Sept. 28, 1926. 1,601,616

C. H. FRIESE-GREENE

COLOR CINEMATOGRAPHY, METHOD AND APPARATUS

Filed July 16, 1924

Fig. 1.

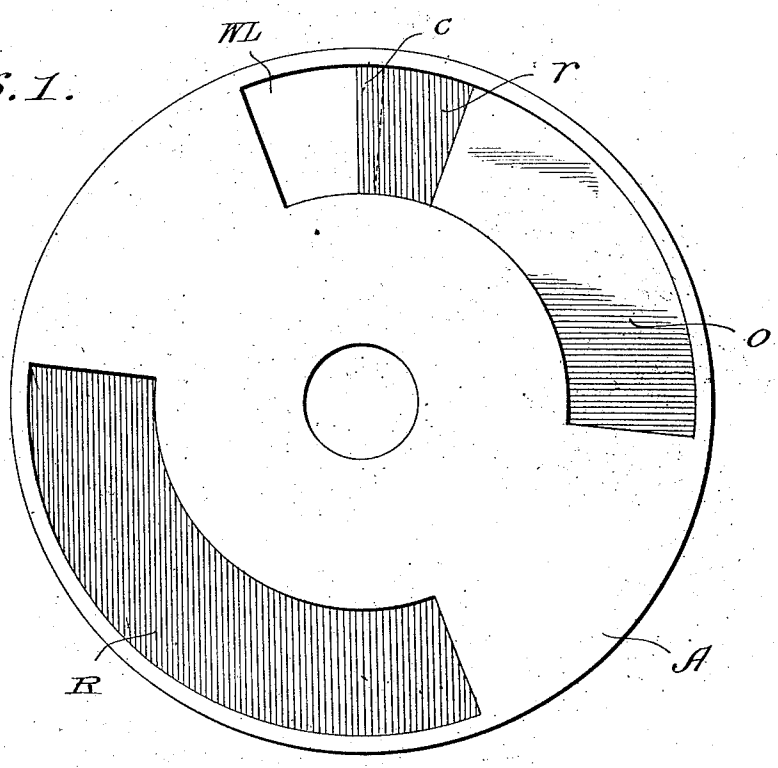


Fig. 2.

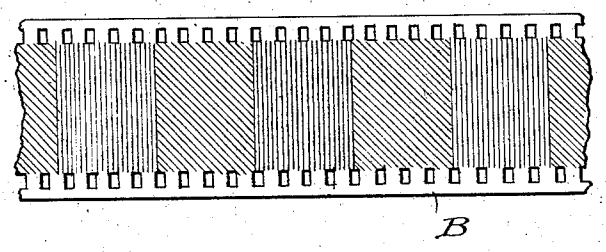
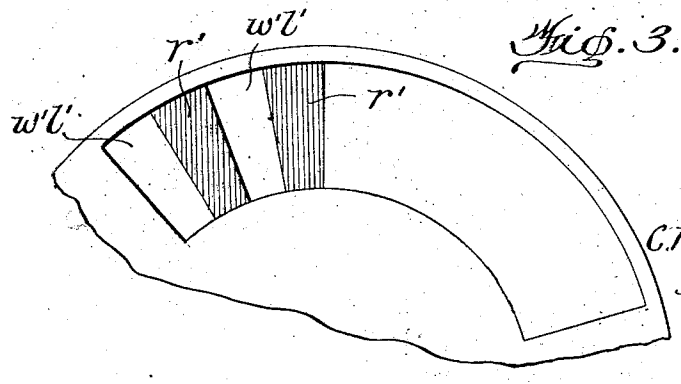


Fig. 3.



Inventor
C. H. Friese-Greene
by Bright & Bailey
Attorneys

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CLAUDE H. FRIESE-GREENE, OF BROMLEY, ENGLAND.

COLOR CINEMATOGRAPHY, METHOD AND APPARATUS.

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This invention relates to color cinematography in which different sections of the surface of a color sensitive or panchromatic film are exposed alternately to light allowed to pass through filters. In practice it is customary to use a disc having a pair of apertures one of which is filled entirely with a filter of a particular color, the other aperture only being partially covered, generally a relatively small portion thereof, by a filter having a complementary or different color. It is known that color sensitive emulsions are more responsive to certain colors than they are to others, so that it is necessary to determine the transmission of color filters through which the film is exposed, which give the best results. The portions of the spectrum from which these colors are selected are usually from the red side for the wholly covered aperture, and the blue end for the other filter which generally also passes while light. While this principle gives good results there is still room for improvement, particularly in instances where grass and foliage in its natural green state has to be photographed, also when photographing in a hazy or misty light, the latter condition often existing almost unsuspectedly during very warm and fine weather so that distant definition may be registered. The object of this invention is to obtain the foregoing desideratum whereby a more perfect reproduction of the object photographed is obtained, and in which the fault, commonly known as fringing is obviated to a minimum, also reduction in speed of projection being obtained together with a finer color gradation.

Broadly this invention is characterized in that the film is exposed through filters all of which are substantially of the same tone of color, one of the filters having in conjunction with it an opening passing white light. In the accompanying drawings, whch are illustrative of my invention in one preferred form:

Fig. 1 is an elevation of a rotatable disk embodying my invention;

Fig. 2, an elevation of a portion of a film colored in accordance with my invention; and

Fig. 3, a view similar to Fig. 1 showing a slightly modified form of disk.

In the preferred embodment of this invention the color employed for the filters is substantially selected from the red side of the spectrum. Preferably an ordinary rotating disk A is employed, rotating at half the speed of an ordinary shutter, but having apertures for filters. One of these apertures is filled entirely with a filter R having a color predominating on the red side of the spectrum. The other aperture is utilized to allow the passage of white light and is partially filled by a filter r with a color also substantially on the red side of the spectrum. The sections of the film B are exposed alternately through the two apertures specified.

The results of employing the same color in each aperture, one of which has an opening allowing the passage of white light gives a result which is appreciably much better than any other arrangement of filters heretofore employed, particularly with regards to the photography of grass or foliage in its natural green state, the picture projected from the positive giving a good green reproduction of the grass or foliage, as well as finer gradations of other colors with a good distant definition, even when objects at a distance are wrapped in mist.

The area of the color filter employed with the opening passing white light may be varied, also the area of white light aperture according to the balance required, likewise the density and tone of the two colored filters may be varied relatively or in common as desired. The color filter having the white light opening may include a relatively small proportion of color from the blue part of the spectrum provided that the addition of such blue color will not affect noticeably the predomination of the approximately red color of the filter, should it be considered necessary to assist the color gradations on the blue side. Alternatively a relatively small area of approximately blue filter having the same effect as the aforementioned incorporation of blue with red may be used in conjunction with the red filter and white aperture, as shown by dotted lines at c in Fig. 1 of the drawings.

Briefly it may be stated the preferred embodiment of this invention resides in employing a disk having two apertures employing filters substantially red i. e. any color except that in which the green color related to the red side of the spectrum predominates, for instance orange, orange red, and yellow may be employed, good examples of suitable dyes being flavazine T or rose

bengale, which are well known photographic dyes, flavazine T being one of the few important dyes belonging to the small class of pyrazolone dyestuffs, being similar to tartrazin, and rose bengale being a triphenylmethane dye of the sub-class—the phthaleins, prepared by treating dichlorfluorescein with iodine.

In employing this invention the best results are obtained by bringing each picture into position for exposure in the gate as quickly as possible, i. e. the rate of change of successive sections to be effected as quickly as possible. Also it is distinctly advantageous to carefully balance the luminous values of the colors applied to the positive film, the colors which are applied to the film being an approximately orange red and an approximately blue green, the former color being applied to those sections of the film which are exposed through the wholly red or approximately red filter, and the other sections being colored with an approximately blue green in known manner. By means of my invention a much more refined and delicate color gradation is obtained. The quick change feature reduces color fringing to a minimum, and the balance of luminous values reduces flicker and running speed during projection. Also owing to the rapid feeding of the film through the gate a longer exposure can be given.

If desired the filter associated with the aperture passing white light may be split up into a plurality of portons in conjunction with a corresponding splitting up of the white light aperture as shown at r', w' l', respectively, in Fig. 3 of the drawings.

The accompanying drawing, Fig. 1, gives a good example of the proportions of filters and white opening to give good results under normal fine weather conditions, the white light opening being indicated by the reference W. L. The shaded O part indicates an adjustable opaque filling. The proportions shown in the drawing have been found to give goods results by employing a flavazine T and red bengale filter for the filter R, and a flavazine T filter for the filter r.

The following formulæ are suitable for preparing the dyes for the filters and the coloring for applying to the positive film.

For the filter R:

Base solution No. 1: flavazine T 1 gram dissolved in 2 oz. of distilled water.

Base solution No. 2: rose bengale 1 gram dissolved in ½ oz. pure alcohol and add distilled water up to 2 oz.

Method.—Immerse a strip of transparent gelatine in base solution 1 for 30 seconds, rinse rapidly in water and allow the gelatine to dry. When dry immerse same in solution 2 for one minute then hang up to dry (do not rinse the gelatine after the immersion in solution 2).

When the gelatine is dry cut same to fit the aperture in the disk.

To make filter r. Use the same formulæ as base solution 1 immersing a strip of transparent gelatine in it for 45 seconds, rinse and allow same to dry. When dry cut to size desired.

It is always advisable when filters have been made and set, to take a test off first so that it is possible to check the balance. A good way of so doing is to photograph objects white and black, the density on the resultant negative of each should appear equal in each successive picture.

Good formulæ for dyeing the positive pictures are as follows:

Orange red for the section that has been exposed through the wholly red filter.

Solution 1: Brilliant red, which is the sodium salt of R-azo-8 toluene p sulphonamino 1 naphthol 3:6 disulphonic acid, 10 grams, dissolved in distilled water 10 oz,

Solution 2: Fast red D, which is naphthionic acid +B napthol disulpho acid R, a bluish red, 10 grams, dissolved in distilled water 10 oz.

To 10 oz. of solution 1 add and mix 6 oz. of solution 2.

Blue green for the section that has been exposed through the white opening and flavazine filter.

Lissamine green, which is sodium salt of tetramethyl-diaminodiphenyl B hydroxynaphthyl-carbinol disulphonic acid anhydride, 10 grams.

Disulphine blue, which is calcium salt of the disulphonic acid of m' hydroxy dibenzyldiethyldiamino-triphenylcarbinol anhydride, 5 grams.

Mix with little distilled water into a thin paste then add distilled water up to 35 oz.

I claim:

1. The method of producing color cinematograph pictures which consists in alternately exposing different sections of a sensitized film through a plurality of filters all of which are of substantially the same tone of color on the red side of the spectrum and one of which has associated with it an opening passing white light.

2. The method of producing a color cinematograph film which consists in exposing alternate sections of the film through different filters each of which is colored substantially red and one of which has associated with it an opening passing white light, and subsequently coloring the sections alternately substantially orange red and blue green.

3. The method of producing a color cinematograph film which consists in exposing alternate sections of the film through different filters each of which is colored substantially red and one of which has associated with it an opening passing white

light, and subsequently coloring the section alternately substantially orange red and blue green, the blue green coloring being applied to the sections that have been exposed through the red filter having the opening passing white light.

4. In color cinematography apparatus, a rotatable disk having a pair of apertures through which a negative film is adapted to be exposed, one of said apertures being entirely filled with a filter having a color substantially red, and the other being only partially filled with a filter also colored substantially red, the latter filter having associated therewith a relatively small proportion of a color it may be desired to transmit to the film.

5. In color cinematography apparatus, a rotatable disk having a pair of apertures through which a negative film is adapted to be exposed, one of said apertures being entirely filled with a filter having a color substantially red and the other having a plurality of substantially red filling sections arranged therein in spaced relation whereby a plurality of apertures for the passage of white light are provided.

In testimony whereof I hereunto affix my signature.

CLAUDE H. FRIESE-GREENE.