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UNITED STATES PATENT OFFICE

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ACETYL N-HETEROCYCLIC COUPLERS FOR COLOR PHOTOGRAPHY

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7 Claims. (Cl. 95—6)

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The present invention relates to color photography and is particularly concerned with photographic color forming or color coupling components which are adapted to be incorporated in photosensitive emulsion layers in the production of photographic film, papers and the like.

This invention is an improvement in the process of color forming development which was first described in United States Patents No. 1,055,155 and No. 1,102,028 to Fischer, in accordance with which colored photographic images are produced by means of a coupling reaction between the oxidation product of a photographic developer containing free amino groups, for instance, phenolic diamines, especially the mono- or unsymmetrically disubstituted ones, like p-dimethylaminoaniline or methoxy-p-dimethylaminoaniline and the like, and an intermediate or coupling component. As is well known, this coupling occurs at those points where a silver image is produced by reduction of the silver halide by the color developer with resulting formation, at these points, of the oxidation product of the developer, which couples with the intermediate or coupling component. The coupling component can be present in the photographic developer. However, in accordance with the preferred methods for practicing this color forming development process, non-diffusible color forming or coupling components are employed which are incorporated in the photosensitive emulsion during manufacture. It is particularly desirable that such non-diffusible color forming or coupling components be employed in case several differently sensitized photosensitive emulsion layers are coated on a single support, as is the case in three-color photographic processes in which the so-called integral tripack films are employed; since, in such cases, any wandering or diffusing of the color component from the layer in which it is incorporated would cause inaccurate color rendition, while attempts to employ the color coupling component in the color forming developer, in such cases, unnecessarily complicates the process of developing.

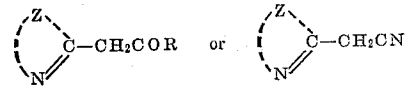
The present invention is particularly concerned with novel color forming components which give, on color forming development, yellow and red to magenta colors.

It is an object of the present invention to provide novel color forming development components which may readily be rendered non-diffusible and which may be readily obtained and incorporated in conventional gelatino silver halide photographic emulsions and which, on color forming development, readily couple with the oxidation product of a color forming developer. Other and further objects of the present invention will be apparent as the present description progresses.

In practicing the present invention, I employ

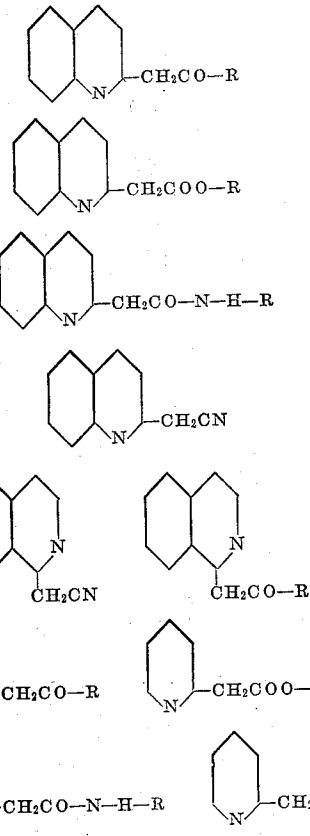
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compounds represented by the following general formula:



in which Z represents the necessary atoms to make up a five or six-membered N-hetero ring and R can be alkyl, aryl or aralkyl and may represent an ester or amide residue.

The components which I prefer to employ are derivatives of pyridine and quinoline, including isoquinoline, in which the carbon atom in ortho-position to the hetero-nitrogen atom of the ring is substituted by a substituent having an active methylene group on 2-position. The methylene group is most readily activated by having a carbonyl or cyan group adjacent thereto and the preferred derivatives of the type adapted for use in the present invention are exemplified by the following types of compounds:



In the above formulas, R may be alkyl, aryl or aralykyl and it should be understood that the rings may be substituted in any desired manner,

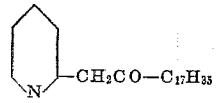
for instance, by alkyl, aryl or aralkyl groups and by such negative groups as halogens, nitro-, carboxyl- or sulfo-acid groups. In order to impart non-diffusibility to the color forming components, it is preferable that R, in the above formula, be a long-chain alkyl group containing at least six and preferably eight or more carbon atoms in the chain, since, as disclosed in Wilmanns' et al. Patent No. 2,186,849, the presence of such long-chain aliphatic radicals imparts non-diffusibility to the component. It should be noted, however, that such non-diffusibility may be obtained when R is aryl or aralkyl by employing a radical having substantive properties, for instance, a diphenyl or stilbene radical, since, as disclosed in Wilmanns' Patent No. 2,179,239, the presence of such "substantive" groups in the molecule imparts non-diffusibility to the color forming component.

The color obtained on color forming development, when using compounds of the above type as color coupling components, can be considerably varied by variation of the substituents in the ring and, to a certain extent, by variation of the group R. Thus, the pyridine derivatives generally give red to magneta colors on color forming development, while when the pyridine ring is substituted so that the quinoline radical is present, yellow colors are generally obtained. However, the presence of a cyan group adjacent to the active methylene group tends to produce red dyes on color forming development. As heretofore mentioned, the solubility of the components and consequently their diffusibility in conventional photographic emulsions, can also be controlled, to a large extent, by the nature of the substituents in the ring and by the nature of the group R which is present. In addition to having non-diffusibility imparted to them by the presence of groups having the properties of imparting non-diffusibility to color forming development components, the presence of acidic groups or several hydroxy groups, as substituents in the pyridine or quinoline rings, or in the group R increases the solubility of the color components. In general, it is preferable to employ color forming components containing both a non-diffusion group and an acidic group to increase the solubility of the component, in order that it may be incorporated in the photographic emulsion, at any stage of the manufacture, by dissolving the component in a weakly alkaline solution.

The present invention will be readily understood from the following specific examples:

Example 1

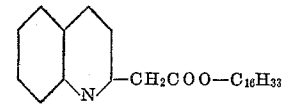
A small amount of 2-acetylheptadecanepyridine having the following formula:



was incorporated in a gelatino silver halide photographic emulsion by dissolving a small amount, say 8 grams, in 3 cc. of sodium hydroxide of 40% strength, 25 cc. of methanol and 70 cc. of water, and then adding this solution to 500 cc. of a conventional gelatino silver halide photographic emulsion, the color coupling component was non-diffusing therein. By developing with a color forming developer p-diethylaminoaniline, a yellow picture was obtained.

Example 2

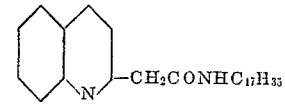
A small amount of cetyl ester of 2-acetylquinoline having the following formula:



was incorporated in a gelatino silver halide photographic emulsion in the same manner as set forth in Example 1 above. This color coupling component was non-diffusing in the emulsion and, on development with a color forming developer in conventional manner, a yellow picture was obtained.

Example 3

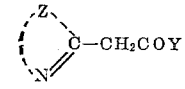
A small amount of 2-acetylamidoheptadecane quinoline having the following formula:



was incorporated in a conventional gelatino silver halide photographic emulsion, in the manner set forth in Example 1, and was non-diffusing therein. On development with a color forming developer, a yellow image was obtained.

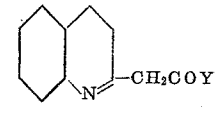
I claim:

1. A photographic silver halide emulsion having incorporated therein, as a non-diffusing color forming development component, a compound having the following formula:



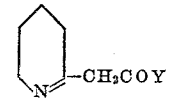
wherein Z represents the residue of a member of the group consisting of pyridine, quinoline and isoquinoline nuclei and wherein Y is selected from the group consisting of —R, —OR, and —NHR, in which R is a member of the group consisting of alkyl, aryl and aralkyl radicals.

2. A photographic silver halide emulsion having incorporated therein a color forming development component having the following formula:



and wherein Y is selected from the group consisting of —R, —OR, and —NHR, in which R is a member of the group consisting of alkyl, aryl and aralkyl radicals.

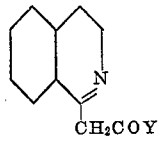
3. A photographic silver halide emulsion having incorporated therein a color forming development component having the following formula:



and wherein Y is selected from the group consisting of —R, —OR, and —NHR, in which R is a member of the group consisting of alkyl, aryl and aralkyl radicals.

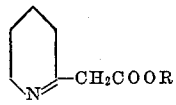
4. A photographic silver halide emulsion having incorporated therein a color forming devel-

opment component having the following formula:



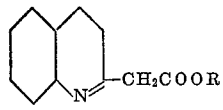
and wherein Y is selected from the group consisting of —R, —OR, and —NHR, in which R is a member of the group consisting of alkyl, aryl and aralkyl radicals.

5. A photographic silver halide emulsion having incorporated therein a color forming development component having the following formula:



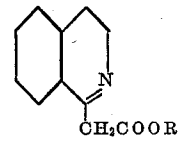
in which R is an aliphatic hydrocarbon radical containing at least 8 carbon atoms.

6. A photographic silver halide emulsion having incorporated therein a color forming development component having the following formula:



in which R is an aliphatic hydrocarbon radical containing at least 8 carbon atoms.

7. A photographic silver halide emulsion having incorporated therein a color forming development component having the following formula:



in which R is an aliphatic hydrocarbon radical containing at least 8 carbon atoms.

ABRAHAM BAVLEY.

REFERENCES CITED

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

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2,179,239	Wilmanns et al.	Nov. 9, 1939
2,186,849	Wilmanns et al.	Jan. 9, 1940
2,214,483	Schneider et al.	Sept. 10, 1940
2,323,504	Wilson	July 6, 1943
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2,343,704	Porter et al.	Mar. 7, 1944
2,359,274	Wilson	Sept. 26, 1944

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Ser. No. 389,222, Verkinderen et al. (A. P. C.), pub. May 4, 1943.