PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Process for Producing Hardened Gelatin Impression Receiving Surfaces, more especially for Imbibition Printing.

We, TECHNICOLOR MOTION PICTURE CORPORATION, a corporation organised under the laws of the State of Maine, United States of America, of 120, Brookline Avenue, Boston, Massachusetts, United States of America, Assignees of FRANCIS CLARKE ATWOOD, a citizen of the United States of America, of 15, Frederick Street, Newtonville, Massachusetts aforesaid, 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 for the preparation of hardened surfaces of gelatine or like material, particularly in association with cellulosic films, such as the celluloid films commonly used in photography and for motion picture reproductions.

The hardening of gelatinous films for various purposes has been known and practised in the prior art by adding thereto certain oxidizing agents which act, in the course of time or in heated solutions of such agents, to stiffen and harden the gelatine. This hardening effect is accelerated by the action of light, more particularly that of the ultra-violet portion of the spectrum.

For some purposes, such procedure for hardening gelatinous substances may be entirely satisfactory. In other adaptations of materials so treated, however, as in the production of motion picture films in which the requirements are exceedingly exacting, the results which are thus obtainable are quite unsuitable; primarily because the hardening action thus effected is not uniform in degree or in distribution over the surface so treated. Moreover, such processes are both slow and expensive to carry out.

In the preparation of motion picture films, and especially those in which colored reproductions are provided, it is now common practice (as disclosed more fully in copending Application Serial No. 270,279) to first prepare and develop a master or matrix film corresponding to each of the complementary colors to appear in the reproduction, for example, one matrix film corresponding to the reds and a second matrix film corresponding to the complementary color thereto, or green, from which the reproduction is obtained by imbibition printing. The blank transparent film upon which the final reproduction in colors is to be provided is now printed from these matrix films. This is accomplished by making superposed impressions upon the blank in red and green dye of appropriate color values, by contact with and imbibition from the so-called red and green matrix films, respectively. In practice, this printing may be done by immersing the first matrix film in the red dye (whereupon, with films prepared by one method, the developed portions of the film surface absorb the dye rapidly and tenaciously while the undeveloped portions do not), removing any surplus dye adhering to other portions of the matrix film, and then contacting the wet surface of the matrix film with the film blank. With matrix films prepared by other methods. it may be the undeveloped portions of the gelatinous surface which absorb the dye, as in the pinatype process.

The dye by imbibition passes directly from the developed (or wet) portions of the matrix to the blank, imparting thereto a series of images, etc., which correspond to the red portions of the colored reproduction to be formed thereon. The blank is then brought into registry and contacted in like manner with the matrix having the green portions of the images developed thereon which have been similarly wet with green dye, whereupon the green portion of the reproduction is transferred to the blank, superimposed upon the red, the two complementary colors supplementing each other and producing a complete association of color values, in the full images thus produced.

For such purposes, it is essential that the surface of the film blank employed shall be readily wet by the dye and that it shall preferentially absorb or adsorb, during a relatively short contact period, substantially all of the dye contained upon the matrix film corresponding

thereto, but that it shall not be so porous as to permit spreading of the dye into other portions of the blank. To this end, it is desirable to harden the surface or outer layer of the gelatine coating. The term "harden" is here employed to signify the alteration of the gelatine whereby it is rendered more insoluble in water, and penetration and absorption of dye solutions and like coloring agents into the surface or through the outer portion of the gelatine layer is restricted, but without inhibiting the uniform wetting of the dye in areas printed therewith. The hardening effect should be uniform over the treated surface and the film should be relatively inert with respect to dye substances, both chemically and physically. It is also important that the dye shall transfer uniformly from the matrix to the blank and thereafter remain in position and maintain its relative distribution thereover, as initially determined by the dye-wet portions of the matrix.

Blanks having surfaces or coatings of hardened gelatine are found to be best adapted to the conditions of transfer thus outlined, and are usually provided upon a backing of cellulosic material such as a celluloid film. In such cases, the gelatine surface or coating should be of uniform thickness and consistency with respect to its imbibition properties, for example, and should also be intimately associated with the celluloid backing to withstand subsequent handling and treatment without separation therefrom.

The procedure of this invention includes the steps of preparing a fluid mixture or solution containing the gelatinous material to be used and a suitable bichromate hardening agent adding a suitable soluble organic and such as acetic acid thereto, extending the fluid into a continuous film or as a coating surface, rapidly drying the solution to a solid or firm consistency and then subjecting the gelatinous surface or film thus produced to a uniform elevated temperature (preferably above the normal atmospheric temperature but below such temperatures as may effect a marked drying or dehydration of the gelatinous substance) until the desired degree of hardening has been attained.

In its specific adaptation to the preparation of gelatine coated film blanks, as above described, a cellulosic backing is preferably employed, such as a celluloid film, which is substantially transparent and of appropriate strength and resiliency. To the surface of this film is applied a solution, also preferably uniform and transparent, containing gelatine and a bichromate hardening agent such as potassium dichromate (in the proportion of approximately 5% of the gelatine used) with the addition of a small amount of an organic acid such as acetic (in an amount of about 3 drops per 100 c.c. of the solution). The solution is diluted to such consistency as will permit of spreading evenly and of uniformly wetting and adhering to the film base. Uniform distribution and intimate association of the solution with the film base are highly desirable, if not essential, for the best results in the hardening, printing and subsequent use of the coated film. This is best secured by careful control of the procedure involved, whether spraying, dipping, or other means, which are well known in the art. The coating thus applied is next allowed to dry, which should be effected as rapidly as is consistent with the properties of the film coating in order to avoid extensive interaction between the gelatine and the dichromate hardener. Reduction of the chromium of the dichromate from the chromic to chromous condition, for example, resulting in a greenish tinge before drying prevents its satisfactory use as an imbibition blank. The dry coated film is then subjected to a temperature appreciably above atmospheric, preferably 90 to 110° F., which is uniformly applied to all portions of the film surface either simultaneously to the whole strip or progressively throughout its length, as by carrying the film through an extended heating chamber, by contact with heated rollers, by spreading out its full length in a constant temperature oven, or the like. It may also be conveniently effected by placing the loosely rolled film in a suitable container and setting the container in the heating chamber. Such heating treatment may be applied for 20 to 60 hours with the composition above described, or for a few hours only, as the case may be, depending in any given instance upon the proportions of hardening agent present, the character and composition of the gelatine used, and the degree and depth of the hardening action required. The surface or film is then washed out with water as a precautionary measure to remove the excess of hardening reagent and thoroughly dried.

Thus treated, the gelatine surface or coating is rendered "harder" and insoluble and hence, when employed as a blank for imbibition printing from photographic matrices and the like, manifests an absorption depending upon the degree of hardening effected and produced, by a substantially complete dye transfer thereto, a transparent reproduction of

accurate color values, definition and registry. Moreover, the hardening effect thus obtained is substantially uniform throughout the depth of the gelatine coating or thickness of the gelatine film so treated.

The degree of hardening effected may be tested and controlled by withdrawing a sample (as by cutting off the end of the film or by testing a portion of the film itself or separate test pieces) washing out excess agent, drying thoroughly and immersing the hardened surface in a 5% solution of standardized pontacyl green S.F. (yellowish) for a given period, say five seconds, and thereafter measuring the color density of the film. The depth or density of color penetration thus served indicates the degree of hardening which has been effected in the gelatine surface.

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. The process of preparing hardened films of gelatine and the like, characterized in that the gelatine of the film is treated with a bichromate hardening agent and an organic acid, dried promptly to a firm consistency, and subjected to an elevated temperature.

2. The process of providing cellulosic films with a hardened gelatine surface characterized in that a gelatine composition is applied to the film, containing a volatile organic acid and a bichromate hardening agent, promptly dried to a firm consistency and thereafter subjected to an elevated temperature.

3. The process of preparing hardened films of gelatine, in accordance with Claim 1 or 2, the acid employed being acetic acid.

4. The process for causing hardness in gelatine films in accordance with Claim 1 or 2, and further characterized in that the temperature of heating is approximately 90—110° F.

5. The process for causing hardness in gelatine films in accordance with Claim 1 or 2, and further characterized in that the heat treatment is continued for such time as to effect the degree of hardening desired as determined by the penetration thereinto of a standard dye solution.

6. As a product of manufacture, a film or surface coating of gelatine or the like having a uniform degree of hardness developed therein by an organic acid and a bichromate hardening agent and the application of an elevated temperature.

7. As a product of manufacture, a film or surface coating of gelatine or the like having a uniform degree of hardness developed therein by a bichromate hardening agent, a volatile organic acid and the application of elevated temperature.

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