

PATENT SPECIFICATION

388,062



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COMPLETE SPECIFICATION.

Improvements in or relating to Colour Photography.

We, KODAK LIMITED, a Company registered under the Laws of Great Britain, of Kodak House, Kingsway, London, W.C.2, (Assignees of JOHN GEORGE CAPSTAFF, British Subject, of Kodak Park, Rochester, New York, United States of America, and MERRILL WILMER SEYMOUR, Citizen of the United States of America, of Kodak Park, Rochester, New York, 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 a method of and apparatus for printing a photographic record having colour-values on a recording film from an original lenticular film whereon a picture has been taken through a colour filter comprising separate colour bands or areas.

When for example a three-colour picture is recorded on a lenticular film and a copy is printed directly from such original film, it has been found that under certain conditions a degradation of the colour values tends to occur, this degradation being largely due to slight imperfections in the lens elements of the lenticular film. The present invention has for its object to provide a method and apparatus whereby records can be printed having a colour-value separation at least as good as that of the original film.

According to the present invention the colour elements on each frame of the original lenticular film are segregated and simultaneously printed as monochrome images on separate areas of a corresponding single frame of an unembossed film of substantially the same width as the original lenticular film, so that the monochrome images on the unembossed film correspond respectively to the component pictures projected from the camera filter on to the original lenticular film.

The monochrome images on the unembossed film may be printed as a composite picture on a second lenticular film thereby forming a copy of the original record.

In the accompanying drawings—
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Figure 1 illustrates one arrangement for printing from an embossed or lenticular film to an unembossed film, 55

Figure 2 is a similar arrangement slightly modified for printing from un-embossed to embossed or lenticular film,

Figure 3 shows in perspective and on an enlarged scale a part of the apparatus shown in Figures 1 and 2, 60

Figure 4 is a portion of embossed film having transverse lenticulations, and

Figure 5 is a similar view of a portion of unembossed film having three-colour component pictures recorded thereon. 65

In the arrangement illustrated in Figure 1 the original film 5 from which the prints are to be taken comprises a support having on one surface an emulsion layer and having its other surface embossed to form a series of transverse lens elements as shown in Figure 4, the pictures having been recorded on the film through a colour filter having three primary colour bands, and the film developed either as a negative or as a reversed original. A light source 6 is arranged to project light through a lens 7 so as to illuminate uniformly a window in a gate 8 through which the film 5 is fed from a supply reel 9 to a take-up reel 10 by pull-down mechanism indicated at 11. Arranged opposite to the gate 8 is a second gate 12 through which an un-embossed film 13 of substantially the same width as the film 5 is fed from a supply reel 14 to a take-up reel 15 by means of a pull-down mechanism indicated at 16. 70

Arranged between the gates 8 and 12 is a lens unit 17 comprising three lenses 18, 19 and 20 (Figure 3) having their apertures restricted by diaphragms 21, 22 and 23 respectively, the lens unit 17 being arranged twice as far from the film 5 as from the film 13. The lens unit is so arranged that the lenses 18, 19 and 20 and their diaphragms 21, 22 and 23 are arranged in positions corresponding to those of the filters through which the original film 5 was recorded. The lenticulations on the film 5 are of the transverse ribbed type and it will be seen from Figure 3 that when the lens element 17 is in position between the gates 8 and 12 75 80 85 90 95 100 105

the lenses and their diaphragms are so displaced with respect to each other that their axes meet the film 5 at points thereon spaced apart in a direction at right angles to the length of each transverse lenticulation, the colour bands being parallel to the lenticulations.

The films 5 and 13 are fed synchronously, a frame at a time, past the windows in the gates 8 and 12, synchronism being obtained by coupling together the pull-down mechanisms 11 and 16 as indicated by the dotted line. Light from the source 6 passing through the lens 7 and film 5 form in the plane of the lenses carried by the unit 17 images corresponding to the filters through which the film 5 was originally recorded. Thus, assuming that these filters are in the form of parallel bands of blue, green and red these images will fall respectively on the lenses 18, 19 and 20. The lenses then project rays representing the form and colour-values of the picture in the exposed frame of the film 5, these rays passing through the gate 12 on to the film 13 where three separate monochrome pictures 24, 25 and 26 are formed in the corresponding frame of the film 13.

The film 13 when thus printed may be projected as a composite picture. If a lens arrangement such as that illustrated in Figure 3 is employed for projection it will be understood that each lens should be covered by appropriate colour filters similar to that used in taking the original picture so that a three-colour composite picture is thus reproduced on the screen.

Figure 2 illustrates an arrangement for printing from the unembossed panchromatic film 13 on to a lenticulated film 5, of substantially the same width. In this arrangement the lens unit 17 is arranged twice as far from the lenticular film 5 as from the unembossed film 13 so that the arrangement of the lenses 18, 19 and 20 with respect to the lenticulations on the film 5 in Figure 2 corresponds with the arrangement of these lenses with respect to the lenticulations on the original film 5 in Figure 1. When the two films in Figure 2 are moved synchronously light from the source 6 passes through the lenses 7 and thence through each of the monochromes 24, 25 and 26 on the lenticular film 5, the component pictures being projected respectively upon the lenses 18, 19 and 20 which register or combine the three pictures into a composite picture in the space of one normal frame (indicated in chain lines in Figure 4) on the lenticular film 5. The film 5, when thus printed, may be projected as a three-colour composite picture by a suitable

optical system.

It will be understood that the arrangements above described and the details of construction of the apparatus employed may be varied without departing from the invention. Thus, the lenticulations or lens elements on the embossed film may be of any desired form such, for example, as spherical or cylindrical and may extend either transversely or longitudinally of the length of the 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. In colour photography the method of printing a photographic record having colour values on a recording film from an original lenticular film whereon a picture has been taken through a colour filter, according to which the colour elements on each frame of the original lenticular film are segregated and simultaneously printed as monochrome images on separate areas of a corresponding single frame of an unembossed film of substantially the same width as the original lenticular film, so that the monochrome images on the unembossed film correspond respectively to the component pictures projected from the camera filter on to the original lenticular film.

2. In colour photography the method of producing a photographic copy on a lenticular film from an original record which has been made on a lenticular film through a colour filter, according to which the colour elements on each frame of the original lenticular film are segregated and simultaneously printed as monochrome images on separate areas of a corresponding single frame of an unembossed film, after which the monochrome images are optically printed as a composite picture on the second lenticular film.

3. In apparatus for printing a photographic record having colour values on an unembossed film from an original lenticular film on which pictures have been recorded through a colour filter, the combination with means for moving the two films synchronously, a composite lens unit or system arranged between the films and having a separate lens and filter corresponding to each colour represented on the original lenticular film, and a light source so arranged as to transmit light through each successive frame of the original film and thence simultaneously through all the lenses of the lens unit or system to each successive corresponding frame of the unembossed film, the two films being of substantially the same width.

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4. Apparatus for optically printing a composite picture on a lenticular film from monochrome images which have been recorded on an unembossed film by the apparatus as claimed in Claim 3, comprising means for moving the unembossed film synchronously with the lenticular film on which the copy is to be made, a composite lens unit or system arranged between these films and having a separate lens and filter corresponding to each monochrome image on the unembossed film, and a light source so arranged as to transmit light through each successive frame of the unembossed film and thence simultaneously through all the lenses of the lens unit or system to each successive corresponding frame of the film to be printed.
5. Apparatus for printing a photographic film record or copy as claimed in Claim 3 or Claim 4, in which the lenses are arranged in positions corresponding to those occupied by the colour areas of the filters through which the original film was recorded.
6. The herein described method of printing a photographic record having colour values on an unembossed film from a lenticular film whereon a picture has been taken through a colour filter.
7. Apparatus for printing a photographic record from one film to another substantially as described with reference to Figure 1 or Figure 2 of the accompanying drawings.

Dated this 17th day of August, 1931.

KILBURN & STRODE,
Agents for the Applicants.

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

Fig. 1.

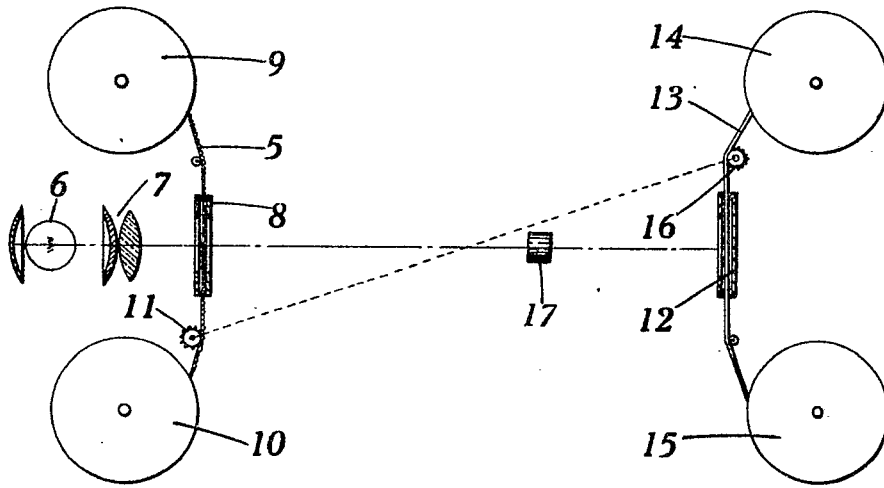


Fig. 2.

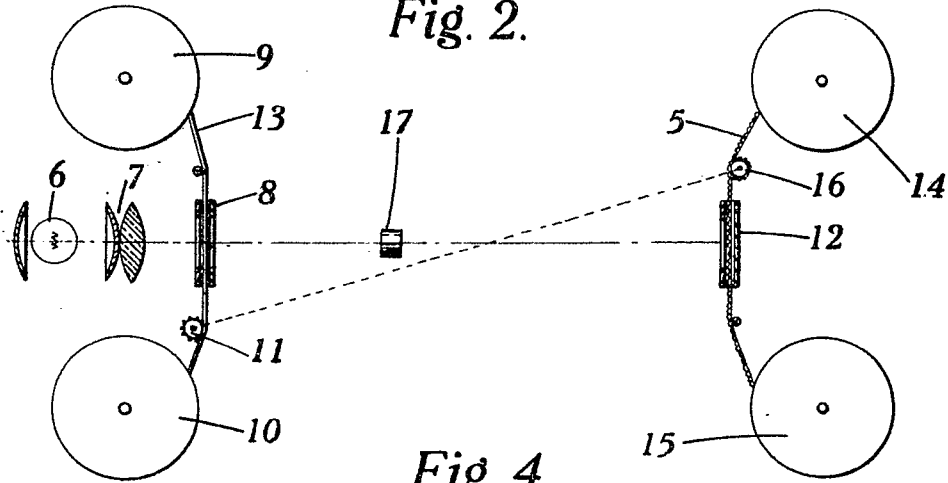


Fig. 3.

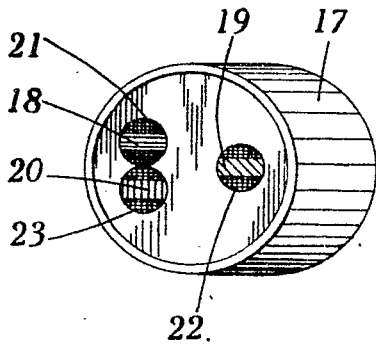


Fig. 4.

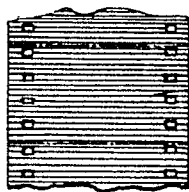


Fig. 5.

