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HYDROXYNAPHTHOIC ACID AMIDE COUPLER

Ilmari F. Salminen, Arnold Weissberger, and Dudley B. Glass, Rochester, N. Y., assignors to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey

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4 Claims. (Cl. 95—88)

This invention relates to color-forming development and particularly to novel coupling components for producing colored images.

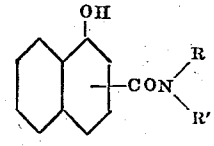
It is known that colored photographic images may be formed by using a developer which forms a colored compound on development. The colored compound thus formed is deposited adjacent to the silver grains of the silver image during the development. It is also known that a colored image may be formed by adding to certain developer solutions or by incorporating in the gelatino-silver-halide emulsion before or after exposure a compound which couples during development with the oxidation product of the developing agent and forms a coloring substance which is likewise deposited adjacent to the silver grains of the silver image during development. Such a compound, which is employed in conjunction with a developing agent for the silver and which couples with the oxidation product thereof during development, is referred to herein as a coupling component or coupler.

The present invention concerns new or improved color forming developers comprising a primary aromatic amino compound, serving as the developing agent, and a coupler as hereinafter defined and also includes a new or improved color development process which consists in developing a reducible silver salt image in a photographic element with the aid of a primary aromatic amino compound in the presence of a coupler as hereinafter defined. It also includes photographic sensitive elements having such a coupler incorporated in one or more emulsion layers.

In British Patent 503,752 carboxylic acid amide couplers are described which are obtained by the reaction of α-naphthol carboxylic acid chloride with amines containing a high molecular substituent group. In these couplers the hydroxyl group of the naphthol constitutes the directing group in the coupling reaction and the carbon atom of the carboxylic acid amide group is, therefore, directly attached to the coupler portion of the molecule, and the amide may be considered as being derived from a primary amine. While these compounds form colored photographic images upon development in primary aromatic amino developers, the coupler molecule in certain cases is unstable to heat and light and is unsatisfactory for that reason.

We have found that hydroxynaphthoic acid amide couplers in which the amide may be considered as being derived from a secondary amine possess more desirable light absorption characteristics for color photography and are more stable to heat and light than the corresponding amides derived from primary amines.

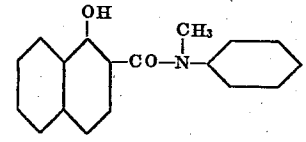
The compounds which we propose to use have the following formula:



wherein R and R'=alkyl, aryl, aralkyl.

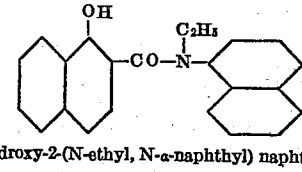
Specific compounds which may be used according to our invention are the following:

(1)



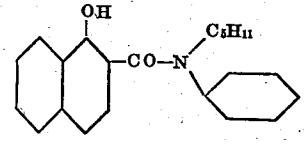
1-hydroxy-2-naphthoic-N-methyl anilide

(2)



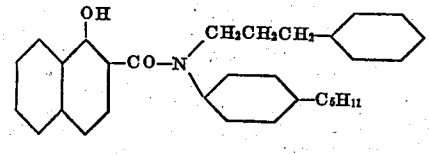
1-hydroxy-2-(N-ethyl, N-α-naphthyl) naphthamide

(3)



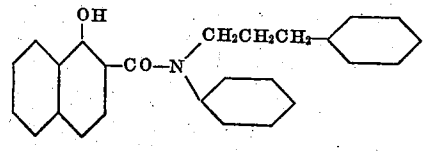
1-hydroxy-2-(N-isoamyl, N-phenyl) naphthamide

(4)



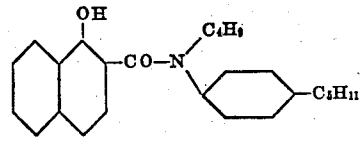
1-hydroxy-2-(N-[γ-phenyl]-propyl, N-p-amylbenzene) naphthamide

(5)



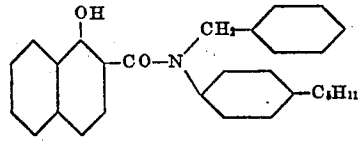
1-hydroxy-2-(N-[γ-phenyl]-propyl, N-phenyl) naphthamide

(6)



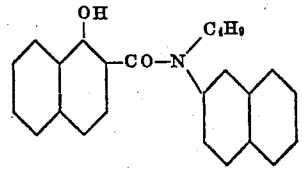
1-hydroxy-2-(N-isobutyl, N-p-amylbenzene) naphthamide

(7)



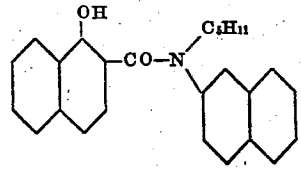
1-hydroxy-2-(N-benzyl, N-p-amylbenzene) naphthamide

(8)



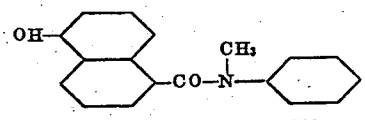
1-hydroxy-2-(N-butyl, N-α-naphthyl) naphthamide

(9)



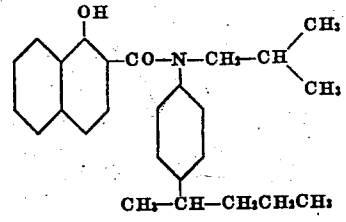
1-hydroxy-2-(N-amyl,N-α-naphthyl)naphthamide

(10)



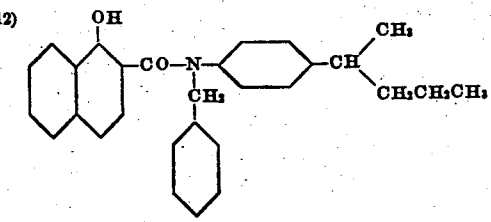
N-methyl-5-hydroxynaphthanilide

(11)



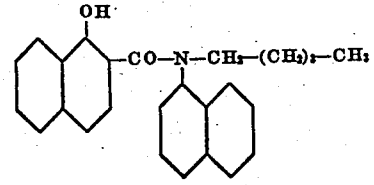
1-hydroxy-2-(N-isobutyl-N-p-sec.-amylbenzene)-naphthamide

(12)



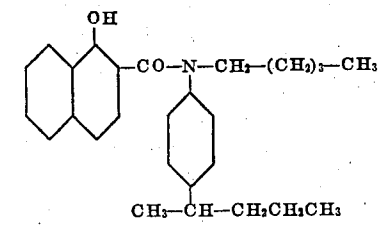
1-hydroxy-2-(N-benzyl-N-[p-sec.-amyl]-benzene)-naphthamide

(13)



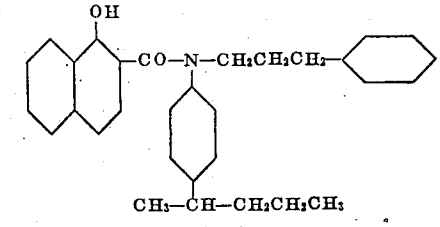
1-hydroxy-2-(N-n-amyl-N-α-naphthyl)-naphthamide

(14)



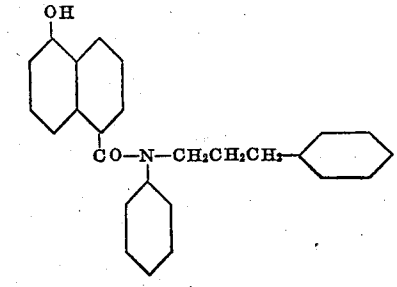
1-hydroxy-2-(N-n-amyl-N-p-sec.-amylbenzene)-naphthamide

(15)



1-hydroxy-2-(N-[γ-phenyl] propyl-N-p-sec.-amylbenzene) naphthamide

(16)



5'-hydroxy-1-(N-phenyl-N-γ-phenyl-propyl)-naphthamide

The couplers may be prepared by the reaction of secondary amines with the acid chlorides of hydroxynaphthoic acids, with the acid chlorides of their esters and subsequent hydrolitic elimination of the acid groups, or with their esters. These reactions can also be applied to the substitution products of the hydroxynaphthoic acids with suitable substituents in one or both rings or the reaction products can be substituted, for example, with chlorine. The couplers made according to our invention may be dissolved in the developing solution or may be incorporated in the emulsion layer according to their solubility characteristics. Compounds 2 to 9 and 11 to 16 are suitable for use in the emulsion layer and the remaining compounds are sufficiently soluble for use in the developing solution. The use of an alcohol in the developer which is a solvent for the coupler improves the color produced particularly when the coupler is in the layer.

These couplers contain a phenolic hydroxyl group which is reactive with the oxidation product of a primary aromatic amino coupling developing agent to form colored images. The compounds are presumably active in the ortho or para position with respect to the position of the hydroxyl group.

The coupling compounds used according to our invention may contain other substituents which do not affect the coupling properties of the compound. For example, the naphthol portion of the coupler may contain substituent groups and may even contain readily replaceable groups such as chlorine or bromine in the position ortho or para with respect to the hydroxyl group where such substituents do not affect the coupling properties. Where we refer in the general formula to aryl and aralkyl groups, it is to be understood that these groups may be further substituted.

The aromatic amino developing agents used with the coupler compounds of our invention include the mono-, di- and tri-aminoaryl compounds and their derivatives formed by substitution in the amino group as well as in the ring, such as alkylphenylenediamines and alkyltoluylenediamines. These compounds are usually used in the salt form, such as the hydrochloride or the sulfate, which are more stable than the amines themselves. Suitable compounds are diethyl-p-phenylenediamine hydrochloride, monomethyl-p-phenylenediamine hydrochloride, dimethyl-p-phenylenediaminehydrochloride and dimethyl-p-phenylenediamine sulfate. The p-aminophenols and their substitution products may also be used where the amino group is substituted. All of these compounds have an unsubstituted amino group which enables the oxidation products of the developer to couple with the color forming compounds to form a dye image.

The following developer formula may be used with the compounds of our invention:

A.	p-Aminodiethylaniline sulfate	grams	2
	Sodium sulfite anhydrous	do	5
	Sodium carbonate anhydrous	do	20
	Potassium bromide	do	2
	Water to	liter	1
B.	Coupler	grams	1 to 5
	Isopropyl alcohol	cc	100

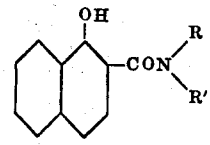
B is added to A.

In case the coupler is incorporated in the emulsion layer, the alcohol in the developer acts as a solvent for the coupler and improves the color. Our development process may be employed for the production of colored photographic images in layers of gelatin or other carrier such as collodion, organic esters of cellulose or synthetic resins. The carrier may be supported by a transparent medium such as glass, a cellulose ester, or a non-transparent reflecting medium such as paper of an opaque cellulose ester. The emulsion may be coated as a single layer on the support or as superposed layers on one or both sides of the support. The superposed layers may be differentially sensitized to form natural color photographic images in the well known manner.

The examples and compounds set forth in the present specification are illustrative only and it is to be understood that our invention is limited only by the scope of the appended claims.

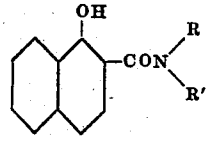
We claim:

1. A color forming photographic developer comprising a primary aromatic amino developing agent and a coupler compound having the formula:



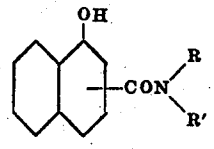
where R is an aryl radical and R' is an aralkyl radical.

2. The method of producing a colored photographic image in a gelatino silver halide emulsion layer which comprises exposing the layer and developing it with a primary aromatic amino developing agent in the presence of a coupler compound having the formula:



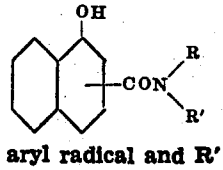
where R is an aryl radical and R' is an aralkyl radical.

3. A color-forming photographic developer comprising a primary aromatic amino developing agent and a coupler compound having the formula:



where R is an aryl radical and R' is an aralkyl radical.

4. The method of producing a colored photographic image in a gelatino-silver halide emulsion layer which comprises exposing the layer and developing it with a primary aromatic amino developing agent in the presence of a coupler compound having the formula:



where R is an aryl radical and R' is an aralkyl radical.

ILMARI F. SALMINEN.
ARNOLD WEISSBERGER.
DUDLEY B. GLASS.