

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION.

### Improvement in Differential Treatment of Photographic Images in Different Depths of an Emulsion.

We, TECHNICALOR MOTION PICTURE CORPORATION, a corporation of Maine, United States of America, of 110, Brookline Avenue, Boston, Massachusetts, United States of America, assignees of LEONARD THOMPSON TROLAND, a citizen of the United States of America, of 110, Brookline Avenue, Boston, Massachusetts, 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:—

The present invention deals with a method of treating photographic films bearing different photographic images in different depths of a single emulsion. These so-called monopacks may, for instance, contain an image representing one colour aspect of a scene in the top stratum of the emulsion while a corresponding image representing another color aspect is recorded in a stratum next to the support of the emulsion.

According to the present invention, the images contained in a film of this nature are exactly and easily differentiated for purposes of printing positives therefrom or for using them directly as colored composite pictures, by first subjecting the film to the action of an oxidizing substance having a certain speed of penetration and then interrupting the action of the oxidizer with a so-called stopper consisting of a reducing agent having a speed of penetration greater than that of the oxidizer.

It has previously been proposed to treat films bearing a plurality of images in one emulsion with solutions adjusted as to time of action and concentration so that, for instance, the upper image of an emulsion containing two images is chemically changed without a substantial change of the lower image. Serious difficulty is ordinarily found in such procedures in restricting the action to the top image. However, we have found that a complete limitation of the change to the upper image can be accomplished by the following procedure.

Ordinarily the images are complementary color aspects, one representing e.g. the red, and the other the green aspect of the ob-

ject-field. The images may be formed by printing from complementary negatives, one negative being printed from the front and the other from the back or by using special film, both exposures may be made simultaneously from one side, as well known in the art. After the images are formed they are subjected to the action of an oxidizing solution capable of changing the heretofore uniform character of the images in such a manner, that after treatment with this solution, one record differs from the other as to density, color, or other characteristics. This solution, having a certain determinable speed of penetration, is permitted to act upon the emulsion until the change effected by it reaches the dividing region between superposed images is reached, as, for instance, the dividing region between the upper image and the lower image of the monopack. Then, in order to limit the action exactly and with certainty to the part of the emulsion above this region, we subject the emulsion at this stage of the process to the action of a reducing agent which will effectively counteract the action of the oxidizing solution, but which penetrates the emulsion considerably quicker than the first solution. The application of this second substance will almost immediately stop the action of the first solution and limit it to the layer above the dividing region mentioned above. In this manner the action of the first solution can be definitely controlled and the images differentiated without running the risk of interrupting the differentiating process either too soon or too late. The images, having now a different chemical character, can be treated in any desired manner for the purpose of obtaining pictures in natural colors and consisting of the records which were originally of the same character.

Although various differentiating and stopping substances may be used to carry out our method, we have found that the following specific process is very well suited for this purpose: Assuming the two images to be in the form of metallic silver, we first place the film in a bleach consisting of an oxidizing agent as for instance cupric bromide or a strong solu-

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tion of iodine in potassium iodide. The oxidising agent as for example the iodine solution is allowed to act until the upper image is completely converted into silver iodide. The film is then immediately immersed in an approximately 10% solution of sodium bisulphite. This solution penetrates the emulsion at a rate much more rapid than that which characterizes the iodine solution, and renders the latter completely inactive before it has time to reach the image in the stratum next to the base. If using cupric bromide as a bleaching agent, sodium bisulphite may be used as a stopping agent, as with iodide, or ammonia can be used instead.

Among other practical applications, this specific method permits a differential coloring of the two images in the following manner: The upper image is left in the form of silver iodide and the lower image in the form of the original metallic silver. If the film is now placed in a solution of potassium ferricyanide, the latter will convert the lower image into silver ferricyanide without appreciably affecting the upper image. The lower image can now be toned blue by immersing the film in ferric sulphite, or another appropriate iron compound, while the upper image can be dyed, for instance, by placing it into a solution of safranine fuchsin or other red dye having an affinity for silver iodide.

It will of course be understood that our method may be applied to emulsions containing more than two images and that the above-described embodiment of our invention is only one of any number of possible embodiments making use of an oxidising compound changing the character of a photographic image and of a stopping reducing compound having a greater penetrating speed than the active compound. It is furthermore understood that the

further separation of the images need not necessarily be accomplished by coloring them in the manner as described above, but by coloring them according to any one of the numerous methods known in the art for this purpose, or by any other appropriate expedient as, for example, by making auxiliary positives before and after the differentiating process, or in any other convenient way according to the purpose for which the color records are to be used.

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. The method of differentially treating images superposed in different depths of an emulsion, which comprises subjecting an emulsion to the action of an oxidising substance having a certain speed of penetration and interrupting said action upon reaching the desired depth by subjecting the emulsion to the action of a reducing agent having a speed of penetration greater than that of said oxidising substance.

2. The method according to claim 1 further characterized in that the first substance comprises a strong solution of iodine and the second substance a solution of bisulphite.

3. The method according to claim 1 further characterized by differentially coloring the bleached and unbleached images.

4. The method having any one or more of the novel characteristics herein described.

Dated the 27th day of July, 1931.

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