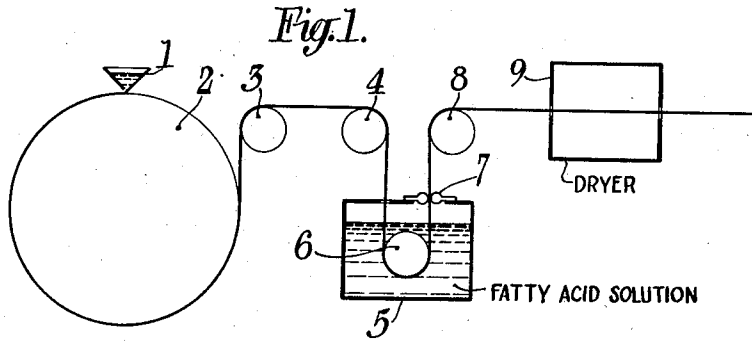
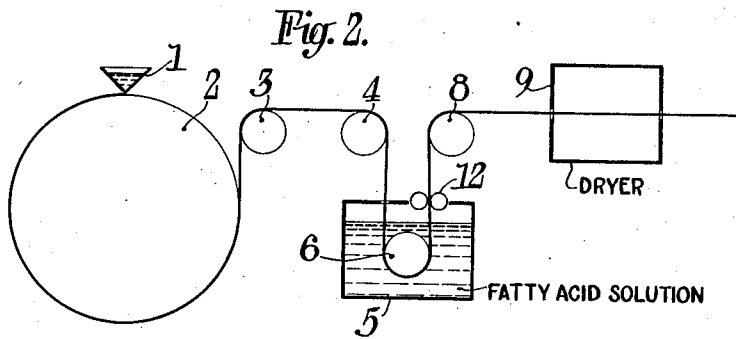
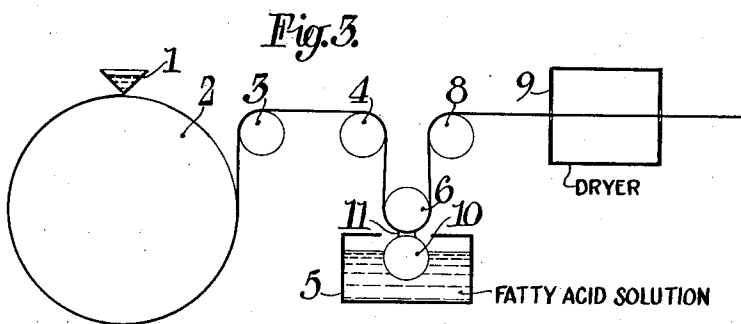


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ANTISTATIC THIN SHEETING

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ANTISTATIC THIN SHEETING

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12 Claims. (Cl. 91—68)

This invention relates to thin, transparent sheeting, and more particularly to thin sheeting made from cellulose organic esters. In recent years, thin, transparent sheeting made from gelatin, regenerated cellulose, cellulose esters, etc. has become widely used for wrapping all sorts of articles. Large quantities of such sheeting are at present employed in packaging by means of automatic packaging machinery.

The usual processes of making thin sheeting involve the spreading of a solution on a very smooth surface, and its solidification thereon. In sheeting of the thinness of that employed for wrapping purposes, the side of the sheeting away from the smooth forming surface is usually not quite so smooth as that next to the forming surface. The slight difference in smoothness of the two surfaces of the sheeting has a tendency to cause the sheeting to jam in the packaging machine. In the case of sheeting made from cellulose organic esters, such as cellulose acetate, this tendency to jam in the machine is considerably augmented by the static charges of electricity which accumulate on the sheeting as a result of the high dielectric constant of the cellulose organic ester. This tendency may be lessened by coating the sheeting with suitable moisture-proofing compositions. Moisture-proofing, however, considerably increases the cost of the sheeting, and as there are many uses for transparent, thin sheeting for which moisture-proofness is not required, it is highly desirable to find a less expensive process for treating thin sheeting to render it capable of running smoothly through the packaging machines. Such a process, and sheeting produced thereby, constitute objects of our invention. Other objects will hereinafter appear.

We have discovered that thin sheeting made from cellulose organic esters, such, for instance, as cellulose acetate, cellulose acetate propionate, and the like, can be prevented from accumulating heavy static charges and given the ability to be run through automatic packaging machinery without jamming by coating it, either on its relatively rough side or on both sides, with a very thin coating of a solid fatty acid, such, for instance, as stearic acid or palmitic acid. This may be accomplished by applying to the sheeting a dilute solution of the acid in a liquid which does not dissolve or materially swell the sheeting material.

The solvents for the solid fatty acids which we prefer to use are volatile hydrocarbons, such as toluene, benzene, low-boiling naphthas such as ligroin, and mixtures thereof. When the low-

boiling naphthas are used alone, the conditions should be such that they do not evaporate so rapidly as to cause local cooling and consequent spotty or hazy coatings. We prefer to use toluene or a mixture of toluene and ligroin, although analogous liquids will occur to those skilled in the art.

We may use a pure solid fatty acid, such, for instance, as pure stearic acid or pure palmitic acid, or we may use a mixture of solid fatty acids, such as commercial stearic acid, which contains about equal proportions of stearic and palmitic acids.

The concentration of the fatty acid in the solvent should be low, in order that a clear, brilliant, transparent coating may be obtained which will not turn hazy when the sheeting is exposed to very high humidities. We have found concentrations of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ satisfactory. A concentration of 1% of fatty acid in the solution gives a coating which is apt to turn hazy when the sheeting is stored at room temperature and humidities of from 90–100%. The maximum allowable amount of solid fatty acid on each side of the finished sheeting is approximately 0.00001 lbs. of fatty acid per square foot of sheeting if a clear coating is to be assured, although it will be apparent that more fatty acid per square foot, i. e. a higher concentration of fatty acid in the coating liquid may be employed, if clarity is not a prime factor.

In addition to running smoothly through the packaging machines, thin sheets of cellulose organic ester coated with solid fatty acid do not adhere to each other when stacked, as is the case with uncoated sheeting. This has the advantage of making it easy to remove a sheet from the pile. Thin sheeting of cellulose organic esters coated with solid fatty acid can be cemented with the same cements which are used for the uncoated sheeting. Furthermore, the scrap sheeting can be dissolved and used without removing the fatty acid, as a small amount of the solid fatty acid is tolerated by the solutions used in sheeting manufacture, and has no deleterious effect upon the product.

While we have described the application of solid fatty acid to thin sheeting made of cellulose organic esters, it will be understood that we may employ these coatings on any thin sheeting, whenever it is desirable to reduce friction or static, such as regenerated cellulose, cellulose nitrate, or the like, in addition to organic ester sheeting. A solvent which does not dissolve or swell the sheeting should, of course, be employed.

In the accompanying drawing, forming a part hereof, are represented various forms of apparatus for carrying out our invention. In the drawing, corresponding numbers refer to corresponding parts. In Fig. I, 2 represents a coating roll or casting wheel of known character, such as is used in the manufacture of photographic film, on which the cellulose organic ester solution is spread by means of a hopper 1 set to deliver the required amount of solution, and dried to form a thin sheet. The thin sheeting is stripped from the roll at the side, about three-quarters of the way around the wheel from the hopper, passes over guide rolls 3 and 4, and under the guide roll 6 immersed in the fatty acid solution in tank 5. The tank should be suitably covered to prevent escape of solvent. As the coated sheeting emerges from the tank, it passes between scraper bars 7 which remove from it any excess solution which clings to its surface. The sheeting then passes over a guide roll 8 and into a dryer represented at 9.

Fig. II represents an apparatus similar to that shown in Fig. I, except that in place of scraper bars, scraper rolls 12 are used to remove the excess of fatty acid solution from the sheeting.

The apparatus shown in Figs. I and II is suitable for use when it is desired to coat both sides of the sheeting with fatty acid. When it is desired to coat only the relatively rough side of the sheeting, an apparatus such as is shown in Fig. III may be used. In this arrangement, the guide roll 6 does not dip into the fatty acid solution. A roll 10 below roll 6 is partly immersed in this solution. The roll 10 does not quite touch the sheeting traveling around roll 6, but comes so close to it that the layer of fatty acid solution which it carries up from the tank 5 is drawn up against the sheeting by capillarity, forming a "bead" of the solution between the two rolls, as shown at 11, and thus coating the sheeting.

While we have above described our invention with reference to the treatment of fully cured, or substantially fully cured, sheeting with a solution of the fatty acid in a liquid which does not dissolve or materially swell the sheeting, it may also be applied with equally satisfactory results in accordance with the procedure outlined in the co-pending application of Jackson B. Wells, Serial No. 673,037, filed May 26, 1933, in which case the stearic acid solution may be applied to the sheeting before removal from the casting surface and while it still contains a relatively considerable amount of residual solvent. In this latter event, the fatty acid may be dissolved in a liquid which is a non-solvent or even a solvent for the cellulosic sheeting since, while the sheeting is supported upon and adhering to a coating surface, there is no danger of wrinkling due to solvent action of the coating. For instance, the fatty acid solution employed may be one of those earlier described in this specification, or it may be one formed by dissolving approximately the same proportion of fatty acid in a liquid which has more or less solvent action upon the uncured sheet, such as acetone, acetone-butyl acetate, or the like.

What we claim as our invention and desire to be secured by Letters Patent of the United States is:

1. Thin, transparent, non-fibrous sheeting,

adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of solid fatty acid.

2. Thin, transparent sheeting of cellulose organic ester, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of solid fatty acid.

3. Thin, transparent sheeting of cellulose acetate, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of solid fatty acid.

4. Thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of stearic acid.

5. Thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of palmitic acid.

6. Thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of a mixture of stearic and palmitic acids.

7. Thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, coated on at least one side with a permanently clear layer consisting essentially of solid fatty acid, the layer weighing not more than 0.00001 pound per square foot of surface.

8. A process of depositing on thin, transparent, non-fibrous sheeting, adapted for wrapping purposes, a permanently clear layer consisting essentially of solid fatty acid, comprising applying to the sheeting a solution of solid fatty acid, of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ concentration, approximately, in a liquid which does not dissolve or materially swell the sheeting.

9. A process of depositing on thin, transparent, cellulose acetate sheeting adapted for wrapping purposes, a permanently clear layer consisting essentially of solid fatty acid, comprising applying to the sheeting a solution of solid fatty acid, of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ concentration, approximately, in a liquid which does not dissolve or materially swell the sheeting.

10. A process of depositing on thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, a permanently clear layer consisting essentially of solid fatty acid, comprising applying to the sheeting a solution of solid fatty acid, of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ concentration, approximately, in a hydrocarbon composition.

11. A process of depositing on thin, transparent, non-fibrous sheeting, adapted for wrapping purposes, a permanently clear layer consisting essentially of solid fatty acid, comprising applying to the sheeting a solution of solid fatty acid, of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ concentration, approximately.

12. A process of depositing on thin, transparent, cellulose acetate sheeting, adapted for wrapping purposes, a permanently clear layer consisting essentially of solid fatty acid, comprising applying to the sheeting a solution of solid fatty acid, of from $\frac{1}{4}\%$ to $\frac{7}{8}\%$ concentration, approximately.

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