

# PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION.

No. 16,932, A.D. 1929.

### Improvements in or relating to Colour Photography.

We, SPICERS LIMITED, a British Company, of 19, New Bridge Street, London, E.C. 4, Dr. JOHN NAISH GOLDSMITH, Ph.D., M.Sc., F.I.C., British Subject, of 5 67, Chancery Lane, London, W.C. 2, THOMAS THORNE BAKER, British Subject, of The Hut, Hatch End, Middlesex, and CHARLES BONAMICO, a French Citizen, of 10 19, New Bridge Street, London, E.C. 4, 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 acetate. Another object is to enable photography in natural colours to be applied successfully to the cinematograph.

Non-inflammable films are generally made from a composition which consists in the main of cellulose acetate. They are generally called cellulose acetate films, but they in fact contain various other bodies such as plasticisers and non-volatile solvents. It is impracticable to apply directly to such films lines or geometrical patterns made up of two, three, or more colours by such a process as that described, for example, in the British Patent No. 217,557.

A specific object of the present invention is to enable such colour patterns to be successfully and readily applied to non-inflammable films, and the invention is in some respects a development from that described in Application No. 22,607 of 40 1928 (Serial No. 322,432).

According to this invention a process of making a multicolour screen for colour photography or cinematography includes the step of so treating a non-inflammable film as to render it capable of absorbing dyes or colours and of having them bleached or discharged therefrom.

According to one form of this invention the process includes the step of treating

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a non-inflammable film in such a way that its normal surface is altered, and instead of being resistant to dyes and to chemical agents which discharge these dyes, becomes absorbent thereof or pervious thereto.

For example, according to this invention a non-inflammable film, the surface of which is resistant to dyes, is treated with a partial solvent such as ether + alcohol or toluene which modifies the surface by rendering it porous. Again, according to this invention the non-inflammable film may be treated with a chemical agent such as caustic soda in water or alcohol, which saponifies the surface layer of the film and has the effect of rendering the surface of the film pervious to dyes.

Again, according to this invention the surface of a non-inflammable film may be treated with dyes which are dissolved in a medium which is a solvent of the non-inflammable film. In other words, the dyes are contained in a penetrating solvent, such for example as a mixture of alcohol and acetic acid.

According to this invention a process of making a multicolour screen for colour photography or cinematography includes the step of applying to a non-inflammable film a cellulosic solution which will readily absorb the dyes or colours.

According to a preferred form of this invention, a process of making a multicolour screen for colour photography or cinematography includes the step of applying to a non-inflammable film a solution of cellulose acetate without dye-inhibiting additions, before applying the dyes or colours which are so chosen that they will readily dye cellulose acetate. Alternatively, said solution may itself contain a dye.

The pure cellulose acetate may conveniently be dissolved in acetone, alone or in conjunction with other volatile solvents.

Alternatively the applied solution may

consist of cellulose acetate and cellulose nitrate dissolved in a common solvent, such as acetone.

This invention also includes a support for a dye reseau comprising in combination a layer of non-inflammable film and a deposited layer of cellulosic material thereon which will readily take the necessary dyes, such as a layer of pure cellulose acetate.

The dyes may be dispersed, or they may be in colloidal suspension in e.g. sulphonated castor oil, so that the dyes may act readily on the cellulose acetate film.

The following is a description by way of example of one method of carrying this invention into effect for the production of cinematographic films in natural colours. A non-inflammable film is produced in any known way, preferably according to the methods described in Patents No. 279,139, No. 281,803, and No. 294,008.

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 of 1928 (Serial No. 321,222), in such a way as to apply to one side of the film a fine layer of a solution of cellulose acetate either without any additions at all or with very small additions such as of plasticisers, insoluble solvents or other materials which would seriously interfere with the action of dyes on the film. Preferably the solution itself embodies a dye, for example a green dye. The method of applying the colour pattern or reseau is similar to that described in Specification No. 22,607 of 1928.

Alternatively, the coating of pure cellulose acetate may be applied in the actual manufacture of the film by the process described in Patent No. 218,803.

Dated this 1st day of June, 1929.

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### PROVISIONAL SPECIFICATION.

No. 23,697, A.D. 1929.

### 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, CHARLES BONAMICO, a French Citizen, of 19, New Bridge Street, London, E.C. 4, 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:—

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

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.

The object of this invention is to enable the multicolour screen to be successfully applied to films made from celluloid or cellulose nitrate.

Taking the case where a film 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);
- (3) a treatment with a bleaching or colour-discharging liquid; and
- (4) a dye of another colour in the spaces thus bleached;

difficulties arise if ordinary celluloid or nitro-cellulose film is used. For example, the original dyeing may be found to lack that uniformity which is essential for good photography in natural colours. Again, it may be necessary to conduct the bleaching or discharging operation with considerable rapidity (i.e. with a restricted period of contact with the discharging liquid) and in that case the original dye (e.g. green dye) may have penetrated so far into the film that effective discharge is not achieved.

According to this invention, when applying a multicolour screen to a film of celluloid, there is first applied a surface layer of collodion or nitro-cellulose, but special precautions are taken to ensure that the dyes shall penetrate only the surface layer.

For example, the dye employed (for example the first dye) is dissolved in benzene or castor oil or in gum arabic

solution or other non-solvent of celluloid. If desired, the nitrocellulose is dissolved in a medium containing a liquid which is a solvent of the dyes used but is not a solvent of celluloid.

In one method of dyeing the surface layer according to this invention the components of the dye are applied separated. Thus the film may be treated first with one compound like  $\beta$ -naphthol, and thereafter the film is treated with another compound such as diazotised paranitraniline

so that red dye is formed by the interaction, and it is characteristic of this invention that these components may be dissolved in a medium (such as water) which will not penetrate celluloid, so that the dye is substantially confined to the surface layer.

Dated this 1st day of August, 1929.

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## COMPLETE SPECIFICATION.

### Improvements in or relating to 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, in the County of Middlesex,

CHARLES BONAMICO, a Citizen of the French Republic, of 19, New Bridge Street, London, E.C. 4, and SPICERS LIMITED, a 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:—

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 sensitized emulsion. Films of this type 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, 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 successfully applied on cinematograph film made from celluloid or nitrocellulose, cellulose acetate or other ester or ether of cellulose.

Taking the case where a film 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);
- (3) a treatment with a bleaching or colour-discharging liquid; and
- (4) a dye of another colour in the spaces thus bleached, difficulties arise if ordinary celluloid or nitrocellulose film is used.

For example, the original dyeing may be found to lack that uniformity which is essential for good photography in natural colours. Again, the original dye (e.g. green dye) may penetrate too far into the film with the result that the bleaching or discharging operation can only be conducted at a comparatively slow rate (i.e. with a lengthy period of contact with the discharging liquid) so that in many cases effective discharge is not achieved.

Further in the case of cellulose acetate and celluloid films difficulties of another type arise due to the presence in the film of plasticisers and/or non-volatile solvents or improvers which render the surface shiny and repellant to dyestuffs, so that it is difficult to apply lines or other patterns of colour directly to the surface of such a film.

According to the invention a method of applying a multicolour screen for colour photography or cinematography to a film of cellulose acetate, celluloid, nitrocellulose or other ester or ether of cellulose includes the step of applying to the surface of the film, a solution of cellulose acetate without dye-inhibiting additions.

In a preferred form of the invention the cellulose acetate is dissolved in tetrachlorethane, to which has been added a small proportion of a mixture of acetone and alcohol.

An example of a particular method of carrying the invention into practice will now be given:—

A celluloid film is coated with a thin film of pure cellulose acetate deposited from a solution of the following composition:—

Cellulose acetate	-	1 grm.
Tetrachlorethane	-	20 cc.
Methylated spirit	-	2.5 cc.
Acetone	-	2.5 cc.

It is found that this surface layer of cellulose acetate without dye-inhibiting

additions readily takes up dyes from solutions which have little or no effect on the untreated celluloid film base. It is to be understood that although this example describes the application of a surface layer of cellulose acetate without dye-inhibiting additions to a film base of celluloid, it is also within the invention to apply the surface layer of cellulose acetate without dye-inhibiting components to a film base of commercial cellulose acetate containing the usual plasticisers.

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 applying a multicolour screen for colour photography, or cinematography to a film of cellulose acetate, celluloid, nitrocellulose or other ester or ether of cellulose, which includes the step of applying to the surface of the film a solution of cellulose acetate without dye-inhibiting additions.

2. A method according to Claim 1 wherein the cellulose acetate is dissolved in tetrachlorethane to which has been added a small proportion of a mixture of acetone and alcohol.

3. A method of applying a multicolour screen for colour photography, or cinematography to a film of cellulose acetate, cellulose nitrate, celluloid, or other ester or ether of cellulose substantially as described and claimed herein.

4. A film of cellulose acetate, cellulose nitrate, celluloid or other ester or ether of cellulose to which a multicolour screen has been applied by any of the special methods described or claimed herein.

Dated this 1st day of April, 1930.

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