

# RESERVE COPY PATENT SPECIFICATION

412,021

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## COMPLETE SPECIFICATION.



### Improvements relating to the Printing of Colour Record Images from Lenticular Films onto Smooth Films.

- 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:—
- 10 This invention relates to photographic printing and more particularly to the printing of lenticular films on smooth film.
- 15 One of its objects is to provide a process of printing part-colour pictures from lenticular film on smooth film in contact. Another object is to print in a manner whereby the lenticular elements of the lenticular film to be printed face the emulsion layer of the smooth film.
- 20 In the accompanying drawings—  
Fig. 1 illustrates an intermediate step of the new process.
- 25 Fig. 2 shows the distribution of light on the margins of the lenticular film when the illumination is through a multi-colour filter.
- 30 Fig. 3 shows the distribution of light on the margins of a lenticular film placed in contact with the film shown in Fig. 2.
- 35 Fig. 4 shows the printing step proper when printing the green sensation.
- It has been found that it is possible to print lenticular films on normal or smooth films in contact when there is inserted in the path of the light rays a lenticular film prepared in a manner as hereinafter described and referred to as a "stencil film".
- 40 The following explanations disclose the essence of the invention. When a lenticular film is illuminated by means of a uniformly illuminated white plane equal in size to one area of a multi-colour filter as usual for taking lenticular films and arranged at a substantial distance from the lenticulated side of the film, there will be obtained after reversal development a film which shows in its emulsion layer a pattern consisting of alternating blackened and transparent stripes. These stripes extend parallel to the lenticular elements and are distributed in such a manner that one transparent stripe and one blackened stripe are co-ordinate with one lenticular embossing. This is illuminated in Fig. 1.
- 55 Referring to Fig. 1, A designates a uniformly illuminated white plane, the three parts *b*, *g* and *r* of which are equal in size to the areas of the three-colour filter or their virtual images used when taking a lenticular film and arranged at the same distance from the film as is arranged the three colour-filter or its virtual image in view taking, the succession of the filter areas being blue, green, red. The areas *b* and *r* of the white plane are masked so that only the light of the white plane, corresponding with the green area of the multi-colour filter, strikes the film. When the lenticular film, consisting of the support B and the emulsion layer C, is developed, there will be produced in the emulsion layer alternating black and transparent stripes. If the development is effected according to the reversal method the transparent stripes fill the space which would be occupied by the green sensation in taking the film through the usual multi-colour filter. The film thus obtained will be referred to hereinafter as the "intermediate film". This intermediate film cannot be used as a "stencil film" in this printing process for the following reasons.
- 60 By inspecting the "intermediate film" it will be easily seen that the middle line of the stripe which is in the middle of the film lies exactly under the central line of the co-ordinate lenticular element, but by inspecting the position of the transparent stripes near the margin of the film it will be apparent that the middle line of the transparent stripes does not lie under the central line of the co-ordinate lenticular element, but is displaced towards the margin. This is shown in Fig. 2. The arrow in the middle of this figure points towards the middle of that area of the illuminating device corresponding with the green area of the multi-colour filter used in taking. The illuminating device could not be represented, as it is too far off; it may be of the kind diagrammatically repre-
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sented in Fig. 1. D designates the lenticular film and  $g^1$  the middle lines of the transparent areas which are displaced towards the margin of the film.

5 When this intermediate film is printed on another lenticular film with the lenticular elements in contact, there will also be formed on the latter film after reversal development alternating blackened and transparent stripes of which each pair of stripes composed of one transparent stripe and one blackened strip is co-ordinate with one lenticular element, the transparent stripes being a real image of the transparent stripes of the "intermediate film". The distribution of the transparent stripes and the blackened stripes is such that the middle line of the transparent stripe at the middle of the film lies under the central line of the lenticular element, but that of the transparent stripes at the margin of the film is displaced towards the middle of the film. These relations are shown in Fig. 3. In this Fig. D designates the "intermediate film" with the stripes  $g^1$ . In contact with this "intermediate film" and facing the same with its lenticular elements there is arranged the "stencil film" E. When the films are illuminated from the side of the intermediate film by diffused light, that is a uniformly illuminated white plane, the middles of the transparent stripes are printed in the manner indicated in Fig. 3, and it is seen that the middles of the transparent stripes, which in the "intermediate film" are displaced towards the margin, have been displaced towards the middle of the "stencil film". By inspection of the two films arranged in contact it will be apparent that, while all the light rays emanating from the transparent stripes of the "intermediate film" cut each other in a point which is situated on the same side of the film as is its lenticulated surface, namely, in the middle of the green area of the multi-colour filter (indicated in the Figure by an arrow), the corresponding light rays of the print, the "stencil film", diverge and their backward extensions beyond the emulsion layer cut each other in a point, which occupies the same position with relation to the print or "stencil film" as to the "intermediate film" with the difference that the side of the film which faces towards this point is in the case of the print or "stencil film" the side bearing the emulsion layer, and in the case of the "intermediate film" the side bearing the lenticular elements.

The function of the "stencil film" as a mask will become apparent when in Fig. 3 the "intermediate film" is

exchanged for an original taken under the same conditions with relation to size and distance of the multi-colour filter or its virtual image as the "intermediate film", and when a normal or smooth film is arranged in contact with the two films, so that the emulsion layer side of the smooth film is in contact with the striped layer side of the "stencil film". This arrangement is shown in Fig. 4. In this Figure K is the original with the picture layer I, L is the "stencil film" with the transparent areas  $g^1$ , M is the light sensitive emulsion layer of the normal film, and H is a source of diffuse light, for instance a uniformly illuminated white plane. By the light emanating from H all the stripes, containing the different colour sensations, are projected on the layer of the "stencil film" but only the light of that colour stripe is transmitted by the transparent stripe of the "stencil film", with which this transparent stripe is conjugate. The light of the stripes corresponding with the other colour sensations is absorbed by the blackened part of the "stencil film". It is seen that the "stencil film" indeed acts as a stencil. The light passing the transparent stripes of the "stencil film" strikes the emulsion layer of the normal film and produces therein a partial colour picture.

In the foregoing, the new process has been described with regard to the production of one colour sensation and more particularly the green part colour picture when the process is used for taking a picture through a three-colour filter having its colour areas arranged in the succession blue, green, red. It is obvious that the process is applicable for printing as many part colour records as may be registered in a lenticular film. It is only necessary to produce as many "stencil films" as there are part colour records to be printed, it being observed that for each "stencil film" to be used for printing a part-colour picture there are to be applied the conditions indicated above for the production of a "stencil film" to be used for printing the green part colour, using in taking the lenticular film a multi-colour filter with the filter areas;—blue, green and red.

As the trace of the rays in optical arrangements is reversible it is also possible to illuminate first the "stencil film" in printing part colour pictures from lenticular film on normal film. In this case the arrangement of films shown in Fig. 4 is changed in the following manner. Next to the source of diffuse light H there is arranged the "stencil film" L facing with its layer side the

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source of light, then follows the original K with its embossed side in contact with the "stencil film", and finally follows the normal film to be printed on having its layer side in contact with the layer side of the original. It is seen that in this case printing is effected while the embossed side of the original is turned away from the emulsion side of the film to be printed on.

The new process is therefore applicable for the contact printing of part colour pictures from lenticular film on normal film with the embossed side of the lenticular film facing the normal film or not. It is of particular importance when printing on a film with a light sensitive emulsion layer applied to both sides of the support. Also in this case it is possible to print in contact on each side a part-colour picture from the same lenticular film in such a manner that the prints are not laterally inverted with respect to one another when viewed from the same side of the normal film. While one part colour picture is printed on one side of the film with the layer side of the lenticular film in contact with the layer of the film to be printed upon, the next part colour picture is printed on the second emulsion layer of the film to be printed on with the embossed side of the lenticular film facing the layer of the film to be printed on. Such contact printing was hitherto not possible.

The process is furthermore well suited for the production of pictures to be viewed by reflected light on films having an ordinary line screen (consisting of alternate transparent and opaque stripes) or a multi-colour line screen. For this purpose printing is conducted with use of a multi-colour filter and with a "stencil film" corresponding to each of the part-colour records in the film to be printed from, the arrangement being as follows:—At the required distance from the multi-colour filter, which is illuminated by means of a source of light, is arranged the lenticular film to be printed from, with the side bearing the colour records facing towards the filter; the "stencil film" is arranged with its lenticulated surface in contact with the lenticulated surface of the lenticular film and the layer which is to receive the print is arranged with its line screen in contact with the striped side of the "stencil film".

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 printing part colour

pictures from lenticular film on normal film in contact, which comprises arranging in contact a lenticular film, containing a silver picture taken behind a multi-colour filter, and a "stencil film" as described herein with their embossed sides facing each other, placing a normal film with its light sensitive emulsion layer in contact with one of the said films arranged in contact and illuminating with a source of diffuse light through the other film.

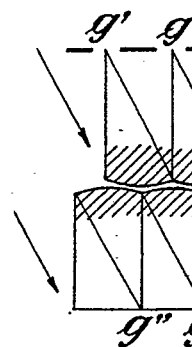
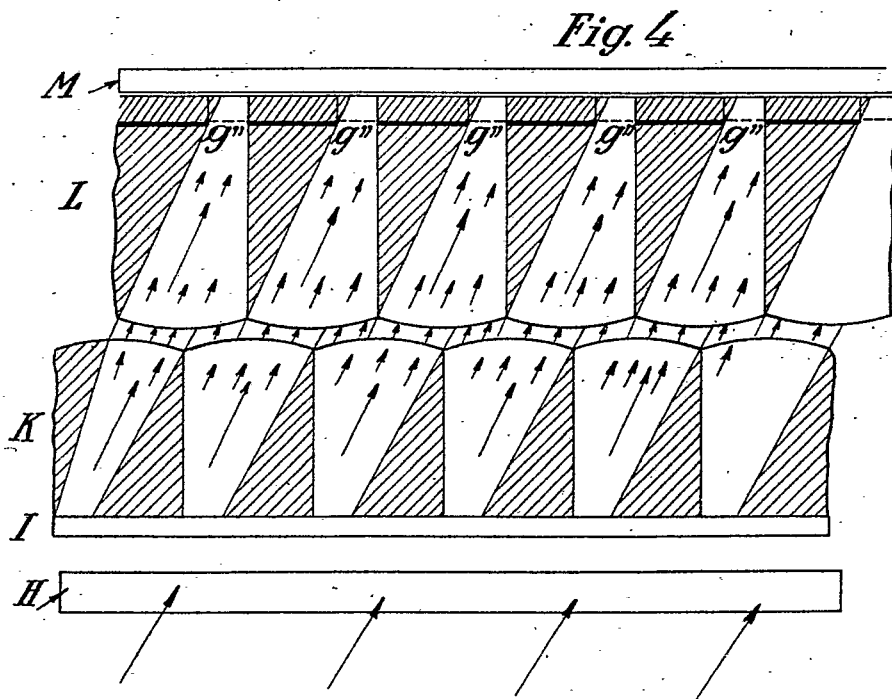
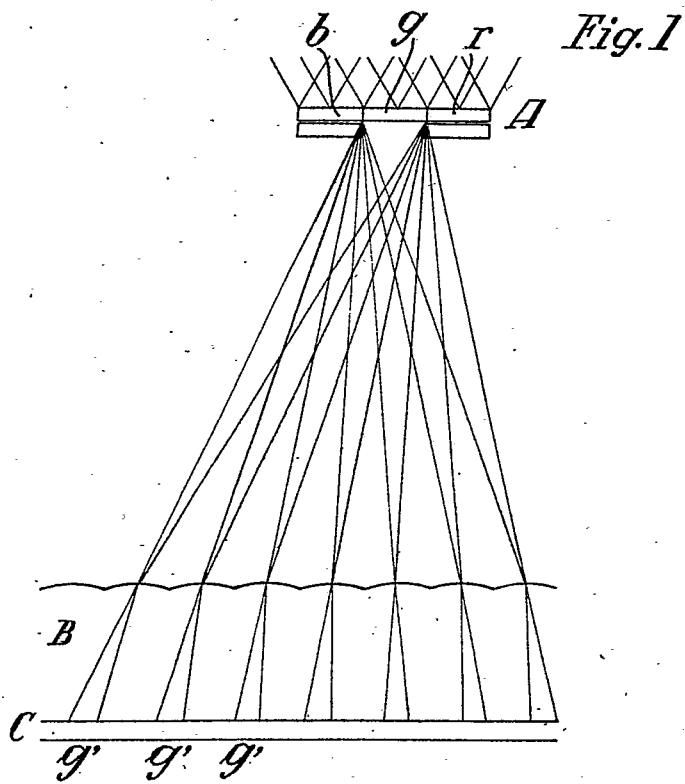
2. A process of printing part colour pictures from lenticular film on normal film in contact, which comprises arranging in contact a lenticular film containing a silver picture taken behind a multi-colour filter and a "stencil film" as herein described, adapted for the transmission of one colour sensation, with their embossed sides facing each other, placing a normal film comprising a support having applied to each side of it a light sensitive emulsion layer, with one of the said emulsion layers in contact with the lenticular film that contains the silver picture, illuminating with a diffuse source of light through the "stencil film", removing the film provided with two emulsion layers, arranging the film that contains the silver picture in contact with a second "stencil film" adapted for the transmission of another colour sensation, placing the normal film provided with two emulsion layers with its unexposed emulsion layer in contact with the "stencil film" and illuminating through the lenticular film containing the silver picture.

3. A process of producing an intermediate film and for making therefrom a "stencil film" suitable for use in printing from lenticular films, which comprises (a) illuminating a light-sensitive lenticular film by means of a diffuse source of light which is equal in size to one colour area of a multi-colour filter and is arranged at the same distance from and in the same lateral relationship to the lenticular film as was that area of the filter or its virtual image arranged during the taking operation in respect of the lenticular film to be printed from with the aid of the "stencil film", and developing said exposed film according to the reversal method to produce the intermediate film; then (b) arranging this intermediate film and another light-sensitive lenticular film in contact with their embossed sides facing each other, illuminating by means of a source of diffuse light through the intermediate film and developing the illuminated sensitive lenticular film according to the reversal method.

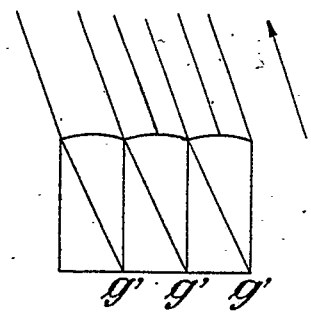
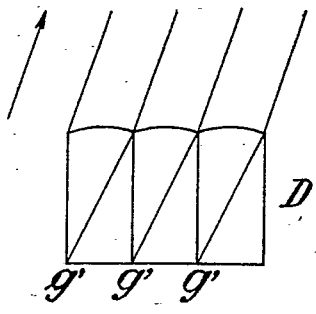
4. A lenticular film made by the process as set forth under (a) or under (b) in Claim 3, containing a silver picture composed of alternating transparent and blackened stripes extending parallel to the lenticular elements, of which stripes each pair composed of one transparent stripe and one blackened stripe is confederate with one lenticular element. 20
5. A lenticular film as claimed in claim 4, wherein the middle lines of the transparent stripes situated near the margin of the film are displaced towards the middle of the film. 25
6. A lenticular film as claimed in claim 4, wherein the middle lines of the transparent stripes situated near the margin of the film are displaced towards the middle of the film. 30
7. In combination, a lenticular film containing a silver picture and a "stencil film" as herein described arranged in contact with their embossed sides facing each other, a normal film with its light sensitive emulsion layer in contact with one of these films, and a source of diffuse light arranged on that side of the films in contact opposite the normal film.

Dated this 1st day of May, 1933.  
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.]

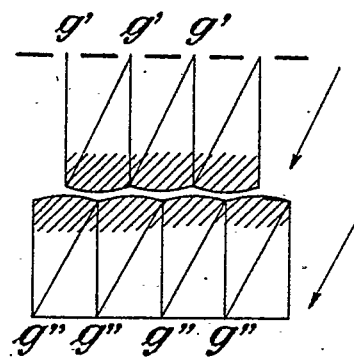
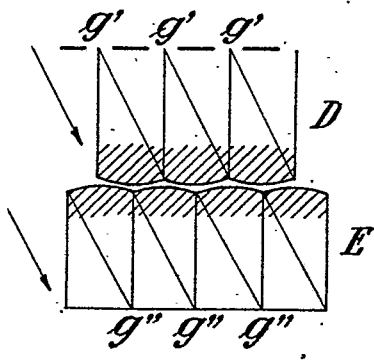


*Fig. 2*



middle of the Filter

*Fig. 3*



middle of the Filter

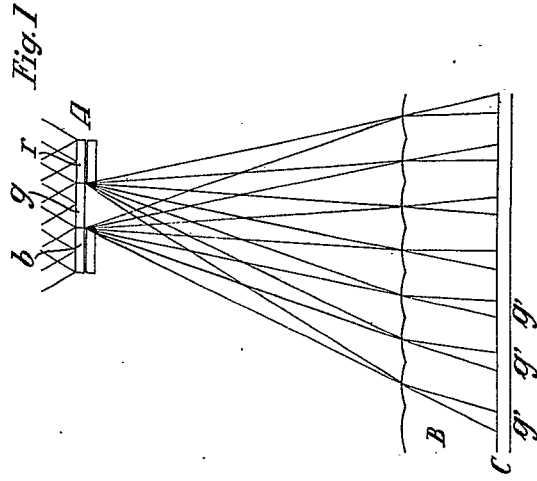


Fig. 1

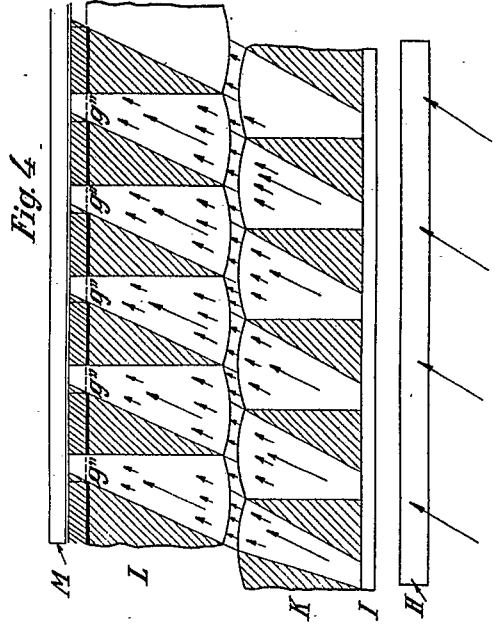


Fig. 4

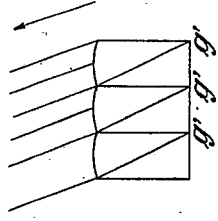


Fig. 2

middle of the Filter

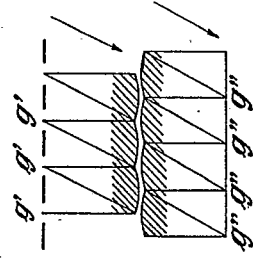
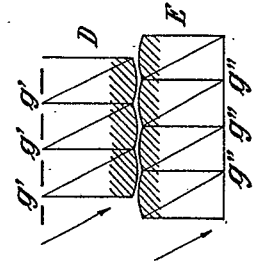
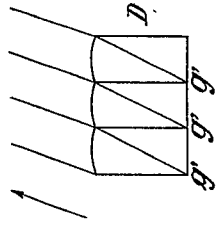


Fig. 3

middle of the Filter



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