

# PATENT SPECIFICATION

301,732

Convention Date (France): Dec. 3, 1927.

Application Date (in United Kingdom): Nov. 30, 1928. No. 35,326/28.

Complete Accepted: Oct. 31, 1929.

COMPLETE SPECIFICATION.

23 NOV 1929



## Improvements in or relating to Apparatus for Reproducing Photographic Colour Prints.

We, SOCIETE FRANCAISE CINECHROMATIQUE (PROCEDES R. BERTHON), a French Societe Anonyme, of 24, rue de la Pepiniere, Paris, France, as assignees of SOCIETE CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINEMATOGRAPHIE EN COULEURS, a French Company, of 9-11, Boulevard de Villiers, Neuilly, France, 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 assemblage of devices adapted to reproduce correctly, by projection on lenticular films of the type described and claimed in Berthon's Patent No. 10,611/09, colour picture records which are likewise on lenticular films, whether the refracting network be carried by such films superficially or between two layers having dissimilar indices.

Essentially, the apparatus comprises an ordinary intermittent feed projection printing machine constituted by two film-feeding devices, the mechanisms of which have a reversed action with respect to each other; in one device the original film is fed for example downwards, and in the other the film to be printed is fed upwards. The optical system is located between the two and is used for projecting the original film on to the blank film by means of a source of light illuminating the original film.

The particular features by which the invention is characterised are as follows:—

1. The image of a punctiform or linear source of light is taken up by an oscillating mirror before the projecting beam reaches the original film;
2. A condenser projects through the original lenticular film the image of the source of light into the plane of the diaphragm of the projection lens;
3. An oscillating diaphragm having a linear slot parallel to the lenticular elements on the film, is arranged in the theoretical plane of the diaphragm of the projection lens and follows the displacements of the image of the source of light

[Price 1/-]

while restricting the useful beam to the central portion of the said image;

4. The shutter interposed across the projecting beam and which is generally provided with one single blade intended to shut off the beam during the displacement of the images, is provided with two auxiliary blades by which the light is intercepted during exposure, when the aperture of the diaphragm passes before two given points of the pupil of the lens, which points correspond to the lines of separation of the colour areas of the three-colour screens used for recording the original film.

5. An optically corrected lens in the vicinity of the film to be printed on and adapted to alter the angle of incidence of the projecting beams on the said film;

6. A fogging lamp, arranged beyond the film to be printed on, serves to reduce the hardness of the images during the subsequent operations of photographic reversal.

Some of these devices are justified by the necessity to eliminate radically all diffraction phenomena resulting from a light beam passing through the refracting network of the original film, a condition which is essential for the preservation of the colours and the suppression of waterings; some of the other devices are merely intended to secure ease of projection of the films reproduced as well as the quality of the images obtained.

The oscillating mirror and oscillating diaphragm pertain to the first-mentioned category of such devices. The oscillating mirror compels the light to pass successively through the original film at the various dissimilar incidences to which the said film was simultaneously subjected during exposure, and only at such incidences. The oscillating diaphragm has for its purpose to retain for each of these incidences only the central portion of the projecting beam, thereby eliminating all the lateral diffraction spectra resulting from the light passing through the network of the original film. Moreover, this elimination of the lateral spectra results in the elimination of waterings, it being impossible for the

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image of the network to be formed in such conditions, as demonstrated by ABBE. Thus, the incidences of the coloured radiations on the original film at the time of view-taking will not be departed from at the time of projection on the film to be printed on and will not be mixed with any radiations of dissimilar incidence due to diffraction. When reproduced, the colours will therefore retain their purity.

The colours obtained by projecting the reproductions, by means of a suitable analysing device, though of the exact hue, would lack in brightness if, during printing, white light were allowed to pass under the incidences which correspond to the opaque lines separating the selecting screens in the view-taking lens. The effect of the auxiliary blades is precisely to suppress all white light along the incidences in question.

The lens arranged in the vicinity of the film to be printed on has a somewhat complex purpose. On one hand it alters the angle under which the pupil of the reproduction lens is seen from the plane of the film to be printed upon; on the other hand it virtually moves the plane of that pupil with respect to said film; consequently it transposes to another scale the focal length of the view-taking lens which served for exposing the original. This makes it possible to use long-focus lenses for projecting the prints in large rooms. The focus of this lens and the distance therefrom to the film to be printed upon will thus be adjusted so as to best utilize the useful angle of the refracting elements of the film while complying at the same time with the best optical conditions of projection in the rooms.

As to the fogging lamp, its purpose is restricted to obtaining photographic qualities of the image, namely harmony and softness, which are difficult to obtain when the photographic reversal processes are applied to commercial positive emulsions, which are intended to give contrasts by direct development.

In the accompanying drawing:—

Figure 1 is a general side elevation of the printing machine showing the two parallel feeding devices and the general arrangement of the moving members.

Figure 2 is a horizontal projection especially limited to the optical system provided with its oscillating mirror and oscillating diaphragm.

Figure 3 is a vertical projection at right angles to the optical axis of the printing machine and to the shutter spindle, the latter being shown in plan, together with the cam controlling both

the oscillation of the moving diaphragm and that of the oscillating mirror.

On all three Figures, identical letters designate identical parts.

A is the lamp body, which is offset laterally with respect to the optical axis of the printing machine.

B is the feeding device through which the original film is fed downwardly from the reel  $b^1$  to the reel  $b^2$ .

C designates the feeding device through which the film to be printed upon is fed upwardly from the reel  $c^1$  to the reel  $c^2$ .

D is the mount for the optical system by which the original film is projected upon the film to be printed upon.

At E is placed the oscillating mirror receiving the light beam from the lamp A and directing it towards the gate of the feeding device B.

F is a condenser interposed between the mirror E and the gate of the feeding device B.

At G is shown the oscillating diaphragm the motion of which is synchronous with that of the mirror E.

H indicates the shutter which, in addition to its normal blade  $h_1$ , is provided with two narrow auxiliary blades  $h_2$  and  $h_3$ .

I is the fogging lamp by which the film to be printed upon is illuminated from behind.

J is the eccentric keyed on the shutter spindle and by which both the oscillating diaphragm G and the oscillating mirror E are actuated through links  $j_1, j_2, j_3, j_4$  and a spindle  $j_5$ .

At K is shown the regulating lens for the incident beam and the reproduction pupil arranged in front of the film to be printed upon.

L is a fan cooling the lamp A and the original film through the sheet metal duct  $l_1$ , with discharge through a tube  $l_2$ .

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 projection printing machine adapted to reproduce colour prints on lenticular films, characterised by an oscillating mirror intended to take up the punctiform or linear image of the source of light before the projecting beam reaches the original film; a condenser by which the image of the source of light is projected through the original lenticular film into the plane of the diaphragm of the projection lens; an oscillating diaphragm having a linear slot parallel to the lenticular elements on the film, arranged in the theoretical plane of the diaphragm of the projection lens and

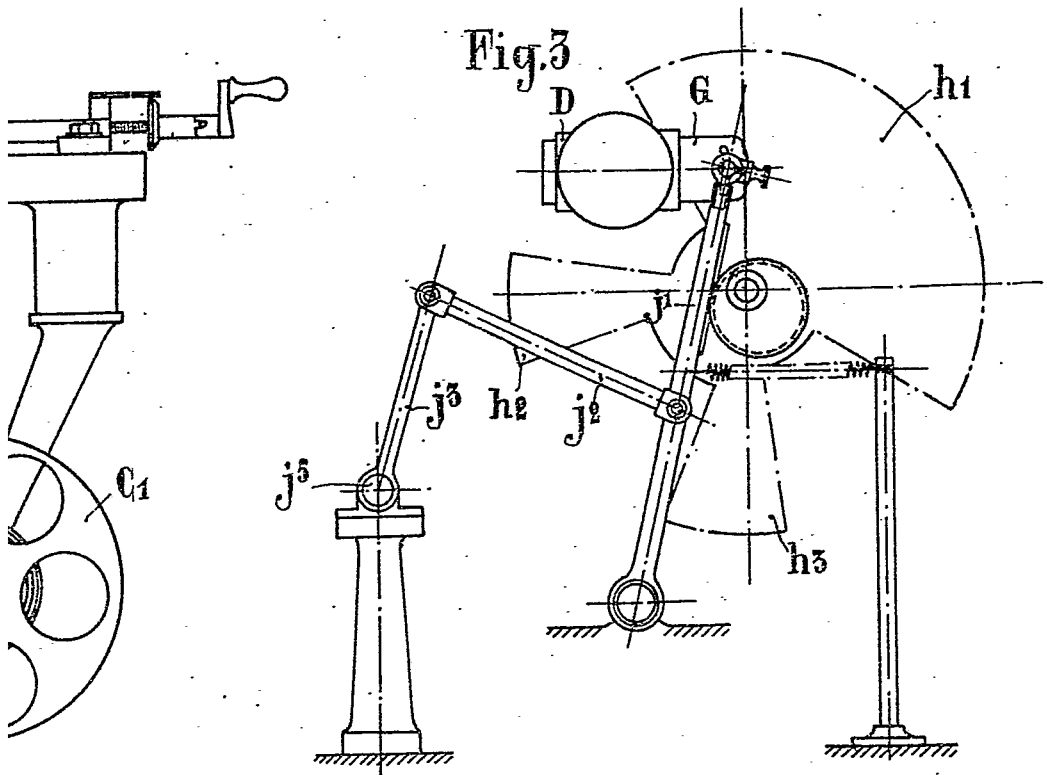
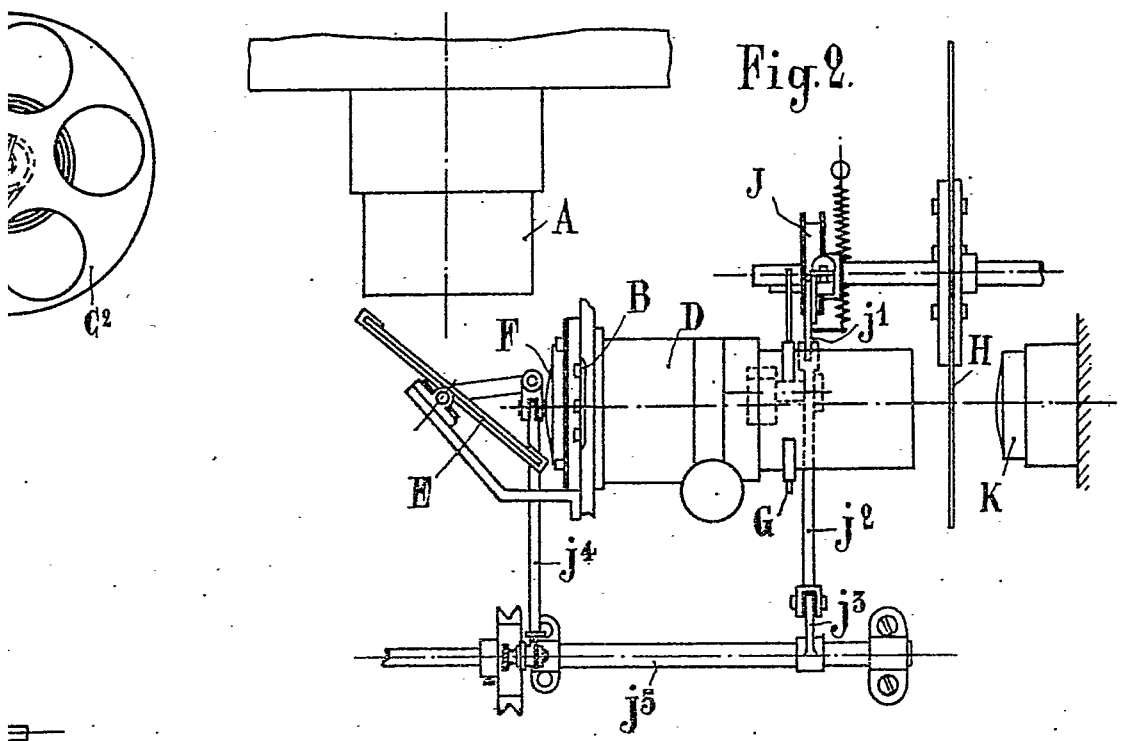
following the displacements of the image of the source of light while restricting the useful beam to the central portion of that image; a shutter interposed across the projecting beam, provided with two auxiliary blades by which the light is intercepted during exposure while the aperture of the diaphragm passes in front of two given points of the lens pupil, which points correspond to the lines of separation of the colour areas of the three-colour screens used for recording the original film; an optically corrected lens, arranged in the vicinity of the film to be printed upon and intended to alter the angle of incidence of the projecting beams on the film to be printed on; and a fogging lamp arranged beyond the latter film and intended to reduce the hardness of the images in the course of the subsequent operations for photographic reversal.

2. The apparatus for reproducing colour prints substantially as described or substantially as illustrated in the accompanying drawing.

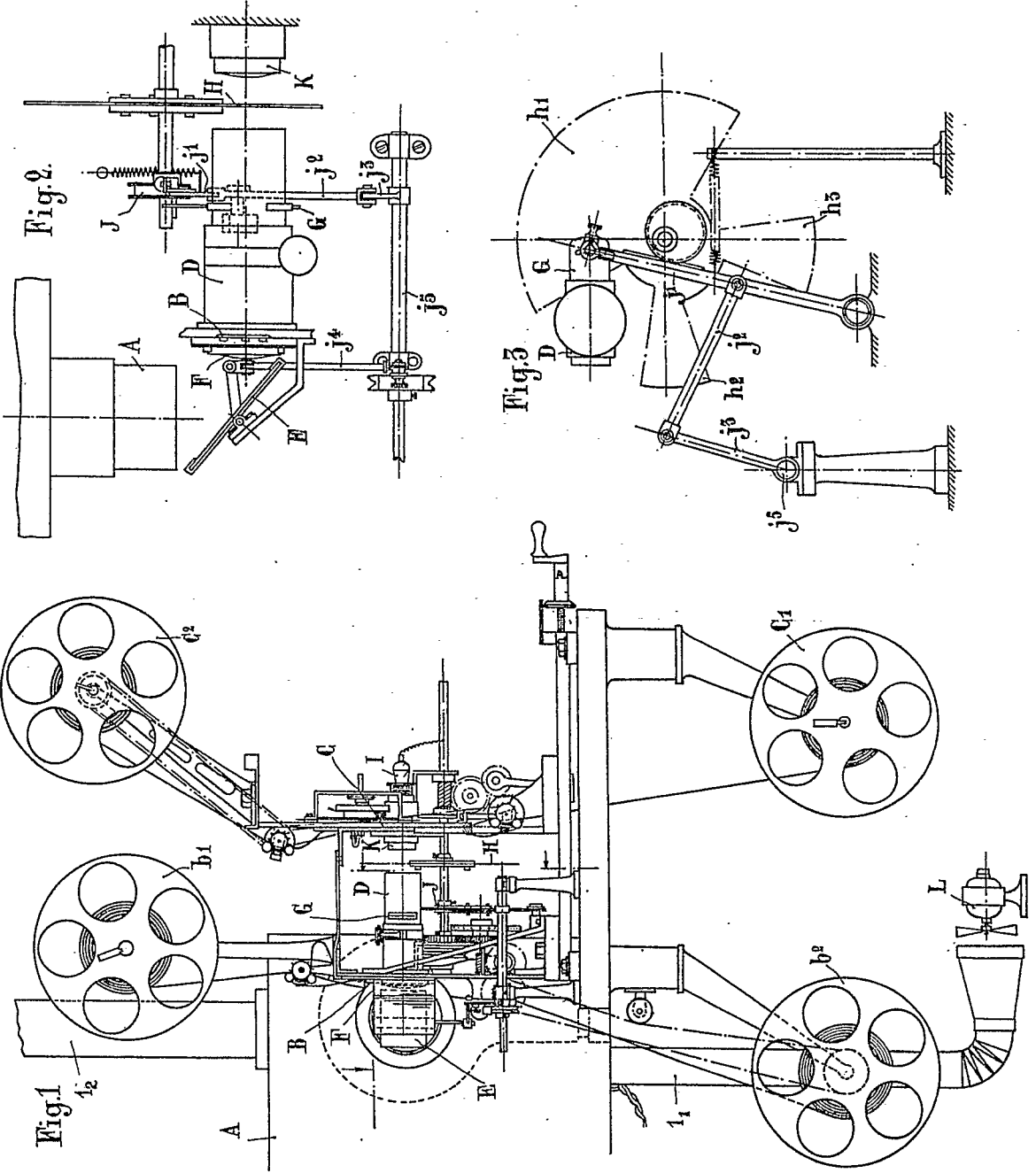
Dated this 30th day of November, 1928.

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