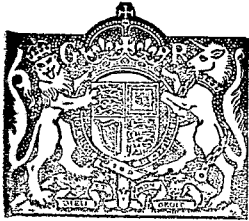


**NOTE.**—The application for a Patent has become void.

This print shows the Specification as it became open to public inspection under Section 91 (3) (a) of the Acts.

## PATENT SPECIFICATION



Convention Date (United State): June 30, 1930.

**384,275**

Application Date (in United Kingdom): Feb. 19, 1931. No. 5283/31.

Complete not Accepted.

COMPLETE SPECIFICATION.

### Improvements in and relating to Film Printing Apparatus.

We, THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, a British Company having its registered office at Crown House, Aldwych, London, W.C. 2, (Assignees of ERNST FREDRIK WERNER ALEXANDERSON, of 8, Adams Road, Schenectady, County of Schenectady, State of New York, United States of America, a citizen of the United States of America), 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 apparatus for making a photographic copy or print of a picture film of that type in which the back of the film is corrugated and colour effects are registered on the emulsion by a plurality of exposure bands corresponding to certain colours opposite each corrugation. It is the object of this invention to provide improved apparatus whereby a print may be made on film having a similar corrugated construction.

The picture film which the printing apparatus devised by us is adapted to copy, may be, for example, similar to that commonly employed for making motion pictures except that on the face opposite to that having the emulsion there are formed a series of minute corrugations the surfaces of which are convex cylinders to record colour effects. With such a film a colour filter screen is placed in front of the camera lens which screen is made up of a plurality of colour bands arranged parallel with the corrugations on the film. The camera lens images the view or object being photographed on the sensitive film in the usual manner, the emulsion being on the rear face of the film instead of on the front face as is usual. As a result of the addition of the colour screen and the corrugations, which it will be understood function as cylindrical lenses, the light rays traversing the several colour bands of the filter screen are caused to form expo-

[Price 1/-]

sure bands opposite each corrugation of the same number as that of the colour bands of the filter screen. The density of each exposure band, therefore, depends upon the intensity of the light traversing the corresponding band of the colour screen.

Various attempts have been made to copy a picture film of this character by such methods as projecting the picture from the film on a screen using the same colour screen to reproduce the colour effects. In accordance with this invention, however, we make a print direct by simple apparatus without producing an image of the view or object photographed and without the use of a colour filter.

This invention will be better understood from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a perspective view of apparatus illustrating an embodiment of the invention; and Fig. 2 is a plan view of the apparatus shown in Fig. 1 in which the film is shown greatly enlarged and out of proportion with the rest of the apparatus for the purpose of making the invention more readily understood.

In the drawing, we have shown at 1 a piece of negative film of the motion picture type having a series of pictures thereon and which to the casual observer does not differ from a piece of ordinary motion picture negative. Film 1, however, as has been indicated above, differs from ordinary motion picture negative in that on the back of the film the celluloid is corrugated lengthwise of the film, each corrugation forming in effect a cylindrical surface which optically functions as a minute cylindrical lens. These corrugations preferably are very narrow; for example, there may be 559 per inch. The corrugations may or may not extend across the entire width of the film. In the drawing we have illustrated them as extending only over the picture portion of the film, the marginal or sprocket portions being plain.

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The image photographed on film 1 in reality comprises a plurality of exposure bands extending parallel with and behind each corrugation, and these bands presumably were formed by the use of a colour screen or filter arranged in front of the camera lens with the bands extending parallel with the film. For example, the colour filter may comprise three colour bands respectively, red, green and blue. The camera lens in co-operation with the corrugations on the film 1 which in effect are minute cylindrical lenses, causes the emulsion to be exposed in three bands behind each corrugation corresponding respectively to the light which passes the red, green and blue bands of the filter. It will be understood that the above referred to process of making the negative is no part of the present invention, but is briefly described merely for the purpose of making the invention more readily understood.

The film 1, which is the negative and from which the print is to be made, will be supported in any suitable manner, such as by a gate of a construction employed in optical film printers, and likewise the sensitive film 2 will be similarly supported. Suitable means will also be employed for moving both films simultaneously in a manner well known in the construction of optical printers. For convenience in illustration we have shown the films 1 and 2 as supported merely by a backing plate 3 and 4 respectively, it being understood that plate 3 has a suitable opening through which the exposing light may pass. Film 2 has the same corrugated construction as film 1; that is, the back surface is formed with longitudinal corrugations which in effect constitute minute cylindrical lenses. The two films are arranged with their back or corrugated faces toward each other. As a source of light for exposing the film 2, we have shown the lamp 6 whose light is collected by the lens 7 and directed in substantially parallel rays toward the negative 1. Between the negative film 1 and the sensitive film 2 are the two similar lenses 8 and 9 which are shown arranged between the films so as to produce on film 2 an image of the picture on film 1. For convenience of illustration we have shown each of the lenses 8 and 9 as a simple convex lens. In the actual construction of the apparatus however, we prefer to employ compound lenses, such as for example the lens employed in the camera by which the negative is originally exposed or lenses which are suitably corrected for the purpose in hand.

Between the two lenses 8 and 9 we have indicated by the dotted line 10 the approximate position which the colour

filter would occupy with respect to the camera lens, it being understood that the two lenses 8 and 9 are equal in size and focal length, being preferably duplicates of the camera lens, and that each lens bears substantially the same relation to the plane of the dotted line 10 as the camera lens did to the plane of the colour filter.

With apparatus such as shown and described the light rays directed on film 1 first pass through the emulsion 11 which, behind each corrugation, has the three exposure bands 12, 13 and 14, corresponding with the light which passes through the corresponding three colour bands of the filter used at the time that the negative was exposed. The light rays passing through the three exposure bands 12, 13 and 14 are refracted by the curved rear face of the corrugation opposite the bands and by the lens 8 so that the rays from the three bands 12, 13 and 14 after passing the lens 8 extend in three parallel bands represented respectively at 12<sup>1</sup>, 13<sup>1</sup> and 14<sup>1</sup>. Three rays are further refracted by the lens 9 and the curved rear face of the corrugation on film 2 to form similar exposure bands 12<sup>11</sup>, 13<sup>11</sup> and 14<sup>11</sup> on the emulsion 15 of film 2. It will be understood that while the two films 1 and 2 are shown in Fig. 2 as so enlarged that the light rays appear to be intercepting by one corrugation of each film, in reality the corrugations are so fine that the light rays extend through the corrugations extending across the entire picture.

By this means we are able to make a print of the negative 1 without first projecting in colours the picture photographed on the negative. The print thus made may be projected on a screen in colours by the use of a suitable colour filter comprising colour bands of a construction similar to that employed in the exposing of the original negative although it may be necessary to reverse the arrangement of the colours in the filter.

We have chosen the particular embodiment described above as illustrative of the invention and it will be apparent that various modifications may be made without departing from the spirit and scope of the invention.

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. Apparatus for making a print of a picture film having corrugations on the back thereof and having opposite each corrugation a plurality of parallel exposure bands determined respectively by a plurality of colour screens employed when

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- the film is exposed, comprising means for supporting the picture film, means for supporting in spaced parallel relation therewith a print film having like corrugations on the back thereof with the backs of the films arranged toward each other. means for projecting light through the picture film, a lens between the respective means supporting the films arranged in co-operation with the corrugations on the picture film to combine in each of a plurality of bands the light coming collectively from the corresponding bands opposite all of the corrugation of the picture film, and a second lens between said lens and the supporting means for the print film, constructed and arranged to produce in co-operation with the corrugations on the print film a plurality of exposure bands similar to those on the picture film.
2. Apparatus for making a print of a picture film having corrugations on the back thereof and having colour exposure bands opposite each corrugation thereof on a print film of similar construction, comprising means for projecting light through the picture film toward the print film, a lens between the films arranged in co-operation with the corrugations on the picture film to combine in each of a plurality of separate bands the light passing all of the corresponding bands of the picture film and a similar lens between the first mentioned lens and the print film.
3. Apparatus for making a print of a picture film having corrugations on the back thereof and having colour exposure bands opposite each corrugation on a print film of similar construction, comprising a light source for exposing the print film controlled by the picture film, a plurality of similar lenses between the films, one of the lenses being arranged relative to the picture film in such a manner that the exposing light passes between the lenses in parallel rays and is divided into bands corresponding respectively to the colour exposure bands opposite each corrugation of the picture film and the other lens being similarly arranged relative to the print film.
4. Apparatus for making a print on a print film of a picture film having corrugations on the back thereof and having exposure bands opposite each corrugation corresponding respectively to the red, green and blue elements of the object pictured, the print film being of similar corrugated construction, comprising a light source at the side of the film opposite that having the corrugations, a lens arranged to refract the light passing through the picture film to produce parallel rays forming three bands, each band consisting of the sum of the rays traversing the corresponding exposure bands of the picture film, and a similar lens arranged in co-operation with the corrugations on the print film to refract said parallel rays to form exposure bands on the print film similar to those on the picture film.
- Dated this 18th day of February, 1931.  
 JOHN GRAY,  
 Crown House, Aldwych, London, W.C. 2,  
 Agent for the Applicants.

