Dec. 12, 1933. K. C. D. HICKMAN 1,939,171

PHOTOGRAPHIC FILM BASE AND COATING THEREFOR

Filed April 7, 1931

Fig.1.

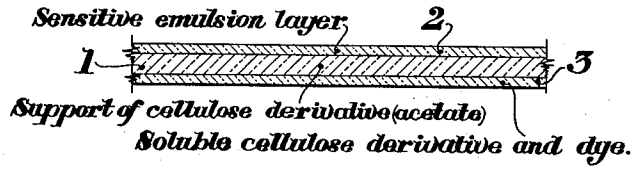


Fig.2.

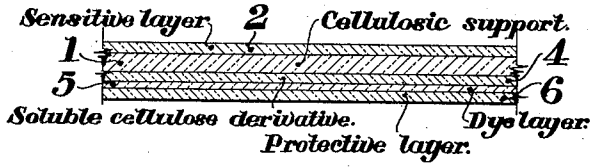
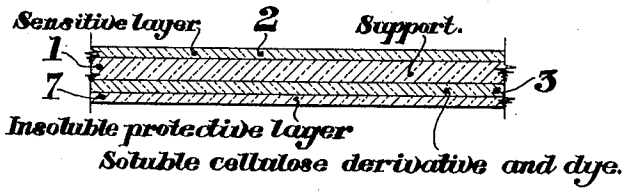


Fig.3.



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PHOTOGRAPHIC FILM BASE AND COATING THEREFOR

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9 Claims. (Cl. 95—9)

This invention relates to photographic film and to coatings adapted to be applied thereto for the purpose of improving the characteristics of the film and particularly adapted to prevent halation.

I have discovered that the soluble derivatives of cellulose are particularly useful for this purpose when combined with, or used as a carrier for, dyes or other coloring media. When such a coating is applied to the back of a photographic film, that is to say, the side opposite to that upon which the light-sensitive emulsion is applied, the coating will absorb light which is transmitted through the emulsion and the film so that reflection of the light and the halation effects resulting therefrom are entirely or substantially overcome. Such coatings being water soluble are removed completely from the film when the latter is subjected to the actions of a water solution, as in the subsequent treatment of the film in the developing and fixing baths. Consequently, the film, when the developing and fixing operation is completed, has its normal appearance.

I will now describe my invention more completely, referring when necessary to the accompanying drawing in the several figures of which the same reference characters designate the same parts and in which

Fig. 1 is a section on an enlarged scale of one embodiment of my invention.

Fig. 2 is a similar section of another embodiment of my invention.

Fig. 3 is a similar section of a third embodiment.

The object of the invention may be attained in various ways. For example, a solution of cellulose aceto-lactate in water may be combined with a suitable water soluble dye or admixed with a pigment and applied to the film. Such an aceto-lactate is described in the pending application of C. J. Staud and C. S. Webber, Serial No. 341,032, filed February 18, 1929. Various dyes of this type are available such as nigrosine. The solution may be applied to the film by a well understood procedure as a thin layer. When dry it provides a thin coating on the film which prevents halation and is readily removed when the film is subjected subsequently to treatment in water solutions. Alternatively, a water solution of the ester of cellulose can be applied to the film and dried, forming a thin transparent coating as a base or undercoating for a coating of a spirit soluble dye. Numerous dyes of this character can be used such as spirit blue R or nigrosine. A solution of the dye is applied over the undercoating of the water soluble ester of cellulose which it permeates more or less completely. It prevents halation and is readily removable when the film is thereafter subjected to a water solution.

In Fig. 1, the film made by either of the above processes is shown, the support being designated 1, the sensitive emulsion layer 2, and the backing of cellulose derivatives including a dye being designated 3.

In a modified procedure, the film may be first provided with a coating of the water soluble solution cellulose derivative. A coating of an alcohol soluble dye may then be applied and a final protective coating of the water soluble cellulose derivative may be added. When such a film is placed in a water solution, the outer layer consisting of the cellulose ester is dissolved and sufficient water diffuses through the dye coating to soften the undercoating of soluble cellulose ester. The layers are thus easily removed from the film to leave it in a transparent state.

Such a film is shown in Fig. 2, wherein 1 and 2 represent, as in Fig. 1, the support and sensitive layer respectively, the first coating of soluble cellulose derivate is shown at 4, the dye layer at 5 and the outer protective layer at 6.

The water soluble esters of cellulose are subject to the effect of humidity in the atmosphere. Consequently, under certain climatic conditions, it is preferable to apply, as the outer protective coating 6, a water insoluble material. Thus, a coating of the soluble cellulose ester, either including a dye as at 3, Fig. 3, or as a base layer 4 for an alcohol soluble dye layer 5, may be applied to the film. Thereafter, the film receives a coating of material 6 or 7 which is insoluble in water but soluble in alkaline solutions such as are employed in the development of photographic films. A suitable material is a solution of egg albumen in water. The latter coating after drying may be subjected to sufficient heat to render the albumen insoluble in water. It is readily soluble, however, in alkaline solutions, and the coating including the water soluble ester of cellulose is removed when the film is subjected to development.

Another material which is useful as the top or waterproofing coating 6 or 7 is cellulose nitrate in a solvent such as ethyl acetate or butyl acetate, coated over the soluble layer very thinly. There are available also for use in such protective layers a number of water insoluble proteins. Thus a layer of water insoluble but alkali soluble casein may be used. Also a spirit soluble gum or

resin such as Sandarac with a small amount of wax such as stearic acid dissolved in 50% ethyl acetate and 50% ethyl alcohol furnishes a good protective medium.

For the purpose of this invention I prefer to employ the aceto-lactate of cellulose as described in the application identified, although other soluble cellulosic derivatives may be utilized. A suitable coating material may be prepared as follows:

Formula I

	Parts
Cellulose aceto-lactate	4
Water	90
Glycerine	1/10
Saponine	1/10
Dye	5

Before using this mixture, 1/10 part by weight of egg albumen is dissolved in 10 parts of water and the latter solution is added to the cellulose aceto-lactate solution. I may include, as hereinbefore indicated, a water soluble dye such as nigrosine in the proportion of 5 parts by weight in the solution as described, or the solution without the dye may be applied to the film as a base for an alcohol soluble dye. For the latter solution I prefer to employ 2 parts by weight of nigrosine in 88 parts by weight of ethyl alcohol. After the coating of undyed cellulose aceto-lactate is dry, the alcohol soluble dye is applied to the film and an overcoating of cellulose aceto-lactate, similar to the first, may be then applied. If dye is included in the cellulose aceto-lactate solution, one coating is sufficient.

An example of a more water resistant coating is:

Formula II

	Parts
Egg albumen	3
Water	100

This solution is made slightly alkaline to phenolphthalein. This solution can be applied to the film either with or without the addition of a little acetone. The dried coating of albumen may be rendered insoluble in water by passage over heated calenders at a temperature of approximately 70° C. This coating is insoluble in water but is soluble in alkaline solutions such as are employed commonly for the development of photographic films.

An alternative method of carrying out the invention is as follows. A first layer is applied to the film consisting of

Formula III

	Parts
Cellulose aceto-tartrate	50
Acid blue black	20
Tartrazine	5
Egg albumen	20
Saponine	1
Glycerine	1
Water	903

When this has dried, a second layer is applied of

Formula IV

	Parts
Cellulose nitrate	10
Butyl acetate	200
Ethyl acetate	800

This is dried in the usual manner. The resulting film has a greenish black layer which is smooth and durable, and is removed as a coherent skin or in flakes in a few minutes in a stream of water.

The removal of the outer coating permits water to attack the soluble ester of cellulose forming the under coating thus permitting removal of the dye from the films during the normal development of the film.

It is apparent from the above that a non-halation layer made in accordance with my invention may consist of one, two or more separate layers or coatings. Finally, the dyes may be contained in any of the layers in various combinations or alone.

While I have described particularly the use of cellulose aceto-lactate, it is to be understood that I contemplate as equivalents the other known soluble mixed esters and other derivatives such as soluble cellulose ethers, soluble cellulose acetates or soluble cellulose xanthates. In general these have the advantages that they adhere strongly to the support but can be dissolved cleanly from it; the layer acts as an insulation layer protecting the support from permanent staining by the dye, in some cases they act as anti-static layers.

In the term "non-halation layer" it is understood that I include any of the above combinations, whether of one or more actual layers or coatings.

Various changes may be made in the procedure and particularly in the constituents and the proportions thereof in the coatings without departing from the invention or sacrificing any of its advantages.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A non-halation photographic element comprising a light-transmitting supporting layer, a photographically sensitive layer on one face thereof, and a layer comprising a water-soluble cellulose derivative and a light absorbing medium carried on the other face of the supporting layer.

2. A non-halation photographic element comprising a light-transmitting supporting layer, a photographically sensitive layer carried on one face thereof, and a layer of a water-soluble mixed cellulose ester carrying a light absorbing medium carried in the other face of the supporting layer.

3. A photographic film comprising a supporting layer of an insoluble cellulosic plastic material, a photographically sensitive layer carried on one face thereof, and a layer containing cellulose aceto-lactate on the other face thereof.

4. A non-halation photographic film comprising a light-transmitting supporting layer, a photographically sensitive layer on one face thereof, and a layer containing cellulose aceto-lactate and a dye on the other face thereof.

5. A non-halation photographic film comprising a light-transmitting supporting layer, a photographically sensitive layer on one face thereof, a layer of a water-soluble cellulose derivative carrying a light absorbing coating on the other face thereof, and a protective coating over said layer.

6. A non-halation photographic film comprising successively a photographically sensitive layer, a light transmitting supporting layer, and a layer of a water-soluble cellulose derivative carrying a light absorbing coating and a water-insoluble protective coating over said layer.

7. A non-halation photographic film comprising successively a photographically sensitive layer, a light transmitting supporting layer, and a layer of a water-soluble mixed ester of cellulose carrying a light absorbing medium and a protective coating of water-insoluble protein.

8. A non-halation photographic film comprising successively a photographically sensitive layer, a light transmitting supporting layer, and a layer of a water-soluble cellulose derivative carrying a light absorbing coating and a water-insoluble protective coating over said layer, said coating being soluble in an alkaline solution.

9. A non-halation photographic film comprising successively a photographically sensitive layer, a light transmitting supporting layer, a layer of a water-soluble mixed ester of cellulose carrying a light absorbing medium and a protective coating of water-insoluble protein which is soluble in an alkaline solution.

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