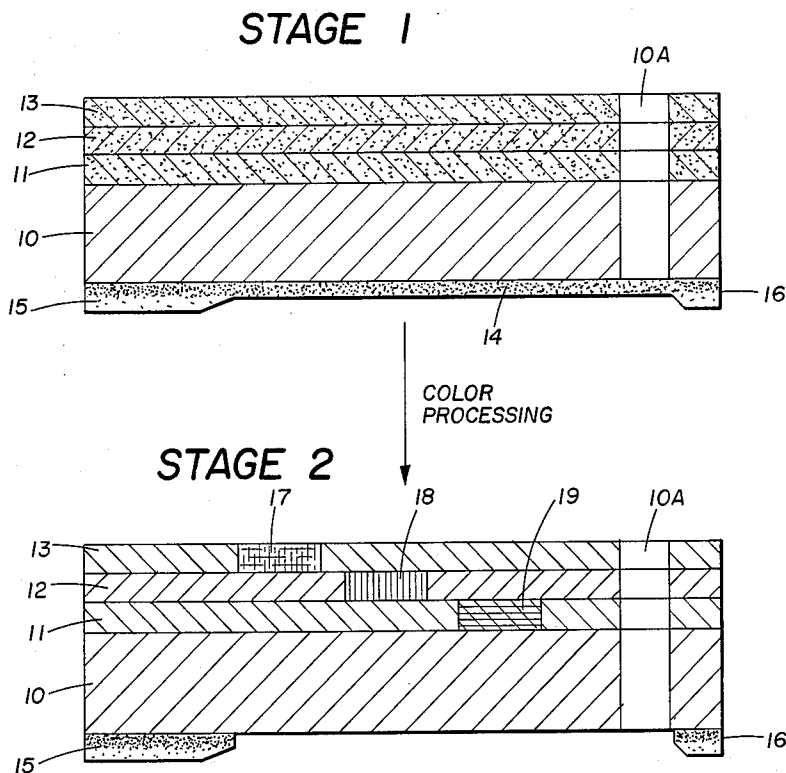


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RECORDING MOTION PICTURE FILM
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MAGNETIC STRIPING COMPOSITION FOR SOUND RECORDING MOTION PICTURE FILM

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2 Claims. (Cl. 252—62.5)

This application is a division of application Serial No. 257,498 which is a continuation-in-part of our U.S. application Serial No. 82,372 filed January 13, 1961 now abandoned.

This invention concerns photographic films and especially motion-picture films provided with a sound track capable of being magnetized during or after exposure.

Magnetic sound tracks have been found to be advantageous for use with motion-picture films since the sound recording is accomplished with relatively simple and inexpensive equipment as compared to the more complicated means required when a photographic sound track is employed. This is particularly true since magnetic tape has found wide use for recording sound. Therefore, it has been desirable to find a simple means of combining the magnetic tape method of sound recording with the relatively simple methods of recording the photographic image.

Various methods have been attempted in order to provide a unitary combination of magnetic sound track with the motion-picture film. This has frequently been obtained by applying a magnetic stripe to the film after processing. The sound can then be added to the striped film. One disadvantage of this procedure is that the sound must be recorded at the time the photographic image is using a separate system, but one which is synchronized with the visual image.

In certain instances, a groove has been cut in the motion-picture film and the magnetic sound track deposited therein. However, this has been an expensive process due to the difficulty of cutting a groove having uniform dimensions without having a detrimental effect on the motion-picture film. Efforts to apply the magnetic stripe on the back of sensitized film have been unsuccessful due to the presence of the antihalation layer in the back of the film which is removable during processing with alkaline photographic developer solutions. A magnetic stripe applied over the antihalation layer would be completely or partially removable along with the antihalation layer, making this method impractical. This problem of coating a sound stripe over an antihalation layer is aptly described in Wilkins U.S. Patent 3,050,758 where the antihalation layer is removed locally before applying the stripe to obtain firm adherence of the stripe to the film support.

Magnetic stripes have also been attached to the motion-picture film using an adhesive or cementitious means such as for instance by depositing the magnetic stripe on its own support and then laminating the support bearing the magnetic stripes onto the motion-picture film. Many of these magnetic stripes, particularly those applied as laminates are easily abraded, subject to removal, and the like. This is particularly true when this type of film is subjected to normal cleaning operations such as washing with carbon tetrachloride, methyl chloroform, or the like. In addition, some of these compositions have been brittle and have had unequal expansion characteristics as compared to those of the film base.

We have found a method of applying a magnetic stripe over the antihalation layer so that it is composite with the antihalation layer and firmly adhered to the film sup-

port rather than being adhered to the surface of the antihalation layer. The stripe is thus not removable during processing. Moreover, our magnetic stripe has excellent sound properties and will adhere to the film through photographic processing and through normal cleaning operations.

One object of this invention is to provide a striping composition for applying a magnetic stripe on motion-picture film. Another object is to provide a method for applying magnetic striping to sensitized photographic motion-picture film. A further object is to provide a sound motion-picture film which can be used to record sound at the same time the film is exposed photographically. An additional object is to provide a magnetic film stripe which is resistant to removal using ordinary film processing and cleaning solutions.

We have found that in applying the magnetic stripe to the antihalation layer we can use an organic solvent solution containing a suitable binder for the magnetic particles, such as magnetic iron oxide, and a lower N,N-dialkylamide of an aliphatic acid, with the result that the antihalation layer is partially or completely dissolved in the region of the stripe, and the binder and solvents reach the film base where they effectively anchor the magnetic stripe. The stripe is therefore a composite of the components of the striping composition and of the antihalation layer rather than the magnetic composition merely being laminated or adhered to the surface of the antihalation layer. The stripe is firmly adhered to the film support and irremovable from the support providing the binder is insoluble in the alkaline processing solutions such as developer solutions customarily used in processing the film. In absence of the N,N-dialkylamides the antihalation layer is not adequately penetrated by the striping composition so as to effectively prevent the removal of the stripe during alkaline processing operations.

The N,N-dialkylamides which are preferred are the lower N,N-dialkylamides of the lower aliphatic acids of 2 to 4 carbon atoms, particularly the lower N,N-dialkylformamides and the lower N,N-dialkylacetamides, such as N,N-dimethylformamide, N,N-dimethylacetamide, N,N-diethylacetamide, N,N-diethylformamide, N,N-dibutylformamide and N,N-dimethylbutyramide. Amides such as formamide have deleterious effects upon the photographic quality of the film since they have been observed to alter the emulsion sensitivity during drying of the film.

The quantity of the N,N-dialkylamide in the striping composition will vary depending in part upon the particular N,N-dialkylamide used, the type of other solvent present, the polymeric binder used, the composition of the antihalation layer and the film support. However, in general, about 9–22% by weight of the N,N-dialkylamide can be used in the striping solution and the balance of the solvent mixture may be selected from other organic solvents to provide a satisfactory coating composition. These may be selected from well-known solvents depending in part on the particular binder used for the iron oxide to provide suitable solubility and compatibility of the binder with the dialkylamide and the components of the antihalation layer and of the film support. Mixtures of two or more of the dialkylamides are very useful. If desired coloring materials such as dyes, e.g., fluorescent dyes, may be added to the striping composition to facilitate identification of the sound stripe.

The magnetic stripe can be applied to the unsensitized film prior to coating the emulsion or emulsion layers on the opposite surface of the film support. Preferably, the film support is first coated with the antihalation layer then with the emulsion layer and the sound stripe. The process is particularly useful for applying the sound stripe to multilayer color films for subtractive color photography provided with an antihalation layer.

An auxiliary stripe composed of substantially the same components as contained in the sound striping composition can be coated onto the edge of the film opposite to the sound stripe to serve as a balance stripe which facilitates winding of the film in a roll, as shown in Stage 1 of the drawing.

Polymeric film forming substances insoluble in alkali solution are suitable as binders for magnetic oxide and include those prepared from cellulose or its derivatives such as cellulose esters and ethers as, for example, nitrocellulose, cellulose acetate, cellulose acetate butyrate, cellulose propionate cellulose butyrate, cellulose acetate propionate, methyl cellulose, ethyl cellulose and benzyl cellulose, polymerization products such as polyvinyl chloride and polyvinyl acetate, alkali-insoluble polyacrylic compounds or condensation products such as the products obtained by condensation of polyhydric alcohols with polybasic organic acids, as for example, alkyd resins such as the condensation product of glycerol and phthalic acid. Natural and artificial rubber, polyamides, polyesters, polyolefins, polyvinylacetals, methylmethacrylate resins, and polyurethanes are also suitable. Mixtures of the binders or of the binders and suitable plasticizers or humectants may also be used.

The magnetic materials of the striping composition can vary in their magnetic properties, such as permeability and coercivity. Ferro-magnetic materials of well-known types such as acicular magnetic iron oxide can be used. Desirable properties can be obtained by varying the ingredients of magnetic compositions. Thus magnetizable alloys are useful, for instance, alloys with iron or copper, aluminum, nickel, cobalt, and carbon, one component thereof being non-magnetic in most cases. The magnetic materials may be prepared as finely divided particles by various methods including the thermal decomposition of the corresponding metal carbonyls. Iron prepared from iron carbonyl may be employed, but iron alloys prepared from mixtures of metal carbonyls may also be used as, for example, iron alloy with nickel, cobalt, chromium, tungsten, or molybdenum. The methods of U.S. Patent 2,694,656 may, for example, be used for preparing suitable ferro-magnetic materials. The IRN magnetic iron oxides manufactured by the C. K. Williams Co., 640 N. 13th Street, Easton, Pennsylvania are very useful, e.g., IRN-110 magnetic iron oxide or IRN-115 magnetic iron oxide having higher coercivity.

The solvents which can be used for the solvent mixture of the striping composition include, in addition to the N,N-dialkylamides, and which comprises the non-critical portion, may be selected from volatile organic solvents such as methyl alcohol, ethyl alcohol, isopropyl alcohol, butyl alcohol, 2,2,4-trimethylpentane, methylene chloride, carbon tetrachloride, methyl chloroform, methyl ethyl ketone, hexane, cyclohexylamine, hexanediamine, benzene, methyl glycol acetate, ethyl acetate, xylene, dioxane, ethylene diamine, 2-ethoxyethyl acetate, ethyl acetate, butyl acetate, toluene, amyl alcohol, propyl alcohol, and the like. However, a striping composition employing the above organic solvents without an N,N-dialkylamide would be inoperative in our invention. Thus, as will be shown in the examples below when a solvent such as acetone is substituted for the dialkylamides in the striping solution, the result is that the stripe is not composite with the antihalation layer and does not adhere to the film support with the result that the stripe is removed during the processing operations. Other solvents such as acetic acid (glacial), concentrated ammonium hydroxide, tetrabutyl ammonium hydroxide (10%) substituted for the alkyl formamide have also been found to be inoperative. Certain solvents distort the base. Others result in flaking of the magnetic stripe. Still others are incompatible with the binder or are not solvents for the binder.

The film base carrying the emulsion and antihalation layers is a cellulose ester film base well known in the art, such as cellulose nitrate, but preferably is a cellulose or-

ganic acid ester film base such as cellulose acetate, cellulose propionate, cellulose acetate-propionate, cellulose acetate-butyrate. A preferred film base is cellulose triacetate having more than 43% acetyl content. U.S. Patents 2,607,704, 2,739,069 and 2,739,070 describe such bases in more detail.

The antihalation layers to which the magnetic striping is applied are those customarily used on photographic films and comprise as the binding material a water-insoluble, alkali-soluble synthetic colloidal material, such as cellulose ester or synthetic resin. The cellulose ester is preferably a dicarboxylic acid ester of cellulose having the mentioned solubilities, such as cellulose acetate phthalate, cellulose acetate maleate, cellulose acetate succinate, cellulose acetate propionate phthalate, cellulose acetate propionate maleate, or cellulose acetate propionate succinate. A useful synthetic resin is a polyvinyl resin such as polyvinyl phthalate or polyvinyl acetate phthalate. Typical antihalation layers are disclosed in U.S. Patent 2,327,828, issued August 24, 1943, to Simmons which illustrates the range dicarboxylic acid acyl content of the alkali-soluble colloidal materials, e.g., about 22 to 33% phthalyl in the case of cellulose acetate phthalates.

The proportions of binder to magnetic oxide or its equivalent may vary from about 1:1 to 1:5 by weight solids basis. Suitable solvent is added to make a viscous mixture. The solids to solvent ratio can be from about 1:2 to 1:4 depending, for example, on the binder used. It will be appreciated that other modification in the ratios or proportions can be made depending on the coating conditions and the like provided that a suitable amount of the dialkylamide is used to obtain the composite stripe.

The accompanying drawing shows greatly enlarged cross-sectional view in Stage 1, the appearance of a representative motion picture color film of the reversal type provided with a magnetic stripe and a balance stripe both stripes being composite with the antihalation layer and adhered to the film support. The magnetic stripe can thus be coated at either edge of the film or even between the edges when the film is to be subsequently slit at the stripe to provide two or more films each provided with a stripe. In Stage 2 the film is shown substantially as it appears after color processing, dye images being present in the emulsion layers and the antihalation layer having been removed from the areas not covered by the stripes leaving the magnetic stripe and the balance stripe which are composites of the components of the striping composition and of the antihalation layer, affixed to the film support.

The following examples are intended to illustrate our invention but not to limit it in any way.

Example 1

A magnetic striping formulation was prepared having the following composition:

	Grams
Nitrate dope	640
Ethyl glycol	28
Butyl cellosolve	200
N,N-dimethylformamide	200
Magnetic iron oxide	320

The nitrate dope of the above formula was an approximately 15% dope prepared by dissolving cellulose nitrate in a mixture of butyl alcohol, ethylene glycol monomethyl ether and amyl acetate. This magnetic striping composition was coated over an antihalation layer which had been coated upon a cellulose acetate-propionate film base. The antihalation layer contained an alkali-soluble binder of cellulose acetate phthalate. The film was then immersed in an alkaline developing solution which dissolved the antihalation layer. However, the magnetic striping adhered tenaciously to the film base. When Scotch tape was applied to the magnetic stripe following removal of the antihalation layer, the stripe adhered when the tape was quickly removed.

Example 2

A coating composition as described in Example 1 was coated on the antihalation coated surface of a cellulose acetate-propionate film base. A color (subtractive type) emulsion had been coated on the reverse side. This film was exposed in a camera adapted to record sound during the exposure of the film and the sound recorded. The color film was then processed. The sound track adhered satisfactorily to the film after processing as determined using the Scotch tape test referred to in Example 1. After processing, the sound record was played back and was found to be equivalent in quality to tracks on films striped after processing.

Example 3.—Color motion picture film provided with sound and balance stripes

A film shown in Stage 1 of the drawing was provided by coating a cellulose triacetate film base 10 having perforations 10a at one edge with differently sensitized gelatino-silver halide emulsion layers 11, 12 and 13. A black antihalation layer 14 containing alkali-soluble cellulose acetate phthalate binder was coated on the rear surface of the film base. A sound stripe 15 about 100 mils wide was coated over the antihalation layer at the non-perforated edge and a 30 mil wide balance stripe 16 was coated from the same striping composition outside the perforations at the other edge. The magnetic striping composition was that described in Example 1. A photomicrograph of a cross-section of the coated element showed that the sound stripe 15 and the balance stripe 16 appear substantially as shown in Stage 1 of the drawing and are composite with the antihalation layer and firmly adhered to the support 10. After exposure of the film to a colored subject, color processing was carried out as usual using conventional alkaline silver halide developing solutions. As a result of processing, as shown in Stage 2, dye images 17, 18 and 19 were obtained in layers 11, 12 and 13, and the antihalation layer 14 had been removed from the support except in the areas occupied by stripes 15 and 16 which are each a composite of the components of the antihalation layer admixed with the components of the striping formula. Thus, each stripe includes a mixture of cellulose nitrate, cellulose acetate phthalate, black colorant, and magnetic oxide adhered to the support 10, although there is little mixing of the components near the outer surface of each stripe and progressively more mixing near the interface of the stripes and the support. Thus, when the stripes are viewed through the base 10 from the emulsion side of the processed film, they appear to be black due to the presence of the black colorant of the antihalation layer, whereas, when the stripes are viewed from the support side of the film, they show the tan color of the ferro-magnetic oxide. The stripes adhered strongly to the base when tested as in Example 1 and when the film was subjected to normal handling, such as in a camera and a film projector.

Example 4.—Attempted replacement of N,N-dialkylamide solvent in striping formula

A motion picture film was prepared as in Example 3 except that the N,N-dimethylformamide of the striping

formula which was coated over the antihalation layer, was replaced by an equal amount of acetone.

A photomicrograph of a cross-section of the film showed that composite stripes were not obtained; that is, the stripes were adhered only to the surface of the antihalation layer and had not become composite therewith. Upon processing the film as described in Example 3, both the sound and balance stripes stripped off the support thus showing the necessity of using the dialkylamide solvent in the striping solution.

Example 5

A motion picture film was prepared in the manner described in Example 3 except that the striping composition contained a mixture of N,N-dialkylamides as follows:

	Grams
Nitrate dope -----	640
Butyl cellosolve -----	400
Amyl acetate -----	75
Tricresyl phosphate -----	75
N,N-dimethyl formamide -----	200
N,N-dimethyl acetamide -----	100
Magnetic iron oxide -----	400

The nitrate dope used in the above formula had the composition

	Percent
Cellulose nitrate -----	15
Butyl alcohol -----	28
Ethylene glycol monoethyl ether -----	28
Amyl acetate -----	53

The stripes coated onto the antihalation layer from this striping composition formed composite stripes and adhered firmly to the film support through film processing operations and handling in a camera and a film projector.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

What we claim is:

1. A magnetic striping composition adapted to coating onto an alkali-soluble antihalation layer of a motion picture film to form a magnetic stripe composite with the layer and irremovable from the film with alkaline solution, consisting essentially of an organic solvent solution of from about 1:1 to 1:5 parts by weight of a film forming polymeric binder insoluble in alkaline solution to ferro-magnetic particles and about 9–22% by weight of a lower N,N-dialkylamide of a lower aliphatic acid.

2. The composition of claim 1 wherein the solution contains cellulose nitrate as the binder and the dialkylamide is a member of the class consisting of lower N,N-dialkylformamides and lower N,N-dialkylacetamides.

No references cited.

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