

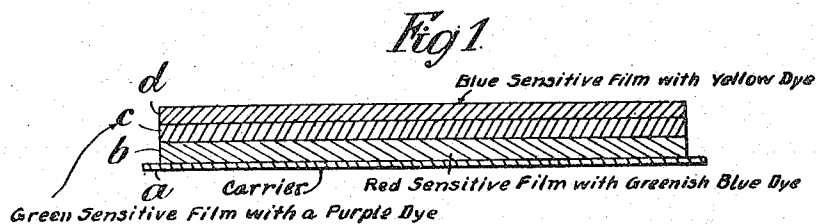
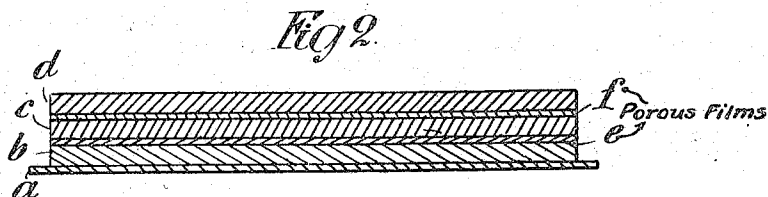
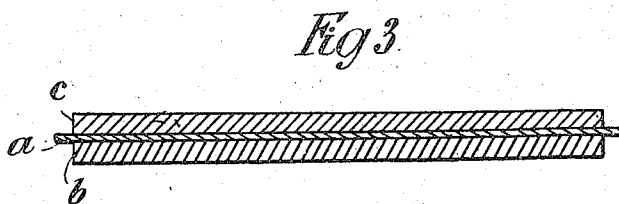
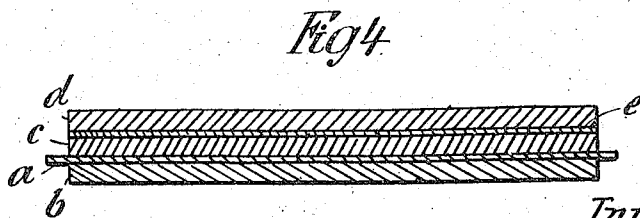
Nov. 25, 1924.

1,517,049

J. H. CHRISTENSEN

FILM AND METHOD FOR THE PRODUCTION OF COLORED PICTURES

Filed Sept. 6, 1919



Inventor
Jens H. Christensen
by Rasmussen, Stockbridge & Bond
Attorneys

UNITED STATES PATENT OFFICE.

JENS HERMAN CHRISTENSEN, OF HOLTE, DENMARK.

FILM AND METHOD FOR THE PRODUCTION OF COLORED PICTURES.

Application filed September 6, 1919. Serial No. 322,123.

To all whom it may concern:

Be it known that I, JENS HERMAN CHRISTENSEN, a subject of the King of Denmark, residing at Holte, Denmark, have invented
 5 a new and useful Improvement in Films and Methods for the Production of Colored Pictures; and I do hereby declare the following to be a full, clear, and exact description of the same.

10 This invention relates to photography and particularly to photographic films and methods for the production of colored pictures.

It has been proved that the finely divided
 15 silver in an exposed and developed photographic film has a special catalytic effect on the action of reducing agents on certain dyes, which without the presence of this catalyzer can only with difficulty or only
 20 at a high temperature be bleached through reducing agents. According to the invention this circumstance is taken advantage of for producing colored photographic pictures.

25 In the accompanying drawing Figs. 1 to 4 illustrate various steps in the practice of the invention.

If for instance a silver bromide-gelatine
 30 plate is dyed with a dye that is readily bleached in the presence of a catalyst, examples of which are aurophenine which is:

Diaminostilbene disulpho acid $\left\{ \begin{array}{l} (4) \text{ Phenol, 1} \\ (4) \text{ Phenetol, 1} \end{array} \right.$

35 and Congo-Reinblau which is

Tolidine tetrazotée having 2 molecules of acid H. where "acid H" means:

1.8 amidonaphthol 3.6 disulpho acid.

40 Diamine fast red F which is benzidine $\left\{ \begin{array}{l} (1) \text{ Salicylic acid 4:5} \\ (1) \beta\text{-aminonaphthol sulpho acid 2:8:6, in acid solution} \end{array} \right.$

Benzoazurine G which is dianisidine $\left\{ \begin{array}{l} (2) \alpha\text{-naphthol sulpho acid N. W. 1:4} \\ (2) \alpha\text{-naphthol sulpho acid N. W. 1:4} \end{array} \right.$

45 And rosophenine S. G.

Primuline + α -naphthol sulpho acid N. W. which is

$P-N=N(2)C_{10}H_7(OH)(SO_3Na)1:4$

50 the plate being either soaked in a solution of this dye or the emulsion being colored before the coating, and if such a plate is exposed in a photographic camera or otherwise an ordinary black silver picture in a
 55 colored gelatine film is obtained after de-

veloping with an ordinary developer and fixing. Through subsequent treatment with a powerful reducing agent such as sodium hydrosulphite, stannous chlorite etc. it has been proved that the dye is bleached in such
 60 places of the film as contain silver and the degree of bleaching is dependent on the quantity of the silver so that a picture with half-tones is obtained. A 1-3% solution of sodium hydrosulphite may be used. 65
 When the bleaching is finished the silver can be dissolved and removed by known means such as chromic acid, so-called Farmer's reducer etc. so that a clear color picture
 70 remains.

Instead of as described above, developing picture with one reducing agent and thereafter bleaching with another reducing agent, the reduction of the silver and the
 75 bleaching of the dye can be effected in one operation. The developing and bleaching can for instance be effected simultaneously by means of the following solution:

100 parts of water.
 2 parts of sodium hydrosulphite. 80
 2 parts of potassium bromide.

Thereafter the silver as well as the silver bromide can be removed by means of Farmer's reducer.

Most of the dyes adapted for the purpose
 85 belong to the so-called dianile dyes. Some dyes give a better result when the reduced silver before the treatment with the bleaching reducing agent in well known manner is transformed into another compound, i. e. 90
 is toned. Some dyes are thus especially well bleached when the silver picture in well known manner is toned to a Prussian blue picture and when the hydrosulphite solution is made alkaline. 95

By arranging two or more of the said colored sensitive films on each other or on opposite sides of a celluloid film, which sensitive films may be in a suitable manner sensitized for colored light and lie directly
 100 on each other or be separated from each other by suitable porous films, it is possible by direct exposure or by printing of a colored picture to produce a picture in more colors. Thus the method is also adapted for
 105 producing of copies from color plates.

In the annexed drawing Fig. 1 shows a section through a carrier *a* and three superposed sensitive films *b*, *c* and *d*. *b* is red sensitive and contains besides the sensitizer 110

a greenish blue dye, *c* is green sensitive and contains besides the sensitizer a purple dye and *d* is only blue sensitive and contains a yellow dye.

5 Figure 2 shows the same films separated by porous films *e* and *f* consisting for instance of porous celluloid or hardened gelatine.

10 Figure 3 shows one sensitive film on each side of the carrier and finally

Figure 4 shows two films on one side of the carrier separated by a porous film *e* and one film *b* on the other side.

The carrier *a* in Figures 3 and 4 must be 15 transparent which is not necessarily the case with the carrier *a* in Figures 1 and 2.

Some of the said dyes color the gelatine directly and need no mordanting. With 20 others, a mordanting is desirable, in precipitating the dye in the film with metal salts in known manner.

Having thus fully described my invention I claim as new and desire to secure by Letters Patent:

25 1. The method of producing colored photographic pictures by bleaching consisting in exposing a silver halide gelatine film containing a dye which can be bleached by 30 means of a reducing agent, developing the same and catalytically bleaching at least

part of the said dye in such places of the film as contain silver after development.

2. The method of producing colored photographic pictures by bleaching consisting in exposing a silver halide gelatine film 35 containing a dye which can be bleached by means of a reducing agent; treating said film with a solution of a hydrosulphite compound until at least part of the dye is bleached in these parts of the film in which 40 the silver halide is reduced.

3. A sensitized photographic element comprising a film containing a silver halide and a substantial amount of a dye which will be bleached catalytically by reducing agents 45 on places on the said film which after developing will contain silver.

4. A sensitized photographic element comprising a film containing a silver halide and a substantial amount of a dianile dye which 50 will be bleached catalytically by reducing agents on places on the said film which after developing will contain silver.

In testimony whereof I have affixed my signature in presence of two witnesses.

JENS HERMAN CHRISTENSEN.

Witnesses:

CECIL V. SCHOU,
C. V. HOGSTED.