

[54] **DIORGANOPOLYSILOXANE-BASED
LUBRICANT FOR ORGANIC FIBERS**

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[58] **Field of Search** 252/8.6, 9; 117/139.5 A

[56] **References Cited**

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[57] **ABSTRACT**

Organopolysiloxane mixtures having a wide molecular weight distribution and viscosity range which may be used as lubricants for organic fibers.

4 Claims, No Drawings

DIORGANOPOLYSILOXANE-BASED LUBRICANT FOR ORGANIC FIBERS

The present invention relates to organopolysiloxane mixtures and more particularly to organopolysiloxane mixtures having a wide molecular weight distribution and viscosity range which may be used as lubricants for organic fibers.

Heretofore compositions containing organopolysiloxanes, especially dimethylpolysiloxanes and organic oils and/or waxes have been used to treat organic fibers. These compositions impart a lubricating property or increased gliding ability to the treated fibers. Increased gliding ability reduces the fiber's tendency to break or tear when subjected to stresses in rapidly operating sewing machines or weaving looms.

Although these organopolysiloxane-based lubricants impart a certain gliding ability to organic fibers, they have certain disadvantages. For instance, siloxane units having alkyl groups of at least 14 carbon atoms are not readily available and they are not effective in the absence of organic oils and/or waxes.

In addition, the organic oils and/or waxes are not compatible with dimethylpolysiloxanes. Also difficulties are encountered in mixing organic oils and/or waxes with the organopolysiloxanes and separation of the mixture often occurs. Likewise, the organic oils and/or waxes may impart an undesirable odor to the fibers. Furthermore, elevated temperatures are required in order to apply the wax to the fibers.

Therefore it is an object of this invention to provide a lubricant for organic fibers. Another object of this invention is to provide an organopolysiloxane-based lubricant for organic fibers. Still another object of this invention is to provide a lubricant for organic fibers which is more effective than the organopolysiloxanes-wax or wax-like compositions used heretofore. A further object of this invention is to provide a lubricant for organic fibers which uses organopolysiloxanes having organo groups up to 5 carbon atoms and have a wide molecular weight distribution.

The foregoing objects and others which will become apparent from the following description are accomplished in accordance with this invention, generally speaking, by providing a lubricating composition for organic fibers which comprises a mixture of organopolysiloxanes whose SiC-bonded organic radicals are alkyl groups having from 1 to 5 carbon atoms. The mixture of organopolysiloxanes contain (a) from 10 to 75 percent by weight of an organopolysiloxane having a viscosity of from 20 to 200 cs. at 25°C., (b) from 10 to 50 percent by weight of an organopolysiloxane having a viscosity of from 1,000 to 30,000 cs. at 25°C. and (c) from 0 to 80 percent by weight of an organopolysiloxane having a viscosity of from 201 to 999 cs. at 25°C.

At least 90 mole percent of the siloxane units of the diorganopolysiloxanes employed pursuant to this invention are diorganopolysiloxanes of the general formula:



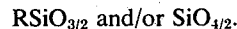
and the remaining copolymer siloxane units are generally triorganosiloxanes units of the general formula:



The R_3SiO -units can sometimes be replaced by units of the general formula:

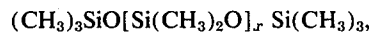


In addition to the siloxane units mentioned above, the organopolysiloxanes may contain up to 10 mole percent of other copolymer siloxane units, such as those corresponding to the general formula:



In the above-indicated formula, R represents the same or different alkyl radicals having from 1 to 5 carbon atoms and R' represents hydrogen, or branched alkyl radicals having from 1 to 5 carbon atoms, such as the tert-butyl radicals or an aryl radical, such as the phenyl radical.

It is preferred that at least 50 percent of the SiC-bonded organic radicals in the diorganopolysiloxanes employed pursuant to this invention (R radicals in the above formula) be methyl radicals. Examples of other SiC-bonded organic radicals which may be present in the diorganopolysiloxanes employed in this invention, are the ethyl, n-propyl, isopropyl, n-butyl, sec.-butyl, n-amyl and sec. amyl radicals. The preferred diorganopolysiloxanes are those corresponding to the formula:



or similar formulae, where x represents one of the above-indicated viscosities.

Generally from about 30 to 70 percent by weight of the diorganopolysiloxanes employed in this mixture have a viscosity of from 20 to 200 cs. at 25°C., and more preferably have an average viscosity of at least 50 cs. at 25°C.

The diorganopolysiloxanes having a viscosity of 1,000 to 30,000 cs. at 25°C., whose SiC-bonded organic radicals are alkyl radicals having from 1 to 5 carbon atoms (b) are present in an amount of from about 15 to 50 percent by weight and have an average viscosity below about 10,000 cs. at 25°C., and more preferably below about 5,000 cs. at 25°C. Generally, the best results are obtained when the amount of diorganopolysiloxane (a) is greater than the amount of diorganopolysiloxane (b) and when as many different viscosities as possible are contained in the mixture, i.e., when at least 10 percent by weight of the organopolysiloxane mixture contains polysiloxanes whose SiC-bonded organic radicals are alkyl radicals having from 1 to 5 carbon atoms and a viscosity of from about 201 to 999 cs. at 25°C.

In order to combine easy applicability with particularly good lubricating properties, it is preferred that the diorganopolysiloxane mixture employed in this invention have a viscosity below about 600 cs. at 25°C. and preferably from about 200 to 300 cs. at 25°C.

For obvious reasons, it is preferred that other additives, such as organic oils and/or waxes or wax-like substances be excluded from the lubricating compositions of this invention. Although it is not preferred, materials such as natural and synthetic oils, paraffin and beeswax may be included in the lubricating composition of this invention.

The organopolysiloxane mixtures employed in this invention are preferably used in the absence of a sol-

vent or dispersing agent, but if desired, they can be employed in the form of dispersions in water or in organic solvents such as aliphatic and aromatic hydrocarbon solvents, e.g., n-hexane, octane, benzene, toluene, xylene or as solutions in organic solvents such as ethers, e.g., di-n-butylether and halogenated hydrocarbon solvents.

The lubricating composition may be applied to the organic fibers in the form of threads or yarns. The fibers may also be in the form of rovings, fleeces, mats or cloth. These compositions can be applied to organic fibers made of any material, such as wool, cotton, rayon, hemp, natural silk, polypropylene, polyester, polyurethane, polyamide, polyethylene, cellulose acetate and polyacrylonitrile or mixtures thereof.

The composition of this invention may be applied to the fibers by any conventional technique known in the art, such as by spraying, immersion or by passing the fibers across a base which has been soaked with the lubricating composition.

It has been found that the compositions of this invention which contain a mixture of diorganopolysiloxanes having from 1 to 5 carbon atoms are more effective as a fiber lubricant than the mixture employed heretofore which contain organopolysiloxanes and/or wax and wax-like substances.

The embodiments of this invention are further illustrated by the following examples.

EXAMPLES 1 THROUGH 6

Polyethyleneglycol-terephthalic acid ester yarns are treated with the compositions of this invention by passing the yarns through a bath containing the compositions described in the Table. The amount of lubricant absorbed by the yarn is approximately 2 percent of the yarn's weight. The dimethylpolysiloxanes employed are trimethylsiloxy end-blocked dimethylpolysiloxanes which at 25°C. have the viscosities indicated in the Table.

Four layers of a strongly dressed cotton cloth are sewn with the treated yarn on a sewing machine having a speed of 5,000 stitches per minute and a thread-drawing tension of 300 g. The effect of the lubricant is measured in the following Table by the length of the seam which can be sewn with the same distance between stitches before the thread breaks.

TABLE

Finish Dimethylpolysiloxane Mixtures				
No.	Viscosity of the dimethylpolysiloxane employed in preparing mixture (in cs.)	Quantitative Ratio in Wt. %	Viscosity of Mixture (cs.)	Seam Length to Break (× 40cm.)
1	100/5000	50/50	600	3.3
2	100/350/2000	37.5/31.25/ 31.25	250 to 300	4.6
3	20/100/500/5000	30/30/20/20	250 to 300	12.8
4	100/250/500/1000/2000/5000	66.66/6.66/ 6.66/6.66/ 6.66/6.70	250 to 300	19.3
5	350/0	100/0	350	1.9
6	350/Paraffin, Fp. 65°C.	85/15	undetermined	2.5

In the above Table, the sequence of the figures listed in the column "Quantitative Ratio in weight percent" relate to the sequence of the components listed in the preceding column. For example, the mixture of Example 2 contains 37.5 percent by weight dimethylpoly-

siloxane having a viscosity of 100 cs. at 25°C., 31.25 percent by weight dimethylpolysiloxane having a viscosity of 350 cs. at 25°C., and 31.25 percent by weight dimethylpolysiloxane having a viscosity of 2,000 cs. at 25°C.

Examples 5 and 6 are comparison examples in which the composition of Example 5 contains dimethylpolysiloxane fluid having a viscosity of 350 cs. at 25°C., and Example 6 contains a mixture of the dimethylpolysiloxane fluid having a viscosity of 350 cs. at 25°C. and a paraffin having a flash point of 65°C.

A comparison of the values in the column "Seam Length to Break (× 40cm.)" for finishes in Examples 1 through 4 with the values illustrated for the finishes in Examples 5 and 6 clearly shows the superiority of the lubricating compositions of this invention.

Although specific examples of the invention have been described herein, it is not intended to limit the invention solely thereto but to include all the variations and modifications falling within the scope of the appended claims.

What is claimed is:

1. A lubricating composition for organic fibers which comprises a mixture of organopolysiloxanes containing:

- a. from 10 to 75 percent by weight of an organopolysiloxane having a viscosity of from 20 to 200 cs. at 25°C.,
- b. from 10 to 50 percent by weight of an organopolysiloxane having a viscosity of from 1,000 to 30,000 cs. at 25°C., and
- c. from 0 to 80 percent by weight of an organopolysiloxane having a viscosity of from 201 to 999 cs. at 25°C.,

in which the organo groups of said organopolysiloxanes consist of alkyl groups having from 1 to 5 carbon atoms.

2. The composition of claim 1, wherein from 30 to 70 percent by weight of organopolysiloxane (a) having an average viscosity of at least 50 cs. at 25°C. and from 15 to 50 percent by weight of the organopolysiloxane (b) having a viscosity below 5,000 cs. at 25°C. are present in the composition.

3. The composition of claim 1, wherein the amount of organopolysiloxane (a) exceeds the amount of organopolysiloxane (b) and organopolysiloxane (c)

which has a viscosity of from 201 to 999 cs. at 25°C. is present in an amount of at least 10 percent by weight.

4. The composition of claim 1 which contains an organic solvent.

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