Oct. 15, 1940. P. GOLDFINGER 2,217,899

LIGHT-SENSITIVE MULTILAYER MATERIAL

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Fig. 1

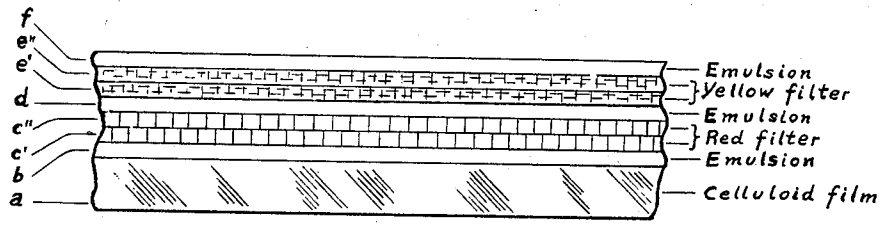
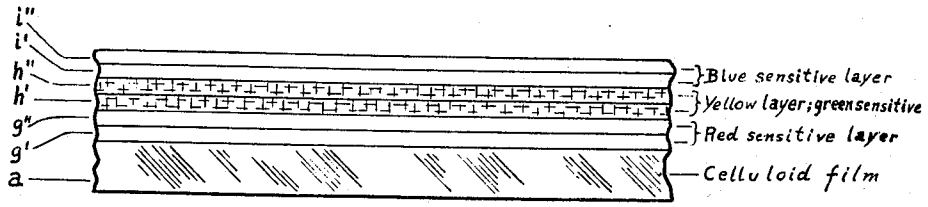


Fig. 2



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LIGHT-SENSITIVE MULTILAYER MATERIAL

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3 Claims. (Cl. 95—2)

The present invention relates to a multilayer light-sensitive material for color photographic purposes in which the exposure of a light-sensitive layer is influenced by the presence of a screening dye. Thus, for example, in a film in which a color-sensitive layer is arranged behind a colored colloid layer a part of the light is absorbed by the dye and only the transmitted light rays are capable of exposing the light-sensitive substance.

Exact observations have shown that the exposure of a light-sensitive layer in a multilayer material is not always sufficiently uniform if the layer is exposed through a colored filter layer. One object of my invention is, therefore, to improve the uniformity of the exposure in those light-sensitive layers of a multilayer material which are exposed behind a colored layer.

It has been found that the fluctuations in the density of the exposed layer are caused by slight variations in the thickness of the screening layer. It is, therefore, a further object of my invention to provide a multilayer light-sensitive material in which the layers containing a screening dye are of a more uniform thickness. Further objects of my invention will be apparent from the following description.

The invention is based on the observation that the fluctuations in thickness are in most cases more or less regular deviations of the average thickness. The supposition may be taken that these deviations are caused by the oscillations of the support during its passage through the coating device and drying apparatus before the coating has set.

As it is very difficult to restrain the oscillations or vibrations of the support, I have tried to balance the resulting fluctuations in the thickness of the layer by a compensation method. According to the invention the colored colloid layer is formed by two successive coatings of the colored colloid solution which together form two contiguously connected and substantially identical strata of the colored colloid layer. The result of this double coating is a colloid layer of a more uniform thickness than is obtainable by a single coating. The total thickness of the layer may be about the same as that of layers hitherto produced in the form of a single coating or the total thickness may be increased by the superposition of the two strata of substantially identical colloids.

The invention is illustrated schematically in the attached drawing. Fig. 1 illustrates a first example of the invention as applied to filter layers made up of two substantially identical coatings. According to a second example illustrated in Fig. 2, dyed emulsion layers are made up of two substantially identical coatings in accordance with my invention.

In the example illustrated in Fig. 1, a panchromatic emulsion *b* is coated upon a Celluloid film *a* and on top of the emulsion layer *b* a red filter layer *c'*, *c''* is coated in the following manner: 4 grams of Rhodamine B (Schultz Farbstofftabellen, 7. Auflage, 1. Band, Leipzig 1931, No. 864) are dissolved in 200 ccs. water and mixed with 1400 ccs. of 2½% gelatin solution. 80 ccs. of this colored gelatine solution are coated upon 1 sq. m. of the panchromatic silver halide layer *b* to form a coating *c'*. After the coating *c'* has dried or set, a second coating *c''* of 80 ccs. of the same red colored gelatine solution is coated upon the first coating *c'* to form a coating *c''*. Thereafter, a layer of orthochromatic emulsion *d* is coated on the red filter layer *c'*, *c''* and a yellow filter layer *e'*, *e''* is applied as follows: 8 grams of Tartrazine (Schultz 1. c. No. 737) are dissolved in 200 ccs. water and mixed with 1400 ccs. gelatine solution of 2½%. A first coating *e'* of 80 ccs. per sq. m. is applied on top of the orthochromatic layer *d* and after the setting or drying of the coating *e'*, a second coating *e''* of 80 ccs. per sq. m. of the same yellow gelatine solution is coated upon the first coating *e'*. An ordinary blue sensitive emulsion *f* is coated over the yellow filter layer *e'*, *e''*. The dyestuffs may be fixed in the gelatine by precipitating agents and the gelatine solutions may contain a hardening agent. It is preferable to add a somewhat higher amount of hardening agent to the portion of colored gelatine solution used for coating the lower stratum of the filter layer.

The light-sensitive layers in the above example or more generally light-sensitive layers in any other multilayer material may be coated also by a double coating process so that the total thickness not only of the filter layers, but also of the light-sensitive silver halide layers is more uniform than in the case of a layer formed by a single coating. Such an arrangement is illustrated in connection with the example of Fig. 2. This uniform thickness is especially important in the case of layers which, in the production of dyestuff images, are dyed throughout the entire depth of the layer as uneven thickness at different places causes an uneven intensity of the coloration.

The invention is also applicable to multilayer materials in which the screening dye is present

not in a layer of plain colloid but in a light-sensitive layer. In the example illustrated in Fig. 2, Chrysophenine G (Schultz 1. c. No. 726) may be used for coloring a light-sensitive silver halide emulsion which is sensitized to green light. This emulsion is coated in two successive coating operations to form two contiguously connected strata *h'* and *h''* of the yellow silver halide layer in a multilayer material, the other layers of which may be a blue sensitive silver halide layer and a red sensitive layer situated on either side of the green sensitive layer. These blue and red sensitive layers are illustrated as consisting of two coatings each and are marked *i'*, *i''* and *g'*, *g''*, respectively. The support is indicated as a Celluloid film *a*. The dyestuff, Chrysophenine G, acts as a screening dye during exposure and as an image-forming dye after exposure if the dyestuff is locally destroyed at the exposed and developed portions by a dye-destroying agent such as, for instance, an acid thiocarbamide solution. In this case the more uniform thickness of the colored emulsion layer is useful not only during the exposure as explained in connection with plain gelatine filter layers, but has the further advantage that all the portions where no dyestuff is destroyed in the formation of the dye picture and which represent the darkest points of the final image show the same color intensity without any noticeable fluctuations caused by uneven coatings. This applies as well to colored sound records as to picture records.

In the case of a sound film in which the sound record is in the form of a black silver record on a uniformly colored background it is also advantageous that the color of the background does not change its density and also in this case the colored layers according to the invention have a remarkable usefulness. The black silver sound record is printed or recorded either in a colorless layer over which a colored layer lies superimposed or in a colored layer itself and in both cases the colored layer is composed of two contiguously connected part layers.

What is claimed is:

1. A light-sensitive multilayer photographic material comprising at least two light-sensitive silver halide emulsion layers sensitized to record differently colored lights, at least one layer of the multilayer material having incorporated therein a coloring matter and serving as a screening layer for an underlying light-sensitive layer, said screening layer being of substantially uniform thickness and color intensity and comprising two substantially identical coatings directly superposed to each other.

2. A light sensitive multilayer photographic material comprising at least two light-sensitive silver halide emulsion layers sensitized to record differently colored lights, at least one of said layers having incorporated therein a coloring matter and serving as screening layer for the other layer, said screening layer being of substantially uniform thickness and color intensity and comprising two substantially identical coatings directly superposed to each other.

3. A light-sensitive multilayer photographic material for color photography comprising at least two light sensitive silver halide emulsion layers sensitized to record differently colored lights, at least one of said layers being arranged for exposure through the other of said layers, said other of said layers being of substantially uniform thickness and transparency and comprising two identically sensitized coatings directly superposed to each other and a coloring matter in each of said coatings.

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