

RESERVE COPY

PATENT SPECIFICATION

172,714

Application Date: Sept. 8, 1920. No. 25,919/20.

Complete Accepted: Dec. 8, 1921.



COMPLETE SPECIFICATION.

Improvements in or relating to Colour Kinematography.

We, ZOECHROME LIMITED, a British company, of 146, Bishopsgate, in the City and County of London, and THOMAS ALBERT MILLS, a subject of the King of Great Britain, of 72, Manor Street, Clapham, in the County of London, 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:—

This invention relates to an improved method of producing kinematograph films of the type in which each individual picture or element of the film is a complete colour rendering of the subject.

According to this invention there are produced upon the negative film (by the aid of suitable colour screens) a set of images of full or normal size which will be referred to hereinafter as key images and interposed sets of small sized colour-giving images, each preferably of half the linear dimensions of a key image. The small colour-giving images may be three in number, corresponding to the usual triple division of colours, and the key image taken without a colour screen so as to give the black and white effect only. Or the key image may also be a colour image, giving say the blue in the resulting positive film, either the blue being printed alone, from the negative key image, or by a double printing both the blue and a similar black and white or true key image, and only two small images may be produced. Each key image and its associated small images are taken simultaneously through separate lenses and, as the lens for the large image has to have a correspondingly greater focal length and if employed to give a direct image would form an obstruction for the small images, the increased focal length is preferably pro-

vided for by a prism or other reflector, allowing all the lenses to lie in the same plane. This displaces the key image from its corresponding colour images and therefore between the key and colour images of one exposure are interposed the key and colour images of other exposures.

In producing the positive film from the original negative the latter is moved at each operation through a distance equal to a key image and the following small colour images, closing up the key images on the positive film so that they are reproduced in succession without the interposition of the colour images, these being afterwards enlarged and superposed. The reproduced image, if the key image is to be in one of the colours employed, say blue, is suitably coloured or dyed, but if the key image is black and white the usual process only is employed. Or the same large image may be reproduced twice, once as a black and white image and once in colour. The reproduced key film is then coated with a sensitive emulsion and one of the colour sets of images is then enlarged to the key size and superposed upon the key images, the new positive images being coloured to the required colour, complementary to that of the colour screen employed for the negative. The next set of colour-giving pictures is similarly superposed and, in the case of the process employing black and white key images and three colours, the third set of colour images is then superposed, with the result that the finished film is a complete colour rendering of the subject and can be projected by the usual apparatus upon the screen. The apparatus employed for producing the positive may be of the type described in the Specification of Patent No. 16,353 of 1913 (Middleton). It is to be understood that the term "key image" is used in a wide

[Price 1/-]

sense as the image which is originally taken of full size and thus serves as the most important image in giving definition to the picture, but it is not necessarily an opaque or black and white image in the positive picture.

In order that the said invention may be clearly understood and readily carried into effect, the same will be more fully described with reference to the accompanying drawings, in which:—

Figure 1 is a diagram illustrating the production of a negative having a set of key images and three sets of colour-giving images; and

Figure 2 is a similar diagram illustrating the case in which the key image is also one of the colour giving images.

Referring first to Figure 1, A is the negative film. B, B are the key images of full size. C, C, C, are three sets of half size colour-giving images arranged with one central image and two images side by side. D, D¹ are the camera lenses, of which the larger lens D is of twice the focal length of the smaller lenses D¹. E is a prism reflector. The lenses are arranged as shown at the right of the figure, the small lenses forming a triangle below the large lens. The triangle may be inverted to bring a pair of small lenses close to the large lens and leaving only one small lens at an appreciable distance. The reflecting prism E is arranged so that the pencil of light from the large lens D, indicated by dotted lines, is reflected from the lower and upper surfaces *e*, *e*¹ and on to the film A, a distance of two full images existing between the resulting image and the images due to the lenses D¹. The length of the path from the large lens to the film is twice that of the direct path from one of the small lenses to the film so that the increased focal length of the large lens is provided for while allowing the lenses to be placed in the same plane. The shutter mechanism and the colour screen are not shown as they may be of ordinary type.

In Figure 2 the key pictures B¹ are produced by the aid of a colour screen, say red, and instead of separating the images by a full picture width as in Figure 1 the separation is of half a picture width only, to accommodate a pair of small colour images C¹ taken through the two other colour screens of the set of three. The small lenses D² are placed symmetrically below the large lens D. Otherwise the arrangement is as in Figure 1, and the prism reflector E doubles the distance of the path from the lens D to the film.

In producing a position from the negative film as shown in either Figure 1 or Figure 2 the key image is thrown upon the positive film and the negative film is moved for each exposure in the apparatus through the space of two pictures or a picture and a half according to whether the arrangement of Figure 1 or Figure 2 is employed, the positive film being moved one picture space at a time. The positive film with the key images on it is then developed and fixed and may be varnished before sensitising again. If the key image is also a colour one the positive image is coloured to, say, blue. Or a black and white key image may be used and a second printing from the large images taken and coloured.

The resensitised positive film is again exposed and the enlarged images of one of the sets of small colour images superposed upon the key images. The lens system employed for copying is arranged to give the required enlargement, while for the key pictures, the original and reproduced images are of substantially equal size. The images B and C having been relatively displaced by the action of the reflector, the colour images superposed must be those separated by the intermediate images, as indicated by the dotted lines in the drawings, so that the colour images shall be those taken by the same exposures as the key images on which they are superposed. The positive film is coloured and resensitised again for the second colour set, the operations being repeated where a key picture and three small pictures are employed as in Figure 1. The final result is a positive film fully coloured and adapted to be projected by the usual projecting apparatus. The three colour system has been taken as the basis of the method described and illustrated, but it is obvious that other colour systems may be used.

Owing to the fact that the key images and the colour images are taken simultaneously the original film should be moved more rapidly than is the case with an ordinary film, since the space of two or of one and a half ordinary pictures has to be covered between each exposure, while the coloured positive is moved at the normal speed for projection. Since the key image is of full size the projection on the screen gives a clearness of impression substantially as good as that of the ordinary uncoloured picture. To obtain this clearness it is not essential that the colour producing images should be so sharp, so that the smaller scale on which they are taken does not materially affect the sharpness of the result and the

- great advantage is obtained that the colour effect is given by an addition to the length of the negative film of only 50 or 100 *per cent.* according to the colour system employed. The disturbing rainbow effect produced when colour images are taken successively is also entirely eliminated by the simultaneous exposure of a complete set of images.
- 10 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:—
- 15 1. A method of making coloured kinematograph films in which a set of full sized images is produced on the negative film, with small sized interposed images, from which negative film a positive film is produced by superposing successively the said images, brought to the same dimensions, and suitably colouring the different positive images, for the purpose specified.
- 20 2. In a method of making coloured kinematograph films, producing a negative film of alternating key images of full size and colour-giving images of small size, by a system of lenses and colour screens, and providing for the longer focal length required for the full size images by interposing a reflector between the corresponding lens and the film.
- 25 3. A negative kinematograph film for the production of a coloured positive film, which negative film carries a succession of key images of full size along with a simultaneously taken succession of colour-giving images of small size, for the purpose specified.
- 30 4. A negative kinematograph film for the production of a coloured positive film, which negative film carries a succession of full size key images interposed between which are sets of three half size colour-giving images, produced by simultaneous exposure with corresponding key images, for the purpose specified.
- 35 5. A negative kinematograph film for the production of a coloured positive film, which negative film carries a succession of full size key and colour-giving images interposed between which are pairs of half size colour-giving images, produced by simultaneous exposure with the corresponding full size images.
- 40 6. A negative kinematograph film according to Claim 3, 4 or 5, in which the full size image is taken by simultaneous exposure with the small size images separated from the said full size image by interposed images taken at different exposures, for the purpose specified.
- 45 7. A method of making coloured kinematograph films, in which a negative film carrying a succession of full size key images and interposed small size colour giving images is moved in the positive producing apparatus in steps equal to a complete set of images and the positive film is moved in steps of one image at a time, the succession of operations being repeated for each colour with the colour giving images enlarged and superposed on the corresponding key images, the successive positive images being taken on the same surface separately sensitised and being coloured as required for the complete picture.
- 50
55
60
65
70
75
80

Dated this 8th day of September, 1920.

HASELTINE, LAKE & Co.,
28, Southampton Buildings, London,
England, and
55, Liberty Street, New York, N.Y.,
U.S.A.,
Agents for the Applicants.

85

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

