Dec. 7, 1954 S. LEVINOS ET AL 2,696,439

PHOTOGRAPHIC STABILIZATION PROCESS

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FIG. 1

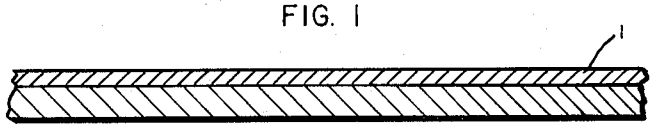



FIG. 2

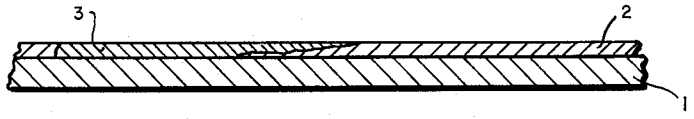



FIG. 3




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# PHOTOGRAPHIC STABILIZATION PROCESS

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4 Claims. (Cl. 95—88)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to a photographic product and method of producing the same and particularly to a means for stabilizing the unexposed silver halide content therein.

In the photographic art it has long been considered that the processing steps subsequent to development of the image were unnecessarily time consuming and wasteful in the amount of water necessary for such processing. The present invention includes means for eliminating the conventional steps of dissolving the residual unexposed silver halides and subsequent washing in water for a prolonged period.

An equivalent result is accomplished in an entirely different manner. Instead of dissolving and washing away the unexposed silver halides they are left in the final picture and chemically rendered light stable and also completely transparent. By so treating the photographic emulsion the final washing step is eliminated.

It is a primary object of the present invention to provide a photographic process which can be accomplished without the use of large quantities of water.

A further object of the invention is to greatly reduce the time necessary for processing photosensitive material.

A still further object of the invention is to provide a rapid processing method for photosensitive material wherein the finished product will remain chemically and physically unchanged over a long period of time.

Other objects and features of the invention will appear from the following description and will be particularly pointed out in the claims.

To present a clear and complete conception of the invention a specific embodiment thereof will be described herein and illustrated in the accompanying drawing in which:

Fig. 1 is a cross-sectional view of an unprocessed photosensitive element.

Fig. 2 is the same element after an image has been developed therein.

Fig. 3 is a cross-sectional view of the sensitive material after completion of the treatment according to the invention.

As above stated, it has been conventional practice in processing photosensitive material to eliminate residual silver halides remaining after development by dissolving and washing away. The present invention follows a procedure in which the residual silver halides are not removed but are treated in such a manner that they become stabilized and rendered permanently transparent. In this manner an equivalent result is obtained in a greatly shortened length of time.

The process can be used in connection with any type of photosensitive material having a light sensitive emulsion and a base. The end product is a print, a negative or transparency which has the identical appearance and utility of a product produced by conventional methods.

The product of the process is made from conventional photosensitive material having the usual base or support of suitable transparent sheet material in the case of film. In the case of material having a paper base the process is more suitably adapted to such a base which is water resistant.

The final product itself therefore has a supporting base 1 to which adhere a layer of gelatin 2 containing the developed silver image 3 and the reaction products 4



resulting from the stabilizing treatment of the halides provided by the process. The manner of stabilizing the residual silver halides will be described in more detail hereinafter.

In practicing the invention, conventional photosensitive material is exposed in a camera or other instrument in the usual manner. The material is then developed in a conventional developer which may be of the 2,4-diaminophenol hydrochloride or elonhydroquinone types. The development step is carried out in the conventional manner to produce any desired gamma.

The development is then stopped in a suitable manner as by using a stop bath which conveniently may also have a film hardener ingredient therein. After the stop bath treatment the film or other product is stabilized by treatment in an aqueous bath containing thiourea and glycerin after which the surplus stabilizing liquid is removed from both surfaces of the material which is then dried without washing.

The development and short stopping solutions may contain the usual ingredients while the stabilizing solution contains the critical elements for final finishing of the material. It is considered, however, that a better understanding of the invention will be gained by presenting a specific group of formulas and a suitable procedure as follows:

It will be understood that the following presentation is not to be construed in any manner as limiting the invention as set forth in the appended claims.

It has been found that a slightly different procedure for developing films and paper produces a better result. Both procedures, therefore, will be presented.

Film is developed for approximately three minutes at 68° F. in the following bath:

| | Grams |
|---|---|
| Sodium carboxymethyl cellulose (medium viscosity)[1] | 1.0 |
| Ammonium sulfite | 75.0 |
| 2,4-diaminophenol hydrochloride | 6.8 |
| Ammonium bromide | 2.0 |
| Water to make 1 liter | |

[1] Suspend 1 gram carboxymethyl cellulose in 10 cc. methyl alcohol, add to the solution while stirring rapidly.

After development to the desired gamma the film is immersed in the following stop bath and hardened for about 1 to 2 minutes.

Chromium ammonium sulfate, 30.0 gram
Water to make 1 liter

From the stop bath the material is placed in the following stabilizing bath for a period of two to three minutes:

| | | |
|---|---|---|
| Thiourea | grams | 30.0 |
| Glycerin | cubic centimeters | 20.0 |
| Water to make 1 liter | | |

A similar procedure is followed for processing photographic prints on a paper base. The prints are first developed for the required time in the same bath as that used for film as set forth above after which they are treated in a stop bath as follows:

Sodium bisulfite, 30.0 gram
Water to make 1 liter

From the stop bath the prints are then treated in a stabilizing bath as follows for substantially two minutes at a temperature of 68° F.:

| | | |
|---|---|---|
| Thiourea | grams | 15.0 |
| Glycerin | cubic centimeters | 10.0 |
| Water to make 1 liter | | |

To insure maximum quality in the final product certain details should be observed. For example, after treatment in the stabilizing bath films should be squeegeed on a glass plate; first on the back and then on the emulsion side of the film. Roll films should be squeegeed after hanging to dry. Perforated films after squeegeeing should be gone over with an absorbent wad of cotton to remove all excess solution from the perforations.

Films and paper should be constantly agitated

throughout the processing and excess chemicals should be removed from the surface of the prints with a squeegee after which they are dried in the usual manner.

The developing bath formula above presented has a neutral pH value. It has been found that this developer and other developers having neutral pH values used in connection with a non-acid stop bath achieve maximum benefit in the practice of the invention and produce a product which is stable over long periods of time.

Photographic units processed in the above manner have the identical quality of the same materials processed in the conventional manner. The developed silver image 3 within the gelatin of the emulsion is surrounded by the reaction products 4 of the process which have been rendered completely transparent. The process causes no change in the predictable contrast of the unit and maintains the highlight areas of a print and the shadow areas of a negative perfectly clear and unmodified.

Referring to the drawings it will be noted that the bulk of the ingredients in the emulsion remain in the finished unit and that the stabilized silver halides 4 have not been removed but have become transparent. As a result the finished emulsion layer is substantially uniform in thickness.

We claim:

1. A method of processing photographic material having an exposed silver halide, light sensitive layer comprising developing said photographic material in a developer wherein the developing agent is 2,4-diaminophenol hydrochloride, said developer having a substantially neutral pH value, removing the material from the developer, treating the developed material with a solution of a material selected from the group consisting of an alum and an acid salt of a polybasic acid, said solution characterized in that it will maintain substantial chemical neutrality within the material, and treating the photographic material in a 1% to 3% solution of thiourea.



2. A method of processing photographic material according to claim 1 and wherein the photographic material has a water resistant paper support.

3. A method of processing photographic material according to claim 1 and wherein said photographic material is treated in a solution of chromium ammonium sulfate after its development.

4. A method of processing photographic material according to claim 1 and wherein said photographic material is treated in a solution of sodium bisulfite after its development.


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