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PATENT SPECIFICATION



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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:—

10 In colour photography all methods which are operated with screens adapted for the production of pictures in colours are associated with certain difficulties in respect of printing on light-sensitive layers likewise provided with such screens. Both with irregular grain screens and with regular grain or line screens, especially also with the lenticular screen devised by Berthon, the prints show an undesired spottiness or streakiness, generally called "moiré effect", which is due to a sequence of areas of true and untrue reproductions of the colours or of no reproduction at all. This effect is caused by the fact that neither with the irregular grain screens nor with the regular grain or line screens do all elements of the screen of the image to be printed coincide exactly with correspondingly coloured elements of the screen of the printing layer. A perfect registration of the elements of both screens is quite impossible in the case of the irregular grain screens, and, though it is theoretically possible in the case of the regular grain or line screen, it cannot be realised in practice owing to the high degree of fineness of the granulation or striation.

40 To avoid this moiré effect various suggestions have been made for imparting a certain reduction of definition to the print whereby the streakiness originating from the screen disappears. It has, for instance, been proposed to displace relatively to each other the parts of the printing device during the printing operation, or to insert in the path of the rays an opaque disc, a black and white line screen or an oscillating plano-parallel glass disc.

50 In the "British Journal of Photography" 1909, colour supplement, page 71/72, Farmer described such auxiliary

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means as applied to grain screen plates. When movable parts are used in printing, the processes require rather complicated devices; the insertion of a black and white screen strongly reduces the light intensity in printing. Moreover it is difficult to determine exactly the diminution of definition which is to be imparted to the print, so as to obtain a maximum of an unobjectionable and uniform reproduction of colour together with a maximum of definition.

65 According to the present invention an exactly determinable restriction of definition for avoiding the streakiness is obtained in printing by optical projection a photographic picture having a regular screen adapted for the production of pictures in colours onto a light-sensitive layer having a like screen by inserting in the path of the rays a lenticular screen the lens elements of which have an outline, viewed perpendicularly to the screen, which is geometrically similar to the outline of the lenticular embossings, grains, lines or other elements of the screen to be printed, viewed perpendicularly to the latter. By suitably choosing the size of the lens elements, the result can be attained that the light emanating from one part of the screen of the original is spread exclusively over a determined minimum surface of the light-sensitive printing layer. It is advisable to give the lens elements of the lenticular screen to be inserted such a size and focal length that of the undeflected image produced behind each screen element of the printing layer only a limited number of interference images is produced in each interference direction.

95 If, for instance, a negative on a lenticular screen film having a system of parallel cylindrical lenses is to be printed by optical projection on a like film having the same lenticular embossing, it is possible to obtain a perfect registration of a screen unit, that is to say, a sequence of stripes corresponding with the stripes containing the red, green and blue colour records in the negative, by causing a single interference picture to be produced on each side of the undeflected image and

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causing these interference images to appear at a distance from each other which is as great as the breadth of the stripe of the undeflected image of a colour stripe of the negative. To this end a system of adjacent cylindrical lenses of a given breadth is inserted in the passage of the rays, the said lenses running parallel to the embossing of the negative and positive films. To adjust the distance of the interference images, produced in the light sensitive layer in the manner indicated above, the screen is inserted at such a position that the angle α under which a colour stripe of the image of the negative screen is seen from the inserted screen satisfies the equation

$$b = \frac{\lambda}{\sin \alpha}$$

λ being the wave length of the light used for printing and b the breadth of the cylindrical lenses. The focal length of the cylindrical lenses of the lenticular screen to be inserted must be chosen in such a manner that the light emanating from any point of the negative just spreads within the breadth of a screen unit, that is to say, the sequence of red, blue and green stripes.

For avoiding any streakiness in printing pictures having regular screens, the elements of which consist of polygons or circles, lenticular screens are inserted at a suitable position in the path of the rays, the lenses of which have a corresponding form, that is to say are polygons or circles; the position of the inserted screen is determined in the manner above described, b in the above formula in this case representing the distance between the mid-points of adjacent elements. The number of the lens elements per unit area and the focal length of the elements are determined accordingly.

The process according to this invention can, of course, also be applied to the printing of photographic images having irregular multi-colour screens, though it is then not possible to insert in the path of the rays a lenticular screen which is geometrically similar to the screen of the image. It is advisable, in

this case, to choose a lenticular screen, the elements of which approximately correspond with the elements of the irregular grain screen. Prints are thus obtained which practically do not show any streakiness and whose colours are the actual colours.

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 by optical projection a photographic picture having a regular screen adapted for the production of pictures in colours, on a light-sensitive layer provided with a like screen, wherein there is inserted in the path of the rays a lenticular screen the lens elements of which have an outline, viewed perpendicularly to the screen, which is geometrically similar to the outline of the lenticular embossings, grains, lines or other elements of the regular screen of the picture to be printed, viewed perpendicularly to the latter screen.

2. A process as referred to in claim 1, wherein the size and focal length of the elements of the lenticular screen to be inserted are chosen in such a manner that the light emanating from any point of the negative just spreads within the breadth of a screen unit, that is to say, one sequence of red, blue and green stripes.

3. A process of printing a photographic picture having an irregular multi-colour screen, on a light-sensitive layer provided with a screen adapted for the production of pictures in colours, wherein there is inserted in the path of the rays a lenticular screen the lens elements of which corresponding approximately with the elements of the irregular screen of the picture to be printed.

Dated this 18th day of October, 1930.

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