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TREATING NATURAL AND ARTIFICIAL FIBERS

Alcidus G. Bouhuys, Enka, N. C., assignor to American Enka Corporation, Enka, N. C., a corporation of Delaware

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This application is a continuation in part of my application Serial #678,728, filed July 1, 1933.

The present invention relates to lubrication and protection of yarns, threads, filaments, textile fibers or the like consisting wholly or partially of natural or artificial materials.

After the yarn, thread, or filament has been spun or formed and the final product finished, it is subjected to considerable physical wear during the various knitting, weaving, braiding, winding, and other textile treatments or operations which it must undergo. Thus, before going into various processes such as weaving, knitting, braiding, winding, or coning, the yarns, threads, or filaments are often previously treated for their protection with oily treating liquids which form a protective film over their surface and which have some lubricating properties. So treating the yarn, threads, or filaments tends to prevent damage to them during the operations mentioned, during which operations the yarn, threads, or filaments are usually exposed to comparatively high tensions. For economic reasons, such an oil treatment of the yarn, thread, or filament is made while they are in the dry state and during the winding operations of the original yarn package.

Coning and winding oils heretofore described have the defects that yarns, threads, or filaments treated with such mixtures require either a thorough scouring before the yarn, thread, or filament is dyed, or the inclusion in the oil of such a large amount, (at least over 25%), of sulfonic acid salts of mineral oils or other known emulsifying agents as to reduce the lubricating properties of the oil to such an extent that it is impracticable for commercial use.

Among the objects of the present invention is to provide a new and improved method and composition of the character described above for lubricating and protecting yarn, thread, and filaments, and an improved protected and lubricated product.

An improvement of the compositions of the present invention over known compositions consists in that, by the admixture of a suitable combination of alkali metallic and organic base soaps hereinafter described with mineral oil sulfonic acid salts, and mineral oil, a coning oil and/or winding oil with much higher lubricating properties is obtained than has heretofore been possible, and in which any detrimental and undesirable features which might be attributed to the presence of such soaps or of a small amount of free oleic acid can be readily overcome by the addition of a suitable antioxidizing agent such as diphenylamine, resorcinol, phenol, or hydroquinone.

Among the further objects of the invention is the provision of a method which comprises protecting and lubricating fabric, yarn, thread, filaments, or textile fibers, artificial as well as natural, during mechanical operations upon them and dyeing the said materials, which method does not require the removal of the lubricating and protecting agent from the said materials in a separate operation prior to contact of said materials with dyeing agents. The invention may be applied to natural fibers, fabric, thread or yarn, such as cotton, silk, etc., or to artificial fabrics, yarn, threads, or filaments such as viscose silk, cellulose acetate silk, cuprammonia and nitro silks and the like, or mixtures thereof, eliminating the heretofore necessary step of scouring.

According to the present invention the fabric, yarn, thread or filament is impregnated with or has applied to it, in any suitable manner, a composition consisting essentially of a mixture of suitable mineral oil lubricant, a suitable alkali metal soap-like emulsifying agent such as the sodium or potassium soap of oleic acid, triethanolamine soap of oleic acid, and mahogany sulfonates or mineral oil sulfonates such as may be obtained by treating crude mineral oil stocks or naphthas with concentrated or fuming sulfuric acid and reacting upon the obtained sulfonic acids with an alkali metal hydroxide such as sodium hydroxide. These mineral oil sulfonates or mahogany sulfonates are well known and therefore need no detailed description here. It is preferable, however, to employ purified sulfonates because of their lighter color and generally more acceptable operation. As sulfonates may also be used the alkali metal salts of the sulfonic acids obtained by allowing an excess of sulfuric acid to act upon an aromatic hydrocarbon, for example, naphthalene, or benzene, in the presence of oleic acid, such sulfonic acids being sometimes known as Twitchell reagent, and the term mineral oil sulfonate as used herein is used as including these reagents as well as true mahogany or mineral oil sulfonates.

A further part of the present invention consists in utilizing in the above described composition a free fatty acid, such as oleic acid, which is particularly useful to make the soaps used as described above dissolve completely and clearly—the probabilities being that the added free fatty acid counteracts hydrolysis of the soaps used. A still further part of the invention consists in adding to the mixture of mineral oil, soaps

and mineral oil sulfonates, solvents for potassium soaps, which are as a rule difficult to prepare in the form of a clear solution, and for this purpose the following solvents may be used; monoethylether of diethyleneglycol (carbitol), monobutylether of ethylene glycol (butyl cellosolve), monobutylether of diethyleneglycol (butyl carbitol), etc.

As mineral oil any acid free, clear, colorless, or slightly colored mineral lubricating oil may be used. A chemically inert and stable mineral lubricating or paraffin oil from 30 seconds Saybolt viscosity (100° F.) up may be used. The viscosity of the oil may be even as high as 80 seconds Saybolt viscosity. However, a mineral oil with a viscosity between 30° and 70° Saybolt acts very satisfactorily. The so-called white oils, which are purified mineral lubricating oils, may be advantageously employed as the mineral oil.

The composition may be prepared by intimately mixing the various ingredients in the desired proportions, and as examples of various compositions, ranges of proportions, and what are now believed to be preferred proportions, the following are given; but it is to be understood that the invention is not limited to these specific examples:

Example 1

	Preferred proportions	Ranges of proportions
	Percent	*Percent*
Mineral oil, #30	60	40-75
Sodium salt of mineral oil sulfonic acid	9	5-14
Potassium oleate	16	5-20
Triethanolamine soap of oleic acid	9.7	4-30
Oleic acid	0.3	0.1-4
Monoethylether of diethyleneglycol	5.0	3-10
Diphenylamine	Trace.	0.01-0.1

Example 2

	Preferred proportions	Ranges of proportions
	Percent	*Percent*
Mineral oil, #50	65	40-75
Sodium salt of mineral oil sulfonic acid	8	5-12
Potassium oleate	13	5-20
Triethanolamine soap of oleic acid	9.2	4-30
Oleic acid	0.3	0.1-4
Monobutylether of diethyleneglycol	4.5	3-10
Resorcinol	Trace.	0.01-0.1

In practical use triethanolamine soap of oleic acid has proved to be very satisfactory, but the corresponding mono- and di-ethanolamine soaps may also be used. The latter two, however, may not be employed with like advantage as the former. An objection against the use of the mono- and di-ethanolamine soaps is that the elimination of soaping or scouring before dyeing, referred to herein, cannot be so well obtained and, furthermore, when using these soaps a larger proportion of free oleic acid would be necessary, and such larger proportions of oleic acid in the coning or winding oil described herein is not desirable. Monoamylamine soap of oleic acid gives very satisfactory results as a substitute soap for the triethanolamine soap, but its strong odor may prove an objection to some extent in commercial use.

The following method for preparing the composition has been found to give very successful results.

Mineral oil, in the range of proportions from 40% to 75%, is first introduced into a mixing drum, and to this is added the solvent for the soaps which is monoethylether or monobutylether of diethyleneglycol from 3% to 10%, and oleic acid. While stirring slowly, enough potassium hydroxide is added to form, from 5% to 20% potassium oleate.

After stirring this mixture for about 15 minutes, a sample is analyzed for the free fatty acid content to determine the correct amount of triethanolamine which will be required to neutralize all the acids with the exception of substantially 0.3% of calculated free fatty oleic acid in the final mixture. The calculated required amount of triethanolamine which is generally from 4% to 30% is next added slowly and the stirring continued for about 10 minutes. Finally, the mineral oil sulphonate is added in the proportion of from 5% to 14%. A trace of an antioxidizing agent such as resorcinol, diethyleneglycol or the like is added to the final mixture.

All of the ingredients used should be water-free or substantially water-free at the time the composition is made if a clear product is to be prepared. Heat may be employed to bring ingredients into solution.

Fabrics, yarn, threads and filaments which have been coated or impregnated with the composition of the present invention, either before or during the making of the fabric or other articles, may be passed into the dye bath or brought into contact with a dyeing liquid without preliminary hot soaping, scouring or similar treatment, to remove the winding oil composition or oil part thereof. The oil coating or impregnating of the fabric, yarn, threads, or filaments, on such direct entry of the oiled or lubricated material into a neutral or alkaline dye bath does not de-emulsify or break out as an oily liquid even when the dye bath contains inorganic salts added for the sake of better exhaustion of the dye bath. Examples of such inorganic salts are sodium chloride and sodium sulphate. Thus the oil or components thereof does not float on the top of the dye bath or prevent or decrease the dye absorption when the dye is in contact with the fabric, yarn or filament. The invention, therefore, also contemplates the dyeing of the fabric, yarn or filament without previously removal or substantial removal therefrom of the winding or coning oil composition by scouring.

In treating yarns, threads or filaments which weaken when wetted out, such as yarns, threads, or filaments of certain artificial materials, it is desirable that they be treated in the dry state with the composition also substantially free from water. Otherwise, the composition may be applied to the material to be treated while it is more or less in a wet condition and the composition applied to the material in this condition may or may not contain considerable water content. It is also within my invention to apply the composition substantially free of water to a substantially dry fabric, yarn, thread or filament for lubricating and protecting them during various operations to which they may be subjected in the textile industry, for example, weaving, knitting, braiding, winding or coning of threads or filaments.

Using an amine soap and alkali metal soap together in the composition as more fully set forth in Examples 1 and 2 above, has been found in practice to result in a composition of the character described with excellent properties as regards lubrication and protection, solubility or emulsifying power, stability, nonimpairment of

the dyeing process, appearance and odor of the product, elimination of washing or scouring due to the rapid emulsification of the oil with water or salts containing dye bath, prevention of adhesion of wound fiber or yarn, moisture proofing, and general applicability for the purposes intended.

The compositions described herein are usually employed between the time the fiber is formed, for example fibers of viscous silk, and the time the final product, such as woven fabric or knitted goods or other article, is finished.

The terms "lubricating", "lubrication", or "lubricating power" used herein are used to describe the property of the composition or other material which protects the yarn threads or filaments by decreasing the friction between them and the machine parts with which they come in contact and/or which decreases friction between yarn, threads, or filaments themselves.

I claim:

1. A stable homogeneous solution for the treatment of artificial threads, filaments, fabrics and the like, comprising a mineral oil, a mineral oil sulphonate in an amount insufficient to inhibit the lubricating properties of the mineral oil, other emulsifying agents having lubricating properties including alkali metallic and organic base soaps, and a solvent for the soaps of the class consisting of monoethylether of diethylene glycol and monobutylether of diethylene glycol, whereby moisture may be absorbed without stratification of the materials.

2. A stable homogeneous solution for the treatment of artificial threads, filaments, fabrics and the like, comprising a mineral oil, a mineral oil sulphonate in an amount insufficient to inhibit the lubricating properties of the mineral oil, alkali metallic and triethanolamine soaps of oleic acid and a solvent for the soaps of the class consisting of monoethylether of diethylene glycol, whereby when moisture is absorbed, stratification of the materials is prevented.

3. A stable homogeneous solution for the treatment of artificial threads, filaments, fabrics and the like, comprising 40 to 75% mineral oil, 5 to 12% mineral oil sulphonate, 5 to 20% alkali metallic olenate, 4 to 30% amine soap of oleic acid and 3 to 10% of a solvent of the class consisting of monoethylether of diethylene glycol and monobutylether of diethylene glycol.

4. A composition according to claim 3 which further includes 0.1 to 4% oleic acid and less than 0.1% of an antioxidizing agent of the class consisting of resorcinol and diphenyl amine.

ALEIDUS G. BOUHUYS.