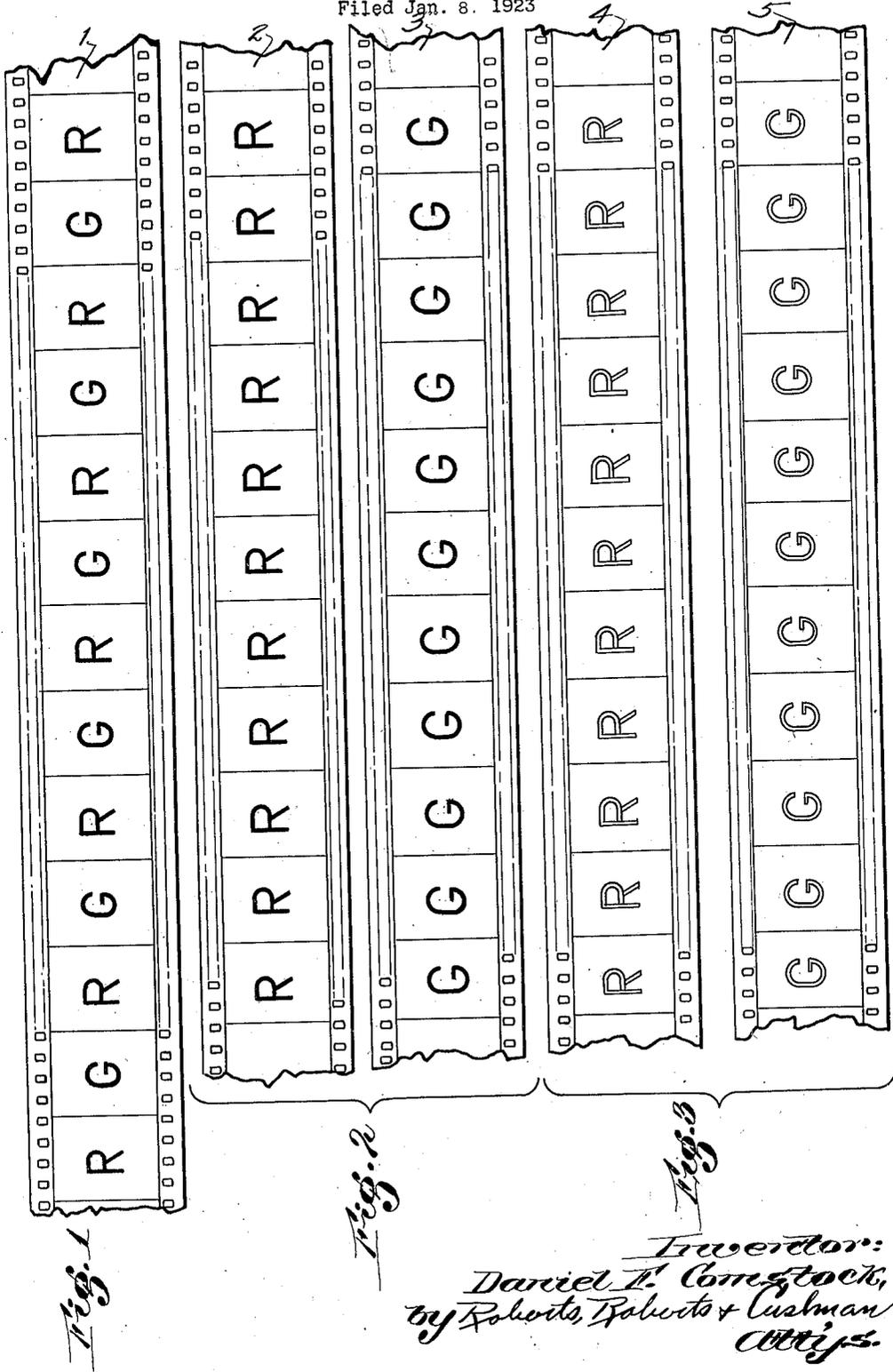


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COLOR CINEMATOGRAPHY

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## UNITED STATES PATENT OFFICE.

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## COLOR CINEMATOGRAPHY.

Application filed January 8, 1923. Serial No. 611,256.

This invention relates to the art of motion pictures and more particularly to the color branch of the art wherein complemental series of positive images, respectively representing different color aspects of the scene, are in superposed registry on a single width film.

The principal object of the invention is to provide a method of forming color cinematographic film which affords the advantages of forming the original complemental negatives on a single film (called a multiplex film) and which at the same time avoids the difficulties of printing the final positives from a multiplex film.

In one aspect the invention involves making a primary film in the form of a multiplex negative 1 (Fig. 1) in any suitable manner (as for example according to the disclosure in prior applications Serial No. 77,237, filed Feb. 9, 1916, Serial No. 415,074, filed October 6, 1920, Serial No. 415,018, filed October 6, 1920, Serial No. 534,055, filed Feb. 4, 1922 and Serial No. 544,084, filed March 16, 1922) and before printing the final positives reproducing on separate secondary films 2 and 3 (Fig. 2) the respective series of images in such form that the final positives 4 and 5 (Fig. 3) may be printed in a contact machine (such as a printer of the black-and-white type adjusted for registration sufficiently accurate for color work) and in such form that the respective series of final positives may be colored in any one of a wide range of methods, indeed any method (using pigment or chemical action or both) by which the coloring is greater or lesser as the exposure is greater or lesser respectively. The secondary films are preferably formed by printing directly from the multiplex primary film and then reversing the positive images to form negative images. By forming the secondary films from relatively slow small-grained stock the light scatter which takes place in printing the final positive film is less than usual when final positive film is printed directly from the original or primary negative film. This is particularly important where the final positive film is printed through the back as for example in making direct relief picture film.

By varying the printing light in forming the secondary films the relative color values of the respective series, as well as the rela-

tive intensity of succeeding sections of each series, may be corrected in making the secondary films so that in making the many positive reproductions the intensities and color values are made uniform without varying the printing light each time and without the skilled attention ordinarily required. By accurately positioning the images of the secondary films relatively to the sprocket holes or other registering openings in the respective secondary films the registration of the complemental final positive images relatively to each other may be effected more easily and accurately than in the case where the final positive series are printed directly from an original negative film bearing complemental series of negatives, it being possible to correct irregularities in the positions of the primary negatives relatively to their registering openings in making the secondary films as for example by using a projection printer to print the secondary films.

While the present invention is applicable to color cinematography in three or more colors its application to two-color work will serve for the purpose of illustration. A camera suitable for exposing a two-color negative is disclosed in application 534,055, filed February 4, 1922. A printer adapted concomitantly to print separate films from the two-color negative film is disclosed in application Serial No. 512,399, filed Nov. 2, 1921, although the respective series of images may if desired be printed separately in a printer adapted to print only one series at a time. As above stated the positive images thus formed on the secondary films are preferably reversed to form negative images, any suitable reversing process being employed, but instead of reversing the printed images on the secondary films the images on the primary film may be reversed before printing so that the printed images will be in the form of negatives without reversal. The positive film is subsequently printed from the secondary film by any suitable printer, an accurately registering printer of the black-and-white type being suitable. Inasmuch as the relative intensity of the images is rendered uniform in making the secondary films the positive films may be printed with a constant light intensity. Thus, instead of regulating the light throughout the printing of each positive film

(about one hundred positive films usually being printed) it is necessary to regulate the light only throughout a single printing, namely, in printing the secondary films.

5 The present invention is particularly useful in the production of direct relief positives such as disclosed in application Serial No. 512,202, filed November 2, 1921, where the positive films are exposed through the back and the relatively unexposed portions of the emulsions are etched away leaving the exposed portions in relief, the reliefs being colored and projected in registry or used as matrices for imbibition printing.

10 By employing relatively slow small-grained stock for the secondary films they may be made less light scattering than the original fast large-grained negative; consequently in printing through the backs of the positive

15 films, where light scatter is most destructive of definition due to the separation of the positive emulsion from the negative images by the thickness of the celluloid of the positive film, the secondary films afford better

20 definition, other factors being the same, than would the original negative.

From the foregoing it will be evident that when using the method herein disclosed the primary negative is used very little and

25 may be preserved in substantially its initial condition, and that substantially the entire range of color processes are available for use in coloring the final positives.

I claim:

35 1. The art of cinematography which comprises forming primary series of complementary negative images, forming separate secondary negatives from said series respectively by a printing process, varying the

40 printing light to compensate for irregularities in the intensity of the primary series, and printing complementary positive series from said secondary negatives.

45 2. The art of cinematography which comprises forming primary series of complementary negative images, forming secondary negatives from said primary series respectively by printing from the negatives and reversing the printed images, varying the

50 printing light to compensate for irregularities in the intensity of the primary series, and printing complementary positive series from said secondary negatives.

55 3. The art of cinematography which comprises forming complementary series of negative images, forming secondary films from said series respectively by a printing process, varying the printing light to compensate for irregularities in the intensity of the

negative series, photographically printing complementary positive series from said secondary films, and maintaining the printing light substantially constant in printing the positive series.

4. The art of cinematography which comprises forming complementary series of negative images, forming secondary negative films from said series respectively by printing from the negative images on separate films and reversing the printed images, and forming a positive film from said secondary negative films with the complementary positive images in registry relative to each other.

5. The art of cinematography which comprises forming complementary series of negative images concomitantly on the same film, forming separate secondary films from said series respectively by a printing process, varying the printing light to compensate for irregularities in the intensity of the negative series and printing complementary positive series from said secondary films.

6. The art of cinematography which comprises forming complementary series of negative images concomitantly on the same film, forming separate secondary negative films from said series respectively by printing from the negative images and reversing the printed images, and printing complementary positive series from said secondary negative films.

7. The art of cinematography which comprises forming complementary series of negative images concomitantly on the same film, forming separate secondary negative films from said series respectively by printing from the negative images and reversing the printed images, and forming a positive film from said secondary negative films with the complementary positive images in registry relative to each other.

8. The art of cinematography which comprises forming complementary series of negative images concomitantly on the same film, forming separate secondary negative films from said series respectively by printing from the negative images and reversing the printed images, varying the printing light to compensate for irregularities in the intensity of the negative series, and forming a positive film from said secondary negative films with the complementary positive images in registry relative to each other.

Signed by me at Boston, Massachusetts, this twenty-eighth day of December, 1922.

DANIEL F. COMSTOCK.