This invention relates to a novel composition of matter for use in the textile art. More particularly, this invention relates to a novel antistatic and lubricating composition for treating textile fibers and to fibers treated therewith.

Lubricants and like compounds are usually applied to textile fibers, filaments, yarns and the like to reduce the tendency toward breakage of the individual filaments when they are subjected to various mechanical strains, and to lubricate the individual filaments in order to facilitate handling in such operations as spinning, twisting, winding, reeling, drafting, weaving, carding, combing, and the like.

Textile fibers tend to accumulate electrostatic charges during the various handling operations such as spinning, twisting, winding, and the like. The accumulation of electrostatic charges causes the fibers to become electrically repellent to one another and to become electrically attracted to the equipment on which they are handled. As is known in the art, such a condition is highly undesirable in that it interferes substantially with the efficiency and effectiveness of processing operations. Hence, there is usually incorporated into a textile lubricant a compound that will reduce substantially or completely eliminate the tendency of the textile fibers treated therewith to accumulate the undesirable electrostatic charges during processing. Such compounds are usually referred to in the art as "antistatic agents."

The new synthetic resin fibers such as those prepared from polyester resins, polyamide resins, polyolefin resins, and resins prepared by the polymerization and copolymerization of certain acrylic compounds have proved highly satisfactory for use in the textile industry. These fibers, which normally have hydrophobic properties, are used in the manufacture of fabrics and like materials. Often, these hydrophobic fibers are blended or associated with hydrophilic fibers such as cotton, wool, viscose and the like to provide fabrics having certain desired properties.

Various lubricating and antistatic compositions have been proposed for treatment of the above-mentioned hydrophobic synthetic resin fibers. However, these compositions have not proved entirely satisfactory in use.

One particular problem involved in the use of known treating compositions is that, when hydrophobic fibers treated therewith are blended with hydrophilic fibers, the applied composition tends to migrate to the hydrophilic fibers leaving the hydrophobic fibers substantially devoid of antistatic protection and satisfactory frictional characteristics.

An object of this invention is to provide a novel composition of matter having both lubricating and antistatic properties for application to hydrophobic fibers, which composition will not migrate substantially to hydrophilic fibers with which the treated hydrophobic fibers are blended or associated.

Another object is to provide textile fibers treated with the novel composition of this invention.

Other objects of this invention will, in part, be obvious and will, in part, appear hereinafter.

For a complete understanding of the nature and the objects of this invention, reference is made to the following detailed description.

Briefly, in accordance with this invention, there is provided a novel composition of matter adapted particularly to be applied to textile fibers having hydrophobic properties such as textile fibers prepared from polysamide resins, polyester resins, polyolefin resins, and the like whereby there is provided a treated textile fiber having outstanding antistatic properties and frictional properties.

Further, hydrophobic textile fibers treated with the composition of this invention can be blended with or associated with hydrophilic fibers such as cotton, wool, viscose and the like without any substantial migration of the applied composition or any of the components thereof to the hydrophilic fiber.

The novel antistatic and lubricating composition of this invention is comprised of (A) a compound selected from the group consisting of polyoxyethylene glycol having an average molecular weight of from 400 to 800, polyoxypropylene glycol having an average molecular weight of from about 400 to 800, methoxy polyoxyethylene glycol having an average molecular weight of about 400 to 800, and mixtures thereof, (B) polyoxyethylene glycol monolaurate wherein the polyoxyethylene glycol group has an average molecular weight of about 200, and (C) N,N-di(β-hydroxyethyl) lauramide. Compound (B) is often referred to as polyoxyethylene glycol 200 monolaurate. Compound (C) is the amide derived from the reaction of stoichiometric amounts of lauric acid and diethanolamine.

While various proportions of the above components can be employed in preparing the novel composition of this invention, it is preferred, for textile applications, that the composition be comprised of from about 20 to 60 parts by weight of (A), from about 10 to 40 parts by weight of (B), and from about 10 to 40 parts by weight of (C).

While the above composition, containing components (A), (B) and (C), in the above range of proportions, has proved highly satisfactory in use, other components can be incorporated therein if desired to give added properties or to improve to some degree the antistatic and lubricating properties thereof.

Thus, while the antistatic properties of the above base composition are highly satisfactory for most applications, the antistatic properties of this base composition can be improved somewhat by the incorporation therein of polyoxyethylene laurel amine wherein the polyoxyethylene group has an average molecular weight of about 200, stearamidopropyl dimethyl - β-hydroxyethyl ammonium nitrate, and mixtures thereof. The total amount of these compounds that can be conveniently incorporated into the base composition can be varied from about 5 percent to about 20 percent by weight based on the total weight of the base composition.

For those textile processing operations that require low fiber-to-metal frictional characteristics and high inter-fiber frictional characteristics, the base composition can be modified by the addition thereto of methoxymethyl phthalate in an amount equal to about 5 percent to 25 percent by weight based on the total weight of the base composition.

It has been determined also that dimethyl butyldimethyl octoxycynid, and mixtures thereof in an amount equal to from about 3 percent to about 20 percent by weight based on the total weight of the base composition can be added to the base composition to provide for increased solubility of the components which comprise the base composition, to provide a composition of lower viscosity, and to provide a composition having improved wetting power so that in many applications to fibers it will spread more uniformly over the surfaces thereof.

Also, it has been determined that the antistatic and frictional characteristics of the base composition can be improved to some extent by adding thereto methoxyethyl
palmitate, diethylene glycol monoleate, and mixtures thereof. The amount of these compounds or mixtures thereof can be conveniently incorporated into the base composition is from about 3 percent to about 20 percent by weight based on the total weight of the base composition.

The above enumerated ingredients or compounds that can be incorporated into the base composition to improve to some extent the properties thereof are the desired formulation and are well known in the art, and are available commercially. Also, the above enumerated compounds or mixtures thereof can be incorporated into the base composition in accordance with the teaching of Patent 2901,466. These fibers are treated by immersion in an aqueous medium of the following composition:

<table>
<thead>
<tr>
<th>Percent</th>
<th>Polyoxyethylene glycol (average molecular weight 600)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>N,N-di(β-hydroxyethyl) lauramid</td>
</tr>
</tbody>
</table>

The treated fibers are allowed to air dry or are placed in an oven maintained at a temperature of from about 105° C. to 110° C. for about an hour and substantially all the water is removed. The amount of applied composition is equal to about 0.3 percent by weight based on the weight of the fibers. The treated fibers are blended in a 50 percent-50 percent ratio with viscose staple fibers. The blend is carded and allowed to condition for two weeks. At the end of this period, static measurements indicated that the resulting fiber blend had excellent antistatic properties indicating substantially no migration of the applied composition to the hydrophilic viscose fibers.

**Example II**

Polypropylene staple fibers are treated with an aqueous medium of the composition set forth in Example I, and in accordance with the procedure described in Example I. The applied composition provides excellent control of static throughout all textile processing operations to which the treated fibers are subjected. The amount of applied composition in this example is about 0.5% by weight of the weight of the fibers.

**Example III**

The following composition, in an aqueous medium, is applied to staple polyester fibers similar to those described in Example I and evaluated in the same manner as described in Example I.

<table>
<thead>
<tr>
<th>Percent</th>
<th>Polyoxyethylene glycol (average molecular weight 600)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>N,N-di(β-hydroxyethyl) lauramid - 25.5</td>
</tr>
<tr>
<td>15</td>
<td>Polyoxyethylene glycol 200 monolaurate - 25.5</td>
</tr>
</tbody>
</table>

The treated polyester fibers are blended in a 50 percent-50 percent ratio with viscose fibers and aged for two weeks. Test results indicate excellent antistatic properties of the blend at the end of this period indicating substantially no migration of the composition to the hydrophilic viscose fibers. The amount of applied composition is about 0.3% by weight of the weight of the fibers.

**Example IV**

Polyester staple fibers similar to those described in Example I are treated with the following composition in an aqueous medium:

<table>
<thead>
<tr>
<th>Percent</th>
<th>Polyoxyethylene glycol (average molecular weight 600)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>N,N-di(β-hydroxyethyl) lauramid - 25.5</td>
</tr>
<tr>
<td>60</td>
<td>Polyoxyethylene glycol 200 monolaurate - 25.5</td>
</tr>
</tbody>
</table>

The treated polyester fibers are blended with viscose fibers in a 50 percent-50 percent blend and the resulting blend is subjected to a carding operation. Excellent control of static is obtained during this operation. Excellent frictional characteristics are obtained also. The amount of composition applied in this example is about 0.4% by weight of the weight of the fibers.

**Example V**

The following composition, in an aqueous medium is
applied to polyester fibers of the type described in Example I and in accordance with the procedure of Example I:

\[
\begin{array}{l|c}
\text{Percent} & \\
\hline
\text{Polyoxyletherylene glycol (average molecular weight 600)} & 40 \\
\text{Polyoxyletherylene glycol 200 monolaurate} & 20 \\
\text{N.N-di(\(\beta\)-hydroxethyl)lauramide} & 25 \\
\text{Dimethyl octylenediol} & 15 \\
\end{array}
\]

The applied composition, in an amount of about 0.4\%, by weight of the weight of the fibers, gives excellent antistatic properties to the treated fibers. Further, blends of this treated fiber with hydrophilic fibers have excellent antistatic properties after the blend is aged for about two weeks. The wetting properties and antistatic characteristics of the above composition are slightly better than those of the composition of Example I.

**Example VI**

The following composition, in an aqueous medium, is applied to polyester staple fibers similar to those described in Example I and in the manner similar to that described in Example I:

\[
\begin{array}{l|c}
\text{Percent} & \\
\hline
\text{Polyoxyletherylene glycol (average molecular weight 600)} & 30 \\
\text{N.N-di(\(\beta\)-hydroxethyl)lauramide} & 20 \\
\text{Methoxyl ethyl palmitate} & 15 \\
\text{Diethyletherylene glycol monooleate} & 20 \\
\text{Polyoxyletherylene glycol 200 monolaurate} & 15 \\
\end{array}
\]

The treated fibers are tested in the same manner as described in Example I and are found to have highly satisfactory antistatic properties and frictional properties.

**Example VII**

The composition of Example I is applied to cellulose acetate fibers and in the manner described in Example I. The amount of composition applied is about 0.4\% by weight of the weight of the fibers. The treated fibers retain excellent antistatic and frictional properties after two weeks of aging.

While in the above examples staple fibers are employed, it is to be understood that equally satisfactory results are obtained when continuous filament fibers are treated in a similar manner.

The novel antistatic and lubricating composition of this invention is adapted particularly for the treatment of synthetic resin fibers having hydrophobic properties and in particular those hydrophobic synthetic resin fibers prepared from polyester resins, polyamides, polyolefins, and polyacrylates. Specific polyacryl fibers that can be treated in accordance with this invention are those prepared from polyethylene and polypropylene.

Other textile fibers, filaments, yarns and the like that can be treated with the antistatic and lubricating composition of this invention include those prepared from the organic acid esters of cellulose such as cellulose acetate, cellulose triacetate, cellulose acetate butyrate, and cellulose acetate propionate.

Fibers, filaments, yarns and the like treated with the novel composition of this invention are provided with substantial antistatic protection for prolonged periods of time. The build-up of electrostatic charges on the treated fibers is substantially eliminated. As previously set forth, one of the primary advantages of the novel composition of this invention is that it does not migrate to hydrophilic fibers when hydrophobic fibers treated with the composition are blended with or associated with hydrophilic fibers during textile processing steps, thereby providing for substantially continued control of static and frictional properties during subsequent textile processing operations.

The compositions of this invention provide for highly satisfactory fiber-to-fiber and fiber-to-metal frictional properties of the treated fibers during processing. They do not corrode textile equipment and have no toxic effects.

The above description and examples are illustrative of this invention and not in limitation thereof.

We claim:

1. A textile lubricant composition especially adapted for the lubrication of hydrophobic fibers consisting principally of 20–60 parts of a polyoxyletherylene glycol having an average molecular weight of 400–800; 10–40 parts of polyoxyletherylene glycol monolaurate wherein the polyoxyletherylene group has a molecular weight of about 200; 10–40 parts of N,N-di(\(\beta\)-hydroxethyl)lauramide, and 5–20\% by weight of stearamidopropyl dimethyl-beta-hydroxyethyl ammonium nitrate.

2. A textile material comprising a blend of hydrophobic textile fibers and hydrophilic fibers, the hydrophobic textile fibers having a coating of the textile lubricant composition defined in claim 1.

3. A textile material comprised of a blend of viscose fibers and polyester fibers, the polyester fibers having a coating of the textile lubricant composition defined in claim 1.

4. A textile lubricant composition particularly adapted for lubricating hydrophobic resin fibers consisting of the following ingredients: polyoxyletherylene glycol having an average molecular weight of 600–34\%; N,N-di(\(\beta\)-hydroxethyl)lauramide—25.5\%; polyoxyletherylene glycol monolaurate wherein the polyoxyletherylene group has a molecular weight of about 200–25.5\%; and stearamidopropyl dimethyl-beta-hydroxyethyl ammonium nitrate—15\%.

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