

Improvements in or relating to Reproducing Embossed Photographic Films.

We, SOCIÉTÉ FRANÇAISE CINECHROMATIQUE (PROCEDES R. BERTHON), of 24, rue de la Pepiniere, Paris, France, a French body corporate, as assignees of
 5 SOCIÉTÉ CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS, resident in Neuilly (Seine), France, a French body corporate, 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 comprises a process of
 15 reproducing embossed photographic films by projection, consisting (a) in illuminating the gelatine-coated face of the embossed film to be reproduced by a point or linear source of light; (b) in forming, by
 20 means of a field lens placed between the source and the film, an image of the source at a distance from the film corresponding to the distance between the lens originally used for taking the picture and the film receiving the image formed by it; and (c) in eliminating the direct rays passing through the film by means of a diaphragm which is designed to intercept
 25 all the central rays and is disposed in the projection lens used to project the exposed film on a second unexposed embossed film.

The projection of a photographic picture may give rise to two images—(1) the image of the source of light through
 35 the picture (generally formed in the plane of the diaphragm of the projection lens), and (2) the image of the picture itself formed on the screen. If the picture is formed on an embossed film, that is a film the support of which has refracting lines imprinted by rolling and numbering about
 40 30 to the mm., the lines give rise to a diffraction phenomenon when the film is projected with the gelatine side facing the source of light.

This phenomenon is illustrated by Figure 1 which shows an enlarged cross-section of an embossed film and the manner in which an oblique ray of light spreads through the thickness of the film.
 50 The embossed film support *c* bears a photographic picture *E* on one face and refractive embossed elements *P* on the other
 [Price 1/-]

An oblique ray *SI* passes through a transparent element *I* of the picture. Its normal path should be *S—I—R—M*, but on account of diffraction resulting from the smallness of the element *I*, the ray is diffracted in the directions *R₁M₁* and *R₂M₂*. It will be seen that the ray *R₂M₂* diverges from the main ray *RM* and encroaches on a refractive element adjacent to that corresponding to the transparent element *I* of the photographic picture. The number of refractive elements which are interfered with by the diffracted rays is the greater the more the original ray *SI* is oblique.

The projection of an embossed film gives rise to diffracted images, in addition to the central undiffracted image, of the source of light, these images being formed by the field lens placed between the source and the film which is to be reproduced. The diffracted images constitute spectra of the 1st, 2nd, 3rd etc. orders, diminishing in brightness from the 1st to the next, and so on. The central image is formed from direct or undiffracted rays, and is much brighter than the diffracted images.

The projection of an exposed embossed film on an unexposed embossed film yields under these conditions a film which, when subsequently projected on a screen by means of a projection lens fitted with a three-colour filter, gives rise to an image which has a certain predominant colour to the detriment of other colours. Thus if the three-colour filter has a central green band, the image projected on the screen will have a general greenish tint, because of the bright central undiffracted rays which were allowed to pass through the projection lens when the original film was reproduced.

The object of the invention is to provide a special diaphragm which will eliminate these central undiffracted rays during reproduction by projection, and so obtain duplicates which will give a true rendering of colour.

The arrangement diagrammatically shown in Figure 2 is used.

A is a point or linear source of light according to the nature of the lenticular elements embossed on the film used;

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B is a field lens which forms at C an image of the source of light A;

D is an exposed embossed film to be reproduced, the gelatine side of which faces the source of light A. The focus of the field lens is selected so that the image C of the source of light is formed on the axis substantially at a distance DC from the film, corresponding to the distance between the lens used when the film D was exposed and the film receiving the image formed by it;

E is a reproduction lens projecting the picture D on a second film F also embossed but unexposed.

G is a diaphragm intercepting the whole of the central rays, i.e. direct rays which passed through the film D without being diffracted. An example of such a diaphragm is shown in plan in Figure 3.

This arrangement is used with advantage in combination with devices for eliminating waterings, described in R. Berthon's Patent Specification No. 265,069.

The waterings resulting from the optical superposition of the embossed network of the original film on the embossed network of the unexposed film are most evident when the intensity of the rays transmitted through the system is increased as much as possible, thereby obtaining the maximum sharpness of the projected image of the network. Thus, if the bright central beam is eliminated by a diaphragm according to the invention, the sharpness of the image of the embossed network will disappear, and in this way the watering effect will become less evident.

The devices described in the foregoing are not limitative, more particularly in

respect of the shape of the diaphragm G, which depends upon the nature of the embossed elements and the source of light used.

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 process of reproducing embossed photographic films by projection, consisting (a) in illuminating the gelatine-coated face of the embossed film to be reproduced by a point or linear source of light; (b) in forming, by means of a field lens placed between the source and the film, an image of the source at a distance from the film corresponding to the distance between the lens originally used for taking the picture and the film receiving the image formed by it; and (c) in eliminating the direct rays passing through the film by means of a diaphragm which is designed to intercept all the central rays and is disposed in the projection lens used to project the exposed film on a second unexposed embossed film.

2. Apparatus for use in carrying out the process claimed in Claim 1, substantially as described with reference to the accompanying drawing.

3. Printed photographic films when produced by the process claimed in Claim 1.

Dated this 25th day of July, 1928.

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Fig. 1

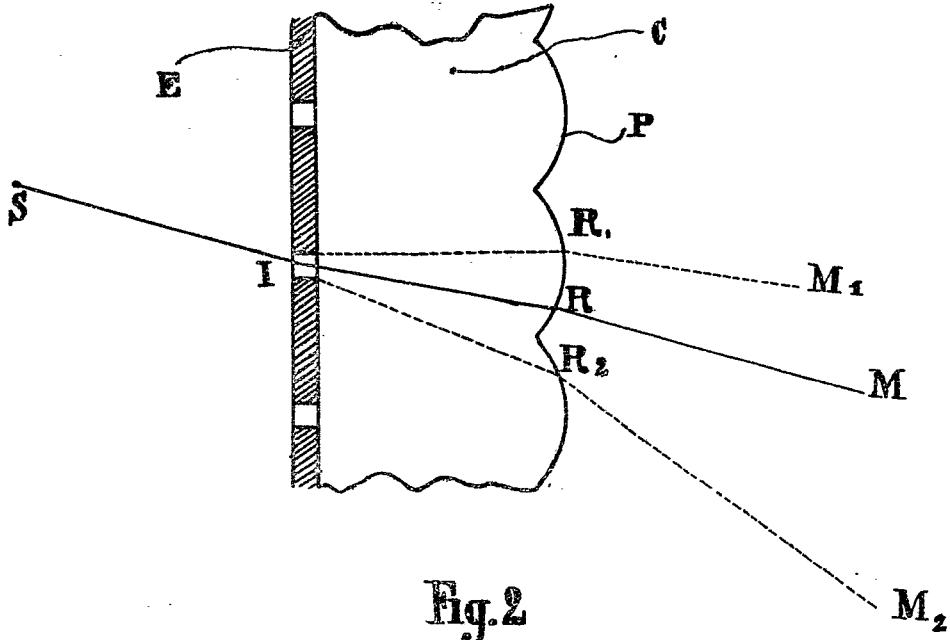


Fig. 2

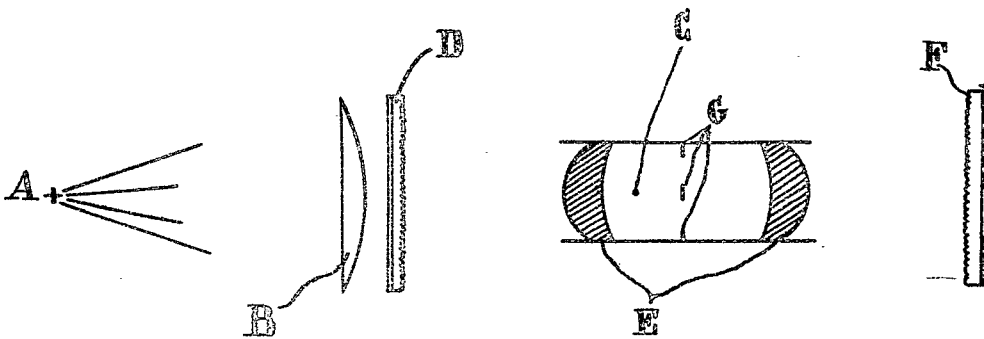
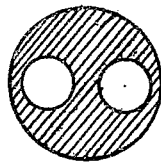


Fig. 3



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