

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in Colour Photography.

We, Dr. JOHN NAISH GOLDSMITH, a British Subject, of 67, Chancery Lane, London, W.C. 2, THOMAS THORNE BAKER, a British Subject, of the Hut, Hatch End, Middlesex, and SPICERS LIMITED, a British Company, of 19, New Bridge Street, London, E.C. 4, do hereby declare the nature of this invention to be as follows:—

10 This invention consists in improvements in or relating to colour photography, and particularly to the production of photographic films which carry a reseau or multicolour screen as well as
15 a sensitised emulsion. Films of this type can be used for taking photographs, or for reproduction of photographs of cinematograph films in natural colours.

20 By means of the process described in British Patent Specification No. 22,607/28, (Serial No. 322,432) successful results have been achieved in applying the multicolour screen to a film made of cellulose acetate composition.

25 The object of the present invention is to enable the multicolour screen to be successfully applied in cinematographic films of various kinds, including films made from celluloid, from cellulose nitrate, from viscose and the like.

30 Taking the simple case where a film is to receive

- (1) A dye of one colour, say green;
- (2) A series of lines of a resist (such,
35 for example as fatty ink);
- (3) Treatment with a bleaching or colour-discharging liquid;
- (4) A dye with another colour in the spaces thus bleached;

40 a further object of this invention is to ensure that the dyed zones of the film shall be such that the discharge of colour therefrom, and the application of another colour, shall be readily accomplished
45 without "creeping" under the resist lines, and without masking of one colour by another so that, in fact, the separate colour elements are clearly distinct and
50 have their proper colour values. Another object is to ensure uniformity of the colour value or intensity from side to side of each line of colour.

According to this invention, it has been
[Price 1/-]

found that with any given "base" (i.e. with a supporting film which may be celluloid, cellulose, cellulose nitrate or other ester or ether of cellulose) and where a special surface layer is to be used which is to receive the dyes, and from which dye can be discharged, it is possible to isolate the surface layer from the base by an intermediate layer or septum.

This invention, therefore, includes a film for colour photography and cinematography comprising a base of one material, a surface layer of another material amenable to dyes and to discharging agents, and an intermediate layer of an isolating material.

This invention also includes a method of preparing a film for colour photography which includes the steps of coating the basic film with a layer of isolating material, then with a surface area of a material amenable to dyes, and to discharging agents and applying to the film thus prepared a multicolour screen.

As indicated above, the basic film may be any transparent film suitable for carrying photographic emulsions or photographic pictures, such as film made from celluloid, from viscose, from cellulose nitrate or from other esters or ethers of cellulose.

The surface layer which is to receive the dyes may be of cellulose nitrate (or collodion) or it may be of cellulose prepared from viscose or other cellulose solution, or it may be of any similar material which will readily receive dyes and from which dyes can be discharged by suitable discharging agents.

The isolating layer differs from the other two layers either in chemical composition or in physical properties or in both. The function of the isolating layer is to locate substantially or completely the dyeing and discharging operations in the surface layer, or in other words to inhibit the penetration of dyeing agents or discharging agents into the film base. The isolating layer may be substantially impervious or not amenable to the dyes used, or it may be produced from a solution of cellulose acetate with or without added agents such as plasticising agents;

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again, the isolating layer may be a condensation product of formaldehyde and phenol or thiourea, or it may be a varnish or coating of other synthetic resin.

5 The following is a description by way of example of one method of carrying this invention into effect in making a cinematograph film in natural colours with a base of celluloid.

10 The celluloid film is passed through a film-coating machine (such, for example, as that described in British Patent Specification No. 22,609/28 (Bonamico) (Serial No. 321,222)) and there is applied thereto
15 a fine coating of cellulose acetate containing plasticising agents. It is important that the coating should not be too thick, and to ensure the desired fineness of coating it is desirable to use a solution of
20 cellulose acetate wherein the viscosity has been adequately reduced by addition of suitable solvent liquids. Further, there may be added to the solution of cellulose acetate agents which diminish the inter-
25 facial tension between the cellulose acetate solution and the celluloid surface, such as cyclohexanone.

When this acetate film is dry the film is passed again through a film-coating
30 machine and there is applied thereto a fine coating (surface layer) of collodion. Conveniently, this surface layer contains one of the dyes (say green dye).

Now proceeds the process of applying
35 the reseau or multicolour screen.

The film (the surface layer of which is dyed uniformly green all over) is then led through a printing machine by means
40 of which extremely fine-parallel lines of a resist (such, for example, as a greasy ink) are printed upon it. The printing may be effected by means of a small

engraved steel roller having (in one case) 15 lines and 15 intervening grooves per millimetre. The film at this stage
45 exhibits 15 clear green lines and 15 opaque greasy lines (green underneath) per millimetre, both kinds of line being of about the same width. After an interval to let the ink dry the film is led in succession
50 (a) over a bath which bleaches and dissolves out the green dye from only the clear spaces, leaving unattacked the green lines protected by the ink; (b)
55 over an inking roller which applies a red dye to the spaces between the ink lines, after which the film is thoroughly washed with water to remove excess of dye; (c)
60 through a solvent cleansing bath of benzene to remove the ink lines, leaving exposed the clear green lines.

The film is again led (when dry) through the printing machine which produces parallel lines of a resist (such as greasy ink) as before, but this time at
65 right angles to those formerly made. After an interval for the ink to dry the film is led in succession (a) over a bath which bleaches and dissolves out the red
70 and green dye from only the clear spaces between the greasy lines, (b) over an inking roller which applies a violet dye which dyes the interline spaces, and (c)
75 through a solvent cleansing bath of benzene. The film is then dried, is coated with a suitable substratum and is thereafter coated with a layer of sensitised emulsion (a panchromatic emulsion).

Dated this 30th day of July, 1929.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London,
E.C. 1,

Chartered Patent Agents,

COMPLETE SPECIFICATION.

Improvements in Colour Photography.

We, Dr. JOHN NAISH GOLDSMITH, a
80 British Subject, of 67, Chancery Lane, London, W.C. 2, THOMAS THORNE BAKER, a British Subject, of the Hut, Hatch End, Middlesex, and SPICERS LIMITED, a
85 British Company, of 19, New Bridge Street, London, E.C. 4, 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:—

90 This invention consists in improvements in or relating to colour photography, and particularly to the production of photographic films which carry a reseau or multicolour screen as well as

a sensitised emulsion. Films of this type
95 can be used for taking photographs, or for reproduction of photographs or for cinematograph films in natural colours.

By means of the process described in British Patent Specification No. 322,432,
100 successful results have been achieved in applying the multicolour screen to a film made of cellulose acetate composition.

The object of the present invention is to enable the multicolour screen to be
105 successfully applied to cinematographic films of various kinds, including films made from celluloid, from cellulose nitrate, from viscose and the like.

Taking the simple case where a film
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is to receive

(1) A dye of one colour, say green;

(2) A series of lines of a resist (such, for example as fatty ink);

5 (3) Treatment with a bleaching or colour-discharging liquid;

(4) A dye of another colour in the spaces thus bleached.

10 It is found that the dyes which are thus applied to the surface of the film tend to penetrate from the surface into the body of the film with the result that in the subsequent bleaching operation, it is difficult and sometimes impossible, for instance in the time available for a continuous process, to discharge the dye completely from the portions of the film which are unprotected by the resist lines, and thus this undischarged dye will mask the colour of another dye which is subsequently applied to the bleached spaces.

15 It is one of the objects of this invention to provide means whereby penetration of the dyes into the body of the film may be avoided.

20 It has previously been proposed to coat the surface of the film with a substratum of permanently adhesive material such for example as porous soluble glue, or with a layer of gelatine, and then to apply to this prepared surface either a colloid layer such as bichromated dyed gelatine or albumen or a sensitive emulsion on which is printed the multi-colour screen. The substratum is applied to the film only in order to secure better adhesion between the screen-bearing layer and the film; and the function of such a substratum is not to prevent the dyes from penetrating from the colloid layer into the body of the film, which problem does not arise at all in the method in which the multi-colour screen is formed by exposing to light a layer of bichromated dyed gelatine.

25 According to this invention, it has been found that with any given "base" (i.e. with a supporting film which may be celluloid, cellulose, cellulose nitrate or other ester or ether of cellulose) and where a special surface layer is to be used which is to receive the dyes, and from which dye can be discharged, it is possible to isolate the surface layer from the base by an intermediate layer or septum, which is substantially waterproof, and thus to prevent penetration of the dyes from the surface layer into the body of the film base.

30 According to the invention a film of celluloid, viscose, cellulose nitrate or other ester or ether of cellulose is prepared for colour photography by coating the basic film with a layer of isolating material, which is substantially waterproof, then with a surface layer of a

material amenable to dyes and to dye-discharging agents, and applying to the film thus prepared a multicolour screen.

According to a feature of the invention the surface layer which is to receive the dyes consists of cellulose nitrate, collodion, cellulose prepared from viscose or other cellulose solution, or other similar material which will readily receive and permit of the subsequent discharge of dyes.

The isolating layer differs from the other two layers either in chemical composition or in physical properties or in both. The function of the isolating layer is to locate substantially or completely the dyeing and discharging operations in the surface layer, or in other words to inhibit the penetration of dyeing agents or dye-discharging agents into the film base. The isolating layer may comprise cellulose acetate with or without added agents such as plasticising agents; again, the isolating layer may be a condensation product of formaldehyde and phenol or formaldehyde and thiourea, or it may be a varnish or coating of other synthetic resin.

The following is a description by way of example of one method of carrying this invention into effect in making a cinematograph film in natural colours with a base of celluloid.

The celluloid film is passed round a roller which dips into a bath containing a 14—15% solution of cellulose acetate in acetone with sufficient plasticisers (i.e. about 5—6%) to prevent the dry film from curling. By this means a coating of cellulose acetate whose thickness is of the order of from 4—8 μ may be applied to the surface of the celluloid film. If the 15% solution of cellulose acetate is found to be too viscous, its viscosity may be reduced by addition of further quantities of solvent. The cellulose acetate solution may, if desired, be prepared by dissolving cellulose acetate film, such for example as scrap commercial film, in acetone. In this manner the desired quantity of plasticisers will be incorporated in the solution.

Further there may be added to the solution of cellulose acetate higher boiling solvents, such as cyclohexanone.

When this acetate film is dry the film is passed again through a film-coating machine and there is applied thereto a fine coating (surface layer) of collodion. Conveniently, this surface layer contains one of the dyes, for example a green dye such as malachite green.

Now proceeds the process of applying the reseau or multicolour screen.

The film (the surface layer of which is

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dyed uniformly green all over) is then led through a printing machine by means of which extremely fine parallel lines of a resist (such, for example, as a greasy ink) are printed upon it. The printing may be effected by means of a small engraved steel roller having (in one case) 15 lines and 15 intervening grooves per millimetre. The film at this stage exhibits 15 clear green lines and 15 opaque greasy lines (green underneath) per millimetre, both kinds of line being of about the same width. After an interval to let the ink dry the film is led in succession (a) over a bath which bleaches and dissolves out the green dye from only the clear spaces, leaving unattacked the green lines protected by the ink; (b) over an inking roller which applies a red dye to the spaces between the ink lines, after which the film is thoroughly washed with water to remove excess of dye; (c) through a solvent cleansing bath of benzene to remove the ink lines, leaving exposed the clear green lines.

The film is again led (when dry) through the printing machine which produces parallel lines of a resist (such as greasy ink) as before, but this time at right angles to those formerly made. After an interval for the ink to dry the film is led in succession (a) over a bath which bleaches and dissolves out the red and green dye from only the clear spaces between the greasy lines, (b) over an inking roller which applies a violet dye which dyes the interline spaces, and (c) through a solvent cleansing bath of benzene. The film is then dried, is coated with a suitable substratum and is thereafter coated with a layer of sensitised emulsion (a panchromatic emulsion).

We make no claim to anything disclosed in Specifications Nos. 257,501 and 224,571.

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 method of preparing a film of celluloid, viscose, cellulose nitrate or other ester or ether of cellulose for colour photography which includes the steps of coating the film base with a layer of isolating material which is substantially waterproof, then with a surface layer of a material amenable to dyes and to dye-discharging agents, and applying to the film thus prepared a multi-colour screen.

2. A method according to Claim 1, wherein the surface layer which is to receive the dyes consists of cellulose nitrate, collodion, cellulose prepared from viscose or other cellulose solution, or other similar material which will readily receive and permit of the subsequent discharge of dyes.

3. A method according to Claim 1 or Claim 2, wherein the isolating layer comprises a cellulose acetate with or without added agents such as plasticising agents.

4. A method according to Claim 1 or Claim 2, wherein the isolating layer consists of a coating or varnish of a synthetic resin, such for example as a condensation product of formaldehyde and phenol or formaldehyde and thiourea.

5. A support for a multicolour screen for use in colour photography or cinematography comprising a celluloid film base, an isolating coating of thickness about 4—8 μ of a solution of cellulose acetate in acetone containing plasticisers, and a surface layer of collodion.

6. A method of preparing a cellulose ester film for colour photography, substantially as described.

7. A cellulose ester film when prepared for use in colour photography by the special method described and claimed herein.

Dated this 25th day of April, 1930.

BOULT, WADE & TENNANT,
Chartered Patent Agents,

111/112, Hatton Garden London, E.C. 1.