[Second Edition.]

PATENT SPECIFICATION

345,986

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COMPLETE SPECIFICATION.

Improvements in Sound Record Motion Pictures.

We, TECHNICOLOR MOTION PICTURE CORPORATION, a corporation of Maine, United States of America, of 120, Brookline Avenue, Boston, Massachusetts, United States of America, assignees of LEONARD THOMPSON TROLAND, a citizen of the United States of America, of 120, Brookline Avenue, Boston, aforesaid, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to cinematographic films of the type bearing a record of sounds concomitant with the scene depicted and more particularly to sound-record film for the display of motion pictures in natural colours. The sound record may be of either of the well-known types, one of which is characterized by a variable-density constant-width band or stripe and the other by a constant-density and variable-width band. Heretofore it has been usual to produce this band or stripe by the common photographic process involving developed silver and the results have been unsatisfactory in that the sound waves are not accurately recorded for the reason, we believe, that the photographic characteristic of a silver emulsion is not a straight line; and in the case of constant-density variable-width recording the presence of fog adjacent the variable-width stripe makes it difficult to obtain a satisfactory degree of contrast between the stripe and adjacent areas of the film.

Objects of the present invention are to provide a film which faithfully records the sound for accurate reproduction, which is less costly to produce, and which greatly simplifies the production of sound record motion pictures in natural colours.

According to this invention the ultimate sound record does not comprise developed silver but on the contrary this record, whether of variable density or variable width, is formed with dye either as a dye relief image or an imbibition print therefrom. In the case of coloured pictures, this dye may be the same as one of the dyes used in forming the colour pictures. The record may be formed by photographic printing from a negative, developing, hardening, etching and staining, or preferably by imbibition from a stained relief matrix on a gelatine coating or the like. Although the use of dyes for producing sound records has heretofore resulted in poor definition, we have discovered that the limited class of dyes hereinafter referred to are free from this difficulty.

While the pictures may be printed photographically by any desired colour process, preferably they are also printed along with the sound record, as by imbibition, thereby forming the picture and sound record concomitantly in the same series of operations.

Applied in the variable-width way this method will yield a band or stripe having very high density and therefore adequate contrast with the adjacent regions of the film; and when the band or stripe is in the form of a relief the contrast may be rendered very high by etching off all the gelatine in the adjacent regions leaving bare celluloid which will not, of course, imbibe the dye. In both the variable-width and variable-density methods, the contrast may be enhanced by using a dye which is strongly absorbed by the rays to which the pick-up or sound-reproducing device is sensitive.

A preferred mode of procedure consists in forming the sound and picture negatives, on the same film or different films respectively, printing one or more positives from the negatives, using a separate positive for each colour aspect recorded in the case of colour pictures, preferably with the sound record reproduced on one or more of the positives bearing the picture images, converting both the picture and sound positive images into gelatine reliefs (e.g. by exposure through the celluloid backing and dissolving off the unexposed gelatine as described in patent No. 188,329) and then dyeing the matrix images and printing them on a suitable blank film by imbibition as described, for example, in patent No. 307,659, dated May 14, 1928, the sound

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record preferably being printed simultaneously with the pictures.

The method of the present invention includes the preliminary preparation of photographic positive film which may be exposed and developed with respect to one or more given colour aspects of the scene to be depicted and simultaneously exposed in another portion of the same or a different film (preferably through the transparent backing) to correspond to sound wave vibrations. The coating of the film or at least the sound record portion of the coating may be dyed (before exposure) strongly to absorb one or more colours in the variable printing light (other colours being less absorbed) as more fully described in patent No. 263,650, dated February 8, 1926 thereby to accentuate the relative depths of penetration of the light and to exaggerate the relative contours of the sound record which is thereby produced in the gelatine after development and the removal (as by etching in hot water) of the undeveloped gelatine. While the pictures may be formed by any suitable photographic process they are preferably formed in like manner by an etching process or the similar process involving differential hardening without etching. This film may be formed by reversing the negative or by printing a matrix from the negative.

For the purpose of illustrating the invention typical embodiments are shown in the accompanying drawings in which,

Fig. 1 is a face view of a film of the variable-density type;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing the variable-width type of sound record;

Fig. 4 is a section on line 4—4 of Fig. 3; and

Fig. 5 is a similar section of a dye absorptive blank printed by imbibition.

The illustration shown in Fig. 1 comprises a film 1 having the usual rows of sprocket holes 2, pictures 3 between the rows of sprocket holes, and a sound record 4 on the extended lateral margin of the film. According to the preferred procedure above outlined, the film is coated with an ordinary silver emulsion, preferably treated as described in patent No. 263,650 and both the picture images and the sound record are developed in black and white, the density of the sound record varying longitudinally of the film in accordance with the variable sound as indicated by the variable shading. The gelatine coating (especially of the sound record portion) preferably is sensitized with respect to the more actinic portion of the exposure light, as by adding a small amount of sodium bichromate to the gelatine emulsion, or a suitable yellow dye such as naphthol yellow or quinoline yellow or a mixture of the two. After development, hardening, bleaching and etching both the picture images and the sound record would then be in relief as shown in Figs. 2 and 4, all other portions of the film comprising bare celluloid as shown in Fig. 4. The relief images thus obtained are then stained with appropriate dyes. The blank film printed from this matrix by imbibition would also present a similar appearance except in that the picture and sound record would not be in relief but would comprise dye imbibed into the gelatine layer 5 (Fig. 5) of uniform thickness as shown at 3″ and 4″ respectively in Fig. 5. In producing a film in natural colours by such an imbibition process it will be understood that the blank film would first be printed with a matrix representing one colour aspect of the object field, for example the red-orange aspect, and subsequently printed with another matrix representing another colour aspect of the object field, as for example the blue-green aspect. In such a colour process the sound record may be on only one or both of the matrices, being printed in one colour only when on only one matrix and being printed in both colours in superposition when on both matrices. Likewise the process may be used for printing a three or four-colour picture film.

The film shown in Fig. 3 is similar to that shown in Fig. 1 except in that the sound record is of the constant-density variable-width type. As in the case of Fig. 1, Fig. 3 serves to illustrate any one of the three films above referred to, namely the negative, the matrix or the imbibition print. In the case of the negative the picture and sound images may comprise developed silver, in the case of the matrix they may be in the form of dyed reliefs, and in the case of the printed blanks they may be in the form of dyed prints.

From the foregoing it will be understood that for the display of pictures in black-and-white the dyed relief film, which constitutes the intermediate of the three films above described, may be used as the projection film instead of transferring the dye contained therein to a dye-adsorptive blank.

According to this invention the presence of a small amount of fog (such as is ordinarily present in commercial methods of black-and-white photography) in the regions adjacent a variable width sound record such as shown in Fig. 3

does not affect the finished product, whether it be a relief as shown in Fig. 4 or an imbibition print as shown in Fig. 5, for the reason that all of the gelatine is etched off in those regions leaving bare celluloid which imbibes no dye.

One aspect of the invention consists in the discovery that greatly improved definition may be attained with a small class of dyes characterized by slow and shallow diffusion into wet gelatine. While it is not entirely clear why the few dyes of this classification afford such marked improvement in sharp definition we believe it is due to the fact that penetration of these dyes is retarded in such marked degree (due to viscosity and/or chemical affinity for gelatine) as to confine the dye substantially to the surface of the gelatine and thereby prevent lateral diffusion. Typical examples of these dyes comprise Fast Red A Extra (Colour Index 176) Fast Acid Green B (Colour Index 667) Fast Wool Blue B (Colour Index 209) and Anthracene Yellow G R pure (similar to Colour Index 195 and Shultz 177). Dyes of this class are particularly applicable to the production of sound records of the variable-width constant-density type.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. A film for reproducing sounds concurrently with the reproduction of concomitant scenes characterized in that the sound record is in the form of a dye relief image or an imbibition print therefrom so as to have an approximately straight line characteristic at least in the region of lower densities whereby the sounds are accurately reproduced throughout a wide range of intensities.

2. A film according to claim 1, characterized in that the dye of the sound record is substantially confined to the surface stratum of a layer of gelatine or the like.

3. A film according to either of the two preceding claims further characterized in that the dye image has variable width.

4. The method of producing a film according to claim 3 characterized by differentially hardening the exposed and non-exposed portions of an exposed emulsion and etching off the gelatine or the like adjacent the variable edge of the image.

5. The method according to claim 4, further characterized by dyeing said image and then transferring the dye to a dye-absorptive blank by imbibition.

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2nd Edition

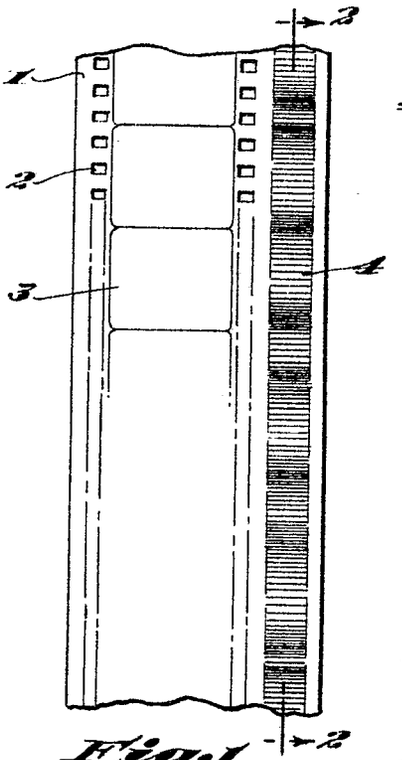

Fig. 1

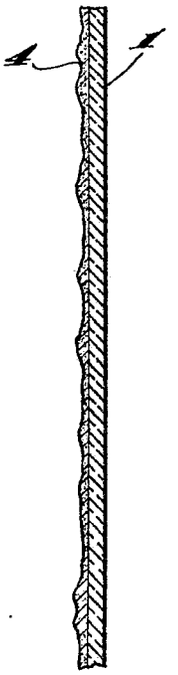

Fig. 2

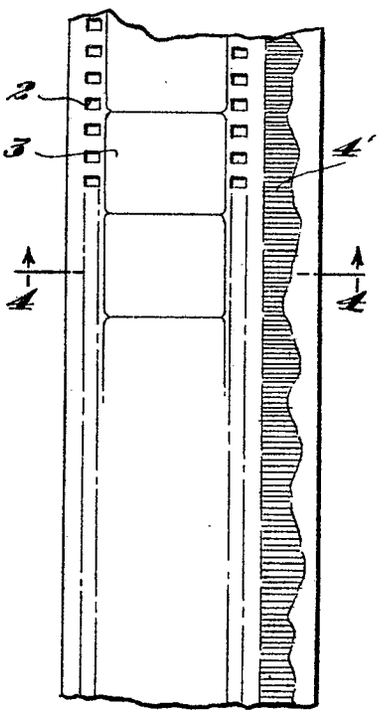

Fig. 3

Fig. 4

Fig. 5

Malby & Sons, Photo-Lith.