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PATENT SPECIFICATION



Application Date: April 17, 1936. No. 11115/36.

478,501

Complete Specification Left: April 2, 1937.

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PROVISIONAL SPECIFICATION

Production of Cinematographic Effects in Colour and Means Therefor

We, ALBERT GEORGE HILLMAN, British Subject, of The Cottage, Braywick Road, Maidenhead, and GEORGE HARMER JOHNSON, British Subject, of 5 Harlequin Avenue, Great West Road, Brentford, Middlesex, do hereby declare the nature of this invention to be as follows:—

10 The present invention relates to the production of cinematographic effects in colour by the additive method and means therefor.

15 The invention aims to project positive films suitable for the three (or more) colour process of colour cinematography without departing from the standard picture pull at present employed in the projection of black and white films and to reduce the effects of colour fringing which is liable to occur when combining on the screen constituent images which record different phases of motion.

25 A further object of the invention is to enable a projector which is suitable or has been adapted for projection in two colours to be applicable for projection of films made according to three colour processes.

30 Broadly, according to the present invention, instead of projecting all the colour constituents simultaneously in superposition, we project successively in superposition different pairs of such constituents and rely upon persistence of vision to produce the total colour reconstitution.

40 The invention can be carried into effect by using a projector provided with two objectives which are adjustable to superpose on the screen two adjacent images, and so arranging the filters, or changing their position, during each shift of the film as to cause each image to be projected twice through its appropriate colour filter, once with the preceding negative and once with the following negative. Thus, each colour constituent image will be projected first with one of the other colour constituents and then,

after a film shift, with the third colour constituent.

Although persistence of vision is relied upon to blend the colours, that fatigue to the eye of the spectator, due to colour pulsation, which is incidental to two colour processes relying on persistence of vision for this purpose is reduced or avoided, as the colours reflected by the screen are the relatively high transparency complementary colours formed by combining at each projection beams of two of the primary colours. Thus, assuming the sequence of projection of the beams is (1) red plus green, (2) green plus blue-violet and (3) blue-violet plus red, the beams forming the combination (1) tend to produce pale yellow, the beams (2) to produce a light blue and the beams (3) to produce magenta.

By way of example, the invention is well suited for the projection of films produced from a negative band taken in accordance with our concurrent application No. 11114 (Serial No. 478,500), filed 17th April, 1936, but the invention is applicable to other three colour processes, such as those in which the colour constituent images are taken successively or are all taken simultaneously either by exposure to the same beam or to different beams.

In one suitable form of the invention the filters are mounted on a disc in concentric bands interrupted by radial opaque or other supporting portions. Three groups of such bands may be used, the outer band in one group being blue, the middle band green, and the inner band red, and the bands being appropriately varied in the other groups so that the second projection of each picture area is made through the proper filter after the filter disc has been turned through 120° whilst the film is shifted.

Dated this 17th day of April, 1936.

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Patent Agents for the Applicants,

COMPLETE SPECIFICATION

Production of Cinematographic Effects in Colour and Means Therefor

We, ALBERT GEORGE HILLMAN, British Subject, of The Cottage, Braywick Road, Maidenhead, Berkshire, and GEORGE HARMER JOHNSON, British Subject, of Harlequin Avenue, Great West Road, Brentford, Middlesex, 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 relates to the production of cinematographic effects in colour by the additive method, and consists in a process for the projection of films produced by the three colour process which can be carried into effect with the standard projection apparatus used for black and white films, since it requires only a single picture shift after each period of exposure and that shift, and the period of exposure, may be of the normal time duration. It is however requisite that the original negatives should comply with certain conditions hereinafter explained, though no claim is herein made to any special method of producing such negatives.

It is not possible to obtain complete colour superposition on the screen with a three colour process unless three frames in the respective colours are taken simultaneously and projected simultaneously. This, however, would involve, in addition to the use of an excessive amount of film, great practical difficulties, especially in the projection, since it would be necessary to adapt the projection machines in the various cinema theatres so that when employed for the projection of such films the ordinary single shift should be replaced by a triple shift. On the other hand, if each image were taken separately, with a film shift between successive exposures, a pronounced lack of superposition would generally occur if two or more images were projected at the same time, which would be greater the more rapid the movement of the scene taken, and such lack of superposition would produce strong and persistent colour-fringing.

No process has been proposed which satisfactorily solves this difficulty, but the present invention does provide that, at least at alternate projections, images are superposed on the screen which have been produced by simultaneous exposure in the camera at the same stationary period of the film, and are therefore alike, or, alternatively, that the picture

on the screen at any instant is the result of two images which show the whole scene in one phase and also show moving parts out of that phase, but at less intensity than the stationary parts of the scene. It is naturally also advantageous that the shift period in the camera should be reduced so far as possible and though this may involve the use of mechanism not found in the ordinary camera this is comparatively unimportant, since special cameras may be employed for taking colour films, whereas it is a practical commercial necessity that the films can be projected on the standard instruments.

Accordingly the present invention consists in a method of projecting cinematographic films containing recurring groups of three colour constituent images which have not all been taken simultaneously, but which have been exposed together in pairs during the same stationary position of the film of which each pair has been exposed together twice, which consists in projecting the positive film at approximately the same average rate (feet per second) as that at which the negative images were taken, advancing the film in the projector by single shifts and projecting simultaneously two frames of different colour values so that each frame is projected first with the preceding frame and then with the following frame, the picture on the screen at any instant being the result of the mixture of two beams of different colours and at alternate projections the images of the two frames projected being in the same phase.

Alternatively the picture on the screen at any instant is the result of two images which have both been exposed together and each of which has also been exposed with another image, e.g., by the method described in the specification of Patent No. 414,065 with the result that the images show the whole scene in one phase and moving parts out of that phase but at less intensity than the stationary part of the scene.

Although persistence of vision is relied upon to some extent to blend the colours, that fatigue to the eye of the spectator, due to colour pulsation, which is incidental to processes in which only one frame is projected at a time, is reduced or avoided as the colours reflected by the screen are the relatively high transparency colours formed by combining at each projection beams of two of the

original colours. Thus assuming the sequence of projection of the beams is (1) red plus green, (2) green plus blue-violet and (3) blue violet plus red, the beams forming the combination (1) tend to produce pale yellow, the beams (2) to produce a light blue and the beams (3) to produce magenta. It follows that the simultaneous superposition of a pair of images is an essential feature of the present invention. The method of appropriately colouring the image beams during projection forms no part of this invention; self coloured films, moving filters or any other appropriate means may therefore be used.

By way of example, negatives having the aforesaid characteristics may be obtained in accordance with the processes described in my co-pending application No. 11114/36 (Serial No. 478,500), dated 17th April, 1936 or in prior patent specification No. 414,065.

If each image area has been exposed twice with the same companion image area, as in the process according to application No. 11114/1936 (Serial No. 478,500) the images projected at each alternate projection will be in phase; if each image has been exposed once with the preceding image area and once with the following image area as in prior patent No. 414,065, the picture on the screen at any instant is the result of two images which show the whole scene in one phase and also show moving parts out of that phase but at less intensity than the stationary parts of the scene.

In all cases it is preferable that the negative taken at the same stationary period should be exposed to a divided beam.

The invention can be carried into effect by using a projector provided with two objectives which are adjustable to superpose on the screen two adjacent images, and so arranging the filters, or changing their position, during each shift of the film as to cause each image to be projected twice through its appropriate colour filter, once with the preceding image and once with the following image; thus each colour constituent image will be projected first with one of the two other colour constituents on opposite sides of itself and then, after a film shift, with the other of the two other colour constituents.

The accompanying drawings illustrate by way of example apparatus suitable for carrying out the invention:—

Fig. 1 is a diagrammatic view of the main projector parts and Fig. 2 is a front view of the filter disc.

In one suitable form of the invention

the filters are mounted on a disc 12 in concentric bands interrupted by radial opaque or other supporting portions. Three groups of such bands may be used, the outer band 1 in one group A being blue, and the inner band 2 red, pair B comprising an outer band 3 which is green and an inner band 4 of blue, and the pair C comprising an outer red band 5 and an inner green band 6 so that the second projection of each picture area is made through the proper filter after the filter disc has been turned through 120° whilst the film is shifted. According to present day practice, the film is moved down in the projector at the rate of twenty-four pictures each second, so that in such a case the negative film is moved in the camera at the same average rate. The pictures are of the usual size.

The projector comprises a double windowed gate 7 and an objective 8, 9 to each window 10, 11. The objectives are mounted so as to be adjustable to superpose on the screen the images projected through the two windows. The filter carrier 12 may be driven step-by-step in synchronism with the film shift. The film is shifted down by one picture frame at a time, e.g., by means of any of the usual intermittent devices.

13 is the usual safety shutter and 14 the main shutter which is shown in the particular projector illustrated in front of the lenses. The filter 12 is illustrated diagrammatically in Fig. 1 but it would be placed as near to the lenses as possible.

We would have it clearly understood that where we use the word "simultaneously" we do not exclude cases in which, owing to the relation of the shutter aperture to the exposure windows, the exposure of one image area begins and ends slightly before the beginning and ending of the exposure of the other image area, although for the greater part of the period both image areas are simultaneously exposed, e.g. as in the camera described in my aforesaid application No. 11114/1936 (Serial No. 478,500) and Patent No. 414,065.

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. A method of projecting cinematograph films containing recurring groups of three colour constituent images which have not all been exposed simultaneously but which have been simultaneously exposed in pairs during the same stationary position of the film and of which each pair has been exposed together twice, which consists in project-

- ing the positive film at approximately the same average rate (feet per second) as that at which the negative images were taken, advancing the film in the projector by single shifts and projecting simultaneously two frames of different colour values so that each frame is projected first with the preceding frame and then with the following frame, the picture on the screen at any instant being the result of the mixture of two beams of different colours and at alternate projections the images of the two frames projected being in the same phase.
2. A method according to claim 1, but modified in that each colour constituent image has been exposed at one stationary position of the film with the preceding colour constituent image and at the next stationary position of the film with the succeeding colour constituent image. 20
3. A method according to either of the preceding claims, characterised by the colour constituent images having been exposed at the same stationary period to a divided beam. 25
4. Method of projecting cinematographic films for the production of effects in three colours substantially as herein described. 30
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Dated this 2nd day of April, 1937.

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Fig. 1.

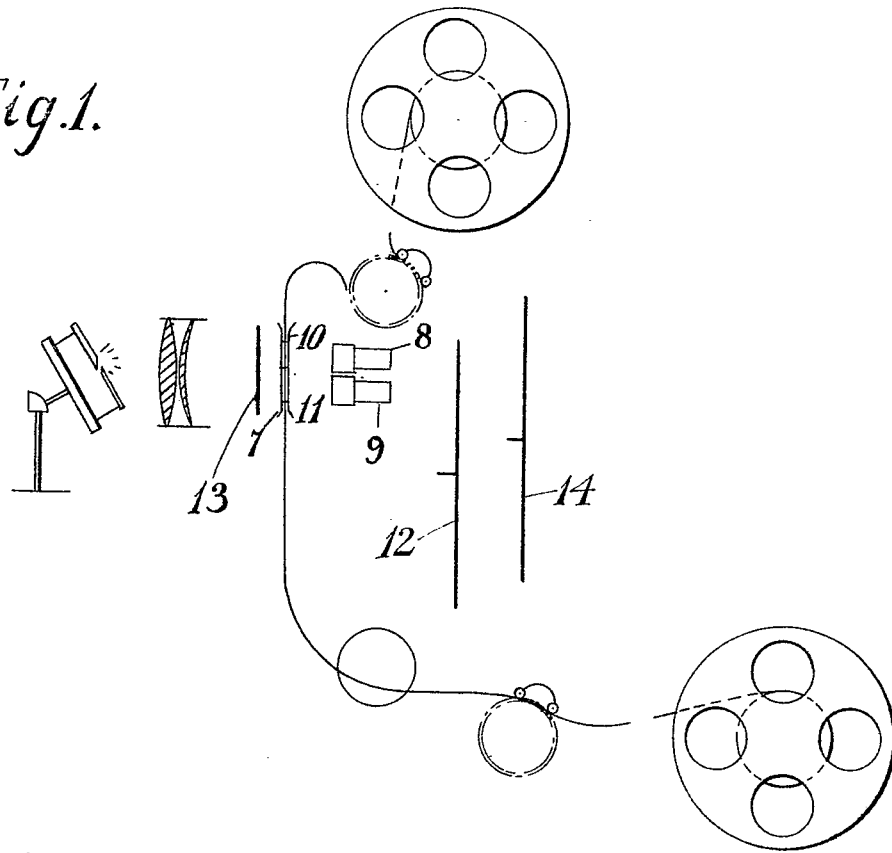
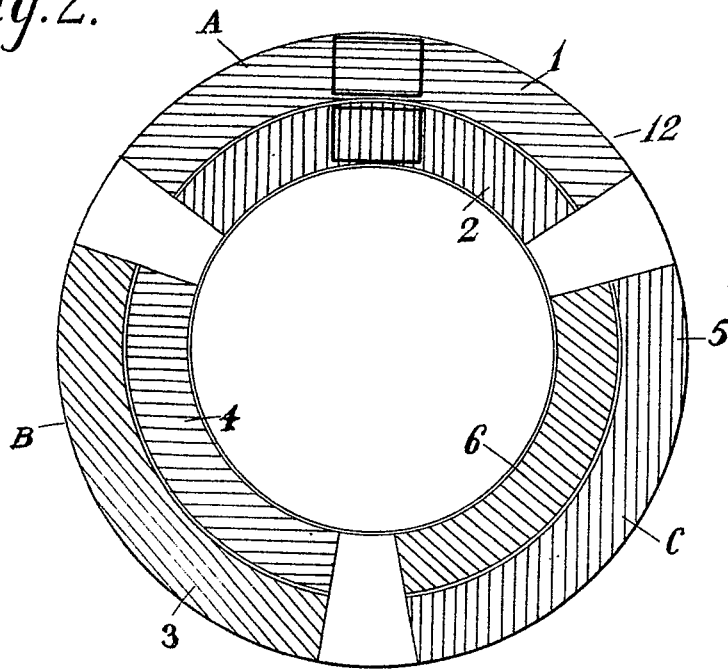


Fig. 2.



[This Drawing is a reproduction of the Original on a reduced scale.]