Jan. 16, 1945. J. A. C. YULE 2,367,551

PHOTOGRAPHIC MATERIAL

Filed April 1, 1942

FIG. 1

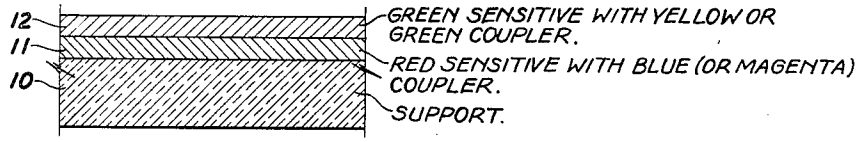


FIG. 2

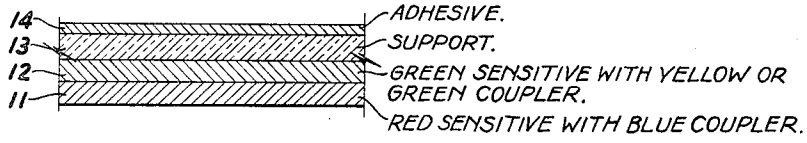


FIG. 3

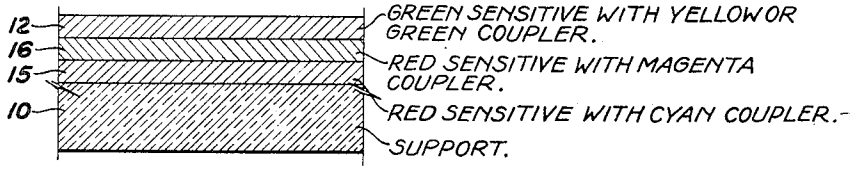


FIG. 4

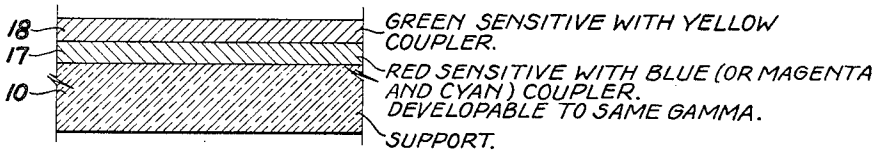


FIG. 5

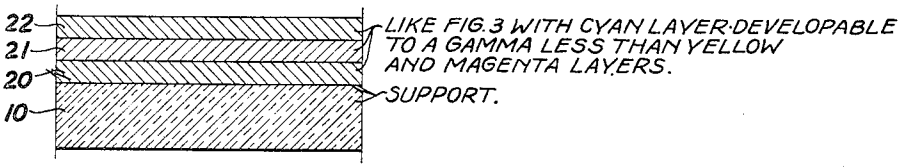
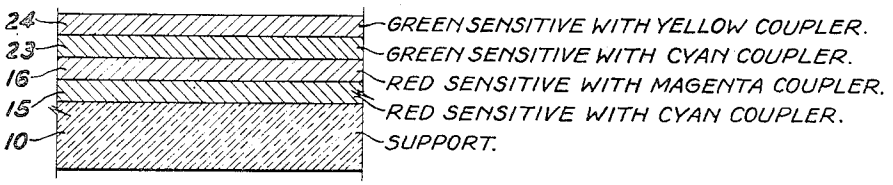


FIG. 6



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Patented Jan. 16, 1945

2,367,551

UNITED STATES PATENT OFFICE

2,367,551

PHOTOGRAPHIC MATERIAL

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Application April 1, 1942, Serial No. 437,155

6 Claims. (Cl. 95—2)

This invention relates to photosensitive materials and particularly to materials used for color reproduction.

It is the primary object of the present invention to provide a photographic material for making a multi-colored mask for use in the color correction process described in my copending application filed concurrently herewith.

Specifically, it is the object of the invention to provide a material which can be developed to a multi-colored mask for a positive or negative multi-color record through which it has been exposed. When the mask is placed in optical register with the original multi-colored record, prints may be made therefrom either in the form of color separation records for use in photomechanical processes or in the form of multilayer subtractive color records.

According to the invention, such a material is multilayer and is made up of a plurality of parts each of which consists of one or more of the layers. One part is sensitive to green light only by suitable sensitization and filtering, and this part contains color couplers developable to a color which absorbs blue and transmits green light. Such a color in one embodiment is yellow; in another embodiment it is green. Another part of the material is sensitive to primary red light only and contains couplers developable to blue.

Suitable couplers are described in U. S. Patent 2,126,337 Mannes and Godowsky, and in copending applications 314,689, Mannes and Godowsky now U. S. Patent 2,304,940, and 371,612, Jelley and Vittum, now U. S. Patent 2,322,027. In general, couplers consist of those compounds having a reactive methylene group or phenolic hydroxyl group so that they couple with the development product of a primary aromatic amino developing agent to give different colors depending on which coupler is selected.

In one embodiment of the invention, the red-sensitive part of the material consists of two layers, one of which contains a coupler developable to magenta, and the other of which contains a coupler developable to cyan. Similarly, in the embodiment in which the green-sensitive part is to be developed to green, it may be made of two layers, one developable to yellow and the other to cyan.

Since satisfactory color correction according to the invention of my copending application can be obtained with equal amounts of correction for the blue and green separations, one embodiment of the present invention has the green and red-sensitive parts developable to equal equivalent gammas. In that embodiment in which the green-sensitive part is developable to yellow and the red-sensitive part is developable to blue, the fact that both parts are developable to the same equivalent gamma simultaneously also means that a neutral gray area in the record being masked will reproduce as a neutral gray in the mask itself which thus permits a convenient check on whether the processing of the mask is proceeding properly.

The "equivalent gamma" of a dye image is the neutral gramma it would have if just sufficient of the complementary dye or dyes is added to give a neutral color. In fact, any other method of defining the gamma of a color layer depends on the hue of the illuminating light, and hence, is not as definite as the characteristic called "equivalent gamma."

In a different embodiment of the invention which is possible when the red-sensitive part is made of two layers, the layer developable to cyan is arranged to give a slightly reduced gamma compared to the other layers when all three layers are developed simultaneously.

According to a preferred embodiment of the present invention, this multi-layer material is provided with an adhesive on one surface so that it may be attached to the multi-colored record being copied during exposure and processing of the mask and during printing from the record thus masked.

Attention is drawn to the fact that the mask is negative with respect to the exposing image; i. e., is negative if the original record is positive and is positive if the original record is negative, as required by the invention of my application concurrently filed and referred to above. The coupler type of color development is particularly useful when negative records are thus required.

The invention is illustrated in the accompanying drawing in which:

Fig. 1 illustrates a general form of the invention;

Fig. 2 is similar to Fig. 1 but has an adhesive coating;

Figs. 3, 4, 5, and 6 respectively illustrate various forms of the embodiment shown in Fig. 1.

In Fig. 1 a support 10 such as the usual film base carries two layers 11 and 12 of which the lower one is sensitive to red light and contains a coupler so as to be developable preferably to blue or at least to a color which transmits blue and absorbs green. The upper layer 12 is sensitive to green light and contains couplers so as to be developable to yellow or green. The sensitization

of the layers may involve suitable filtering such as red filter between the two layers and/or a yellow filter on top of the upper layer to cut off blue light. In that embodiment in which the layer 12 is developable to green, it is sometimes desirable to have the layer 11 developable to the complementary magenta rather than to primary blue. In Fig. 2 these same sensitive layers are carried on a thin support 13 having an adhesive 14 on the other surface thereof so that the material may be attached to the multi-color record through which it is to be exposed. The support 13 acts to protect the record while the layers 11 and 12 are being processed.

In Fig. 3 the upper layer 12 is green-sensitive with a yellow or green coupler as in Fig. 1, but the red-sensitive part consists of two layers 15 and 16 with cyan and magenta couplers respectively. Of course, the blue coupler of layer 11 in Fig. 1 may be made up of cyan and magenta couplers.

Fig. 4 is similar to Fig. 1 in that the lower layer is red-sensitive with a blue coupler which may comprise magenta and cyan couplers in the different layers as in Fig. 3 and the green-sensitive layer contains a coupler which absorbs blue and transmits green. As is common practice when discussing dyes, the terms "transmit" and "absorb" are used only relatively meaning "transmit to a high degree" or "absorb to a high degree," since no dye absorbs any color completely or transmits any color completely. The important feature of Fig. 4 is that the two parts, whether made of two or more layers, are developable to the same equivalent gamma. This has been shown to give satisfactory color correction in most color reproduction processes. If the green-sensitive layer specifically contains a yellow coupler (the other embodiment being the case wherein it contains a green coupler), the yellow and blue are complementary so that a gray area in the record being masked reproduces as gray in this mask. For example, the gray scale which is often incorporated into or along side a multi-colored record to be printed will in this embodiment reproduce as neutral gray, thus giving a convenient check on the processing of the material.

On the other hand, certain photomechanical processes require reduced contrasts in the yellow and magenta printers; and hence it is sometimes convenient to make a multi-colored mask which has a higher gamma to blue and green light. Therefore, as shown in Fig. 5, a red-sensitive layer 20 containing a cyan coupler is made of slightly less contrasty material than the layers 21 and 22 containing magenta and yellow couplers respectively. As in Fig. 3, the upper layer 22 may contain either a yellow or green coupler depending on what type of color correction is desired; i. e., on whether correction of blue by green and green by red only are desired, or whether correction of red by green is also desired.

In Fig. 6 the red-sensitive part is divided into two layers 15 and 16 as in Fig. 3, and the green-sensitive part is also divided into two sensitive layers containing cyan and yellow couplers respectively. Of course, the possibility of having the green part in two layers and the red-sensitive part in one layer only with a blue coupler might be considered, but since blue couplers are rare, the splitting of the red-sensitive part into two layers is more useful than the splitting of the green-sensitive part which in general is not necessary since both yellow and green couplers are well known and are satisfactory.

Having thus described various embodiments of my invention, I wish to point out that it is not limited to these structures, but is of the scope of the appended claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. A multi-layer material for making a universal color correcting mask negative to the exposing light comprising one part which is sensitive to green light and is not sensitive to red light and which contains color couplers developable to a color which absorbs blue and transmits green and another part of which is sensitive to red light and is not sensitive to green light and is in two layers one of which contains a coupler developable to magenta and the other of which contains a coupler developable to cyan.

2. A multi-layer material for making a universal color correcting mask negative to the exposing light comprising one part which is a layer sensitive to green light and is not sensitive to red light and which contains a yellow coupler and another part which is sensitive to red light and is not sensitive to green light and is in two layers respectively containing magenta and cyan couplers, the cyan layer being developable simultaneously with the other two layers to a gamma slightly less than that of either of said other two layers.

3. A multi-layer material for making a universal color correcting mask negative to the exposing light, the sensitive layers of said material consisting solely of one part which is sensitive to green light and is not sensitive to red light and which contains color couplers developable to a color which absorbs blue and transmits green and another part which is sensitive to red light and is not sensitive to green light and which contains color couplers developable to a color which absorbs green and transmits blue, said couplers being developable simultaneously to complementary colors and including a yellow coupler in the green sensitive part, a magenta coupler in the red sensitive part and a cyan coupler in only one of said parts.

4. A multi-layer material for making a universal color correcting mask negative to the exposing light, the sensitive layers of said material consisting solely of one part which is sensitive to green light and is not sensitive to red light and which contains a yellow coupler and another part which is sensitive to red light and is not sensitive to green light and which contains two color couplers one developable to cyan and the other simultaneously developable to magenta.

5. A multi-layer material for making a universal color correcting mask negative to the exposing light, the sensitive layers of said material consisting solely of one part which is sensitive to green light and is not sensitive to red light and which contains two couplers one developable to cyan and the other simultaneously to yellow and another part which is sensitive to red light and is not sensitive to green light and which contains a magenta coupler.

6. A multi-layer material according to claim 3 in which the two parts contain such relative amounts of silver halide that they are developable simultaneously to substantially the same equivalent gamma.

JOHN A. C. YULE.