Nov. 24, 1925. 1,562,828

A. HERNANDEZ-MEJIA

PROCESS OF COLORING MOTION PICTURES

Filed Jan. 16, 1919

Fig. 1.

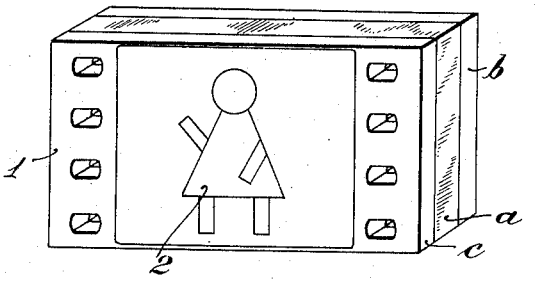


Fig. 2.

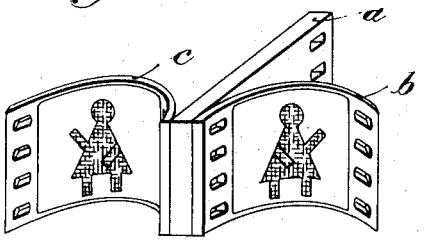


Fig. 3.

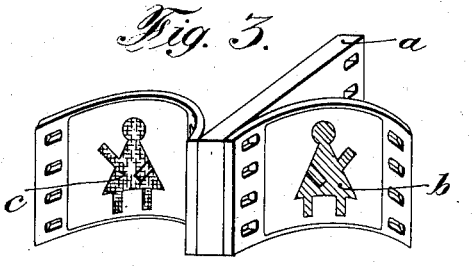


Fig. 5.

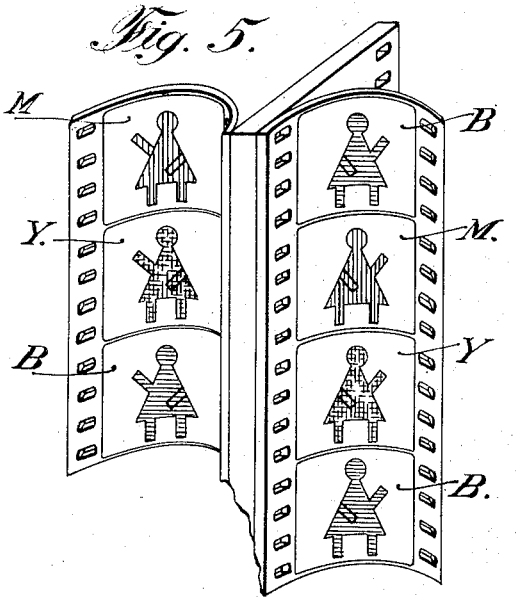
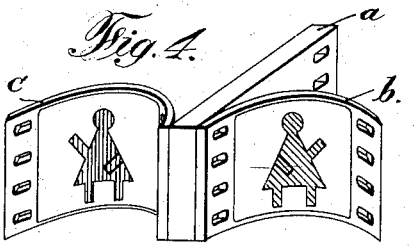


Fig. 4.



Inventor

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UNITED STATES PATENT OFFICE.

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PROCESS OF COLORING MOTION PICTURES.

Application filed January 16, 1919. Serial No. 271,359.

To all whom it may concern:

Be it known that I, ARTURO HERNANDEZ-MEJIA, a citizen of the Republic of Venezuela, and resident of New Rochelle, in the county of Westchester and State of New York, have invented a certain new and useful Process of Coloring Motion Pictures, of which the following is a specification.

This invention relates to the art of making photographic transparencies, or pictures of motion, or still life, in single prints or ribbons or films, and more particularly to a method of coloring the silver or other images, by substituting another product for the reduced silver or silver halid.

The invention has for its object simplifying the usual lengthy operations heretofore necessary to change the color of the silver image in photographic transparencies, more particularly in the case of films double coated or coated on both sides, for subtractive processes of natural color projection, wherein the color is usually on the film itself. It is one of the processes utilized by me in practicing my Patent No. 1,174,144, issued March 7, 1916 wherein a double coated film is described and first used for this purpose.

The invention will be understood by reference to the annexed drawings in which,—

Fig. 1 shows a perspective view of the transparency constituting the invention.

Figs. 2, 3, and 4 show differently colored sections of double coated motion picture films, with the supports that carry the sensitive material being shown as curled away from the base of the film, for clearness of illustration.

Fig. 5 shows a double coated motion picture film, wherein three colors are utilized on each side of the film.

The transparency 1, Fig. 1, comprises a base *a*, of celluloid or any other transparent substance, having coatings or supports *b*, *c* consisting of gelatine or similar substance that carries the sensitive material. Each side of the transparency has thereon an image, which images constitute color records taken through complementary screens and are in register with each other, as described in my Patent No. 1,174,144.

All known methods of changing the silver into a colored compound, can be used in connection with this invention, the principal feature of which is the coloring of both sides of a film to one monotone or single color, and then, either protecting one side, and immersing the entire film in the chemical solutions which changes the color of the other side to another color, or applying the color changer to one side only (the one the color of which it is desired to change), leaving the other side colored as originally.

For this purpose I take advantage of the fact that many colored substances have the property of changing their color when subjected to the oxidizing and other actions of various chemicals.

As for example, I find that by using the well known intensifying and coloring properties of certain metals, for instance uranium (the chloride or the nitrate) and copper (the sulphate or the chloride) in combination with alkali ferricyanide (potassium ferricyanide) they will change the silver comprising the images on commercial positive films, to a brownish, reddish or orange color, according to the length of immersion, while if the film, dry or wet, is then subjected to a bath of another metallic salt in solution, (ferric chloride, for instance), the image will turn blue, blue-green or green, according to length of action of the metallic chloride, and subsequent treatments. The action in this example, is very rapid, and furnishes means of spraying, brushing or contact applications locally, of the metallic chloride or other color changer to the silver and uranium ferrocyanide or similar image, which instantly changes its color.

When the coloring operation is conducted by means of dyes, on bleached or mordanted images, the same rationale is followed. For instance; when the double coated film is bleached by immersion in potassium iodide solution, the images on both sides rendered mordanted to readily form with basic or certain acid dyes, a color lake. This is better shown by way of simple illustrations, in Figs. 2, 3 and 4, where the steps are as follows; in Fig. 2, the images on both sides of the film have been mordanted in iodide, converting the images into silver iodide, hydrosol or similar mordanting compounds. By immersion in a solution (1% dye solu-

tion is suitable) of a yellow basic dye (auramine for instance), both images are now converted into yellow areas corresponding to the greater or lesser densities of the photographic image. In Fig. 3, the image of coating *c* is still yellow, while the image of coating *b* is now green. This is accomplished by spraying, brushing, padding, rolling or locally applying color formers, that will convert the yellow image on coating *b* to a green image; for this purpose a strong (3%) solution of a basic or acid dye, which has affinity for auramine is used. For instance, malachite green or methylene blue, will serve as a good example of this group of dyes which have the properties of being absorbed by the mordanted surfaces, rapidly and thoroughly, and at the same time having little action on the gelatine or other coating of the commercial positive film, leaving same quite clear on short washing in water, more particularly if acidulated, (acetic acid serves very well). In Fig. 4, the image on coating *c* is shown of a red color, and this is accomplished in one of two ways. Either the film of Fig. 3 is treated on the *c* side, to convert the yellow image therein to a red color, by application of a red dye that has affinity for auramine, (as examples, rhodamines, saffranines, fuchsines) or the film of Fig. 4 is first mordanted, immersed in red dyes, (rhodamines, saffranines of fuchsines, for instance) and then subjected to local treatment to change the red image to a green image, as described for Fig. 3 above.

While these descriptions are given as relating to single areas on both sides of a film, they are equally applicable to any film coloring, such as consecutive or successive images, of the same colors or of different colors, on one side, or on both sides, or where the images are situated laterally, or horizontally, or successively or vertically placed in their sequence, the main feature of the invention being to color all the areas in a monotone and then change the color of any particular area, no matter where situated, by local applications of a different color former, in contradistinction of present methods where it is generally the practice to apply each different color to the area selected by means of protective coatings or mechanical appliances to prevent chemical action on the untreated side or area necessitating a series of coatings, dyeing, removal of one coating, dyeing a second time, another coating and long immersions and washings between each operation which impairs the delicate surfaces of commercial positive films, and consumes time and labor unnecessarily.

As a particular instance of the usefulness of this invention, the coloring of double coated film for substractive and additive (combined) projection, on the three color basis, is shown in Fig. 5. All the seven images shown were originally colored yellow by the methods described above, and then by local application of blue color changers and red color changers, only two operations and washings were necessary to produce at least three color effects, the yellow areas requiring no further treatment than the original yellow dye base, formed on a single mordanting operation, in contradistinction to former methods wherein at least twenty-one operations (seven groups of three) were necessary to successively apply resists, remove them, mordant, dye, wash, dry and successively handle the film, for each side, and for each of the three colors. While yellow is mentioned herein as a first color, it was done as an example, as it is obvious that any sequence of coloring is practicable.

The following are some of the dyes which I have tried successively, although there are many others, and many new ones are constantly being added by the color manufacturers, in this country and abroad.

List.

Saffranine	Rhodamine B
Fuchsene	Xylene red B
Magenta	Methyl and
Malachite	Crystal violet
Green	Victoria blue B
Auramine	Methylene blues
Pyronin	Methylene green
Acridine red	Brilliant
Thionin blue	Emerald
Methyline yellow	Diamond, and
Methyl violet	Victoria greens
Xylene red	Eosine group of dyes
Acridine orange	Erythrosine
Chrysoidine	Rose bengal
Rhodamine 6 G	Phloxine and uranine.

Compound tints are best obtained by successive baths of different dyes, as mixtures are apt to stain unequally. Good effects may be obtained by first staining up with a basic dye and then applying an acid dye; and if the combinations are suitably chosen, very intense colors may be obtained in this way, as the basic acts as a mordant for the acid dye. Such dyes which give best results are those of the triphenylmethane series to which the eosines belong, for instance, roseaniline phasphene aurine, Hoffman violet, alkali blue, eriocyanine, chrome red, alizarines, azo green, flourescein, irisamine, galleine and caeruline and banzyl violet.

In the descriptions herein preference has been given to silver images, which are at present the most practised methods of producing photographic records, but it can be readily seen that the invention is not limited

to those salts only. Images produced by bichromatizing gelatine and exposing to light, or any other photographic method which is capable of being colored wholly in a monotone color, and then selected areas being changed to another color, are all included and can be used in and with this invention.

Having thus described my invention, I claim:—

1. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, from one of which negatives certain color sensations have been omitted and from the other of which other, complementary, color sensations have been omitted, developing and fixing said images, toning both of the same to a color corresponding to the sensations omitted from one of said negatives, and applying to one side of said material a toning solution adapted to turn the image on said side from such color to a color corresponding to the sensations omitted from the negative from which was imprinted the image on said side.

2. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, one taken through a green filter and the other taken through a red filter, developing and fixing said images, immersing the material in a uranium toning solution, to tone both images red, fixing and washing the same, and applying to the side of said material on which the second of said images was imprinted, a toning solution containing ferric salts, adapted to turn the image on said side from red to green.

3. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, one taken through a green filter and the other taken through a red filter, developing and fixing said images, toning both of the same red, and applying to the side of said material on which was imprinted the image from the negative taken through the red filter, a toning solution adapted to turn the image on said side from red to green.

4. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being printed from a negative from which certain color sensations have been omitted, the other of said images being printed from a negative from which other, complementary, color sensations have been omitted, one of said images being of a compound having a color corresponding to the sensations omitted from one of said negatives, and the other of said images being of a compound formed by the reaction of said former compound and another substance and of a color corresponding to the sensations omitted from the negative from which this image was printed.

5. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being printed from a negative taken through a green filter and the other being printed from a negative taken through a red filter, one of said images being of a compound having a red color, and the other of said images being of a green colored compound formed by the reaction of said former compound and another substance.

6. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being printed from a negative taken through a green filter and the other being printed from a negative taken through a red filter, one of said images being of a red colored compound formed from a uraninum solution, and the other of said images being of a green colored compound formed by the reaction of said former compound and a ferric solution.

7. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, from one of which negatives certain color sensations have been omitted and from the other of which other color sensations have been omitted, developing and fixing said images, toning both of the same to a color corresponding to the sensations omitted from one of said negatives, and applying to one side of said material a toning solution adapted to turn the image on said side from such color to a color corresponding to the sensations omitted from the negative from which was imprinted the image on said side.

8. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, toning both of the sides to one color, and applying to one of the sides a toning solution adapted to turn the image on said side to a different color.

9. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, toning both of the sides to one color, and applying to one of the sides a toning solution adapted to turn the image on said side to a complementary color.

10. A photographic process comprising imprinting, in alignment, upon opposite sides

of light-transmissive material, sensitized upon both sides, two images from negatives of the same object, toning both of said sides red, and applying to one of the sides a toning solution adapted to turn the image on said side from red to green.

11. A photographic process comprising imprinting, in alignment, upon opposite sides of light transmissive material, sensitized upon both sides, two images from negatives of the same object, immersing the material in a uranium toning solution, to tone both images red, and applying to the side of said material on which the second of said images was imprinted, a toning solution containing ferric salts, adapted to turn the image on said side from red to green.

12. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being printed from a negative from which certain color sensations have been omitted, the other of said images being printed from a negative from which other color sensations have been omitted, one of said images being of a compound having a color corresponding to the sensations omitted from one of said negatives, and the other of said images being of a compound formed by the reaction of said former compound and another substance and of a color corresponding to the sensations omitted from the negative from which this image was printed.

13. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being of a colored compound, and the other of said images being of a compound of a different color formed by the reaction of said former compound and another substance.

14. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being of a colored compound, and the other of said images being of a compound of a complementary color formed by the reaction of said former compound and another substance.

15. A double coated photographic transparency having two positive images of the same object printed in alignment upon its opposite sides, one of said images being of a compound having a red color, and the other of said images being of a green colored compound formed by the reaction of said former compound and another substance.

16. A double coated photographic transparency having two positive images of the same subject printed in alignment upon its opposite sides, one of said images being of a red colored compound formed from a uranium solution, and the other of said images being of a green colored compound formed by the reaction of said former compound and a ferric salt solution.

17. A photographic process comprising imprinting, in alignment, upon opposite sides of light-transmissive material, sensitized upon both sides, two images from negatives of the same subject, rendering the images in the same color, and converting one of said colored images to a different color.

Signed at the city of New York, in the county of New York, and State of New York, this 15th day of January, A. D. 1919.

ARTURO HERNANDEZ-MEJIA.