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PATENT SPECIFICATION



Convention Date (Germany): Aug. 6, 1929.

364,559

Application Date (in United Kingdom): Aug. 6, 1930. No. 23,588 / 30.

(Patent of Addition to No. 356,701 : dated May 8, 1929.)

Complete Accepted: Jan. 6, 1932.

COMPLETE SPECIFICATION.

Process of Photographic Printing.

We, I. G. FARBENINDUSTRIE AKTIEN-GESELLSCHAFT, a Joint Stock Company organised according to the laws of Germany, of Frankfurt a/Main, Germany, 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:—

and therefore it is impossible to produce a projection in true colours in an ordinary projection apparatus of great focal length from a lenticular film which has been exposed by means of a lens of short focal length, since the position of the plane in which, for true-colour reproduction, a filter must be placed or an image of the filter projected is only adapted for lenses

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ERRATUM.

SPECIFICATION No. 364,559.

Page 1, line 86, for "reel" read
"real"

PATENT OFFICE,

May 14th, 1932.

taken; between the negative and positive films is placed an optical system which has in front of the positive film a conjugate plane of the plane in which the colour filter was placed when the negative was originally exposed, and in this conjugate plane is placed an objective which projects onto the positive film an image of the negative to be copied. In the said specification there is described by way of example an optical system which yields a positive picture of the same size as the negative. With this arrangement pictures are obtained in which the colour filter in projection or its virtual image has the same size and the same distance from the film as the colour filter in the original exposure.

Projection lenses in general possess a greater focal length than exposure lenses
[~~Revised~~]

placed in the plane of the image of the filter for projecting onto the positive film an image of the negative to be copied, is displaced from that plane so as to produce a real or virtual image of the filter in a predetermined, desired position in relation to the positive different from the position of the filter in relation to the negative in the original exposure. If it is desired to print a positive film suitable for true colour projection with any of the usual projection systems the aforesaid objective is placed in such a position that there is produced a virtual image of the filter situated at infinity. A positive film of this type can be projected with lenses of every focal length when the colour filter is placed in the front focal plane of the lens.

The plane of the image of the filter can

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We, I. G. FARBENINDUSTRIE AKTIENGESELLSCHAFT, a Joint Stock Company organised according to the laws of Germany, of Frankfurt a/Main, Germany, 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:—

10 This invention relates to a process of printing from a lenticular film on to a film of the same kind and obtaining thereon a picture without lateral inversion, that is to say the right and left sides of which correspond with the right and left sides respectively of the film (master film) from which the print is made. The invention is an improvement in or a modification of that described in Specification No. 356,701.

The said Specification describes a process for optically printing without lateral inversion from lenticular films on to films of the same kind and in which the emulsion side of the negative or master film faces the lenticular screen side of the positive film, the negative film being illuminated on its lenticular screen side, with or without a colour screen, by means of an objective equal in function to that by means of which the negative film was taken; between the negative and positive films is placed an optical system which has in front of the positive film a conjugate plane of the plane in which the colour filter was placed when the negative was originally exposed, and in this conjugate plane is placed an objective which projects onto the positive film an image of the negative to be copied. In the said specification there is described by way of example an optical system which yields a positive picture of the same size as the negative. With this arrangement pictures are obtained in which the colour filter in projection or its virtual image has the same size and the same distance from the film as the colour filter in the original exposure.

50 Projection lenses in general possess a greater focal length than exposure lenses

[Price 1/6]

and therefore it is impossible to produce a projection in true colours in an ordinary projection apparatus of great focal length from a lenticular film which has been exposed by means of a lens of short focal length, since the position of the plane in which, for true-colour reproduction, a filter must be placed or an image of the filter projected is only adapted for lenses of short focal length.

In the following description and claims, reference is made for convenience to a colour filter and to real and virtual images of the filter. It is not, however, essential to use a colour filter in the printing process, and when no filter is used, it is to be understood that the equivalents of the filter, and its image are respectively the planes in which the filter if used, would be placed and in which its image would be projected in order to obtain a true colour reproduction.

According to the present invention, from a lenticular screen negative which was exposed by means of an ordinary lens of short focal length there may be printed positives suitable for true colour projection with lenses of greater focal length. For this purpose the process of the said specification is modified in that the objective which in the aforesaid process is placed in the plane of the image of the filter for projecting onto the positive film an image of the negative to be copied, is displaced from that plane so as to produce a real or virtual image of the filter in a predetermined, desired position in relation to the positive different from the position of the filter in relation to the negative in the original exposure. If it is desired to print a positive film suitable for true colour projection with any of the usual projection systems the aforesaid objective is placed in such a position that there is produced a virtual image of the filter situated at infinity. A positive film of this type can be projected with lenses of every focal length when the colour filter is placed in the front focal plane of the lens.

The plane of the image of the filter can

be displaced in a simple manner by printing with an optical system comprising two separate parts, each part being movable independently of the other, in which system the part facing the positive film and constituting the objective hereinbefore referred to (hereinafter called the second part) may be situated at any point between the other (first) part and a plane situated at a distance from the plane of the image of the filter projected by the first part, measured in the direction of the positive film, equal to the focal length of the second part, but does not occupy the plane of the image of the filter projected by the first part.

In the annexed diagrams Figs. 2 and 3 illustrate by way of Example an arrangement suitable for the invention the arrangement described in the parent specification being shown in Fig. 1. The reference letters on Figs. 1, 2 and 3 of the drawings have been selected to accord with those of Fig. 1 of the aforesaid specification.

The negative film N is fitted as in the said specification in the plane of the focus of the lens or lens combination L_3 , so that all rays appertaining to any point of the film are directed by the lens L_3 to run parallel. Now, when displacing the lens L_4 from the plane F_2 in the direction of the positive or negative film (Fig. 1) the image projected by the negative film N will take part in the movement of the lens L_4 without changing its size and its position in the plane of the focus of the lens L_4 . The positive film P must in each case be brought into the plane of the image produced by the lens L_4 . When viewed from the positive film the filter image F_2 is seen always under the same angle, that is to say the angle formed by the rays extending to the edge of the filter image. The virtual image of the filter is, however, when viewed from the positive film, more and more displaced from F_2 in the direction of L_3 and the negative film N, the more the focus of the lens L_4 approaches the plane F_2 . As soon as the focus of the lens L_4 coincides with the plane F_2 the virtual image of F_2 is, when viewed from the positive film, at infinity (Fig. 2). A displacement of L_4 in the direction of L_3 brings, however, the filter image nearer to the positive film, and also in this case the angle remains the same (Fig. 3).

Hence it follows that by a simple displacement of the part of the optical system

L_4 facing the positive film from the position which it occupies in Fig. 2 towards the plane F_2 positive films can be prepared with various positions of the image of the filter. Thus, according to this invention suitable positive films can be printed for every projection system. It is preferred to adjust the printing lens system in such a manner that the virtual image of the filter lies at infinity. In this manner positive films are obtained which can be projected by means of various different projection systems by adapting for projection the colour filter in the front focus plane of the projecting objective.

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. In the process of optically printing without lateral inversion from a lenticular film onto a film of the same kind forming the subject of Specification No. 356,701 the modification which consists in placing the objective, which projects onto the positive film an image of the negative to be copied, in a plane which is removed from the plane of the image of the colour filter produced by the optical system between the films, for the purpose set forth.

2. A process as referred to in claim 1, wherein the filter has a virtual image situated at infinity.

3. A process as referred to in claim 1 or 2, in which for printing there is used a lens system comprising two parts movable independently of each other, that part which faces the positive film (the second part) being given any desired position between the other (first) part and a plane situated at a distance from the plane of the image of the filter projected by the first part, measured in the direction of the positive film, equal to the focal length of the second part, but not occupying the plane of the image of the filter projected by the first part.

4. An arrangement of lenses for the process referred to in any of the preceding claims constructed and adapted to operate substantially as described with reference to Fig. 2 or 3 of the accompanying drawings.

Dated this 6th day of August, 1930.

ABEL & IMRAY,
30, Southampton Buildings, London,
W.C. 2,

Agents for the Applicants.

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

FIG. 1.

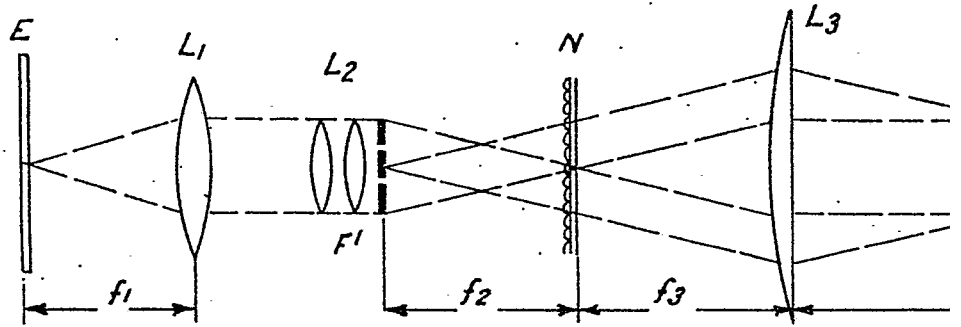


FIG. 2.

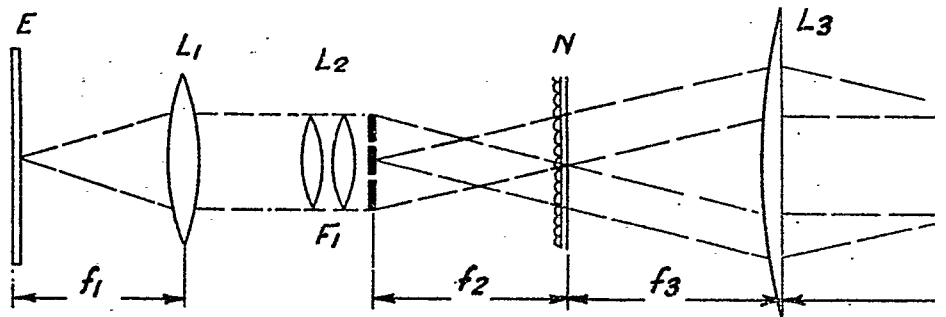


FIG. 3.

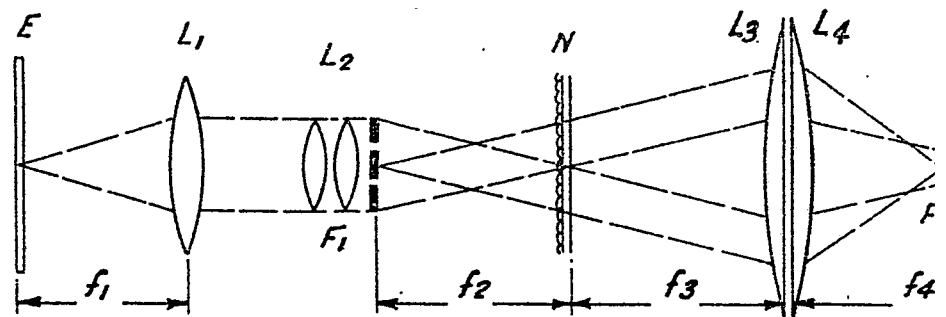
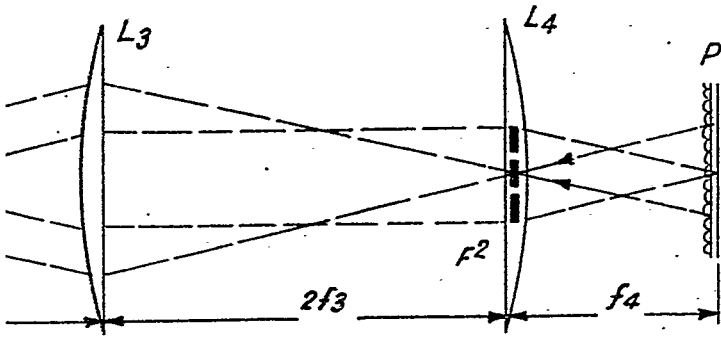


FIG. 1



G. 2.

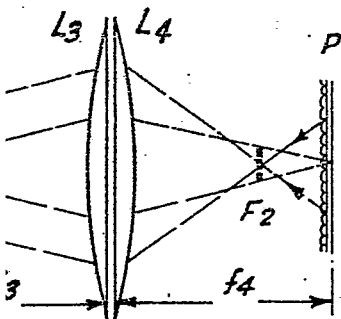
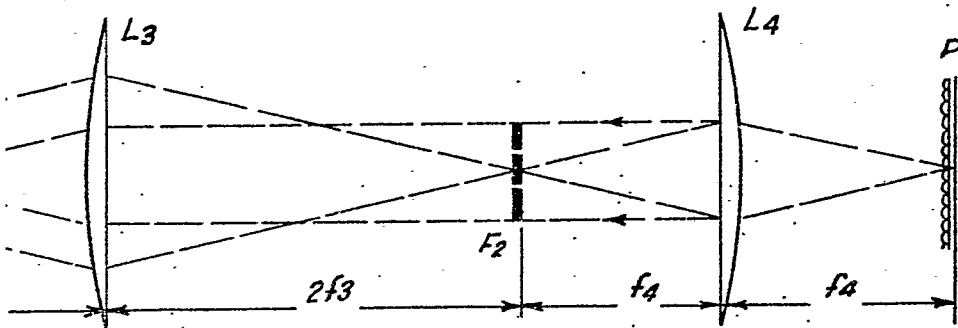


FIG. 1

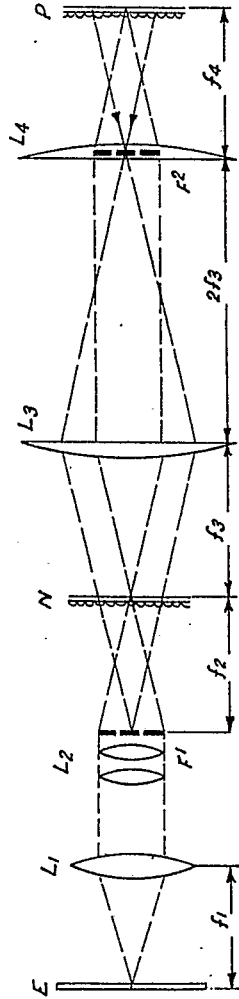


FIG. 2

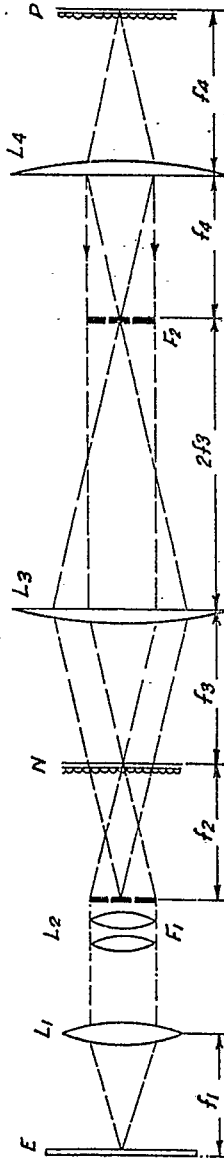
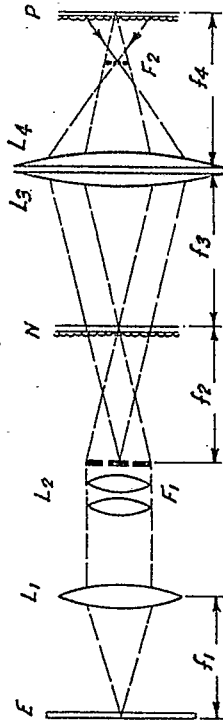


FIG. 3



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