on a separate support and is adapted to be superposed on said photosensitive element after exposure thereof.

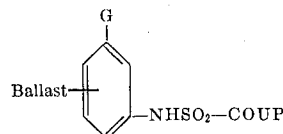
13. The film unit of claim 12 wherein said discharging means is a rupturable container and is so positioned during processing of said film unit that a compressive force applied to said container by said pressure-applying members will effect a discharge of the container's contents between said dye image-receiving layer and the outermost layer of said photosensitive element.

14. A photographic film unit which is adapted to be processed by passing said unit between a pair of juxtaposed pressure-applying members comprising:

- a. a photosensitive element comprising a support having thereon a red-sensitive silver halide emulsion layer having associated therewith a cyan dye image-providing material, a green-sensitive silver halide emulsion layer having associated therewith a magenta dye image-providing material, and a blue-sensitive silver halide emulsion layer having associated therewith a yellow dye image-providing material;
- b. a dye image-receiving layer; and
- c. a rupturable container containing an alkaline processing composition, said rupturable container being adapted to be positioned during processing of said film unit so that a compressive force applied to said container by said pressure-applying members will effect a discharge of the container's contents within said film unit;

said film unit containing an aromatic, primary amino color developing agent; at least one of said dye image-providing materials being a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye.

15. The film unit of claim 14 wherein said sulfonamido compound has the formula:



wherein:

1. COUP is a photographic coupler capable of react-

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ing with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;

2. Ballast is an organic ballasting radical of such molecular size and configuration as to render said alkali-cleavable compound nondiffusible during development in an alkaline processing composition; and

3. G is OR or NR_1R_2 wherein R is hydrogen or a hydrolyzable moiety and R_1 and R_2 are each hydrogen or an alkyl group.

16. A process for producing a photographic transfer image in color comprising:

- A. imagewise-exposing a photosensitive element comprising a support having thereon at least one photosensitive silver halide emulsion layer, each said silver halide emulsion layer having associated therewith a dye image-providing material comprising a nondiffusible m-sulfonamidoaniline or m-sulfonamidophenol which is capable of reacting with oxidized, aromatic, primary amino color developing agent to release a coupler moiety which is capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;

- B. treating said photosensitive element with an alkaline processing composition in the presence of an aromatic, primary amino color developing agent to effect development of each of said exposed silver halide emulsion layers, thereby oxidizing said developing agent;

- C. said oxidized developing agent thereby reacting with said sulfonamido compound to release said coupler moiety which couples with oxidized, aromatic, primary amino color developing agent to form an imagewise distribution of diffusible dye as a function of said imagewise exposure of each of said silver halide emulsion layers; and

- D. at least a portion of each of said imagewise distributions of diffusible dye diffusing to a dye image-receiving layer to provide a positive image.

17. The process of claim 16 wherein said treatment step B) is effected by:

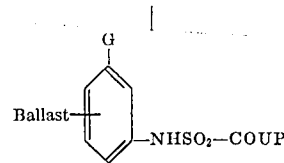
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- A. superposing over the layer most remote from the support of said photosensitive element said dye image-receiving layer coated on a support;

- B. positioning a rupturable container containing an alkaline processing composition between said exposed photosensitive element and said dye image-receiving layer, said alkaline processing composition containing said developing agent; and

- C. applying a compressive force to said container to effect a discharge of the container's contents between said most remote layer of said exposed photosensitive element and said dye image-receiving layer.

18. The process of claim 16 wherein said sulfonamido compound has the formula:



wherein:

1. COUP is a photographic coupler capable of reacting with oxidized, aromatic, primary amino color developing agent to produce a diffusible dye;
2. Ballast is an organic ballasting radical of such molecular size and configuration as to render said alkali-cleavable compound nondiffusible during development in an alkaline processing composition; and
3. G is OR or NR_1R_2 wherein R is hydrogen or a hydrolyzable moiety and R_1 and R_2 are each hydrogen or an alkyl group.

19. The process of claim 18 wherein G is NR_1R_2 wherein R_1 and R_2 are alkyl groups having eight to 22 carbon atoms.

20. The process of claim 16 wherein said sulfonamido compound is present in said silver halide emulsion layer.

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