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TREATMENT OF ARTIFICIAL SILK

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

Whereas it is intended that the treatment of natural fibers be included, the invention will be described in its specific application to fibers of artificial origin. After cellulosic solutions such as viscose have been extruded to form threads and the final product has been finished, it is normally subjected to several different textile operations in order to fabricate the thread into a merchantable article. These textile operations, namely, knitting, weaving or braiding must be conducted by complicated machinery, which exposes the thread to considerable wear unless it is otherwise treated with a lubricative and protective medium. In addition to the damage to the thread occurring as a result of the wear between the thread and the mechanical parts with which it comes in frictional contact, a certain amount of friction takes place between the threads themselves during the process of fabrication. These difficulties are greatly aggravated by the use of modern high speed machines and unless the thread is coated with a protective medium, breaking, rupturing and uneven fabrication will occur.

In order to overcome the foregoing obstacles the textile industry, and principally the rayon industry, has employed many different lubricating agents. Lubricating agents alone such as mineral oils can not be used, as they impart to the thread a harsh feeling and are not self-emulsifiable with aqueous solutions. Moreover, if lubricants are used without the addition of emulsifying and softening agents, the quantity necessary to provide a smooth surface would be so large that it would be impractical.

In providing an improved lubricating composition having certain advantages over the art, United States Patent No. 2,025,435 of Aleidus G. Bouhuys discloses and claims a composition for treating artificial threads. Such a composition contains a lubricant, an emulsifying agent and a solvent. This solution has been found to give beneficial results more specifically described in the patent.

It has now been determined that materials for protecting threads must have additional prerequisites for effecting optimum fabricating operations. By extensive experimentation it has been concluded that certain emulsifying and softening compositions used in combination with

the lubricants have impaired the wetting out properties of the mixture. In other words, in an effort to promote emulsification of the lubricating compositions, the added substances have to a great extent presented other serious drawbacks to the use of such a mixture. Now, in order to reduce the friction between the threads and the mechanical parts to a minimum, the lubricating composition must form a coherent film over the threads and must also have the characteristic of spreading perfectly over the metal parts with which the thread comes in contact. This property is known as wetting out the various surfaces. When all of the surfaces properly wet out, considerably smaller quantities of the lubricating mixture may be employed with improved results.

It is, therefore, the object of the present invention to provide a method for treating textile fibers and more specifically threads of cellulosic origin whereby the fibers or threads will have the necessary lubricating and emulsifying properties and will have the additional characteristic of forming an effective film on the surface of the thread and all other surfaces with which the treated thread comes in contact.

Another object of the invention is the provision of a novel lubricating composition which will wet out steel and porcelain surfaces as well as the surface of the thread per se.

It is still further contemplated to treat threads of artificial origin with a lubricating composition which contains an emulsifying agent, a softening agent and a solvent for the mixture, said solution effecting stable emulsions with water in any concentration.

An additional object of the present invention is to provide a protective medium for artificial silk threads which is lime-resistant, that is, it appreciably resists forming precipitates with the soluble salts of alkaline earth metals.

According to the present invention one of the most important aspects is the proper selection of the materials to be used in combination. The types of lubricating compositions which will form emulsions and also coherent films on cellulose and metal surfaces are rather limited and in order to determine which ones will wet out both the cellulose surface and metallic surfaces, it becomes necessary to conduct certain tests. The following test for wetting out has been successfully applied. The composition is dissolved in a volatile solvent and spread over the surface to be tested. After evaporation of the solvent, if a continuous and coherent liquid film of the com-

position remains on the surface, the lubricating composition has the property of what is termed properly wetting out that surface. If the lubricant will not wet out the surface, it will form small drops thereon.

The foregoing test was conducted and the following lubricating compositions were adjudged to wet out cellulose and steel surfaces. Lubricants were used such as mineral oils and certain higher fatty acid esters of monohydric alcohols and particularly the lower monohydric alcohols mixed with emulsifying agents such as sulphonated olive oil and organic derivatives of amines. As softening agents which were used in the combination and did not retard the wetting out power of the mixture were materials such as glycerine and sulphonated alcohols.

The following table exemplifies the various groups of materials and any compound from either one of the groups may be mixed with one or more of the compounds of the other group and the resulting composition will exhibit the necessary characteristics for treating threads of natural or artificial origin:

25	<i>Lubricants</i>	<i>Emulsifying and softening agents</i>
	Fatty acid esters (a) Butyl stearate (b) Butyl myristate (c) Ethyl palmitate Mineral oil Higher fatty acids (a) Oleic acid	Sulphonated alcohols (a) Cardinols Sulphonated olive oil Organic derivatives of amines (a) Amine soap of oleic acid (b) Substituted hexanol- amines Glycerine
30		

It is, of course, to be understood that in preparing a suitable composition by mixing materials selected from the different groups in the above table, a solvent is usually desirable in order to provide a clear solution. For example, it would ordinarily be to advantage to add a small quantity of oleic acid or Carbitol to obtain complete miscibility of the other ingredients and provide a clear emulsion with water.

The importance of the proper selection of materials to be employed might be shown more clearly by pointing out that certain emulsifying and softening agents formerly employed destroy the wetting power of the lubricant for one or more surfaces with which it comes in contact. For instance, sulphonated castor oil, Monopol oil and Prestabit oil act to promote emulsification but prevent the composition from wetting out either the thread or the metal parts, and in addition, they leave sticky residues which are objectionable. Compounds which have been frequently used as both softening and emulsifying agents are the metallic soaps such as alkali oleates. It has been determined that these soaps are entirely unsatisfactory from the standpoint of forming coherent films of the composition on porcelain and metallic surfaces.

In summing up the scope of the present invention a novel composition has been provided which offers a number of advantages over former compositions employed for analogous purposes. The present composition has several advantageous properties which were formerly lacking, namely, lubrication, emulsification, softening, wetting out, hygroscopicity and lime resistance. In addition to these properties, when esters are employed as the lubricant, they will readily saponify and thereby increase the solubility of the mixture. The emulsifying agents employed normally impart to the mixture the necessary hygroscopicity and lime resistance, that is, the composition will have the tendency to absorb moisture from the

air and are stable toward calcium and magnesium, as they will not form precipitates with alkaline earth metals. Furthermore, the emulsion is resistant toward breaking in the dye bath in the presence of soluble inorganic sulphates and as a result will not hinder the action of the dye if left in the thread during the dyeing operation.

It is to be understood that the proportions of the lubricant, emulsifier and softener may be varied in accordance with the specific application of the composition. Examples of compositions which have been determined to give satisfactory results are given below:

Example 1.—A simple lubricating composition may be formed according to the principles of this invention by thoroughly mixing about 75 parts by weight of butyl stearate with about 25 parts by weight of sulphonated olive oil and a sufficient quantity of oleic acid to render the mixture a clear solution. The resulting composition is readily emulsifiable in water in any proportion and gives a very stable emulsion. It will form a coherent and an effective film on the surface of the thread and on the surface of the metallic and porcelain parts with which the thread comes in contact. This effective wetting out of all surfaces permits the application of smaller amounts than has hitherto been possible. For example, the thread may be impregnated with amounts ranging from 0.1% to 0.5% of the weight of the thread and friction will be reduced to a minimum.

Example 2.—Another lubricating and softening composition may be prepared in accordance with the concept of this invention by employing a lubricant consisting of a mixture of 40 to 70% by weight of mineral oil and 5 to 25% by weight of butyl stearate. To this lubricant per se is added about 5 to 15% by weight of diethyl cyclohexylamine and about 10 to 30% by weight of oleic acid. Most of the oleic acid reacts with the amine to form the oleate. A small percent of free oleic acid remains which effects a clear solution. This composition has such a high degree of wetting out that small amounts ranging from 0.25 to 1.5% by weight of the thread may be successfully employed.

In both of the foregoing examples if additional softening of the thread is necessary, a small amount, for example, from 1 to 5% by weight of a sulphonated alcohol may be substituted in the mixture in place of the corresponding amount of emulsifying agent.

Example 3.—One specific composition which is found to provide an effective protective medium for the thread is 65% by weight of mineral oil, 10% by weight of butyl stearate, 8% by weight of diethyl cyclohexylamine, 16% by weight of oleic acid and 1% by weight of glycerine.

The lubricating compositions made by any of the preceding examples are in accordance with the principles of this invention and may be applied to the textile material by dipping skeins in the treating emulsion or by forcing the emulsion through wound spools, cakes or other packages of thread, or by applying the lubricating mixture directly to the thread. The composition is so finely dispersed and stable that no filtering action takes place and hence there is an even distribution of the composition throughout all parts of the package.

While three specific embodiments of the above invention have been given, it is to be understood that these examples are merely illustrative of the general principles and not limitative of the

scope thereof. The invention herein described is to be limited only within the scope of the appended claims.

What I claim is:

5 1. A lubricating composition for use in the treatment of yarns of artificial origin comprising a solution formed of a mixture of mineral oil and butyl stearate, a substituted hexylamine and a solvent for the mixture.

10 2. A lubricating composition for use in the treatment of yarns of artificial origin comprising 40 to 70% by weight of mineral oil, 5 to 25% by weight of butyl stearate, 5 to 15% by weight of diethyl cyclohexylamine and 10 to 30% by weight of oleic acid.

15 3. A thread having improved characteristics

and especially adaptable for weaving and knitting purposes comprising a core of cellulose origin and a film thereon formed of a mixture of mineral oil and butyl stearate and a substituted hexylamine, said mixture being dissolved in a solvent. 5

4. A thread having improved characteristics and especially adaptable for weaving and knitting purposes comprising a core of cellulosic origin and a film thereon formed of a mixture of 40 to 70 percent by weight of mineral oil, 5 to 25 percent by weight of butyl stearate and 5 to 15 percent by weight of diethyl cyclohexylamine, said mixture being dissolved in 10 to 30 percent by weight of oleic acid. 10

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