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PROCESS FOR THE PRODUCTION OF COLORED PHOTOGRAPHIC PICTURES

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Fig.1.

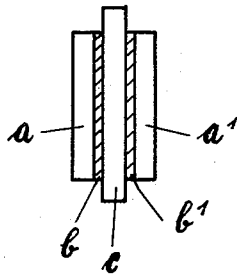
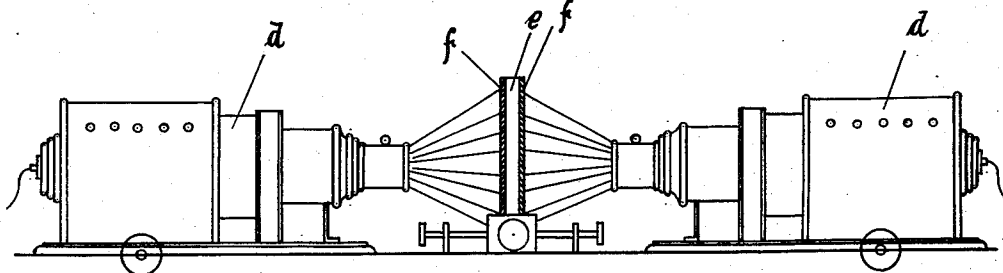


Fig.2.



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PROCESS FOR THE PRODUCTION OF
COLORED PHOTOGRAPHIC PICTURESFranz Müller, Bielefeld, Germany, assignor to
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7 Claims. (Cl. 95—2)

Processes for the production of colored photographs are already known, according to which three-part photographs are to be made and printing blocks produced from these part negatives, that is clear glass plates are coated with hard gelatine and this coating is rendered sensitive to light by means of a chromium salt. These blocks are copied with the three-part negatives.

This process, if properly carried out, produces pictures with good color shades, but the difficulties in the photographing and the reproduction, and the expense necessitated thereby, have prevented this process from being generally introduced.

According to the invention this problem has been solved in an entirely different simpler and cheaper manner, so that this process can be also generally carried out by amateurs. The feature of the invention consists in that by one photographing on a bi-pack with different color sensitive plates or films negatives are produced which are copied by projection on to the two sides of a positive film coated on both sides, only weak diapositives being thus produced which after slightly coloring the two sides with different supplementary colors, are fitted with a reflecting support.

According to the invention two plates (films) are necessary for taking the photograph. One of these plates namely the front plate should be slightly sensitive to blue and strongly sensitive to green.

This plate is then washed in a positive green sensitizer composed of pinaflavin with an addition of pina filter yellow.

The bath has the following composition:

Pinaflavin.....	0.1 gm.
Pina filter yellow.....	0.1 gm.
Distilled water.....	1000 gms.
Ethyl alcohol.....	237 gms.

The plate remains in this bath for 10 minutes and is then dried. All manipulations must be carried out in an absolutely dark room.

The rear plate that is the plate remote from the lens should be particularly sensitive to red, but only slightly sensitive to green, whereas this second plate should not be sensitive to blue.

This rear plate is then treated in the following bath:

Pinachrom hoechst.....	0.1 gm.
Distilled water.....	1000 gms.
Ethyl alcohol.....	300 gms.

This plate also remains 10 minutes in the bath and is then dried. The manipulations must also be carried out in the dark.

An embodiment of the invention is illustrated

by way of example in the accompanying drawing, in which:

Fig. 1 shows the arrangement of the plates with interposed orange filter.

Fig. 2 shows the arrangement of the projection apparatus.

The two plates *a*, *a'* are placed in a plate holder with their faces *b* and *b'* adjacent one another, an orange filter *c* being placed between the two plates for excluding the blue rays from the rear plate. This filter is an ordinary gelatine film of about 0.05 mms. in thickness, coloured pina-orange. The orange pigment may, however, be also added to the pina-chromium bath in which case naphthol-orange is preferably employed, which washes out again during the fixing of the negative. The front plate, which is directed towards the lens, is washed in a distinct green sensitizer. A yellow filter coloring substance is at the same time added to this plate, or a yellow filter placed in front of same which has for its object to slightly damp the blue rays but to allow red to pass through unhindered. The red rays have no effect on this plate. The rear, red sensitive plate is a panchromatic plate, which is washed with one of the known red sensitizers or with a combination of different sensitizers. Whereas the filter washed into the front plate strongly damps the blue rays, but allows a sufficient quantity of these rays to penetrate to the first layer, the orange filter between the plates completely absorbs the blue rays. Therefore, whereas the first plate is strongly blackened at the places where blue was present on the object being photographed, the second, that is the red sensitive plate remains absolutely clear at these blue places. The two plates should be so adapted the one to the other that the rays weakened by passing through the first plate are nevertheless sufficient to blacken the second plate.

After the photograph has been taken, two projection apparatuses *d* are employed for producing the positive picture on a double coated body. The lenses of these projection apparatuses are opposite one another, and the light rays at the middle between these two lenses, when the lenses are correctly adjusted, produce a sharp picture on a ground glass. The two negatives are placed separately one in each of the two projection apparatuses. This projecting apparatus is shown in Fig. 2. A green filter is now placed in front of the negative, which is in the camera nearest to the lens and a red filter in front of the other negative. Thus, a green picture appears on one side of the ground glass screen and a red picture on the other side thereof. As the individual colours on the negatives are separated an additive coloured picture, which is certainly a negative picture, appears on the ground glass

screen so that it is possible with the aid of a simple adjusting screw to accurately correct two negatives so that an absolutely sharp picture is produced on the screen without colour fringes being perceptible. When the two pictures have thus been brought exactly into register, the ground glass and the color filters are removed, and a thin celluloid film *e* coated on both sides with a silver-chlorid-bromid emulsion *f* is inserted in the place of the ground glass. This diapositive film is then exposed.

The silver-chlorid-bromid film also has on one side an intermediate layer of non-actinic colour, which prevents the light rays from passing from one side to the other. This film is then exposed and developed in the following developer:

Solution A

Distilled water..... 500 gms.
Pyrocatechin..... 10 gms.

Solution B

Distilled water..... 500 gms.
Potassium carbonate..... 10 gms.

Equal quantities of the Solutions A and B are taken to form the bath. The film should be amply exposed. The two sides are hardened in this developer exactly according to the blackening.

After the picture has been developed, it is placed in the following mordant bath:

Solution A

Distilled water..... 1000 gms.
Cupric sulphate..... 3 gms.
Potassium citrate..... 37 gms.

Solution B

Water..... 80 gms.
Potassium ferricyanide..... 4 gms.

Shortly before use mix 100 gms. of Solution A with 6 gms. of Solution B. The film is steeped in this bath for 10 minutes, the picture being converted therein into a weak reddish ferricyanide copper picture. The film is then well washed and the side which was adjusted green, comes into a red bath composed of:

Pyronin..... 1 gm.
Distilled water..... 1000 gms.

It remains in this bath for 10 minutes and is then thoroughly washed. The other side of the film is then treated in the following blue bath:

Thionin..... 1 gm.
Distilled water..... 1000 gms.

This side is also bathed for 10 minutes and then thoroughly washed.

The film is then clarified and is placed for about 5 seconds in the following clarifying bath, after which it is again immediately washed. It must be pointed out that, if the film is left for a long time in the clarifying bath, the colours fade considerably.

The clarifying bath consists of:

Distilled water..... 1000 gms.
Sodium thiosulphate..... 100 gms.
Sodium acetate..... 50 gms.

The film is then washed for half an hour and subsequently dried.

It is then placed for a few minutes in the following chromium bath:

Water..... 1000 gms.
Potassium bichromate..... 20 gms.
Ammonia..... 5 gms.

After the drying the red side is subjected to a very strong source of light, for example an arc lamp. Thus, this side is very strongly hardened, but at the same time the light passes through the film to the other side and as on the red side all blue portions remain transparent, the light rays completely harden these portions of the layer on the blue side, seeing that this subsequent hardening is a combination with the preceding hardening by the hardening of the pyrocatechin developer, as, where intensive blue rays prevail, the hardening is effected already by the pyrocatechin developing and the yellow colouring which subsequently takes place cannot be affected.

Where half tones are present, the layer is only partially hardened and it is possible to apply the third colour yellow only on the places where there was yellow, green or orange, because the yellow colour only adheres where the layer is slightly hardened or entirely unhardened.

For colouring the hardened layer, a suitable acid pigment, namely pinatype-yellow F is employed in a solution of:

2 to 100. That is:
Pinatype yellow F. Hoechst..... 2 gms.
Distilled water..... 100 gms.

The copy is left in this bath until a proper three-coloured picture is produced.

In this simple way a three-coloured picture is therefore produced.

The finished films, which still represent very delicate diapositive films, are for example merely mounted on white paper, after which the coloured picture is finished.

The pina colors referred to throughout the above description are manufactured according to a secret process and marketed by I. G. Farbenindustrie A.-G. and are described in the "Pina Handbuch" of that company. These colors possess the property of not coloring at all or only very slightly coloring hardened gelatine, whereas they strongly color unhardened gelatine.

I claim:

1. A process for producing colored photographic pictures consisting in producing weak diapositives by photographically copying negatives produced by exposure on a known bi-pack with plates sensitive to different colors, by projection on the two sides of a positive film sensitized on both sides, in slightly coloring the two sides of this positive film with different complementary colors, and in providing the colored positive film with a reflecting support.

2. A process as specified in claim 1, consisting in employing in the bi-pack for producing the weak diapositives as plate nearer the lens one only slightly sensitive to blue and strongly sensitive to green and as plate remote from the lens one strongly sensitive to red and only slightly sensitive to green.

3. A process as specified in claim 1, consisting in projecting, for making the weak diapositives, the rays of two projection apparatuses through the two negatives and through different colored filters on to a ground glass screen situated between the projection apparatuses for bringing the two pictures exactly into register and correctly focussing according to the colored composite projected picture visible on the ground glass screen, in removing the ground glass screen and the color filters, and in inserting in the place of said screen a known dia-

positive film coated on both sides with emulsion.

4. A process as specified in claim 1, consisting in developing the diapositive in a developer
5 which hardens the layer according to the degree of blackening.

5. A process as specified in claim 1, consisting in developing the two-sided diapositive film provided with only one layer carrier, in converting said film in a mordant bath, and in coloring one side light red and the other side light blue by means of basic pigments and yellow by means of an acid pigment.
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6. A process as specified in claim 1, consisting in developing the two-sided diapositive film provided with only one layer carrier, in converting said film in a mordant bath, in coloring one side light red and the other side light blue
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by means of basic pigments, and in clarifying the white portions in a clarifying bath.

7. A process as specified in claim 1, consisting in developing the two-sided diapositive film provided with only one layer carrier, in converting said film in a mordant bath, in coloring one side light red and the other side light blue by means of basic pigments, in inserting the two-sided diapositive in a chromium bath, in drying the diapositive, in subjecting the diapositive to a strong light from the side carrying the red layer to harden the entire red layer and partly harden the blue layer of the diapositive to render the unhardened and partly hardened portions capable of taking yellow color.
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