United States Patent Office 3,567,635 Patented Mar. 2, 1971

3,567,635

LUBRICANT AND ANTISTATIC COMPOSITION

Kenneth D. Ballou, Greensboro, N.C., assignor to Burlington Industries, Inc., Greensboro, N.C.

No Drawing. Continuation of application Ser. No. 471,752, July 13, 1965. This application June 5, 1969, Ser. No. 833,876

Int. Cl. D06m 13/38, 13/46

U.S. Cl. 252—8.8 1 Claim

ABSTRACT OF THE DISCLOSURE

There is provided a composition for treating textile fibers whereby antistatic and lubricating properties are imparted to the fibers. The composition comprises:

(a) a cationic quaternary ammonium compound such as stearamido-propyl dimethyl β-hydroxyethyl ammonium nitrate,

(b) a nonionic ethylene oxide adduct of mixed fatty amines,

(c) a lower alkyl fatty ester, and

(d) an ethylene oxide adduct of alkyl phenol. There is also provided a process for treating textile fibers with the above composition.

This application is a continuation of application Ser. No. 471,752, filed July 13, 1965, now abandoned.

The present invention relates to a composition of matter and a process for the treatment of textile materials.

In the process of converting wool, polyester or synthetic fibers from the raw state to the finished yarn, the fibrous materials are subjected to the action of mechanical devices which are designed to align the fibers lengthwise and to untangle the mass to provide the continuous lengths with sufficient tensile strength to permit subsequent processing into fabric. These processes include drawing, drafting, combing, etc.

In the course of undergoing the stresses of these processes, the fibers may move at high speeds over metallic guides, toothed devices and/or in relation to one another thereby developing fiber-to-metal and fiber-to-fiber frictional forces. These frictional movements also produce static electric charges on the nonconductive fibers and the resultant forces of attraction and repulsion between fibers and metals may result in uneven yarn, nests, slobs, fly, waste, etc.

In order to avoid or minimize the undesirable characteristics in procesing the fibers described above, it has been the practice to apply to the fiber, at the sliver or roving state, agents or mixtures of agents which provide (a) lubrication of the fibers to reduce friction; and (b) electrically conductive surfaces for the dissipation of static charges. In the prior art, the antistatic and lubrication compounds available require repetitive treatments because these compounds are easily separated from the fibers during the course of the processing. Many of these prior art compounds are also corrosive to the processing machinery. Some of these compounds also cause discoloration of the treated fibers when subjected to mild heat and during storage periods.

It is, therefore, an object of this invention to provide an improved lubricating and antistatic agent for textile materials which is free from prior art difficulties.

It is another object of the present invention to provide an improved antistatic agent for textile materials which

is persistent through the normal processing steps and yet can be readily removed at the end of these steps.

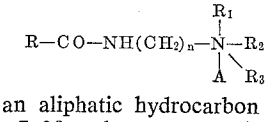
It is a further object of the invention to provide a faster and more economical process for the treatment of textile materials.

Other objects will be apparent from the following description and claims.

There are, at the present time no satisfactory antistatic and lubricating compounds for textile materials, which would be persistent through the normal processing steps for the textile materials and yet be readily removed at the end of such steps. Unexpectedly, I have found that a composition comprising a mixture of a cationic quaternary ammonium compound, a nonionic ethylene oxide adduct of mixed fatty amines and a lower alkyl fatty ester is an excellent antistatic and lubricating composition for textile materials. The composition of the present invention is persistent through the processing steps for converting fibrous materials into tetxile yarns, and yet is readily removed at the end of such processing by scouring. The composition of the present invention, in addition to providing excellent lubrication and static control, is compatible with tints, resistant to discoloration by heat and noncorrosive to textile machinery.

Suitable lower alkyl fatty esters for use in preparing the composition of the present invention are the methyl, ethyl, propyl, butyl, amyl, etc. esters of organic fatty acids. The fatty acids of particular suitability are those containing from 7–20 carbon atoms, e.g., stearic acid. Thus, typical esters for use herein are butyl and methyl stearate. The amount of alkyl fatty ester to be used in the mixture of the present invention can be varied within a wide range. Preferably, however, the ester is present in an amount from about 25% to 75% of the total mixture. (In the present specification and the claims, unless otherwise stated, all percentages and parts are by weight.)

The cationic quaternary ammonium compounds suitable for use in the present invention are known quaternary ammonium surface-active agents having the general formula:



wherein R is an aliphatic hydrocarbon radical containing from about 7–20 carbon atoms, n is a whole number from 1 to 3, R_1, R_2 and R_3 are alkyl, hydroxyalkyl, alkoxyalkyl or ethoxyalkyl radicals containing from 1 to 3 carbon atoms, and A is an anion. A particularly useful compound of the above formula is stearamido-propyl dimethyl β-hydroxyethyl ammonium nitrate. The quaternary component may be used in the present invention in a wide range of amounts. Preferably, however, this component constitutes from about 5% to 25% of the mixture.

The nonionic ethylene oxide adducts of mixed fatty amines to be used in the mixtures of the present invention are also known. These adducts contain from about 3 mols to 10 mols of combined ethylene oxide per mol of amine. The mixed fatty amines are amines of a mixture of fatty acids available, for example, in tallow. A particularly suitable adduct for use in the present invention is a 5-mol ethylene oxide adduct of mixed stearyl, palmityl and oleyl (tallow) amines commercially available under the name Ethomeen T–15. The amount of adduct to be used in the present mixture is preferably in the range of about 5% to 25% of the total.

It is also desirable to include in the composition of the invention an ethylene oxide adduct of an alkyl phenol, e.g., nonyl phenol. Typically, this may be a 9–10 mol ethylene oxide adduct of nonyl phenol although other equivalent adducts comprising 6 to 15 mole ethylene oxide per mole of phenol may be used. Generally, this component will constitute from 3 to 10 percent of the total composition.

In addition to the abovementioned components, the composition of the invention may include other additives, e.g., solvents or diluents, such as isopropyl alcohol, emulsifiers and the like. The diluents and emulsifiers may preferably be present in an amount from 0% to 65% of the total mixture.

The mixture of the present invention may be applied to the textile material in any convenient form and manner. Preferably, however, the composition is applied as an aqueous dispersion by dipping, spraying or the like followed by drying to remove the water added. The concentration of such dispersion should be sufficient to deposit an effective amount of the active materials on the fibers. The optimum amount deposited in any particular case will vary depending on the type of fibers involved. However, the amount deposited will usually fall in the range of 0.5% to 3% active materials based on the weight of fibers with the following ranges preferred for the fibers indicated:

	Percent
Wool	1.0–2.0
Polyester	0.5–1.0
Polyamide	0.5–1.0
Acrylic	0.5–1.0
Modacrylic	0.5–1.0
Cellulose acetate	1.0–3.0

It will be recognized that the above-listed fibers are given only for purposes of illustration since the invention is applicable with respect to any natural of synthetic fibers, or blends (e.g., wool/polyester blends) where lubrication and static control are important. Additionally, it will be appreciated that, while the invention is of special advantage when applied to fibers to facilitate processing into yarns or the like, the invention may also be used to advantage on various textile forms, such as tow, top, roving, sliver, yarn and even fabric.

The critical components of the present compositions have previously been employed for antistatic or lubricant purposes. For example, it is known that stearamido-propyl dimethyl-β-hydroxyethyl ammonium nitrate (Aerotex Antistat CSN) can be used as an antistatic agent for synthetic fibers. The same is generally true for the ethylene oxide adducts of tallow amines and butyl stearate has been used as a lubricant for synthetic fibers. However, the success of the present invention is based on the discovery that the combination of these components, particularly in conjunction with the ethylene oxide adduct of nonyl phenol and in the proportions indicated, demonstrates antistatic and lubricant effects in excess of what might be expected from the effects of the individual components. In other words, the components used herein appear to offer a synergistic effect which is both unexpected and highly advantageous.

The invention is further described and illustrated, but not limited, by the following examples:

EXAMPLES 1 AND 2

The following formulation was prepared by mixing the components together in the proportions indicated:

	Percent
Stearamido-propyl dimethyl-β-hydroxyethyl ammonia nitrate	16.7
Isopropyl alcohol	16.6
Butyl stearate	43.3
5-mol ethylene oxide adduct of mixed stearyl, palmityl and oleyl (tallow) amines	16.7
9–10 mol ethylene oxide adduct of nonyl alcohol	6.7

Another formulation was prepared in the same manner with the following composition:

	Percent
Stearamido-propyl dimethyl β-hydroxyethyl ammonium nitrate	15.25
Isopropyl alcohol	19.75
Butyl stearate	39.5
5-mol ethylene oxide adduct of mixed stearyl, palmityl and oleyl (tallow) amines	15.0
9–10 mol ethylene oxide adduct of nonyl phenol	6.0
Sorbitan trioleate	4.5

The sorbitan trioleate was included in the second formulation to improve ease of emulsification and emulsion stability.

Each of the above formulations was applied in a backwasher bowl as aqueous dispersons at concentrations sufficient to deposit 1–2% active material on wool top or 0.5–1% on polyester fiber. The treated fibers were dried to about 14% moisture for the wool and about 1.5% moisture for the polyester (Dacron). The fibers were then processed to the yarn state with much less difficulty after a single application of either formulation, than possible with multiapplications of conventional lubricant and/or antistatic compositions. Drafting of the treated fibers from sliver into roving and yarn was particularly improved.

It will be appreciated from the foregoing that the invention described herein offers a number of unique advantages. In particular, it has been found that a single application of the composition described herein on prepared fiber (natural or synthetic) provides sufficient lubrication and antistatic control throughout all subsequent processing of the fibers into the woven or fabricated state. Thus, for example, fiber treated according to the invention retains antistatic activity through drying, aging and prolonged storage. In contrast to conventional compositions for antistatic or lubricant purposes, the present composition does not undesirably discolor the fibers, nor is there any loss of the desired effect when the fibers are subjected to heating processes normally encountered in fiber and yarn processing. Additionally, use of the present composition with its combined lubricant and antistatic effects results in fibers which process with fewer faults and less down time than heretofore possible.

Other specific features of the present composition include its ready applicability at a conveniently early stage of fiber processing, e.g., from the backwasher bowl; its specific effectiveness on wool and polyester fibers; its noncorrosive nature with respect to metal and painted surfaces; and, as noted earlier, its compatibility with tints and colorings and its ease of removal from the fibers by scouring.

Other advantages will also be apparent from the foregoing description of the invention, the scope of which is defined in the following claim.

I claim:

1. An antistatic and lubricating composition for treating textile fibers comprising a synergistically effective mixture of ingredients:
   (a) 5% to 25% by weight of stearamido-propyl dimethyl β-hydroxyethyl ammonium nitrate;
   (b) 5% to 25% by weight of a nonionic ethylene oxide adduct of tallow amines having 3 to 10 moles of ethylene oxide per mole of amines; and
   (c) 25% to 75% by weight of butyl stearate.

References Cited

UNITED STATES PATENTS

2,404,240	7/1946	MacLaurin.
2,626,876	1/1953	Carnes.
2,809,159	10/1957	Welles et al.
2,810,694	10/1957	McLean et al.

HERBERT B. GUYNN, Primary Examiner

U.S. Cl. X.R.

117—139.5