PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

The Production of Hardened Gelatine Layers, more especially for Imbibition Printing.

We, TECHNICOLOR MOTION PICTURE CORPORATION, a corporation of Maine, United States of America, of 120, Brookline Avenue, Boston, Massachusetts, United States of America, (assignees of JOHN FREDERICK KIENNINGER, a citizen of the United States of America, of North Cambridge, Middlesex, Massachusetts, United States of America), 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 relates to a method of obtaining a delayed "hardening" effect, so-called, in gelatine films and coatings employed in photography and related arts, and to the resulting product.

It is an object of the invention to arrest or retard the action of hardening agents upon gelatine emulsions or solutions, while in the liquid condition, but to permit such action to proceed upon or during subsequent dehydration and solidification. Other objects will appear from the following disclosure.

The method of the invention includes the steps of incorporating with a gelatine emulsion or solution a potential hardening agent together with a reagent adapted to activate the hardening reaction thereof and also a restraining agent tending to arrest or retard the activating reagent, at least temporarily, and thereafter to so treat the same as to remove or overcome the effectiveness of the restraining agent, either in whole or in part, and to permit or cause the hardening reaction to proceed accordingly.

The potential hardening agent comprises an alkali bichromate solution such as ammonium bichromate or alternatively potassium bichromate.

The activating reagent is characterized by manifesting a suitable reducing action (usually under neutral or acid conditions) to render the hardening agent effective with respect to its hardening reaction upon the gelatine emulsion or solution, a representative group of such reagents is found in the alkali sulfites (or bisulfites) including ammonium sulfite or bisulfite.

[*Price* 1/-]

Preferably, such activation of the hardening reaction is substantially prevented while the emulsion or solution is in a liquid condition and effectuated during or after appreciable solidification and/or dehydration of the same has taken place. To this end a restraining agent is employed which is primarily characterized by rendering the activating reagent ineffective with respect to the hardening reaction and by being removable from the emulsion or solution (either during or after solidification of the same) without physical disruption or harmful decomposition of the remaining constituents, thereby to permit or cause the hardening reagent to function in the desired manner.

The invention will be described as applied to the hardening of gelatine films, and more especially of films intended for use as blanks for the reception of dye images thereon by imbibition printing.

For this purpose a gelatine emulsion or solution may first be prepared in accordance with usual practices of the art and an appropriate amount of sodium or ammonium bichromate is dissolved therein. The activating reagent, which may be sulfurous acid, a soluble bisulfite or ammonium sulfite is also added in suitable proportion. For example, 5% of sodium bichromate and 5% of ammonium sulfite (upon the weight of gelatine) are suitable amounts for most purposes. The restraining agent is added in sufficient quantity to assure its restraining action being effective, due regard being taken of the nature of the other reagents present. Thus, with 5% ammonium sulfite as the activating agent 5% of concentrated ammonium hydroxide solution is ordinarily sufficient. If ammonium bisulfite is employed, however, more of the ammonium hydroxide will be required.

As thus prepared, the hardening reaction of the gelatine solution or emulsion does not proceed at all or goes on only at an extremely slow rate, so that the hardening effect is not appreciable over long periods of time. The emulsion or solution may be applied to the usual backing materials, such as celluloid

strips, in the customary manner. Upon heating and drying the film, and the consequent stiffening or solidification of the gelatine coating, the restraining agent is gradually expelled and the activating reagent and hardening agent are permitted to become effective to react and harden the solidifying gelatine mass, or to accelerate the hardening reaction of the gelatine. Extensive dehydration or solidification of the gelatine mass, however, appears to slow up or prevent the progress of the hardening reaction. Accordingly, when the moisture content of the mass has been reduced, for example, to 15% or less, subsequent hardening action is again extremely slow, or nil, comparable to the initial liquid solution or emulsion.

The dry gelatine film accordingly is hardened in the course of the solidification or gelatinization of the emulsion or solution, but after treatment and complete solidification, as ordinarily effected, is relatively permanent in this respect. The degree of hardening may be controlled by the mutual reactivities of the reagents employed and by the relative amounts, the fluidity of the whole during treatment and the duration and intensity of the hardening treatment. Heat and the prevalence of neutral or acidic conditions generally accelerate the hardening reaction while the continuance of the alkaline conditions induced by the excess of ammonium hydroxide prevents or greatly retards the hardening so long as its influence predominates, and upon physical solidification (or drying) beyond the gel condition the further progress of the hardening reaction is inhibited.

It is to be understood that the commencement and cessation of the hardening reaction are not accompanied by any positive indications in the reactive mass, but that they may take place both in solutions or emulsions and in the dried film. However, under normal atmospheric conditions and relatively low temperatures, such reaction is extremely slow and hardly detectable or significant in its results, so far as the usual applications of the final products are concerned. But at "room temperature" (70° F.) hardening will ordinarily proceed quite rapidly. Likewise, the finished "hardened" product is relatively permanent with respect to its desired characteristic properties if proper proportions of original materials have been used.

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 hardening gelatine compositions or films as used in photography and related arts, which comprises the steps of incorporating therewith an alkaline bichromate hardening agent, a reducing reagent for activating the hardening agent, and a reagent for restraining the action of the activating reagent, and thereafter rendering the restraining agent ineffective to prevent the activating reagent from activating the hardening agent.

2. A method of hardening gelatine compositions or films according to claim 1, characterized in that the restraining agent is rendered ineffective by removing the same.

3. A method of hardening gelatine emulsions or solutions, according to claim 2, further characterized in that the removal of the restraining agent is effected by lapse of time.

4. A method of hardening gelatine compositions or films, according to claim 1 and characterized in that the restraining agent is rendered ineffective by gradually removing the same concomitantly with the solidification of the gelatine substance.

5. A method of hardening gelatine emulsions or solutions, according to claim 1 and further characterized in that the restraining agent is a volatile base and the removal of the restraining agent is effected concomitantly with the solidification of the emulsion or solution at the desired degree of solidification.

6. A method of hardening gelatine emulsions or solutions according to claims 4 or 5 and further characterized in that the restraining agent is removed by heating and drying the emulsion or solution substantially as described.

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