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F. W. WOODWARD ET AL

CINEMATOGRAPH PROJECTION APPARATUS

Filed Feb. 28, 1922

Fig. 1.

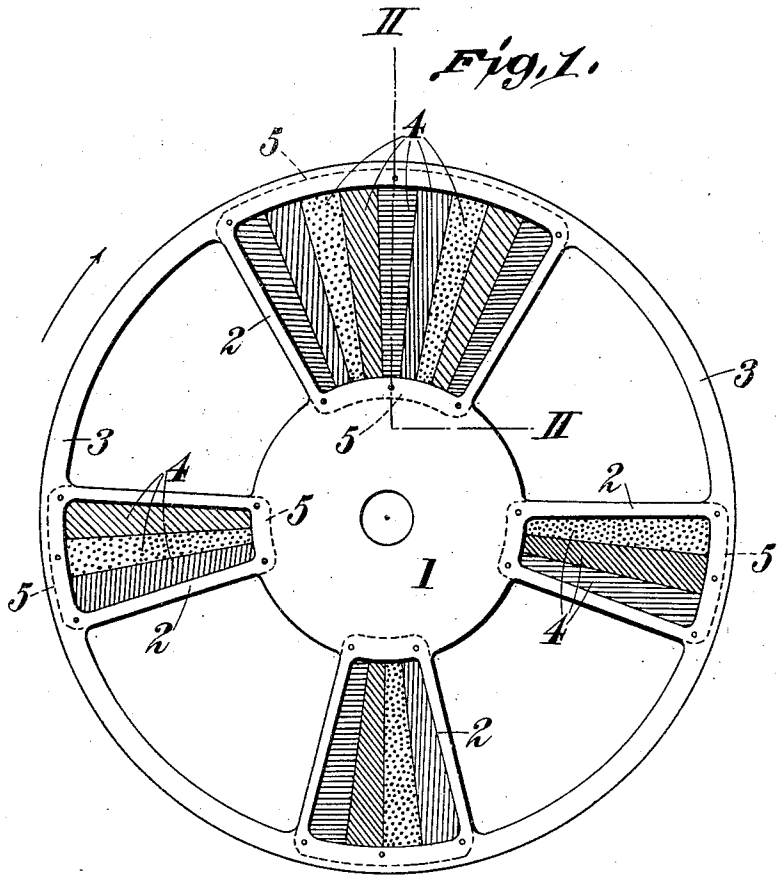
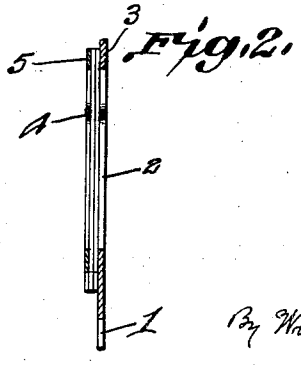


Fig. 2.



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CINEMATOGRAPH PROJECTION APPARATUS.

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To all whom it may concern:

Be it known that we, FREDERICK WILLIAM WOODWARD and ARTHUR ROBERTSON BUTTERY, both subjects of the King of England, residing at Sheffield, England, have invented certain new and useful Improvements in or Relating to Cinematograph Projection Apparatus, of which the following is a specification.

This invention relates to the shutters of cinematograph projection apparatus of the kind operating by means of a blade or blades comprising non-refracting coloured transparent or translucent sections, the object of the invention being to provide improvements in the selection, arrangement, production and protection of the coloured sections whereby the amount of light cut off is reduced, the screen is more evenly illuminated and the pictures are projected more steadily and with less flicker than heretofore has been possible.

According to the present invention the coloured sections of the master blade, producing the period of comparative darkness of the screen in which the picture projected is changed, include all the colours of the spectrum of the light employed or the chief components thereof between and including the blue and the red. The term "blue" as used in this specification is intended to include violet since a violet colour is equivalent to a mixture of blue with red when used as a colour section in a shutter according to the present invention. All the sections are of substantially equal "size-density" that is to say if the colour density is approximately the same the sections will be of equal size, but if the density of one colour is substantially increased its size is proportionally reduced and vice-versa. The colours are preferably arranged in the spectrum sequence and this sequence may be repeated in the master blade and continued to form a recurring series in the compensating blades usually provided to avoid flicker.

The colour sections may be separated from the source of light by mica, conveniently by enclosing them between sheets of mica, or the colour sections may themselves be made of mica the colour being on the side remote from the source of light.

In the accompanying drawings Figure 1 is an elevation of a shutter for cinematograph projection apparatus according to the present invention, colours being indicated thereon according to the heraldic convention, and Figure 2 is a section on line II—II of Figure 1.

The form of shutter for carrying out the present invention illustrated in the drawing comprises a central hub or plate 1 adapted to be keyed to the mechanism and connected by radiating spokes 2 to an outer ring 3. The blades to produce the periods of comparative darkness are fitted or fixed between the hub 1 and ring 3. The blades are made of non-refracting transparent or translucent material and each comprises a number of sections 4 of various colours. The sections 4 are segmental in shape and in the construction illustrated are enclosed between two sheets of mica of the requisite shape secured in place between the hub 1 and the ring 3 by means of frames 5 riveted or otherwise secured to the shutter. The spokes 2 and the portions of the frames 5 corresponding thereto are made as small in width as is consistent with the necessary strength of the construction, in order to reduce to a minimum the simultaneous cutting off of all the rays of different wave length simultaneously which takes place when an opaque body passes the lens. The colour sections 4 may be provided by painting, dyeing, or otherwise colouring the inner surface of one or both of the sheets of mica enclosing them. Or separate coloured sections of celluloid, mica, glass or other transparent or translucent material may be enclosed between the mica sheets. If desired a single mica sheet may be used for each blade of the shutter, in which case it would be disposed between the coloured sections and the source of light.

The number of colours, hues, tints, or shades employed for the sections 4 includes all the colours of the spectrum of the light employed or the chief components thereof from blue to red and although this number and also the arrangement and grouping may be varied, it is generally preferred to use the four colours indicated on the drawing namely, blue, green, yellow, red, which comprise the chief components of the colours in the spectrum of the light usually employed. The best results appear to be ob-

tained when the colours are arranged in the spectrum sequence as indicated. The violet rays may either be ignored or a violet section used instead of or before the blue. The master blade, which operates to produce the period of comparative darkness in which the film is moved to change the picture, contains nine of the coloured sections 4 in the construction illustrated arranged in the spectrum sequence with a blue one at each end of the series. In Figure 1 reading from right to left colours of the master blade are blue, green, yellow, red, blue, green, yellow, red and blue. The sequence of coloured sections is repeated in the master blade and is continued and repeated in the compensating blades. These compensating blades are preferably symmetrically disposed as illustrated, the number and arrangement of the coloured sections therein being such as to produce an approximately complete and continuous repetition of the sequence of colours in recurring series as the shutter rotates. Thus the shutter rotating in the direction of the arrow shown on the drawing the first compensating blade to operate after the master blade has passed the lens contains a green, a yellow, and a red section, the next compensating blade comprises four sections, blue, green, yellow, and red respectively, whilst the third compensating blade is provided with three sections coloured blue, green and yellow respectively. In this case the red section to make the repetition of the sequence of colours complete is omitted in order that the central compensating blade may be reduced in size to four instead of five sections which would otherwise be necessary. Many other arrangements may be made, as for example, the last compensating blade might be blue, green, red or blue, yellow, red, thus omitting either the green or the yellow.

It is to be understood, however, that the number of colours may be varied as well as the number of sections in the blades and the sequence of colours.

When the density of the various colouring media is substantially the same, the size of each of the sections 4 is approximately equal but when the colour density differs the size of the sections is inversely varied so that the "size-density" of all the sections is substantially equal. It is found that if any one colour predominates substantially the pictures shown are apt to be tinted with that colour.

As the shutter illustrated rotates it will be appreciated that during the passage of its blades across the projecting beam, practically the whole of the rays of light in that beam will have been admitted to the screen, as the colour sections are governed in the manner described by those rays. But as each colour section comes into operation it cuts off such a substantial proportion of the rays that the change of the picture projected is as invisible to the human eye as is the case when a shutter with opaque blades is used. The speed at which the colours follow one another is such that they are not separately perceived, the colour effect on the eye being the same as that of the complete unmasked beam. The result is that not only is the screen more evenly illuminated and the pictures projected more steadily and with less flicker than heretofore has been possible, but they will be shown with greater brilliance and hence for a given brilliancy a considerably less powerful light is necessary than when a shutter is used which wholly or partially cuts off all the rays of different wave length simultaneously, or most of them continuously.

What we claim is:—

1. In a shutter for motion picture projection apparatus, a plurality of spaced blades, each including transparent non-refracting colored sectors of substantially equal size-density, the colors of said sectors including the chief components of all the colors of the spectrum of the light with which the shutter is to be used.

2. In a shutter for motion picture projection apparatus, a compensating blade including transparent non-refracting colored sectors of substantially equal size-density, the colors of said sectors including the chief components of all the colors of the spectrum of the light with which said shutter is to be used, and the sectors being arranged in the spectrum sequence.

3. A shutter for motion picture projection apparatus comprising in combination a master blade and one or more compensating blades each of said blades comprising transparent non-refracting colored sectors of substantially equal size-density, the colors of said sectors including the chief components of all the colors of the spectrum of the light with which the shutter is to be used and being arranged in spectrum sequence and grouped in recurring series.

4. A shutter for motion picture projection apparatus including a master blade having transparent non-refracting colored sectors of substantially equal size-density arranged in the following sequence, blue, green, yellow, red, and a flicker blade.

5. In a shutter for motion picture projection apparatus in combination a master blade comprising transparent non-refracting colored sectors of substantially equal size-density arranged in the sequence, blue, green, yellow, red, and one or more compensating blades comprising similar sectors arranged in the same sequence.

6. In a shutter for motion picture projection apparatus a master blade containing a plurality of series of transparent non-

refracting colored sectors, the sectors in each series being arranged in the following order, blue, green, yellow, red.

7. A shutter for motion picture projection apparatus comprising in combination a master blade containing nine transparent non-refracting colored sectors of substantially equal size-density arranged in the following order, blue, green, yellow, red, blue, green, yellow, red, blue and three compensating blades comprising similar colored sectors arranged in the following order, green, yellow, red on the first; blue, green, yellow, red on the second; and blue, green, yellow on the third.

In testimony whereof we hereunto affix our signatures.

FREDERICK WILLIAM WOODWARD.
ARTHUR ROBERTSON BUTTERY.