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TEXTILE OILS

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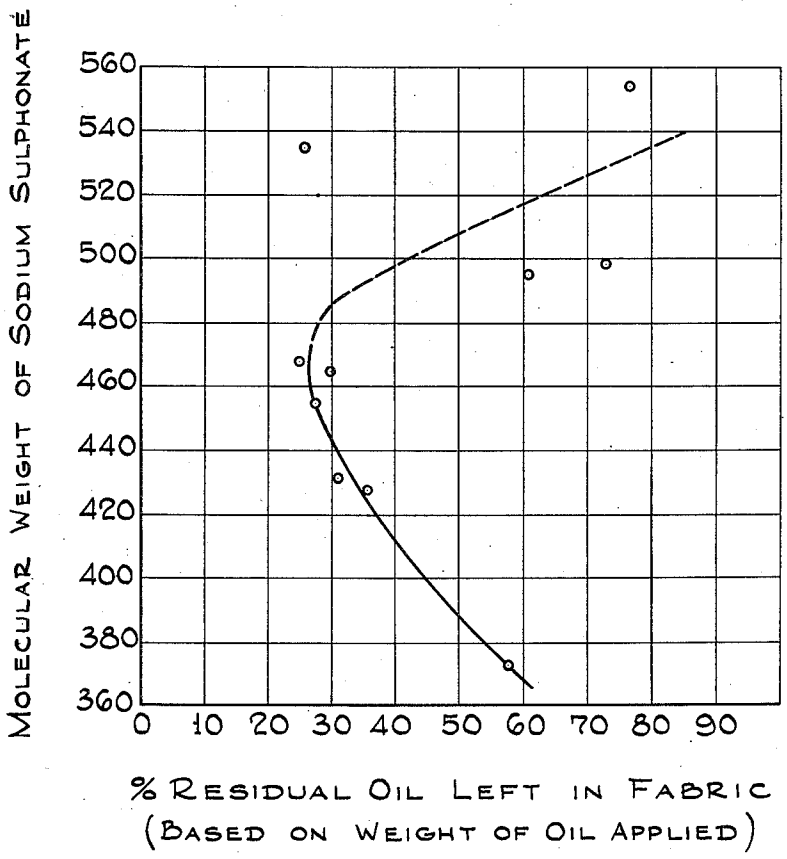

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TEXTILE OILS

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1

The present invention pertains to a textile oil and more particularly to an emulsifiable textile oil which affords effective lubrication for weaving yarns and the like and which can be readily removed by ordinary scouring operations without injury to the textile material.

In the prior art, textile oils have commonly included fatty oils of vegetable or animal origin, for example olive oil which is a very satisfactory textile oil but is expensive and has a tendency to become rancid in use. The use of mineral oils on textiles is well known but these have not been particularly satisfactory for various reasons and especially because they are difficult to wash or scour out of the finished fabric. Ordinarily, it is desirable that the residual oil which remains in a textile material after scouring with soap and soda ash, for example, should not exceed about 0.5% by weight, based on the total weight of the finished textile. Another way of stating this quantitatively is to state that the residual oil should not be more than a small fraction, for example a maximum of 10 or 15% of the original quantity of oil used on the yarn.

It has previously been suggested that a mineral oil mixed with a suitable emulsifying agent might be diluted or emulsified with water so as to minimize the quantity of lubricant required and to obtain more even distribution of the oil on the wool and also to facilitate its removal. For example, in Patent No. 2,079,803 to Holtzclaw and Winning there is disclosed a textile oil which consists of a suitable mineral oil, preferably a white mineral oil, containing about 7% by weight of an oil soluble sulfonate and a small quantity of an ester, such as triethanolamine oleate. The patent referred to describes various compositions wherein the quantities of sulfonates, esters, etc., may be varied somewhat and it suggests also the use of a sulfonated lard oil as a principal additive to the mineral oil. In practice, it has been found desirable to use a small quantity of water and alcohol in compositions such as described in said patent to render the triethanolamine oleate soluble in the oil. The present invention is an improvement over the invention described in said patent to Holtzclaw and Winning.

It has also been known in the prior art that certain oil soluble esters of higher polyhydric

2

alcohols are useful in connection with mineral oil for textile lubricating purposes. Thus in the United States patent to MacLaurin, No. 2,404,240, there is disclosed the use of an oil-soluble ester, such as a trioleate of sorbitol or "sorbitan" and it is pointed out that such materials which improve the emulsification properties of mineral oil may be used advantageously in various textile working operations. In the United States patent to Sharp, No, 2,389,193, there is disclosed a composition containing sulfonates and esters of polyhydric alcohols in rust preventing compositions. In the patent to Goodings et al., No. 2,238,882, there is disclosed a textile oil containing certain specific diesters of glycerol. The composition of the present invention is somewhat related to those of said patents but is based upon a novel combination of ingredients in controlled proportions which results in a textile oil of unexpected and improved properties.

It is an object of the present invention to provide an economical and efficient textile lubricant which can be easily and quite fully removed from finished goods and which combines the advantages of compositions known to the prior art and also offers advantages which have not hitherto been available. According to this invention, it is found that a particularly desirable lubricating composition may be made of mineral oil of appropriate grade, a suitable oil soluble sulfonate in proper proportions, and small controlled quantities of specific wetting or surface active agents which render the lubricants readily emulsifiable in water.

The type of emulsifying agent used according to this invention does not have the objectionable property of unduly raising the viscosity of solutions of sodium sulfonates in mineral oil. Hence, textile oils containing large amounts of sulfonates, with the corresponding improvement in scouring properties, can be utilized.

In the prior art, exemplified, for instance, by the composition disclosed in the Holtzclaw and Winning Patent No. 2,079,803, difficulty has often been experienced in moving oil from the textile material after it is finished. With such compositions it has frequently been found difficult to remove more than 60 to 70% whereas a removal of at least 85 to 90% of the oil is desirable.

Textile oils prepared by dissolving large

amounts (18 to 25%) of sodium sulfonate concentrate (65/35) in mineral oil can be scoured from fabric very satisfactorily. Such materials, however, do not form readily emulsifiable oils and it is necessary to add a third component to produce the required emulsibility. When this is done in accordance with the Holtzclaw and Winning patent, the viscosity of the resulting material is too high for textile processing. On the other hand, when a textile oil is prepared by dissolving 18 to 25% sodium sulfonate concentrate (65/35) and made readily emulsifiable by the addition of 0.5 to 1.5% of the polyoxyethylene derivative of sorbitan mono-oleate, then its viscosity is not as high, and, furthermore, can be adjusted readily by the addition of small amounts of sorbitan mono-oleate and/or ethylene glycol monobutyl ether. It is desirable that the viscosity should be between about 100 and 300 S. S. U. at 100° F.

The following method is used in determining the quantity of oil which is removed in conventional scouring. A 20 gram sample of cloth, previously extracted with ether to remove residual oil from previous treatments, is oiled with 10% of its weight of oil. This oiled sample is placed in a 4-litre jar, together with one litre of scouring solution. The scouring solution consists of water containing 0.2% by weight of soap, the usual kind being soda soaps of low titre and 0.1% of soda ash. It is maintained at a temperature of 110° F.

The jar is placed in a frame and rotated about its horizontal axis at 50 R. P. M. for a period of twenty minutes. After scouring, the sample is rinsed in water at about room temperature, dried, and the residual oil content determined by ether extraction. The residual oil content is expressed as the percentage of original oil applied.

EXAMPLE I

A light mineral oil, for example one having a viscosity of 100 S. S. U. at 100° F. and a viscosity index of 95 attains a viscosity of 177 S. S. U. at 100° F. when 12% of a sodium sulfonate concentrate (65% sulfonate in mineral oil) is added. The actual sulfonate content in this case is approximately 8% by weight and the sulfonate has a molecular weight of about 460. When woolen fabrics, lubricated with 10% by weight of such an oil, are subjected to the scouring test described above, 25% of the oil remains in the fabric as determined by extraction of the oil with ether. When the mahogany soap content is raised to 18% of sulfonate concentrate (i. e. about 12% sulfonate by weight) in the same mineral oil, the viscosity is increased to 205 S. S. U. at 100° F. Upon scouring in the same manner and with the same scouring liquor only 10.5% of the oil remains in the fabric. When the proportion of sodium sulfonate concentrate is increased to 24% (i. e. about 16% of actual sulfonate) the viscosity becomes 257 at 100° F. The scouring test of the high sulfonate oil is very satisfactory, only about 6.0% of residual oil being found in the finished fabric.

The above data show that textile oils prepared by dissolving sodium sulfonates in mineral oil produce very satisfactory products from the standpoint of their ability to be scoured from woolen goods. Unfortunately, such compositions do not form stable emulsions with water, and it is necessary to add an additional ingredient to impart this characteristic.

EXAMPLE II

By the use of a combination of well-known synthetic wetting agents such as sorbitan mono-oleate and sorbitan mono-oleate polyoxyalkylene derivative, it has been found according to the present invention that mineral oil with 18% of sodium sulfonate concentrate (i. e. about 12% sulfonate by weight in the final product) does not have a marked increase in viscosity over the viscosity of the base mineral oil. Such a composition gives good emulsions and has excellent scouring characteristics. Best results are obtained by using small quantities of both the wetting agents referred to, although satisfactory results may be obtained by the use of only one of them. Specifically a composition was prepared by mixing together at ordinary temperatures 86.7% by weight of a mineral oil having a viscosity of 100 S. S. U. at 100° F. and a viscosity index of 95, 12% by weight of sodium sulfonate concentrate (actually about 8% of sulfonate in the final product), 1% sorbitan mono-oleate polyoxyalkylene derivative, and 0.3% of sorbitan mono-oleate. This composition had a viscosity of 184 S. S. U. at 100° F., remained stable for 24 hours in a 10% emulsion and showed 23.9% residual oil after scouring with a standard scouring solution containing 0.2% of standard textile soap and 0.1% soda ash when tested in accordance with the procedure previously described.

EXAMPLE III

A composition consisting of 80.5% of the same mineral oil as described above in Example II, 18.0% of sodium sulfonate concentrate as above (i. e. about 12% sodium sulfonate having average molecular weight of about 460) 1.0% of the sorbitan mono-oleate polyoxyalkylene derivative, and 0.5% of sorbitan mono-oleate. This composition has a viscosity of 202 S. S. U. at 100° F., passed the 24 hour emulsion stability test for a 10% emulsion and showed only 9.5% residual oil after scouring.

EXAMPLE IV

This composition was precisely the same as that of Example III except that only one wetting agent was employed, that is 1.5% of sorbitan mono-oleate polyoxyethylene derivative. It passed the emulsion test mentioned above satisfactorily, showed a residual content after scouring of only 9.2% of the original oil used, but its viscosity was higher, 244 S. S. U. at 100° F.

EXAMPLE V

A composition was prepared containing 73.5% of the mineral oil described above, together with 25% of the sodium sulfonate concentrate, 1.0% of sorbitan mono-oleate polyoxyethylene derivative and 0.5% of sorbitan mono-oleate. It passed the emulsion test and showed a residual oil content of only 4.1% but its viscosity was 302 S. S. U. at 100° F., too high for general use.

EXAMPLE VI

In an effort to reduce the viscosity of the composition of Example V, 1% of butyl Cellosolve (ethylene glycol monobutyl ether) was added, the mineral oil content being reduced to 72.5%. The other ingredients were the same as in Example V. This composition passed the stability test for a 10% emulsion, showed a residual oil in the fabric of only 4.8% and had a viscosity of only 219, which is satisfactory.

The data given above in Examples II to VI is summarized in the following table:

TABLE I

Formulae and inspections of wool oils using sodium sulfonates and synthetic emulsifier

Example No.	II	III	IV	V	VI
Formula, per cent by weight					
Sodium Sulfonate Concentrate (65/35)	12.0	18.0	18.0	25.0	25.0
Sorbitan mono-oleate-polyoxyethylene derivative	1.0	1.0	1.5	1.0	1.0
Sorbitan mono-oleate	0.3	0.5	------	0.5	0.5
Butyl Cellosolve (Ethylene glycol nonobutyl ether)	------	------	------	------	1.0
Mineral Oil (V./100--100° F., V. I.—95)	86.7	80.5	80.5	73.5	72.5
Inspections					
V./100° F. (S. S. U.)	184	202	244	302	219
Emulsion test [1]	pass	pass	pass	pass	pass
Scouring Test [2] (Per Cent Residual Oil)	23.9	9.5	9.2	4.1	4.8

[1] 10% for 24 hours.
[2] Scouring liquor 0.2% soap and 0.1% soda ash.

In view of the favorable showing of the composition of Example III, various scouring solutions were tested to determine scouring characteristics more fully. Thus the quantities of soap and soda ash were varied and the residual oil as determined by ether extraction was noted for each of the scouring solutions. The results are shown in the following table:

TABLE II

Scouring Solution		Scouring Test, Per Cent Residual Oil
Per Cent Soap	Per Cent Soda Ash	
--------	0.1	7.5
--------	0.5	4.0
0.3	--------	27.0
0.5	--------	19.0
0.5	0.1	11.5
0.5	0.5	3.5
0.2	0.1	9.5
0.1	0.5	2.5

The excellent scouring characteristics of compositions containing sodium sulfonate with synthetic emulsifiers when soda ash alone is used as the scouring agent are of particular interest. Thus, with a scouring bath containing 0.1% soda ash and no soap whatever the residual oil content was only 7.5% of the original oil used on the textile. By the use of such a composition, soap may be dispensed with as a scouring agent, which is highly desirable in the woolen trade. On the other hand, tests carried out using soap alone in the scouring bath were not so satisfactory. With as much as 0.3% soap, the residual oil content was 27% and even when the soap was increased to 0.5% the residual oil was 19%.

For purposes of comparison, additional data were obtained using textile oils of the general composition described in the above-mentioned Holtzclaw and Winning patent, using various additives and using a mineral oil of lower viscosity index in one case. It will be noted that only in the last two columns did the scouring test show reasonably satisfactory results and in both of these cases the viscosity was extremely high, being in excess of 400 S. S. U. at 100° F. The results are shown in Table III.

TABLE III

Formula, per cent by weight						
Sodium Sulfonate Concentrate (65/35)	12.0	12.0	12.0	12.0	18.0	24.0
Oleic Acid	1.0	1.0	1.0	1.2	1.5	2.0
Triethanolamine	0.5	0.5	0.5	-------	0.75	1.0
Propylene Glycol	0.3	-------	0.3	-------	0.5	0.3
Butyl Cellosolve (Ethylene glycol monobutyl ether)	--------	0.3	-------	1.5	-------	------
Potassium Hydroxide	--------	-------	-------	0.2	-------	------
Mineral Oil, 100 S. S. U. at 100° F., 35 V. I.	--------	-------	85.2	-------	-------	------
Mineral Oil, 100 S. S. U. at 100° F., 95 V. I.	85.2	85.2	-------	83.6	77.75	71.7
Water	1.0	1.0	1.0	1.5	1.5	1.0
Inspections						
V./100° F. (S. S. U.)	172	173	168	146	430	485
Emulsion (10% for 24 hours)	pass	pass	pass	pass	pass	pass
Scouring Test,[1] Per Cent Residual Oil	38.3	26.0	34.7	42.6	11.6	5.6

[1] Scouring bath, 0.2% soap and 0.1% soda ash.

EXAMPLE VII

In order to show the usefulness of this type of textile oil for the processing of woolen goods, a mill test was conducted for a period of one month. Following is a description of the process:

The lubricant used had the following composition:

Ingredient	Per Cent by Weight
Sodium Sulfonate Concentrate (65%)	25
Sorbitan Mono-oleate	0.5
Polyoxyethylene derivative of Sorbitan Mono-oleate	1.5
Mineral Oil (100 S. S. U. at 100° F., 95 V. I.)	73

The wool was oiled with 6% by weight of the oil based on the weight of the wool in the form of a 30% aqueous emulsion. The wool was then subjected to the various processing operations encountered in the manufacture of woolen cloth such as carding, spinning and weaving. The oil in the cloth was then removed using a scour consisting of 0.14% of soap and 0.28% soda ash. After scouring the residual oil was 0.05% based on the dry fabric weight or 0.8% of that originally applied. After one month's service, no gumming of the steel cards was observed and there was no apparent deterioration of the rubber and leather parts of the machines.

From the above data it will be understood that the invention contemplates the use of various quantities of sulfonates and other wetting or emulsifying agents with or without the use of a small quantity of organic solvent to reduce the over-all viscosity of the composition when such viscosity exceeds desirable limits. Thus the invention contemplates the use of a light mineral oil or mineral base oil, for example an oil of 50 to 200 S. S. U. viscosity at 100° F., preferably having a viscosity between about 75 and 150 S. S. U. at 100° F. This oil will comprise about 70 to 94.5% by weight of the total composition. To this is added from 5 to 20% by weight based on the total composition of a metal sulfonate, preferably an oil soluble alkali metal sulfonate. The percentage limits just referred to apply to the pure sulfonate. The sulfonate is normally added as a concentrate in mineral oil. For example 18% of a 65/35 mineral oil solution of sodium sulfonate is equivalent to 11.7% concentration of the pure sulfonate. Proportions of the concen-

trate added will range from about 7 to 30%. The percentage figures used in the accompanying claims refer to the pure sulfonate or to a substantially pure compound, it being understood that the useful oil soluble sulfonates also may be mixtures of the salts of various metals if desired.

While reference has been made above to specific emulsifying agents, it will be understood that various synthetic emulsifying agents may be employed, although the fatty acid esters, and particularly the fatty acid mono-esters of polyhydric alcohols, are preferred. In particular, the fatty acid mono-ester of hexahydric alcohols are preferred, the esters of sorbitan (partially dehydrated sorbitol) being especially suitable.

It will be understood that various organic solvents may be used in proportions from about 0.1 to about 3.0%, based on the total composition, to control viscosity. The use of such solvents is advantageous when high concentrations of sulfonates are employed. In general, the invention contemplates the use of from 5 to 20% of dry sulfonate (i. e., aside from mineral oil solvent), 0. 5 3% of synthetic emulsifying agent and 0 to 3% of the solvent. Whereas butyl Cellosolve (ethylene glycol mono-butyl ether) is specifically referred to above as the preferred solvent, other solvents may be used, the mono-alkyl ethers of ethylene glycol (known commercially as the Cellosolve compositions) being particularly preferred. The overall mineral oil content will therefore range between about 77 and 94.5% by weight.

It will be understood that various modifications may be made in the composition within the spirit of the present invention. It will also be understood that the invention contemplates improved processes for treating textile oils to secure desirable characteristics and embraces also improved techniques and processes for oiling and scouring thread, yarn, and textile materials generally.

It has been further observed that oil of the general formula of this invention is more easily removed from the fabric by the usual scouring procedure as the molecular weight of the sulfonates used is increased from 380 to about 480. Above 480, removal of the oil becomes more difficult. Hence for optimum results, the sulfonates should be chosen within these limits. This relationship is indicated graphically in the attached drawing.

We claim:

1. A textile oil composition consisting essentially of 76 to 94.4% by weight of a mineral base oil of 50 to 200 S. S. U. viscosity at 100° F., 5 to 20% of sodium sulfonate having a molecular weight between 380 and 480, 0.5 to 2.5% of polyoxyalkylene derivative of sorbitan mono-oleate, and 0.1 to 1.5% of sorbitan mono-oleate.

2. A textile oil composition of low viscosity and good scouring characteristics, consisting essentially of 76 to 94.4% by weight of mineral oil of 50 to 200 S. S. U. viscosity at 100° F., 5 to 20% of oil soluble alkali metal sulfonate having a molecular weight between 380 and 480, 0.5 to 2.5% of the polyoxyethylene derivative of sorbitan mono-oleate, and 0.1 to 1.5% of sorbitan mono-oleate.

3. A textile oil composition consisting essentially of mineral oil of about 100 S. S. U. viscosity at 100° F. which contains about 6.3% by weight, based on the total composition, of sodium sulfonate having a molecular weight between 380 and 480, 1.0% of the polyoxyethylene derivative of sorbitan mono-oleate and 0.5% of sorbitan mono-oleate.

4. A composition according to claim 2 to which is added 0.1 to 3.0% by weight of a glycol monoether to reduce viscosity.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,079,803	Holtzclaw	May 11, 1937
2,436,219	MacLaurin	Feb. 17, 1948
2,454,828	Faust	Nov. 30, 1948

OTHER REFERENCES

"Spans and Tweens," Atlas Powder Company. Copyright 1942.