Patented Mar. 13, 1951

2,544,906

UNITED STATES PATENT OFFICE

2,544,906

POLYVINYL AZINE SOUND TRACK COATING

Thomas Gentry Veal and George P. Waugh, Rochester, N. Y., assignors to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey

No Drawing. Application August 16, 1947, Serial No. 769,077

2 Claims. (Cl. 95—2)

1

This invention relates to photographic color film having a sound track therein.

In recording sound on motion-picture film in which a dye image is present or is later formed, the sound record may be produced either in dye or in silver or some other metal. One of the disadvantages of dye sound tracks is that they possess insufficient absorption to light to which the photoelectric cell is sensitive. Silver sound track images possess sufficient density but since the silver is generally removed from the picture area, the processing bath which removes it from this area also removes it from the sound track area unless special precautions are taken to prevent removal from the sound track area. For this reason, the use of metals inert to the silver removal baths have been proposed, such as gold, described in Mannes and Godowsky U. S. Patent 2,263,009, granted November 18, 1941. The use of a silver sulfide sound track has been proposed in Mannes and Godowsky U. S. Patent 2,143,787, granted January 10, 1939, but this material has the disadvantage that a negative sound image cannot be formed directly since it is necessary to start with a halide in order to sulfide the sound track. The use of varnishes to prevent removal of the sound track image during treatment of the picture areas has also been proposed but these films generally require treatment of the film with a solvent and therefore necessitate a separate step in processing the film.

It is therefore an object of the present invention to provide a novel method for protecting the sound track area of motion-picture film during a portion of the processing of the film. A further object is to provide a protective layer for the sound track which is removable in one or more of the regular photographic processing baths. Other objects will appear from the following description of our invention.

These objects are accomplished by protecting the sound track area at an appropriate stage with a layer of a polyvinyl azine such as polyvinyl pyridine. This material is insoluble in alkali developing solutions but soluble in acid fixing baths.

Our method is useful in any color processes in which images are formed by development of silver and converted simultaneously or subsequently to dye images. It is particularly useful in the process described in Mannes, Godowsky and Wilder U. S. Patent 2, 252,718, granted August 19, 1941. In the process of that patent a multi-layer film having three layers sensitive, respectively, to the primary colors, are exposed

2

to the subject and developed to a negative. The three layers are then selectively rendered developable and color developed to form three subtractive positive dye images in the layers. Both negative and positive silver is then removed from the layers.

In this process the sound track may be printed and developed at the same time as the negative development of the film and the sound track area only, protected with a resist according to our invention while the picture areas are processed to images.

The polyvinyl azines used according to our invention are prepared from vinyl-substituted azines such as vinyl pyridine and its homologues including vinyl quinoline, and vinyl acridine, as well as vinyl derivatives of other six-membered heterocyclic ring compounds containing nitrogen atoms. These compounds are polymerized to form polyvinyl azines such as polyvinyl pyridine for use according to our invention. Polyvinyl pyridine is described in French Patent 849,126.

In using our method for the protection of the sound track area of either multi-layer or single-layer film, the polyvinyl azine protective coating may be applied after black and white silver development of the sound track to protect it during subsequent color development or by applying polyvinyl azine before any development steps, then after color development removing the polyvinyl azine coating and developing a black and white silver image in the sound track area. Our method may also be used in color processing to protect one emulsion layer during the development of another as by protecting a layer on one side of the support while a layer on the opposite side of the support is developed. It may also be used in black and white development in which case the polyvinyl azine could be used to protect the sound track which might then be given a different type or degree of development than the picture area. This is particularly valuable for variable density sound images.

In the preferred embodiment of our invention polyvinyl pyridine is used as the protective resist material. The polyvinyl pyridine which we use was prepared as follows:

In a one-liter clear glass bottle were placed 1.2 grams of benzoyl peroxide, 120 grams of 1-vinyl pyridine (freshly vacuum distilled) and 360 cc. of starch solution made by grinding with water 2 grams of corn starch to a slurry and pouring this slurry into 350 cc. of boiling distilled water. The starch solution was boiled for 2 minutes and cooled. The volume of the starch

solution was then adjusted to 360 cc. to compensate for loss of liquid by vaporization during the boiling operation.

The reaction flask was stoppered by a rubber stopper protected by aluminum foil and then placed on a tumbler in a 50° C. water bath. After 22 hours, the reaction flask was removed from the bath and chilled. The monomer had polymerized in the form of beads. The polymer, in the form of beads or agglomerates of beads, was washed with cold tap water until the odor of monomeric vinyl pyridine was gone. The beads were then rinsed with distilled water and dried at room temperature in an air stream. The product obtained was a light tan in color. It was soluble in ethyl alcohol and in dilute acetic acid to give dopes of high viscosity.

The polyvinyl pyridine had an intrinsic viscosity as measured in absolute alcohol of about 1. The polyvinyl pyridine was applied in the form of a 3% to 5% solution in methyl or ethyl alcohol. Ethyl alcohol was preferred, although it dried more slowly, because it gave more uniform coatings. Any suitable solvent may be used but methyl and ethyl alcohols are good solvents for polyvinyl pyridine and do not appreciably attack the cellulose acetate film base during application. The coatings may be made in any convenient manner as by flowing, dipping, or use of a felt applicator or a brush.

The polyvinyl pyridine coatings may be removed by treatment of the film for a short time in ½% to 20% solutions of acetic acid followed by a water rinse. The coatings may also be removed by 2% hydrochloric acid or 2% sulfuric acid solutions or 2% to 5% solutions of propionic, tartaric, citric or oxalic acid or sodium bisulfate. The water rinse was not necessary to remove the coating but was used because development of the film gave a convenient test for completeness of removal of the polyvinyl pyridine.

The following specific example will illustrate our invention.

A safety base motion-picture film having three superposed differentially sensitive emulsion layers was exposed to a subject and to a sound track image and developed in a negative developer such as that described on page 2, column 1, lines 5 to 19 of U. S. Patent 2,252,718. The sound track area was then coated by application of a 5% dope of polyvinyl pyridine in methyl alcohol. After drying this coating, the film was carried through the remainder of the processes described in U. S. Patent 2,252,718. It was found that this coating was readily removed by treatment in ½% to 24% solutions of acetic acid or in ¼% solution of acetic acid by ½ minute soaking followed by a water rinse. Acetic acid of ⅛% concentration removed the polyvinyl pyridine coating in 1 minute but only partly removed it in ½ minute.

In addition to their use for protecting the sound track areas of film, the polyvinyl azine coatings may be used as anti-halation layers or anti-abrasion layers or for other backing or overcoating layers for photographic film.

It will be understood that the modifications described herein are illustrative only and that our invention is to be taken as limited only by the scope of the appended claims.

We claim:

1. The method of forming a sound track in a multi-layer photographic film having a plurality of silver halide emulsion layers sensitive to different spectral regions, with sound and picture areas, which comprises exposing said film in both the sound track and picture areas, developing a silver sound track in the sound area of said film and negative silver picture images in the picture area of said film, varnishing only the sound track area with a polymerized vinyl azine, processing the film to form positive dye images by color development in the picture area of said film and removing developed silver from said picture area without affecting the negative silver sound image, and then removing the varnish from the sound track area in an acid solution and fixing both areas of said film.

2. The method of forming a sound track in a multi-layer photographic film having a plurality of silver halide emulsion layers sensitive to different spectral regions, with sound and picture areas, which comprises exposing said film in both the sound track and picture areas, developing a silver sound track in the sound area of said film and negative silver picture images in the picture area of said film, varnishing only the sound track area with polyvinyl pyridine, processing the film to form positive dye images by color development in the picture area of said film and removing developed silver from said picture area without affecting the negative silver sound image, and then removing the varnish from the sound track area in an acid solution and fixing both areas of said film.

THOMAS GENTRY VEAL.
GEORGE P. WAUGH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,988,812	Schmidt	Jan. 22, 1935
2,036,442	Tanatar	Apr. 7, 1936
2,448,542	McQueen et al.	Sept. 7, 1948

FOREIGN PATENTS

Number	Country	Date
483,052	Great Britain	Apr. 8, 1938