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TEXTILE LUBRICANT

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This invention relates to the treatment of textile materials and relates more particularly to the lubrication and conditioning of fibers and filaments having a basis of cellulose acetate or other organic derivative of cellulose to render the same more amenable to textile operations such as carding, drafting, spinning, twisting, coning, pining, hanking, weaving, knitting, and the like.

An object of this invention is the provision of an improved conditioning agent for the treatment of textile materials such as filaments and fibers having a basis of cellulose acetate or other organic derivative of cellulose to render said textile materials more amenable to textile operations.

Another object of this invention is the provision of a single-application conditioning agent adapted to be applied to cellulose acetate or other organic derivative of cellulose filaments as said filaments emerge from the spinning cabinet in which they are formed, for lubricating and conditioning the same for the numerous textile operations to which said materials are subjected, either in continuous filament or staple fiber form, prior to being processed to a finished fabric.

A further object of this invention is the conditioning of cellulose acetate or other organic derivative of cellulose staple fibers with a new and improved conditioning agent which renders the cellulose acetate or other organic derivative of cellulose staple fibers treated therewith anti-static and eminently suitable for processing into spun yarns on the cotton system.

Other objects of this invention will appear from the following detailed description.

Various compositions comprising vegetable, animal and mineral oils, both normal and specially treated, in combination with various other substances have been employed for lubricating and conditioning filaments and staple fibers having a basis of cellulose acetate or other organic derivatives of cellulose to render the same more amenable to the various textile operations generally employed in forming said materials into fabrics. In order to process continuous filaments of cellulose acetate or other organic derivative of cellulose material into staple fiber suitable for the production of fine spun yarns, the continuous filaments are usually treated with a suitable lubricant composition as they emerge from the spinning cabinet or metier in which they are formed and then, after a plurality of said lubricated continuous filaments are asso-

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ciated together in the form of a bundle or tow, a separate conditioning agent is applied thereto in the desired amount. The lubricated and conditioned continuous filaments thus obtained are then severed into staple fibers of the desired length.

The lubricating composition is applied to impart a suitable degree of flexibility as well as desirable frictional qualities so that the staple fibers obtained when the continuous filaments are cut may be processed satisfactorily into fine spun yarns. The conditioning agent is applied to said filaments to render the staple fibers anti-static so as to avoid the generation of excessive static electricity which would render processing exceedingly difficult if not impossible. The lubricating and conditioning compositions are applied separately because they are incompatible and, if said compositions are mixed prior to application, they do not produce the desired lubricating and conditioning action. The separate application of each of said compositions is not only uneconomical but is also quite inconvenient. The development of a single composition which could be applied, for example, to continuous filaments of cellulose or other organic derivatives of cellulose as they emerge from the spinning cabinet or metier where they are formed, which will produce the desired lubricating and conditioning action on cellulose acetate or other organic derivative of cellulose staple fiber materials and which is prepared with only a limited number of easily available components has long been sought.

We have now found that staple fibers of cellulose acetate or other organic derivative of cellulose materials may be satisfactorily lubricated and conditioned for spinning operations by the application thereto of a single-application lubricating and conditioning composition comprising a partial ester of phosphoric acid with a long chain aliphatic alcohol, an alkylolamino ester of a long chain aliphatic acid, an alkylolamine such as triethanolamine, diethanolamine, triisopropanolamine or 2-amino-2-methyl-1-propanol and an alkyl phenol such as diamyl phenol, triamyl phenol or dibutyl-m-cresol all mixed into mineral oil in suitable proportions. Although our novel composition is free of sulfonated and/or sulfated compounds, not only is the composition thoroughly dispersed over the fibers on application thereto but the fibers obtained are completely anti-static so that a superior degree of lubrication and conditioning is achieved.

The long chain aliphatic acid alkylolamino es-

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ter which we employ in our novel composition is obtained by reaction of an alkylolamine, such as triethanolamine, diethanolamine, triisopropanolamine or 2-amino-2-methyl-1-propanol with a mixture of straight chain aliphatic acids comprising essentially lauric acid and having an average of about 11 to 12 carbon atoms in the alkyl chain, exclusive of the carboxyl group present. The carbon chain length usually varies from about 10 to 18 carbon atoms. This aliphatic acid mixture may be obtained as a product of the saponification of commercial cocoanut oil. The saponification reaction yields glycerin and the desired mixture of long chain aliphatic acids which may be separated from the glycerin in a suitable manner and then esterified to yield the desired alkylolamine ester. In forming the aliphatic acid alkylolamine ester, the hydroxy radical of the carboxyl group of the long chain aliphatic acids reacts with one of the hydroxy groups of the triethanolamine, for example, splitting off water and forming the diethanolamine-ethyl ester of the long chain aliphatic acid. The reaction may be effected employing the necessary stoichiometric proportions of the long chain aliphatic acid mixture and triethanolamine at a temperature of about 110° C. and continuing the reaction until the viscosity of the reaction product is reduced to about 320 to 340. The reaction may be effected at temperatures up to about 200° C. employing any alkylolamine and fatty acid or mixture of fatty acids which is not volatile at the temperature employed. The viscosity is determined in the Saybolt Universal viscometer at 100° F. and, where the term "viscosity" is embodied herein-after, it is to be understood as being that obtained in the Saybolt Universal viscometer at a temperature of 100° F.

In forming the desired phosphoric acid partial ester of a long chain aliphatic alcohol, the desired alcohol, such as lauryl alcohol, n-octyl alcohol, n-decanol, n-nonyl alcohol or n-undecyl alcohol for example, is reacted with a slight stoichiometric excess of phosphorus pentoxide to form a primary phosphoric acid ester. In carrying out the reaction the temperature is preferably maintained at about 110° C. with stirring until reaction is completed. We preferably employ n-decanol in forming the primary phosphoric acid ester since the n-decyl phosphoric acid, surprisingly enough, has a lower viscosity than the other corresponding esters, and, therefore, yields a composition of a more desirable viscosity.

Our novel composition preferably comprises from 5 to 15 parts by weight of the partial ester of phosphoric acid with n-decanol, 10 to 30 parts by weight of the diethanolamine-ethyl ester of lauric acid, 1 to 4 parts by weight of triethanolamine and 1 to 4 parts by weight of diamyl phenol blended into 50 to 70 parts by weight of acid refined, white mineral oil having a viscosity of 45 to 100.

In forming said lubricating and conditioning compositions, the components are preferably combined by adding the n-decyl phosphoric acid partial ester to the mineral oil, with stirring, followed by the addition of the diethanolamino-ethyl ester of the long chain aliphatic acids, the triethanolamine and the diamyl phenol. Stirring is continued until a smooth homogeneous blend is obtained.

In order further to illustrate our invention, but without being limited thereto, the following examples are given:

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Example I

A mixture of 660 parts by weight of mixed cocoanut oil fatty acids, comprising essentially lauric acid, and 440 parts by weight of commercial triethanolamine are charged into a jacketed reaction vessel. The mixture is raised to a temperature of 160 to 165° C. with steam under pressure and the reaction is effected with continuous stirring until the viscosity of the reaction product levels off to about 320 to 340. Cold water is then circulated through the jacket of the vessel and the reaction product is cooled to room temperature. The product obtained comprises essentially the diethanolamino-ethyl ester of lauric acid.

Example II

100 parts by weight of n-decanol are introduced into a jacketed reaction vessel provided with a steam coil. With cold water flowing through the jacket, 30 parts by weight of phosphorus pentoxide are introduced into the reaction vessel over the course of about 15 minutes while stirring continuously. The reaction temperature rises to about 120° C. and then gradually goes down to about 105 to 110° C. The reaction mixture is maintained at this temperature by the intermittent use of steam in the heating coil. Reaction is continued at this temperature for about 3 hours while circulating the mixture through the vessel, the mixture being continuously withdrawn from the base of the vessel and reintroduced at the top. The product obtained at the end of the reaction is a clear solution of medium brown color comprising essentially the primary phosphoric acid ester of n-decanol, the alcohol radical replacing one of the hydrogens of the phosphoric acid.

Example III

The novel lubricating and conditioning agent of our invention is prepared by blending the compounds prepared in accordance with Examples I and II into mineral oil in suitable proportion together with the desired amount of triethanolamine and diamyl phenol.

Thus, 60 parts by weight of acid-refined white mineral oil having a viscosity of 50 are introduced into a blending vessel, 9 parts by weight of the primary n-decyl phosphate, prepared in accordance with Example II, then added followed by the addition of 20 parts by weight of the diethanolamino-ethyl ester of lauric acid prepared in accordance with Example I. To the mixture obtained are then added 2.5 parts by weight of triethanolamine and 2.5 parts by weight of diamyl phenol and the whole stirred until a smooth, homogeneous mixture is obtained. The resulting mixture comprises the improved single action lubricating and conditioning agent of our invention.

Our novel composition may be applied directly to continuous filaments of cellulose acetate or other organic derivative of cellulose to condition the same for all textile operations and more particularly, for spinning operations after said lubricated and conditioned continuous filaments have been cut to staple fiber lengths. The lubricating and conditioning agent of our invention is particularly advantageous in that it may easily be applied to said continuous filaments at the metier or spinning cabinet where said filaments are formed. In addition, said composition imparts a very desirable hand to treated staple fiber, prevents card loading and lickerin loading

in processing said treated staple and imparts very satisfactory spinning characteristics thereto, particularly when said treated cellulose acetate or other organic derivative of cellulose staple fiber is spun on the cotton system. Furthermore, the composition is anti-static, non-corrosive and its lubricating and conditioning action is unaffected and unchanged over widely differing conditions of temperature and humidity.

Examples of other organic derivative of cellulose materials which may be lubricated and conditioned with said composition are cellulose esters such as cellulose propionate, cellulose butyrate, cellulose acetate-propionate and cellulose acetate-butyrate and cellulose ethers, such as ethyl cellulose and benzyl cellulose. Our novel composition may also be employed for lubricating and conditioning other textile materials.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. A lubricating and conditioning composition consisting essentially of a mixture of 5 to 15 parts by weight of the primary ester of phosphoric acid

with n-decanol, 10 to 30 parts by weight of the diethanolamino-ethyl ester of lauric acid, 1 to 4 parts by weight of triethanolamine and 1 to 4 parts by weight of diamyl phenol blended into 50 to 70 parts by weight of mineral oil.

2. A lubricating and conditioning composition comprising essentially of a mixture of 9 parts by weight of the primary ester of phosphoric acid with n-decanol, 20 parts by weight of the diethanolamino-ethyl ester of lauric acid, 2.5 parts by weight of triethanolamine and 2.5 parts by weight of diamyl phenol blended into 60 parts by weight of mineral oil.

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