March 18, 1952 N. G. HORSKY 2,589,696

METHOD FOR MAKING MOTION-PICTURE FILM

Filed April 12, 1949

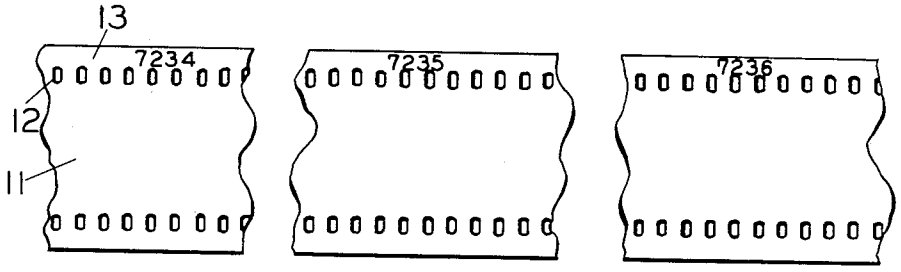

FIG. 1

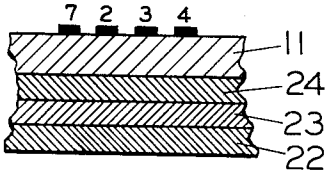

FIG. 2

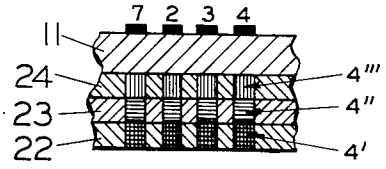

FIG. 3

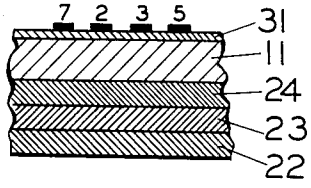

FIG. 4

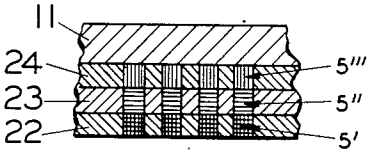

FIG. 5

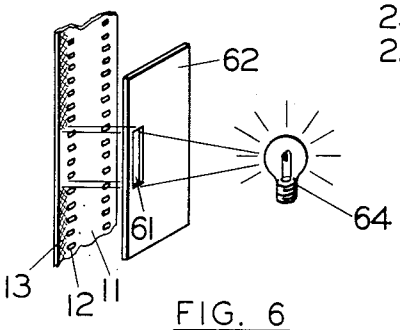

FIG. 6

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METHOD FOR MARKING MOTION-PICTURE FILM

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5 Claims. (Cl. 95—2)

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This invention relates to color photography and more particularly to methods and means for identifying specified portions of developed motion picture film.

In the manufacture of motion picture film which is to be used for the taking of original scenes, the film is ordinarily provided with identifying symbols or numbers by which specified portions of the film can be instantly identified. It is the accepted procedure to ink-print consecutive footage indications between the extreme edge and the perforation of the film. This method, although accepted as a standard procedure by the photographic industry, has the serious disadvantage, particularly in color motion picture film, that the ink-printed footage numbers are quite difficult to read after processing, although the area surrounding these identification symbols is generally kept transparent. Moreover, these ink-printed footage numbers are very poorly reproduced on duplicating and copying materials, with the undesirable result that the photographically copied footage numbers on the duplicate material can not be identified with absolute certainty.

Although several other methods for providing identifying marks for black and white films have been suggested, all of these methods have serious shortcomings. Thus, it has been recommended to use stencils for cutting numbers into the film, but this procedure is not only cumbersome, but frequently leads to objectionable lacerations of the film together with objectionable adherence of cut-out fragments. It has also been proposed to print, photographically, consecutive footage numbers from a moving master film onto the edge of the unexposed movie film. This latter method has the inherent disadvantage that the footage markings can not be read until the film has been developed.

The standard procedure of ink-printing is especially unsatisfactory when used for the identification of color film because they fail to produce identification symbols which can easily be read either on the unexposed or on the processed film. The ink-printed numbers are apt to be washed off by the various processing solutions or rubbed off mechanically by the many machine manipulations. Moreover, the edge area is frequently stained and its color does not differ sufficiently from that of the ink. Furthermore, identification symbols ink-printed on developer-soluble antihalation layers are completely removed during processing. Even under carefully controlled conditions, the standard method does not

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permit the satisfactory reproduction of these symbols on duplicating color material.

It is an object of the present invention to overcome these and other undesirable disadvantages and characteristics and to provide an improved multilayer color film which carries identification symbols of improved legibility and photographic reproducibility.

A further object is to provide a simplified and improved process of producing such color films.

Other objects and advantages of this invention will be apparent by reference to the following specification in which its preferred details and embodiments are described.

Color film used for the taking of motion pictures consists of a transparent support or base on top of which are coated a plurality of separate emulsion layers. Commonly, three emulsions separately sensitized to the primary colors of the spectrum, namely, blue, green and red are used. The complementary colors, i. e., yellow, magenta and cyan are formed in the respective layers through color development either by incorporating a non-diffusing or substantive color former in the emulsion layers or by using color developers which contain, in addition to the developing agent, a soluble color former.

It has been found that the foregoing objects are accomplished by printing with a suitable ink, identifying symbols such as footage indications onto the support side or base of a motion picture color film preferably between the perforation marks and the extreme edge of the film, and flashing the edge of the film with a suitable light directed onto the support side. In this manner, a latent shadow image of the identification symbols is obtained in the multilayer emulsion while the rest of the margin area is fully exposed. After processing, namely, development and removal of all developed silver and undeveloped silver salts, the emulsion carries a colored permanent image of the identification symbol surrounded by a continuous area of distinguishing color character.

This novel procedure makes it possible to provide the film with permanent and mechanically non-removable identification marks, and is of special value when films with a removable, developer-soluble antihalation layer, are used. The herein described process is of equal importance for the identification of negative and reversal films.

The printing inks used in carrying out this invention are of the conventional type and should possess a fairly high drying speed and good op-

tical density. The inks must not contain any ingredients which fog or desensitize the photographic emulsions since in storing the undeveloped film, the ink rests in contact with the light-sensitive emulsion. Inks having as a base, a cellulose ester dissolved in an organic solvent and containing either soluble coloring matter or a dispersion of a pigment, may be used.

The following examples describe, in detail, methods for accomplishing the above objects, but it is to be understood that they are inserted merely for purpose of illustration and are not to be construed as limiting the scope of the invention.

Example I

Two strips of multilayer color movie film of the reversal type and containing color formers fast to diffusion were ink-printed on the base side of the film with footage numbers between the perforation and the extreme edge of the film. Both films were edge-flashed, one from the emulsion side, for the purpose of reducing all the silver halide in this area during the first development and thus obtaining a clear transparent background after the reversal development, the other from the support side to provide an image in the emulsion. After reversal processing including a development in a black and white developer, exposure to a light source to expose all undeveloped silver-halide, development in a color developer containing diethylaminoaniline or a similar color developing agent, bleaching in a solution of potassium ferricyanide and potassium bromide in order to convert developer silver into silver-halide, fixing, washing and drying, the footage numbers of the film flashed through the support side, were more clearly legible than those of the film which was exposed through the emulsion side. A permanent colored image of the ink-printed footage numbers had been formed in the emulsion of the base-exposed film which was resistant to wiping and other manipulations. The footage numbers of the other film which had been flashed from the emulsion side were partly removed by gentle rubbing. The difference between the two films was even more pronounced when duplicate copies made from the edge-flashed films were inspected. The copy made from the base-flashed film showed clear and distinct footage numbers, while the footage indications on the copy made from the emulsion-flashed material were hardly readable.

Example II

Two strips of 35 mm. mutilayer color film of the reversal type containing color formers fast to diffusion and provided with developer-soluble antihalation layers of the type described in United States Patents 2,077,789 and 2,089,764 were ink-printed on the base side with footage numbers. The ink used was a dispersion of Fast Black (Colour Index No. 919) and Oil Red (Colour Index No. 248) in a base of cellulose nitrate dissolved in alcohol and acetone. Both films were edge-flashed, one from the support side and the other from the emulsion side. After the two strips had been exposed in a motion picture camera and processed to reversal images, only the film which had been exposed from the support side carried footage numbers whereas the film which had been edge-flashed through the emulsion side showed no footage numbers whatsoever. It is assumed that the printed numbers were removed together with the antihalation layer.

Example III

Example II was repeated with the exception that the multilayer color film was of the negative type and that the film was developed to a negative by omitting the first development step and the exposure of the undeveloped silver-halide to light. The film edge area of the film which had been edge-flashed from the support side showed clear footage numbers on a dark background, while the film which had been edge-flashed from the emulsion side did not show any footage numbers.

The above specific examples are to be regarded as merely illustrative of the invention and not in any sense restrictive.

To more clearly demonstrate the mechanism involved, this invention is further illustrated by the accompanying drawings in which:

Fig. 1 shows a strip of color motion picture film having ink-printed footage numbers on its support.

Fig. 2 shows in cross section a motion picture color film, greatly enlarged for the sake of clearer understanding, having three emulsion layers on a support carrying footage numbers.

Fig. 3 similarly shows in cross section, the same film after being edge-flashed from the base side and processed by reversal development.

Fig. 4 shows greatly enlarged in cross section, a reversible film carrying a developer-soluble antihalation layer cast over the support. The footage numbers are printed on top of the antihalation layer.

Fig. 5 shows in cross section, the same film after edge-flashing through the antihalation layer and support and processing to a reversal image.

Fig. 6 is a schematic illustration of a simple device for edge-flashing the film.

In Fig. 1, a representative portion is seen of the support 11 of a film, having perforations 12 and showing in a marginal area 13, footage indications 7234, 7235 and 7236. Inasmuch as these numbers are in actual practice one foot apart, the portions are shown in broken lines.

Referring now to Fig. 2, the motion picture film is shown in cross section. The base or support 11 carries the blue sensitive emulsion layer 22 containing a color former for the yellow image, the green sensitive layer 23 containing a color former for the magenta image and the red sensitive layer 24 containing a color former for the cyan image. Ink-printed individual footage numbers 7234 are shown as small raised dark squares.

Fig. 3 demonstrates the effect of development on the film. It is observed that images of numeral 4 have been developed in the three layers as follows: 4' indicates the yellow part image of numeral 4, while 4'' and 4''' indicates the magenta and cyan images, respectively. Similar images of the other numerals have not been identified by separate numbers for reasons of simplicity.

In Fig. 4, the film consists of the base 11, and the previously described emulsion layers 22, 23 and 24. In addition, there is shown a developer soluble antihalation layer 31. The latter carries the ink-printed marking represented by numerals 7235.

In Fig. 5, the effect of development of the film of Fig. 4 is demonstrated. It is important to note that the antihalation layer 31 and, consequently, the ink-printed numerals 7235 are washed away

in the development process. However, a permanent record of these numerals will still be obtained, represented by corresponding color images such as the yellow image 5', magenta image 5'' and cyan image 5'''. The footage numbers become permanent records in the same manner as the developed picture on the film and are easily visible due to the difference in color characteristics.

The light printing of the footage numbers is shown schematically in Fig. 6. The film passes an aperture 61 in a masking plate 62. The light from an appropriate source, for example, the lamp 64 passes through the aperture 61 and exposes the marginal area 13 of the film with the exception of space covered by the footage indication 7234. The main portion of the film is shaded by the masking plate 62 and is not exposed. The exposure is on the base side or antihalation layer side on which the numbers are ink-printed in order to obtain a shadow image.

It will be readily apparent to those skilled in the art that many modifications, such as the use of multilayer film free from color formers but processed in developers containing suitable color couplers, is within the spirit and scope of the invention. Accordingly, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A method for producing permanent identification marks in a multilayer color motion picture film comprising a transparent support covered on one side by a developer-removable antihalation layer and covered on the other side by a plurality of emulsion layers, selectively sensitized to the blue, green and red regions of the spectrum and containing color formers fast to diffusion capable of yielding upon color development, colors complementary to those for which the emulsions are sensitized, which method includes ink-printing identification marks on the marginal area of said antihalation layer between the perforations and the extreme edge of the film, exposing the emulsions with visible light in the marginal area only, through said antihalation layer, thereby creating a latent shadow image of the identification symbols in the emulsion layers, exposing the main area of the film in a motion picture camera, developing the film and removing said antihalation layer during development.

2. A method for the production of permanent footage numbers in a multilayer color motion picture film comprising a transparent support and a plurality of emulsions sensitized to the primary colors of the spectrum and containing color formers fast to diffusion capable of yielding upon color development colors complementary to those for which the emulsions are sensitized, which method includes ink-printing footage numbers on the film base between the perforations and the extreme edge of the film, edge-flashing with visible light the marginal area through the film support, thereby creating a latent shadow image of the identification symbols in the emulsion layers, exposing the main area of the film in a motion picture camera and processing the film to a reversal image by submitting it to black and white development, second exposure, color development, bleaching, fixing, washing and drying.

3. A color motion picture film comprising a transparent film support and a plurality of emulsion layers selectively sensitized to the blue, green and red regions of the spectrum and containing coupling components fast to diffusion which upon color development yield colors complementary to those for which the individual layers are sensitized, said film carrying ink-printed identification marks on the support side in the area between the perforations and the extreme edge of the film, said emulsions being unexposed except for the area between the perforations and the extreme edge of the film, said area containing latent shadow images photographically exposed through the identification marks.

4. A color motion picture film comprising a transparent support covered on one side by a developer-removable antihalation layer and covered on the other side by a plurality of superposed emulsion layers selectively sensitized to the primary colors of the spectrum and containing color formers fast to diffusion, which upon color development yield colors complementary to those for which the individual layers are sensitized, said film carrying identifying ink marks on the antihalation layer between the perforations and the extreme edge of the film, said emulsions being unexposed except for the area between the perforations and the extreme edge of the film, said area containing latent shadow images photographically exposed through the identifying marks.

5. A method for the production of permanent footage numbers in a multilayer color motion picture film comprising a transparent support and a plurality of emulsions sensitized to the primary colors of the spectrum and containing color formers fast to diffusion capable of yielding upon color development colors complementary to those for which the emulsions are sensitized, which method includes ink-printing footage numbers on the film base between the perforations and the extreme edge of the film, edge-flashing with visible light the marginal area through the film support, thereby creating a latent shadow image of the identification symbols in the emulsion layers, exposing the main area of the film in a motion picture camera and then developing the film.

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