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TEXTILE LUBRICANTS

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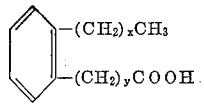
6 Claims. (Cl. 252—8.6)

The present invention relates to textile fiber finishes. It particularly relates to lubricants for threads and fabrics of cotton, wool and synthetics to facilitate the handling and processing of such fibers and to provide the tactile characteristics desired in the finished or semifinished material.

Commercial oleic acid, "white oleic," is used extensively as a textile lubricant. The oleic acid may be applied by spraying the acid onto the fabric or the fabric may be dipped in the oleic acid. A common procedure is to form an aqueous emulsion of the oleic acid and then immerse the textile in the emulsion or the emulsion can be sprayed onto the textile. Part of the oleic acid is saponified with sodium hydroxide to facilitate formation of the emulsion and to produce the type of hand desired. Usually such an emulsion will contain 0.25–5% non-aqueous material. By varying the ratio of salt to acid, it is possible to vary the hand from very scroopy to extremely soft. A high acid content produces a scroopy hand while a high salt content results in a soft hand.

In accordance with the present invention it has been found that aromatized linoleic acid or mixtures of aromatized linoleic acid and fatty acids containing 14 to 20 carbon atoms per molecule are excellent textile lubricants. An important advantage of the present invention is that tall oil fatty acids can be used as a textile lubricant after aromatization of the linoleic acid. The resulting fatty acid mixtures will usually contain at least 5% by weight of aromatized linoleic acid and at least 25% and usually at least 50% by weight of oleic acid. The mixture of acids should be substantially free of and not contain more than 5% by weight of polyunsaturated fatty acids which are acids containing more than one carbon to carbon double bond in the molecule.

While the aromatized linoleic acid may be prepared by the aromatization of substantially pure linoleic acid or by aromatization of the linoleic acid when mixed with other fatty acids, the preferred procedure is to aromatize the linoleic acid in tall oil fatty acids in the presence of a palladium catalyst. Aromatized linoleic acid is a mixture of acids having a characteristic and strong infrared absorption band in the 13.3μ region and having the following structural forumula:



in which the sum of x and y is equal to 10 and y is at least 5 and less than 8. The aromatized tall oil fatty acids may be prepared by any suitable process and may be prepared, for example, as described in the article entitled "The Aromatization of Linoleic Acid With Palladium Catalyst" appearing in The Journal of the American Oil Chemists' Society, volume 33, No. 12, December 1956, pages 609 through 614.

The aromatized tall oil fatty acids can be used in place of and in the same manner as oleic acid as a textile lubricant. The tall oil fatty acids may be applied as such but preferably are partially saponified with sodium hydroxide, diluted with water and mixed to form an emulsion containing about 0.25–5% of non-aqueous material (fatty acid plus soap). Enough of the acid mixture is saponified

to form the emulsion. The ratio of soap to acid may be varied widely to provide the desired lubricity and hand. The textile is immersed in this emulsion or sprayed with the emulsion to deposit soap and fatty acid on the textile. This lubrication is important to the behavior of fibers on carding, spinning and knitting equipment. The hand of fabrics is an important characteristic of textiles. The aromatized tall oil fatty acids have excellent heat (color) stability and excellent resistance to oxidation and the formation of odors. In the following comparisons between oleic acid, tall oil fatty acids and aromatized tall oil fatty acids, the aromatized acids were prepared by heating refined tall oil fatty acids in the presence of palladium on carbon catalyst until the fatty acids were substantially free of polyunsaturated fatty acids and contained a substantial amount of aromatized linoleic acid. The resulting reaction was distilled to separate the aromatized fatty acids from the catalyst and a small amount of by-products. The aromatized tall oil fatty acids had the following characteristics. Analysis was by vapor chromatography.

Acids:	Percent
Below C_{18} sat.	0.4
C_{18} sat.	6.6
C_{18} one double bond	75.0
C_{19} sat.	4.3
C_{18} two double bonds	3.2
Aromatized linoleic acid	10.5
Properties:	
Acid number	196
Iodine value	80
Titer, °C	28

NOTE.—"C_{18}" and "C_{19}" mean fatty acids containing eighteen and nineteen carbon atoms in the molecule, respectively, and "sat." means "saturated."

The refined tall oil fatty acids from which the aromatized tall oil fatty acids were prepared contained 98% fatty acids which contained 44.5% oleic acid, 51% linoleic acid, and 4.5% other fatty acids. As is customary in the analysis of tall oil fatty acids the "oleic acid" includes all of the fatty acid containing eighteen carbon atoms and one carbon to carbon double bond, and the "linoleic oleic acid" also includes the small amount of other acids containing two carbon to carbon double bonds. This refined tall oil also was used in the comparative tests hereinafter described.

Color stability is important for textile lubricants and can be determined by A.O.C.S. Tentative Method L 15a–58. In this test the acids are held at 205° C. for one hour. The Gardner color is determined before and immediately after the test. In a series of comparative color tests, the aromatized tall oil fatty acids had an initial Gardner color of 2 which increased to 4.5 upon heating. The color of the tall oil fatty acids previously described increased from 2½ to 6. A commercial grade of oleic acid extensively used as a textile lubricant also was tested. This commercial oleic acid contained 68.2% oleic acid and 27% saturated fatty acids. The initial Gardner color was 2 and it increased to 4.5. Thus, the aromatized tall oil fatty acids had better heat stability than the refined tall oil fatty acids and compared favorably with oleic acid in this respect.

Textile lubricants must resist oxidation, particularly under warm humid conditions. The oxidative stability of textile lubricants is shown by the "tropics test." In this test the lubricant is applied, for example, as an aqueous emulsion of the fatty acids with part of the fatty acids being saponified with sodium hydroxide. The treated textile is then stored in a container at 100% relative humidity and at 55° C. for about 24 hours. At the end of this test, the sample is checked for odor and dis-

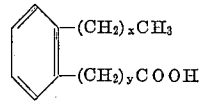
coloration. Comparative tests were made with rayon to which there had been added similar amounts of aqueous emulsions of the oleic acid, the aromatized tall oil fatty acids and the tall oil fatty acids previously described. In each instance an aqueous emulsion was formed containing 2% of the acid component with 50% of this acid having been saponified with sodium hydroxide. The partial soaps of the oleic acid and the aromatized tall oil fatty acids held up very satisfactorily while the partial soap of the tall oil fatty acids failed this test.

While the foregoing tests were with rayon, it is to be understood that the present lubricant can be used with other synthetic staple fibers as well as with natural fibers such as cotton. The present lubricant is particularly useful as a wool lubricant where resistance to oxidation is particularly important.

The aromatized tall oil fatty acids may be used alone or may be mixed with other fatty acids substantially free of polyunsaturation containing from 14 to 20 carbon atoms in the molecule. Preferably, the added acids are saturated and the palm oil fatty acids are especially useful for this purpose. For example, about 10% of palm oil fatty acids may be added so as to increase the saturated fatty acid content to about 20%. Such a mixture will be even more stable to oxidation.

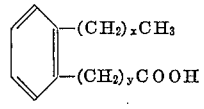
I claim:

1. Textile fiber having thereon as a lubricant an effective amount of a material selected from the group consisting of aromatized tall oil fatty acids and partial soaps of such acids, said aromatized tall oil fatty acids being essentially composed of a mixture of tall oil fatty acids and aromatized linoleic acid, said mixture containing by weight at least 5% of aromatized linoleic acid, at least 50% of oleic acid, not more than 5% polyunsaturated tall oil fatty acids, and the remainder of said mixture being saturated tall oil fatty acids, and said aromatized linoleic acid being a mixture of acids having the formula:



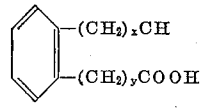
wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

2. Textile fiber having thereon as a lubricant an effective amount of aromatized tall oil fatty acids essentially composed of a mixture of tall oil fatty acids and aromatized linoleic acid, said mixture containing by weight at least 5% of aromatized linoleic acid, at least 50% of oleic acid, not more than 5% polyunsaturated tall oil fatty acids, and the remainder of said mixture being saturated tall oil fatty acids, and said aromatized linoleic acid being a mixture of acids having the formula:



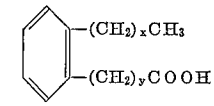
wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

3. Textile fiber having thereon as a lubricant an effective amount of partial sodium soap of aromatized tall oil fatty acids essentially composed of a mixture of tall oil fatty acids and aromatized linoleic acid, said mixture containing by weight at least 5% of aromatized linoleic acid, at least 50% of oleic acid, not more than 5% polyunsaturated tall oil fatty acids, and the remainder of said mixture being saturated tall oil fatty acids, and said aromatized linoleic acid being a mixture of acids having the formula:



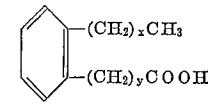
wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

4. Textile fiber having thereon as a lubricant an effective amount of the partial sodium soap of aromatized tall oil fatty acids essentially composed of a mixture of tall oil fatty acids and aromatized linoleic acid, said mixture containing by weight at least 5% of aromatized linoleic acid, at least 50% of oleic acid, not more than 5% polyunsaturated tall oil fatty acids, and the remainder of said mixture being saturated tall oil fatty acids, and said aromatized linoleic acid being a mixture of acids having the formula:



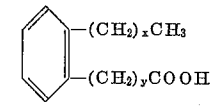
wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

5. Textile fiber having thereon as a lubricant an effective amount of aromatized tall oil fatty acids essentially composed of about 10% of aromatized linoleic acid, about 75% of oleic acid, less than 5% polyunsaturated tall oil fatty acids, and the remainder of said aromatized tall oil fatty acids being saturated tall oil fatty acids, said aromatized linoleic acid being a mixture of acids having the formula:



wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

6. The process of lubricating textile fibers comprising applying to said fibers as a lubricant an effective amount of an aqueous emulsion containing partially saponified aromatized tall oil fatty acids essentially composed of a mixture of tall oil fatty acids and aromatized linoleic acid, said mixture containing by weight at least 5% of aromatized linoleic acid, at least 50% of oleic acid, not more than 5% polyunsaturated tall oil fatty acids, and the remainder of said mixture being saturated tall oil fatty acids, and said aromatized linoleic acid being a mixture of acids having the formula:



wherein the sum of x and y is equal to 10 and y is at least 5 and less than 8.

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JULIUS GREENWALD, *Primary Examiner.*