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PHOTOSENSITIVE MATERIAL AND PROCESS OF MAKING SAME
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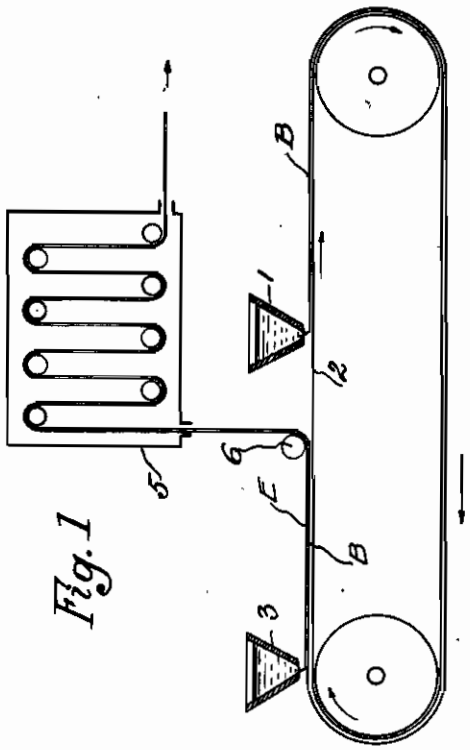
Fig. 2

Fig. 1



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PHOTOSENSITIVE MATERIAL AND PROCESS OF MAKING SAME

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This invention relates to improvements in photosensitive material and to a process of making such photographic material, as films and papers.

It is an object of the invention to provide emulsions of silver halide dissolved in volatile organic solvents and directly united with the emulsion carrier without requiring any pretreatment of the carrier.

Another object of the invention is to provide a process in which the application of this emulsion is carried out in a single train of operations together with the production of the carrier of the emulsion.

Photosensitive emulsions of silver halides with organic volatile solvents are known. The invention has the object of utilizing the high volatility of the solvent for effecting the drying of the emulsion simultaneously with the pouring of the carrier in the usual film pouring machine. Both of these components of the web material may be dried at the ordinary rate of speed at which up to now the film base alone had been dried, and the material leaves the pouring machine ready for being reeled up on film spools.

The production of emulsions suitable for this process may be carried out by adding to, or commingling with, the esters of cellulose or any other soluble organic colloids having a charge of a certain polarity, some halide silver salts having a charge of the opposite or the same polarity. Types of these emulsions are described in a pending application of the same inventor. While they may have distinct characteristics depending upon the polarity of the ingredients, they have the quality, common to both types, that they are stable in organic solvents of great volatility without any segregation occurring. Both types, furthermore, are adapted, upon being poured out in the form of flat layers, to constitute after drying a durable photographic material ready for developing and adapted to retain its qualities for a long time. This material, therefore, has the same desirable qualities as silver bromide gelatine.

The above identified emulsions are distinguished by this greater stability and other valuable qualities from the emulsions formed from collodion in organic volatile solvents. The collodion emulsions segregate the emulsified silver bromide as a precipitate, and this precipitate must, therefore, be re-emulsified prior to its use, as for instance by long-continued shaking of the liquid. The collodion emulsions of silver bromide when poured in the form of a film generally can be employed in wet condition only; in dry condition they are detrimentally affected in the developer (formation of a veil) even though they have not been exposed.

It had been suggested heretofore to introduce some additional ingredients for the purpose of retaining sufficient moisture to permit the use of these collodion emulsion layers in "dry" condition. But these additional ingredients were not adapted to render these emulsions strong enough to withstand shipping conditions and storage, and particularly to render them durable enough for being kept in stock for considerable time.

The emulsions produced by the process of the present invention, although dissolved in organic volatile solvents are eminently suitable for photographic purposes, durable enough to be kept in stock and at the same time are adapted to be converted into dry layers by pouring. They may be poured directly upon the film base to form a firmly adherent light sensitive coating thereon, without requiring a preliminary treatment of the film base rendering the latter adhesive, as had been the practice heretofore when photographic layers were poured upon a film.

The present process utilizes as organic volatile solvents for the photosensitive layer those compounds which have no dissolving power or a very small dissolving power only for the film base.

Ordinarily, if for instance an emulsion of acetyl cellulose and silver halide is poured on a film base of acetyl cellulose, the film as well as the emulsion would be soluble in acetone. It will then suffice to modify, by means of supplementary water, the acetyl cellulose which has the lower acetyl index, as required for the solution of said cellulose so as to differentiate the dissolving power of the acetone for the two acetyl celluloses employed. The acetyl cellulose emulsion may then be applied to the acetyl film base by pouring without in any way being commingled with, or merging into, the same. The emulsion then forms a distinct layer, the pouring of which may be effected upon the dry acetyl film without softening or deforming the film. The layer of emulsion, however, after having become dry on the film base can again be peeled or stripped off of the film. But, if the liquid acetyl cellulose emulsion is mixed with a solvent of a higher boiling point which exerts a dissolving effect upon both layers of acetyl, as for instance, pyrantone, the layer of emulsion will be dried, and at the same time be cemented onto the film base so as to adhere permanently thereto.

According to the present process, the emulsions

after having been dissolved in organic volatile solvents of the type mentioned, are united with the film so as to be directly cemented onto the same without any pretreatment of the film base becoming necessary. In this manner the entire process will be greatly simplified, inasmuch as the application of the emulsion may take place by pouring simultaneously with the production of the film in the pouring machine.

For this purpose the film pouring machine is provided with a second spout to apply the acetyl cellulose emulsion to the film base. This second spout applies the emulsion to that point of the base film at which the film after having passed through the hot air shaft is thoroughly freed of all solvent. The average base film has a thickness of 15/100ths millimeter and the layer of emulsion has a thickness of about 0.01 millimeter only. It is obvious, therefore, that the film base will require a far longer period for drying than the emulsion coating. The coating is poured onto the film base after the latter has become quite dry, and hence the first pouring producing the film base is effected centrally of the film pouring machine, and the emulsion is then applied at the front of the machine, namely at that point where at present in all machines the base film itself is poured.

It has been ascertained by practical tests using acetone as solvent, that this extremely thin coat of emulsion does not require any longer travel for drying than 2–3 meter, provided the combined material travels at the ordinary rate of speed at which the base travels, before the coat is dried and the complete film suitable for removal.

Between that point where the film in its finished form is taken off the pouring machine and that point at which the complete film is being reeled up, the material is again subjected to drying as in normal film coating machines at a somewhat higher temperature (about 70 degrees C.).

In order to prevent the freshly poured and dried film base from being partly dissolved in the solvent of the acetyl cellulose silver halide emulsion, it is advisable, even in the double pouring operation to use as solvent for the emulsion a solvent which has a differential solving effect for the film base. As set forth above, a small quantity of a relatively high boiling solvent may be added for the purpose of thoroughly cementing the emulsion coat to the base.

The volatile organic solvents of the emulsion may be recovered directly while the emulsion is poured on the base, together with the solvents of the base.

In a very similar operation also the emulsion coating may be applied to paper or cardboard using a collodion coating machine equipped for recovery of the solvent. Instead of utilizing a film base to which the emulsion is applied directly without any preliminary base treatment, a thin layer of acetyl cellulose solution dyed white by means of titanium oxide or oxide of barium may be applied (instead of the usual application of baryte) and then the operations of applying the emulsion are carried out in one uninterrupted train.

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