

PATENT SPECIFICATION.

Application Date: Aug. 3, 1928. No. 22,607/28.

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PROVISIONAL SPECIFICATION.



Improvements in or relating to Colour Photography.

(A communication from COMPAGNIE D'EXPLOITATION DES PROCÉDES DE PHOTOGRAPHIE EN COULEURS LOUIS DUFAY, known as "VERSICOLOR DUFAY" of 10, rue Champ Lagarde Versailles (Seine & Oise), France, a French company.)

I, HAROLD WADE, a British Subject, of 111/112, Hatton Garden, London, E.C. 1, do hereby declare the nature of this invention to be as follows:—

This invention consists of improvements in or relating to colour photography. One object is to enable photographs in natural colours to be taken or reproduced on non-inflammable films, viz. films made from cellulose acetate or similar cellulose ester of an organic acid. Another object is to enable photography in natural colours to be applied successfully to the cinematograph.

Hitherto, suggestions have been made for the application to films of celluloid, or of gelatine, of dots, lines or geometrical patterns made up of two, three or more colours. The film thus prepared was coated with a light-sensitised layer after a suitable varnishing. Examples of such proposals may be found in Specifications No. 20,111 of 1908, and No. 217,557.

According to this invention, a process of making a multi-colour screen for colour photography or cinematography includes the step of applying to a film of cellulose acetate, or similar cellulose ester of an organic acid, a solution of collodion, or similar solution of cellulose nitrate, alone, or in admixture with softening or plasticising agents, before applying the dyes or colours. Alternatively, said solution may itself contain a dye.

Further, according to this invention, the said solution may form an effective bond with the film, and dyes applied to the film treated with such solution may penetrate into the film.

This invention also includes a support for a dye réseau comprising in combination a layer of cellulose acetate, or similar cellulose ester of an organic acid and a deposited layer thereon of cellulose nitrate alone or in admixture with softening or plasticising agents.

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This invention also includes a process of making a multi-colour screen for colour photography, or cinematography, in which there is applied to a dyed support, as above described, fatty resists enabling the portions of the support which are not protected by the resists to be decoloured and dyed with another colour.

The said resists may be removed and a fresh application of resists made to enable the portions of the support which are not protected to be again decoloured and dyed with another colour.

The invention relates to the manufacture and use of multi-colour screens and sensitised films for colour photography and cinematography, whether the films be master films (e.g. negatives) or reproduced films (e.g. positives).

Further features of the invention will appear from the following description of one method of carrying the invention into effect in the production of cinematograph films in natural colours:—

A cellulose acetate film is produced in any known way, but, preferably, according to the methods described in Patents Nos. 301,439; 287,635; 281,803 and 243,032. The thickness of the film may be about 0.0055 inch, and the film is conveniently cut to a width of about 10 inches. The clean film, from a bobbin, is led through a coating apparatus, preferably of the type described in Application, No. 22,609/28 (Serial No. 321,222) of even date herewith.

The object is to apply on one side of the film a fine layer of collodion of a definite and uniform thickness, and in the present example the collodion embodies a green dye. It is this collodion coating which is to receive the various dyes, and in determining the composition of the collodion and the thickness of the layer the determining factor is that the ultimate coloured portions shall give the correct spectrum absorption. A 2% solution of industrial collodion, and a 5% solution of industrial collodion, are mixed together in such quantities as to afford the required viscosity. The proportions have to be varied to suit the temperature, humidity and similar conditions. The collodion mixture is dyed green with an alcoholic

solution of malachite green and of auramine. The composition of the dye may be, for example, alcohol 100 parts, malachite green 4 parts, auramine 6.7 parts. The composition of the collodion mixture may be, for example, collodion mixture 30 cc., dye solution 2 cc. For instance, in practice it has been found convenient to apply this solution in such a thickness that an area of 100 c. long by 26 c. wide takes 22 to 25 cc. Thus, the thickness of the layer is about .01 millimetre wet, i.e. .0002 to .0005 millimetre when dry. The collodion layer could be put on uncoloured and thereafter dyed.

The film dyed uniformly green all over is then led through a printing machine by means of which extremely fine parallel lines of greasy ink (intended to act subsequently as fatty resists) are printed upon it. The printing is effected by means of a small engraved steel roller having (in one case) 15 lines and 15 intervening grooves per millimetre. In the example, the lines were at 23° to the axis of the cylinder. 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 of about an hour, 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. The composition of this bath is—

alcohol 100 parts
caustic potash (10% aqueous solution) 2 parts
acetone 4 parts.

(b) over an inking roller which applies a red dye to the spaces between the ink line. In this example, the red dye is basic red N Extra (Kühlmann) 8% solution in alcohol. The film is thoroughly washed with water to remove the excess of dye.

(c) The film is passed through a solvent cleansing bath of benzene and is brushed by roller brushes within the 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 greasy ink, as before, but this time at right angles to those formerly made. In other words, the lines are at 67° to the axis of the cylinder and at right angles to the red and green lines. 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 interlined spaces. The violet dye contains—

crystal violet (4% solution in alcohol) 80 parts, and
malachite green (8% solution in alcohol) 20 parts.

(c) The film is again led through a solvent cleansing bath of benzene and is brushed by roller-brushes within the benzene to remove the ink lines. The film is then dried, is coated with a suitable substratum (such as a thin layer of gelatine and a thin layer of varnish) and is thereafter coated with a layer of sensitised emulsion (a panchromatic emulsion).

The bath referred to above under (a) conveniently comprises—

alcohol 100 parts
caustic potash (10% aqueous solution) 1 part
acetone 10 parts
water 6 parts.

Dated this 3rd day of August, 1928.

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

Chartered Patent Agents.

COMPLETE SPECIFICATION.

Improvements in or relating to Colour Photography.

I, HAROLD WADE, a British Subject, of 111/112, Hatton Garden, London, E.C. 1, 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:—

This invention consists of improvements in or relating to colour photography. One object is to enable photographs in natural colours to be taken or reproduced on non-inflammable films, viz. films made

from cellulose acetate or similar cellulose ester of an organic acid. Another object is to enable photography in natural colours to be applied successfully to the cinematograph.

Hitherto, suggestions have been made for the application to films of celluloid, or of gelatine, of dots, lines or geometrical patterns made up of two, three or more colours. The film thus prepared was coated with a light-sensitised layer after a suitable varnishing. Examples of such

proposals may be found in Specifications No. 20,111 of 1908, and No. 217,557.

According to this invention, a process of making a multicolour screen for colour photography or cinematography of a rectilinear type, i.e. a type in which a regular straight line geometrical pattern is embodied, includes the step of applying to a film of cellulose acetate, or similar cellulose ester of an organic acid, a uniform coating of a solution of collodion, or similar solution of cellulose nitrate, alone, or in admixture with softening or plasticising agents, before applying the dyes or colours. Alternatively, said solution may itself contain a dye.

Further, according to this invention, the said solution may form an effective bond with the film, and dyes applied to the film treated with such solution may penetrate into the film. The expression "effective bond" means that the film produced from the collodion or similar solution of cellulose nitrate modifies the actual surface of the cellulose acetate film.

This invention also includes a support for a dye reseau comprising in combination a layer of cellulose acetate, or similar cellulose ester of an organic acid and a deposited layer thereon of cellulose nitrate alone or in admixture with softening or plasticising agents.

This invention also includes a process of making a multi-colour screen for colour photography, or cinematography, in which there is applied to a dyed support, as above described, fatty resists enabling the portions of the support which are not protected by the resists to be decoloured and dyed with another colour.

The said resists may be removed and a fresh application of resists made to enable the portions of the support which are not protected to be again decoloured and dyed with another colour.

The invention relates to the manufacture and use of multi-colour screens and sensitised films for colour photography and cinematography, whether the films be master films (e.g. negatives) or reproduced films (e.g. positives).

Further features of the invention will appear from the following description of one method of carrying the invention into effect in the production of cinematograph films in natural colours:—

A cellulose acetate film is produced in any known way, but, preferably, according to the methods described in Patents Nos. 301,439, 287,635; 281,803 or 243,032. The thickness of the film may be about 0.0055 inch, and the film is conveniently cut to a width of about 10 inches. The clean film, from a bobbin, is led through a coating apparatus, preferably of the

type described in Application No. 22,609/28 (Serial No. 321,222) of even date herewith. The object is to apply on one side of the film a fine layer of collodion of a definite and uniform thickness, and in the present example the collodion embodies a green dye. It is this collodion coating which is to receive the various dyes, and in determining the composition of the collodion and the thickness of the layer the determining factor is that the ultimate coloured portions shall give the correct spectrum absorption. A 2% solution of industrial collodion, and a 5% solution of industrial collodion, are mixed together in such quantities as to afford the required viscosity. The proportions have to be varied to suit the temperature, humidity, and similar conditions. The collodion mixture is dyed green with an alcoholic solution of malachite green and of auramine. The composition of the dye may be, for example, alcohol 100 parts, malachite green 4 parts, auramine 6.7 parts. The composition of the collodion mixture may be, for example, collodion mixture 30 cc., dye solution 2 cc. For instance, in practice it has been found convenient to apply this solution in such a thickness that an area of 100 c. long, by 26 c. wide, takes 22 to 25 cc. Thus, the thickness of the layer is about .01 millimetre wet, i.e. .0002 to .0005 millimetre when dry. The collodion layer could be put on uncoloured and thereafter dyed.

The film dyed uniformly green all over is then led through a printing machine by means of which extremely fine parallel lines of greasy ink (intended to act subsequently as fatty resists) are printed upon it. The printing is effected by means of a small engraved steel roller having (in one case) 15 lines and 15 intervening grooves per millimetre. In the example, the lines were at 23° to the axis of the cylinder. 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 of about an hour, 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. The composition of this bath is—

alcohol 100 parts,
caustic potash (10% aqueous solution)
2 parts,
acetone 4 parts,

(b) over an inking roller which applies a red dye to the spaces between the ink line. In this example, the red dye is basic red N Extra (Kühlmann) 8% solution in alcohol. The film is thoroughly washed

with water to remove the excess of dye.
 (c) The film is passed through a solvent
 cleansing bath of benzene and is brushed
 by roller brushes within the benzene to
 5 remove the ink lines, leaving exposed the
 clear green lines.

The film is again led (when dry)
 through the printing machine which pro-
 duces parallel lines of greasy ink, as
 10 before, but this time at right angles to
 those formerly made. In other words, the
 lines are at 67° to the axis of the cylinder
 and at right angles to the red and green
 lines. After an interval for the ink to
 15 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
 20 an inking roller which applies a violet
 dye which dyes the interlined spaces. The
 violet dye contains—

crystal violet (4% solution in alcohol)
 80 parts, and
 25 malachite green (8% solution in alcohol)
 20 parts.

(c) The film is again led through a sol-
 vent cleansing bath of benzene and is
 brushed by roller-brushes within the
 benzene to remove the ink lines. The
 30 film is then dried, is coated with a suitable
 substratum (such as a thin layer of gela-
 tine and a thin layer of varnish) and is
 thereafter coated with a layer of sensitised
 emulsion (a panchromatic emulsion).

The bath referred to above under (a)
 conveniently comprises:
 alcohol 100 parts,
 caustic potash (10% aqueous solution)
 1 part,
 40 acetone 10 parts,
 water 6 parts,

Having now particularly described and
 ascertained the nature of the said inven-
 tion and in what manner the same is to
 45 be performed, as communicated to me by
 my foreign correspondents, I declare that
 what I claim is:—

1. A process of making a multicolour
 screen for colour photography or cinema-
 50 tography of the type described including
 the step of applying to a film of cellulose
 acetate or similar cellulose ester of an
 organic acid, a uniform coating of a solu-
 tion of collodion or similar solution of

cellulose nitrate alone or in admixture 55
 with softening or plasticising agents before
 applying the dyes or colour.

2. A process as claimed in Claim 1 in
 which the solution of collodion or similar
 solution of cellulose nitrate contains dye. 60

3. A process as claimed in Claim 1 in
 which the solution of collodion or similar
 solution of cellulose nitrate forms an effec-
 tive bond with the film of cellulose acetate
 and in which dyes applied to the film 65
 treated with such solution penetrate into
 the film.

4. A support for a dye reseau of the type
 described comprising in combination a
 layer of cellulose acetate or similar cellu-
 lose ester of an organic acid, and a
 deposited layer thereon of cellulose nitrate
 alone or in admixture with softening or
 plasticising agents. 70

5. A process of making a multicolour 75
 screen for colour photography, or cinema-
 tography as claimed in any of the preced-
 ing claims, in which there is applied to
 a dyed support fatty resists enabling the
 portions of the support which are not pro-
 tected by the resists to be decoloured and
 dyed with another colour. 80

6. A process of making a multicolour
 screen for colour photography or cinema-
 tography as claimed in any of the preced-
 ing claims, in which there is applied
 to the dyed acetate film fine parallel lines
 of greasy ink enabling the portions of the
 support which are not protected by the
 grease to be decoloured and dyed with
 another colour, characterised in that after
 the said greasy ink has been removed there
 is applied to the dyed acetate film another
 set of parallel lines of greasy ink at right-
 angles to those formerly made, after which 95
 the portions of the film which are not pro-
 tected by the grease are decoloured and
 dyed with another colour, and finally the
 lines of greasy ink are removed.

7. The process of making a multicolour 100
 screen for colour photography or cinema-
 tography, substantially as described.

Dated this 12th day of October, 1928.

BOULT, WADE & TENNANT.

111 & 112, Hatton Garden, London,

E.C. 1,

Chartered Patent Agents.