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PATENT SPECIFICATION

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489,355

Application Date (in United Kingdom): Oct. 19, 1936. No. 28450/36.

Specification not Accepted



COMPLETE SPECIFICATION

Improvements in or relating to the Reproduction or Transmission of Photographs on a Lenticular Support

We, COMPAGNIE FRANCAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON, of 173, Boulevard Haussmann, Paris (8e), France, a Company organised under the laws of 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:—

The present invention relates to a method of printing and transmission of copies on lenticular films or plates, starting from originals which are also lenticular and on which images intended to give the effect of the relief or colour have been recorded. It is known that such printing meets with numerous difficulties when it is effected by optical means; by way of example, mention may be made of the known fact that the optical characteristics of the copies impose corresponding characteristics of the originals, which is not always desirable; it is also known that the known method of double chemical inversion presents numerous drawbacks.

The present invention permits of avoiding all these difficulties by the suitable application of methods of telephotography known in themselves, that is, by transmission and reproduction of the images of the original with the aid of a photoelectric system which projects them point by point onto the copies.

In applying these methods to lenticular films or plates, it is necessary, contrary to the transmission of ordinary photographs, to take certain precautions, in order to take into account the particular properties of the two lenticular surfaces, such as their convergence, the apertures of their elementary chambers and their respective pitches. On the other hand, it is a question transmitting and recording correctly and with very great precision the partial images which are

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placed behind each elementary lens. Under these conditions, the simple scanning of the complex image of the original and its transfer point by point to the copy, as is usually done for an ordinary image, would not be suitable.

According to the present invention, there is first effected a selection of the elementary microscopic images of the original, that is, the partial monochrome images in the case of colours or the images corresponding to the different points of view in the case of relief. To this end, use may be made of all the known methods which effect this selection of the partial images in time or space.

The partial images so extracted from the original photographs are transmitted separately to the copy or copies, on which they are recorded with the aid of suitable optical devices hereinafter described. In carrying out such separate transmission of the partial images, the intermediate photoelectric system may be arranged in such a manner that there correspond to the transparent points of the original, points which are also transparent on the copy; it may also be arranged in order to carry out the contrary; opaque points of the copy then correspond to the transparent points of the original, and *vice-versa*. In the first case, the copy is a direct counter-type of the original without it being necessary to treat it by chemical inversion. The inversion is effected here through the agency of the photoelectric transmission system.

In the second case, which is similar to that of the ordinary photographic copy, a negative original produces a positive copy. It is therefore seen that it is possible, in particular, to obtain positive copies, starting from negative or positive originals indifferently, which is a considerable advantage.

By acting on the form and slope of the

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- amplification characteristic of the electric devices which effect the transmission, it is possible to modify in any form whatsoever and in the desired sense the characteristic of the contrasts of the copy. In the case of the copying of images in colour, these modifications of contrast may be different for each of the fundamental colours, which allows, for instance, of counteracting the coloured dominants which the over-exposed or under-exposed zones of the colour photographs ordinarily present. Thus a means is provided of acting to a large extent on the qualities of the copy.
- Finally, given that the optical systems illuminating the original and copy and effecting the analysis and synthesis of the partial images are completely independent of one another, absolute freedom is given in the choice of the lenticulation of the copy and the optimum values of its convergence, the aperture of the elementary beams etc.
- The essential features of the invention will be better understood by reference to the accompanying drawings, which diagrammatically illustrate two preferred methods of carrying out the invention.
- When it is preferred to effect the separation in time of the partial images of the original and transmit them successively to the copy, the procedure, for example, according to Fig. 1 may be adopted. The lenticular original F is illuminated by a suitable source O. In front of this source there is placed a diaphragm D reproducing, relatively to the film F, the contour of the diaphragm containing in view-taking the colour filter, or, in the case of images in relief, the contour of the emergent pupil of the view-taking objective. The part of this diaphragm which causes the illumination only of one of the partial images of the original is unmasked: in the case of colours, for example, the part r is left open by masking b and v .
- The macroscopic image formed of a first assembly of partial microscopic images which then appears on the film is received by a microscope objective M, which scans it by moving preferably perpendicularly to the linings of the goffering, if the latter is cylindrical. This objective illuminates a photo-electric member P, the current of which, after amplification at A, controls an optical valve V, which lets through more or less of the light emanating from a source S. This light, the variations of which correspond to those of the light received by P, may be concentrated with the aid of an optical system M₁.
- The source S, the valve V and the microscope objective M₁ are arranged in proximity to the film F₁ in order to produce the direct impression thereof by methodical scanning of its surface, the axis of the objective of the microscope being given a suitable angular orientation relatively to the lenticulation of F₁ during the exploration of one of the partial images of the original F by the microscope M. This is shown in Fig. 3 for one of the microscope objectives M¹¹, on the side of the copy film. In this recording device, the independence of the apertures of the elementary beams of the two films is obtained with a great latitude.
- It is also possible, as is shown in Fig. 1, to concentrate the luminous microscopic spot emanating from M₁ on an unpolished surface N. If the receiving system S, VM, effects scanning movements synchronous with the movements of MP, it traces on the unpolished surface N point by point the partial image to be transmitted. It is received in proportion by a suitable objective O₁, of which only the corresponding part r_1 of the diaphragm is open, and projected correctly onto the copy film F₁. The operation is then repeated by unmasking in the source O and objective O₁ the corresponding parts b and v , of their diaphragms, and then the parts v and r_1 , etc.
- It is seen that, in all cases, the gofferings of the two films may have different pitches, characteristics and sizes, and that the directions of the flutings of the two films may also be different, which allows of avoiding moires.
- It is also seen that it is possible, by reversing the direction of the scanning to rotate the image in all desired directions, and finally that by suitably choosing the valve V or its supply system, a positive or negative image can be obtained on the copy.
- Finally, it is seen that by suitably choosing the characteristics of the photo-electric transmission members P, A and V, the gradations of the blackenings of the copy may be modified in the desired sense.
- If, instead of separating the partial images in time, it is desired to separate them in space, it is possible, for instance, to illuminate the original film on the side of the emulsion according to Fig. 2, and to receive the partial images separately by microscope objectives M¹, M¹¹ etc., the orientations of which respectively correspond to the axes of the partial elementary beams. If these objectives simultaneously scan the original F on the side of its goffering each corresponding photo-electric member P¹, P¹¹ etc. "sees" only

the successive points of the corresponding partial image.

By arranging on the side of the copy F_1 the same number of corresponding objectives $M^1, M^{11},$ etc., of which Fig. 3 illustrates only one, each of them receiving a variable luminous beam controlled by an amplifier A and a valve V , which are separate, all the monochromes for example are recorded at the same time.

If the original and copy films are collimated, the movable objectives which scan them may always remain parallel to one another; if, on the contrary, they offer a certain finite, positive or negative, convergence, it is necessary to impart to them, by displacing them with respect to the lenticulations, a slight harmonic oscillation, as a function of the distance of convergence, in order that their optical axes shall always coincide with the axes of the partial elementary beams. This additional oscillating movement which is synchronous with the scanning movements is easy to effect with the aid of levers, cams etc. By regulating its amplitude on the side of the copy, any desired value of the convergence may be imparted to the copy.

It should be understood that both on the side of the original and on the side of the copy, the microphones $M^1, M^{11}, M^{111}, \dots$ and $M_1^1, M_1^{11},$ and M_1^{111}, \dots may not concern at the same moment the same optical element of the lenticulation for each of the films or, therefore, a single point image on the side of the original and its homologue on the side of the copy at the same time. The space occupied by each of the microscope objectives and by its mounting may be such, in effect, that it practically prohibits this concentration of the optical axes of several similar objectives on a single point of each of the films. It is then understood that whatever the phase displacement between these objectives, which is determined by this practical impossibility of grouping them, it is sufficient that, by pairs from one station to the other for instance, the pair $M^1 M_1^1$, the pair $M^{11} M_1^{11}$, etc., these objectives be correctly adjusted relatively to the two films, which are synchronous with one another and of homologous inclination on the gofferings of the films.

Although only a few preferred methods of carrying out the invention have been described, which have been given by way of non-limiting example, it is obvious that the performance of the method forming the object mentioned may make use of any other known means for effecting and reproducing the selection of the elementary microscopic images of a goffered film without departing for this

purpose from the scope of the present invention.

It is also obvious that the telephotographic transmission by wires which has just been described may be replaced by a transmission without wires, according to known practice.

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. Method of printing or transmission of original photographs having a lenticular support on plates or films having a support which is also lenticular for the purpose of reproducing of images in colour or with a relief effect, wherein there is caused to appear at the surface of the original film the elementary components of the original image, characterised in that an optical device receives these elementary components of the original image separately and transmits to a photoelectric system of telephotography known *per se*, the reproduction on a lenticular film taking place, at the receiving station, by means of a microscope objective, the optical axis of which is suitably inclined with respect to the axes of the refracting microscopic elements of the receiving lenticulations, so as to produce in the said elements the elementary component corresponding to that which is transmitted by the transmitting station.

2. Apparatus for carrying out the method claimed in claim 1, characterised in that the original film is successively illuminated by the suitable fractions of the same active surface of a light source, the elementary components of the original image so obtained being respectively and successively received by a microscope objective exploring the film and cooperating with a photoelectric member.

3. Apparatus for carrying out the method claimed in claim 1, characterised in that exploring and receiving microscopes, in a number equal respectively to that of the elementary components, have their axes inclined in a homologous manner with respect to the axes of the microscopic refracting elements of the lenticulations of the transmitting and receiving films, so that at the transmitting station and at the receiving station, these microscopes correspond in pairs to the same group of elementary components.

4. Apparatus as claimed in claims 2 or 3, characterised in that the connections of the electric transmission systems or the control of the valves are effected so as to obtain either a positive image or a negative image starting from the original

image, which may itself be positive or negative.

- 5 5. Apparatus as claimed in claims 2 or 3, characterised in that the rectification of the coloured dominants in the shades of lights of the image to be transmitted is obtained by acting on the response of the systems for amplifying the electric transmission current.
- 10 6. Method of printing or transmission of original photographs having a lenticular support on plates or films having a support which is also lenticular, substan-

tially as hereinbefore described and illustrated in the accompanying drawings. 15

7. Apparatus for printing or transmission of original photographs having a lenticular support on plates or films having a support which is also lenticular, substantially as hereinbefore described and illustrated in the accompanying drawings. 20

Dated this 17th day of October, 1936.

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Fig. 1

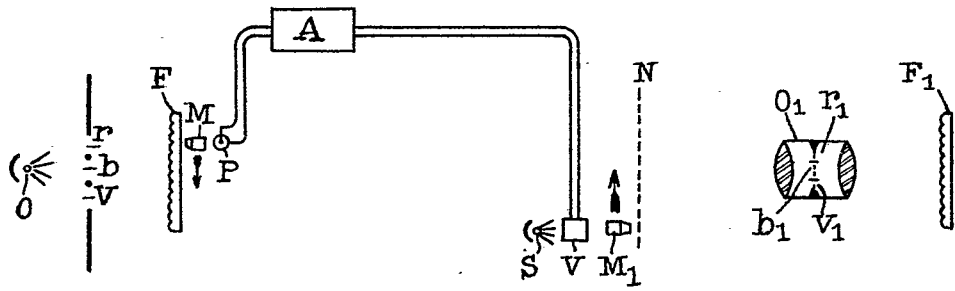


Fig. 2

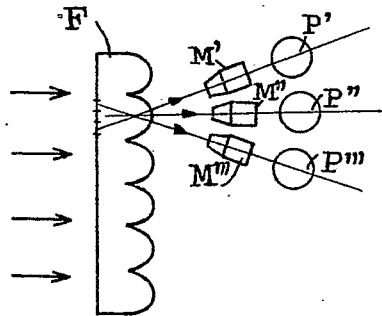


Fig. 3

