

1

3,563,892

TEXTILE-TREATING COMPOSITION AND PROCESS
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3 Claims

ABSTRACT OF THE DISCLOSURE

A novel composition of a major portion of coconut oil and minor portions of (a) the sodium salt of sulfated glyceryl trioleate, (b) a condensate of 1 mol of nonylphenol with 5.5 mols of ethylene oxide, and (c) a mixture of mono- and diglycerides of oleic acid is formulated and used as an excellent lubricant for polyester filaments during the drawing operation. This composition is also utilized on the filaments with an additional overlay finish composition.

Specific textile-treating compositions for synthetic filaments are disclosed in the art and are directed to the solution of specific problems or special processing conditions. As a consequence, changed conditions can render such compounds unsuitable and may even give rise to deleterious effects. Compositions that overcome the problems due to volatilization of low viscosity lubricants in high-temperature processing can be deficient in lubricity functions especially if such compositions tend to become tacky in use.

The composition of the present invention provides improved lubricity for synthetic filaments particularly when the filaments are being treated at elevated temperatures.

The improved lubricating composition of this invention can be applied to synthetic yarns. The composition consists essentially of (a) a major portion of coconut oil, e.g. about 63–67 parts by weight and minor portions of (b) the sodium salt of sulfated glyceryl trioleate, e.g. about 13–17 parts by weight, (c) the condensate formed from 1 molecular proportion of nonylphenol with 5.5 molecular proportions of ethylene oxide, e.g. about 8–12 parts by weight and (d) a mixture of mono- and diglycerides of oleic acid, e.g. about 8–12 parts by weight. The critical blend from these components is especially suited to the lubrication of polyester filaments at elevated temperatures. Further, its compatibility with other treating materials contributes to the efficiency of textile operations.

The composition of this invention is distinguished by its ability to lubricate synthetic filaments, particularly polyester filaments, when they are drawn in a process using an elevated temperature. The filaments may be drawn in various ways such as in a hot draw bath disclosed in Dusenbury, U.S. Pat. No. 3,091,805, dated June 4, 1963, also they may be drawn while passing over heated surfaces or while being heated by high velocity steam in a steam jet. The novel composition when coated on a yarn shows a reduction in yarn breaks per pound of yarn.

Yarn performance during the drawing process is related to the viscosity of its lubricating finish composition and, in general, when these finish compositions are prepared from similar chemical compounds, those with the lowest viscosity can be expected to provide the highest drawing performance. The lubricating composition of this invention will have the lowest viscosity with the highest coconut

2

oil content. However, coconut oil is difficult to emulsify and when an aqueous draw bath is used, the upper limit for this oil becomes about 65%, by weight, because of difficulties brought about by unstable emulsions.

The emulsifier system used for the coconut oil is a combination of ionic and nonionic emulsifiers. The complementing action of these two types of components has been found to give good emulsion stability at the high lubricant level in the composition without adversely affecting the lubricity and heat stability of the overall composition.

In addition to these ingredients, there may be present minor amounts of additives such as buffering agents, tints, emulsification assistants, biocides and the like. The total amount of the additives should not exceed about 5% of the weight of the composition and preferably no individual additive will exceed about 2% of the total weight.

As indicated above, the composition of this invention is applied to the polyester filaments by treatment with an aqueous emulsion. Preferably, the concentration of the emulsion will be between 1 and 5%, by weight, but concentrations as high as 25% may be used.

Application should provide the fibers with from about 0.1% to about 1.5%, preferably 0.1% to 0.7%, by weight, of the composition based on the weight of the dry, treated filaments. The amount of the composition applied to the filaments will depend on the use for which the yarn is intended and also upon the use of a subsequently applied overlay composition. The amount of overlay composition may be from about 0.2% to 2.0% and the total amount of compositions may be from 0.3% to 2.5%, by weight, based on the total weight of dry yarn. For instance, when an overlay finish is used and the yarns are to be used in a weaving operation, the composition of this invention should be about 0.5% to about 0.7% with a total (primary and overlay finish) composition content from about 1.0% to about 1.5%. It may also be desirable to keep the ratio such that the amount of overlay does not exceed twice that of the composition of this invention. When a thermally stable overlay finish is used, the composition of this invention will preferably be present from 0.1% to 0.5% with a total composition content of 0.3% to 1.0%. Other end uses will, of course, require other optimum amounts.

As described above, the composition of this invention may be used alone or in conjunction with other yarn-treating compositions. In a preferred embodiment of the invention, the composition is utilized with compositions whose viscosity is not appreciably affected by changes in relative humidity. Such compositions are described in Olsen U.S. Pat. No. 3,306,850, dated Feb. 28, 1967. A composition of this type using a long chain fatty acid ester, e.g. isobutyl stearate and a phosphate antistat of a long chain alcohol has been found to provide an especially effective combination when it is applied to a polyester yarn carrying the composition of this invention. The resulting coated yarn exhibits excellent characteristics for weaving operations.

When yarns prepared with the composition of this invention are heated to high temperatures such as to 200° C. and above, it is desirable that they be overlaid with compositions having high thermal stability. The normal thermally stable overlay compositions based on blends containing coconut oil are especially preferred because of the compatibility of the two compositions.

As a result of the improved lubricity provided by the composition of this invention, polyester yarns can be produced at a higher quality level and in higher yield. The improved lubricity is believed to be reflected by reduced damage to the filaments as they contact guides, rolls and the like at the high-processing speeds. In processes carried out at an elevated temperature, the lubricity of the composition is believed to result in steady threadline action in the drawing zone and to maintain an effective lubricating action on the heated draw rolls and thus minimizing yarn breakage and the production of undersized or waste packages.

In the examples which follow, all parts are by weight and all percentages are by weight based on the total weight of the components.

EXAMPLE 1

This example illustrates the preparation of the composition of this invention.

Into a 20-gallon (75.7 liter), steam-jacketed, stainless steel kettle is placed 65.0 pounds (29,510 grams) of coconut oil, 20 pounds (9,080 grams) of the sodium salt of glyceryl trioleate as a 25% aqueous material [15 pounds (6,810 grams) dry weight], 10 pounds (4,540 grams) of the material obtained by condensing 1 molecular proportion of nonylphenol with 5-6 molecular proportions of ethylene oxide, 10 pounds (4,540 grams) of a mixture of the mono- and diglycerides of oleic acid and 1 pound (454 grams) of oleic acid. The materials are blended with agitation as the temperature is raised to 60° C., and 1 pound (454 grams) of triethanolamine is then added. The blend is cooled and stored at room temperature for use as required.

Emulsions of the desired concentration are prepared by adding any given amount of the blended composition to an appropriate amount of water to obtain the desired concentration. The emulsion is prepared by heating the blend to 60° C. and slowly adding it, with mild agitation, to water heated to 50° C. The emulsion may then be cooled or heated, e.g., to 95° C., as desired.

EXAMPLE 2

This example compares the performance of the composition of this invention with a known composition used in a high-temperature process.

Part A

Polyester polymer containing 2% titanium dioxide and having a relative viscosity of about 19.5 is melt-spun into a 44-filament yarn in a standard manner. The polymer is prepared from ethylene glycol and the dimethyl esters of terephthalic/5-(sodium sulfo)isophthalic acids in a mol ratio of 98/2. After the filaments are quenched and collected into a yarn, they are guided into contact with a roll rotating in a trough containing a 1.5% aqueous emulsion of the blended composition of Example 1. The yarn contains 0.5% of the blended composition. The yarn then passes to a feed roll rotating at a speed of 1260 yards (1132 meters) per minute from which it is fed to a draw bath heated to 92° C. and on leaving the draw bath passes to hot-draw rolls heated to 121° C. and rotating at 3000 yards (2742 meters) per minute. The drawn yarn has a denier of 70. The draw bath is a 1.5% emulsion of the blended composition of Example 1 and the drawn yarn contains 0.7% of the blended composition. During the production of over 3 thousand pounds (1350 kilograms) of yarn, the number of yarn breaks for each pound (454 grams) of yarn produced is only 0.02.

Part B

After being drawn, the yarn is again treated with a second, or overlay, composition to modify its lubricating and antistatic properties. Application is made by guiding the yarn into contact with a roll rotating in a trough containing the overlay composition as an 18% aqueous emul-

sion. The overlay composition consists of 65% of isobutyl stearate, 10 parts of sodium di(2-ethylhexyl)sulfosuccinate, 6 parts of the ethylene oxide condensate of Example 1, 6 parts of a condensate of 1 molecular proportion of a mixture of secondary aliphatic alcohols having from 11 to 15 carbon atoms with 3 molecular proportions of ethylene oxide, 11.7 parts of a mixture of the phosphate acid esters of the alcohol obtained from 1 molecular proportion of a mixture of secondary aliphatic alcohols having 12 to 15 carbon atoms with 3 molecular proportions of ethylene oxide and 1.3 parts of potassium hydroxide. The overlay composition and emulsion is prepared in much the same manner as that described in Example 1. The yarn contains a total of 1.25% of the treating compositions. The treated yarns then pass to an interlace jet and are then wound to a package under a tension of 27 grams.

Package delivery tensions from the above-mentioned packages were found to be essentially independent of the total amount of the compositions on the yarn. This is an important property since these tensions estimate tension behavior during subsequent operations in mills where the yarn is converted to fabric. As is well known, tension variations are associated with fabric quality.

The 1.5% emulsions described above in Part A are replaced with 1.5% emulsions of a composition consisting of 49 parts of isocetyl stearate, 24.5 parts of sodium di(2-ethylhexyl)sulfosuccinate, 24.5 parts of the material obtained by condensing 1 molecular proportion of stearyl alcohol with 3 molecular proportions of ethylene oxide, 1 part of oleic acid and 1 part of triethanolamine. This is a known composition and has been used successfully in high temperature processing. When this composition is used in the production of over 3 thousand pounds (1350 kilograms) of yarn, the number of yarn breaks for each pound (454 grams) of yarn produced rises to 0.042.

EXAMPLE 3

This example illustrates the effectiveness of this invention in preparing bulky yarns in conjunction with compositions having high thermal stability.

Polyester yarns carrying the composition of this invention are treated separately with two overlay compositions having high thermal stability. One of the overlay finishes is that of Example 1 of German Pat. No. 1,948,015 and the other is prepared from 280 grams of coconut oil, 300 grams of the sodium salt of sulfated peanut oil, 100 grams of a soft hydrocarbon wax, 250 grams of an acid phosphate ester and 33.8 grams of potassium hydroxide. The acid phosphate ester is prepared from an alcohol obtained by condensing 1 molecular proportion of nonylphenol with about 5.5 molecular proportions of ethylene oxide and contains the mono- and diester in a weight ratio of about 1 to 1. Each of these compositions are applied to separate portions of the polyester yarn and the yarns false-twist textured in a manner similar to that described in Example 1 of German Pat. No. 1,948,015. Both of the yarns show good bulk characteristics and high strength retention.

What is claimed is:

1. A lubricating composition for synthetic filaments which consists essentially of about 63-67 parts of coconut oil, about 12-17 parts of the sodium salt of sulfated glyceryl trioleate, about 8-12 parts of the condensate formed from 1 mol of nonylphenol with 5.5 mols of ethylene oxide, and about 8-12 parts of a mixture of the mono- and diglyceride esters of oleic acid.

2. A synthetic fiber containing about 0.1-1.5% by weight of the fiber of a composition consisting essentially of about 63-67 parts of coconut oil, about 13-17 parts of the sodium salt of sulfated glyceryl trioleate, about 8-12 parts of the condensate formed from 1 mol of nonylphenol with 5.5 mols of ethylene oxide, and 8-12 parts of a mixture of the mono- and diglyceride esters of oleic acid.

5

3. A product as defined in claim 2 where said fiber is a polyester fiber.

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6

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