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GELATIN SUBBING COMPOSITION

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FIG. 1

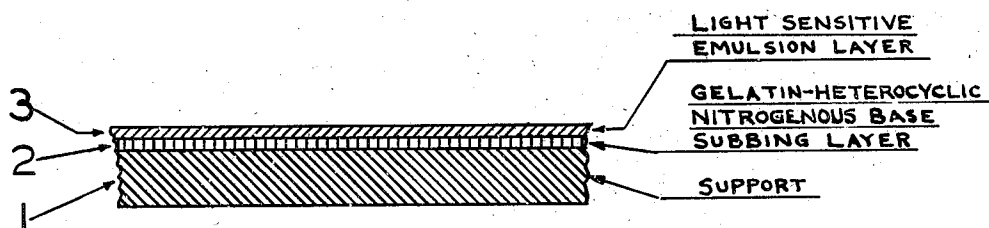
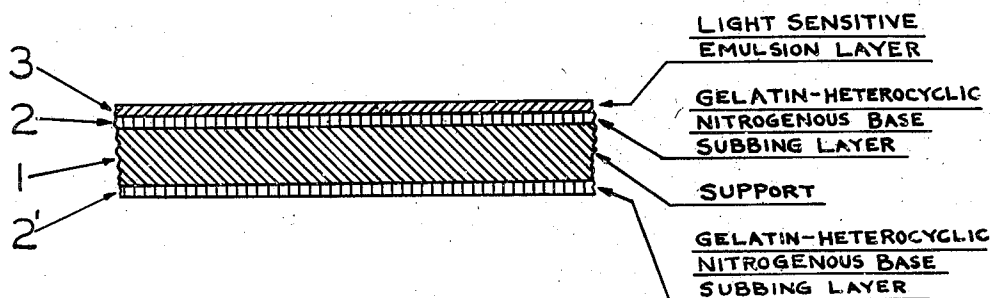


FIG. 2



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GELATIN SUBBING COMPOSITION

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3 Claims. (Cl. 106—135)

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This invention relates to photographic film and particularly to subbing compositions therefor.

It is known that a gelatino silver-halide emulsion will not adhere to an untreated film base. An intermediate or subcoating layer is necessary to prevent frilling of the gelatin layer when wet, or stripping when dry. Since hardened gelatin, as used for glass plates does not adhere to a film base, it is necessary to use a mixture of gelatin with an organic solvent for the material of the film base, such as acetone, ethyl acetate, an alcohol-ether or an alcohol-acetone mixture. Gelatin is insoluble in these organic solvents and the film base is insoluble in water, but it is possible to prepare dispersions consisting of gelatin in a mixture of one of the organic solvents and water with a volatile organic acid, such as acetic acid, and the like, as a dispersing agent.

Many volatile and non-volatile organic acids have heretofore been used as dispersing agents for the gelatin in subbing compositions. It has been found, however, that the use of these acids causes a decrease in sensitivity and artificial ageing of the gelatino silver-halide emulsion layer. This effect is due primarily to the acidic nature of the dispersing agent. Moreover, subbing solutions containing a dispersing agent possessing acidic characteristics have the tendency to corrode the film-making machinery and the solvent recovery system which is customarily a part thereof.

The present invention has as an object to overcome the above-mentioned difficulties and to provide a method of dispersing gelatin in a subbing composition by means of dispersing agents, which will not desensitize and artificially age the gelatino silver-halide emulsion layer and which will not corrode the film-making machinery or solvent recovery system connected therewith.

Another object is to provide a non-desensitizing, non-corrosive dispersing agent for gelatin in subbing compositions.

A further object is to provide a new type of gel solution in which the gelatin is dispersed by means of a non-desensitizing, non-corrosive dispersing agent, which has no adverse effect upon photographic gelatino silver-halide emulsions.

Other objects will appear from the following description.

These objects are accomplished by the use of heterocyclic nitrogenous bases as dispersing agents in gelatin subbing compositions. As suitable hydrogenated heterocyclic nitrogenous bases may be mentioned, N-methyl morpholine, pyr-

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roline, pyrrolidine, piperidine, N-methylpiperidine, 2-methylpiperidine, and the like.

The amount of the above-mentioned heterocyclic nitrogenous bases, which may be employed as a dispersing agent, may vary over a small range, such as for example, from about 0.04% to 1%, and preferably from 0.05% to 0.07%. The gelatin may range from about 0.5% to 1.5% and preferably from 0.5% to 1.0%, and the water from about 2.5% to 7.5%, the balance being substantially an organic solvent or mixture of such solvents. All proportions are by weight.

The subbing compositions are made by mixing the components in various ways in proportions so as to form a free flowing composition which dries or sets within a reasonable length of time and forms a thin layer on a film base. In general, it is desirable to dissolve the heterocyclic nitrogenous base (dispersing agent) in water and add to it the gelatin until the gelatin is dispersed. Slight warming and agitation will facilitate the dispersion of the gelatin in the aqueous solution of the heterocyclic nitrogenous base. The organic solvent or mixtures thereof are then mixed with the aqueous dispersion of gelatin, and the solution thus obtained is deposited on a film base in any convenient manner, such as by beading, immersion, roll application, or otherwise, the subbing operation preferably being carried out in connection with, or as a part of, the process of making the film support itself. The subbing solutions made up as above described are milky-white dispersions of gelatin in the solvent mixture and have a pH of about 7.0 or slightly above depending, of course, upon the concentration of the heterocyclic nitrogenous base employed.

The film bases used in accordance with this invention are the cellulose derivatives, e. g., cellulose nitrate, cellulose acetate, and other lower fatty acid esters of cellulose including simple and mixed esters, such as cellulose propionate, cellulose butyrate, cellulose acetate-propionate, cellulose acetate-butyrate and the like, ethers of cellulose, such the methyl ether, ethyl ether and the like, and the fusible, water-insoluble, synthetic linear superpolymers used for film elements as described in United States Patents 2,071,250-2-3 and 2,130,948. It will be appreciated that each different type of cellulose ester, ether and mixtures thereof, including the synthetic linear superpolymers, requires a slightly different solvent or solvent combination. The solvent or solvent mixture employed must be such that it will have a solvent or at least a

softening or swelling action on the cellulose derivative and the synthetic linear superpolymer support so as to stick or anchor the gelatin upon the area of the support which has been softened or swollen.

Various solvents may be used for the gelatin subbing compositions and these solvents may be chosen according to their action on the film support used. For example, with a cellulose acetate or a superpolymer base a low molecular weight alcohol, e. g., methanol, ethanol, and the like, or a ketone, such as acetone, or a mixture of alcohol and acetone may be employed. The ratio of alcohol to acetone ranges from about 50-50% to 75-25%, respectively. With cellulose acetate-propionate film base, an alkyl ester, such as, for example, methyl acetate, ethyl acetate, butyl acetate, and the like, either alone or with 1,4-dioxane, may be effectively employed. It may be mentioned at this point that the nature of the organic solvent or solvent mixture is immaterial so long as it wets or bites into the cellulose derivative and superpolymer film base material, and the term "solvent" as used in the claims should be so construed. Since the materials suitable for film base and their solvent properties are known, no difficulty is presented in selecting a suitable solvent or solvent mixture for use in the subbing compositions.

In the accompanying drawing the various figures are section views of a number of modifications of photographic film made according to the present invention.

As shown in Figure 1, the support 1 is provided with a subbing layer or coating 2 deposited from a dispersion of gelatin and a heterocyclic nitrogenous base with a light-sensitive emulsion layer 3 deposited on said subbing layer.

Figure 2 illustrates a film in which the both sides of the support 1 are coated with subbing layers 2 and 2'. The light-sensitive emulsion layer 3 is deposited on the subbing layer 2.

When a film base is to be prepared having a gelatin non-curl backing layer, an anti-static, or on an anti-halation layer on the side opposite the light-sensitive layer, the construction illustrated in Figure 2 is preferred. In this construction the subbing layer 2' serves as a non-curl backing layer. As an alternative, an anti-static layer or an anti-halation layer may be deposited on the subbing layer 2'.

The invention will be further illustrated but is not intended to be limited by the following examples.

Example I

A film base of cellulose acetate was coated with the following subbing solution:

	Parts
Gelatin	1.0
Water	5.0
Piperidine	0.05
Methanol	74.45
Acetone	19.50

After the subbing layer had dried, the usual light-sensitive emulsion layer was coated directly on it. After exposure and processing the emulsion adhered tenaciously to the cellulose acetate film support.

Example II

A film base of cellulose acetate-propionate having an acetyl content of 30% was coated with the following subbing solution:

	Parts
Gelatin	1.0
Water	5.0
Pyrrolone	0.07
Acetone	74.00
Ethanol	20.0

After the subbing layer had dried, the usual light-sensitive emulsion layer was coated directly on it. After exposure and processing the emulsion adhered tenaciously to the cellulose acetate-propionate film support.

Example III

A film base prepared from a synthetic linear superpolymer i. e., polyhexamethylene adipamide, of an intrinsic viscosity of 1.12, was coated with the following subbing solution:

	Parts
Gelatin	1.0
Water	5.0
Piperidine	0.05
Methanol	32.00
Acetone	62.00

After the subbing layer had dried, the usual light-sensitive emulsion layer was coated directly on it. After exposure and processing the emulsion adhered tenaciously to the synthetic linear superpolymer film support.

The photographic film bases produced according to the present invention were found to be entirely satisfactory and to give the customary physical requirements, such as extreme strength, flexibility, and good water-resistance.

The small quantity of heterocyclic nitrogenous base which may remain with the gelatin after evaporator of the water and organic solvent from the subbing composition, has no adverse effect upon the light-sensitive emulsion layer, nor has the subbing composition any adverse effect upon the containers in which it is stored, or upon the coating equipment employed.

It will be understood that wherein the claims appended hereto the term "subbing" is used, that such is intended to include the operation of dispersing a subbing layer from any one of the subbing compositions prepared in accordance with the present invention.

While the present invention has been described in considerable detail with reference to certain preferred procedures, materials, and uses, it is understood that the class of heterocyclic nitrogenous bases and their use as dispersing agents for gelatin is not limited thereto and that numerous variations and modifications described in the foregoing specification may be made. As for example, a mixture of two or more of the heterocyclic nitrogenous gases may be employed as dispersing agents.

It is also understood that all the broad examples of the present invention include the preparation of gelatin solutions in general, in which the gelatin is dispersed in the solvent by means of heterocyclic nitrogenous bases, or mixtures thereof. All such modifications and variations are within the scope of the invention as defined by the appended claims.

I claim:

1. A gelatin composition, suitable for subbing a photographic cellulose derivative film base, consisting of a small amount of water, a volatile organic solvent for said film base incapable of dissolving gelatin, and as a dispersing agent for the gelatin a hydrogenated heterocyclic nitrogenous base selected from the class consisting of

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N-methylmorpholine, pyrroline, pyrrolidine, piperidine, N-methylpiperidine, and 2-methylpiperidine.

2. The composition as defined in claim 1 wherein the hydrogenated heterocyclic nitrogenous base is piperidine. **5**

3. The composition as defined in claim 1 wherein the volatile organic solvent is a mixture of methyl alcohol and acetone. **10**

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