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METAL ROPE LUBRICANT

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This invention relates to improved metal rope lubricants, e.g., steel rope lubricants, and also to a process for the lubrication of such ropes with the novel lubricant of the present invention.

Metal ropes as used in cranes, lift cages and shipping are composed of a number of metal (steel) wire strands laid in helical form around a core which is also made of steel wire or hemp of a similar material. These ropes have to support extremely heavy loads. The stretch and bending stress when the rope is under load cause a heavy pressure of the outer strands on the parts of the cable situated more on the inside, as well as a movement of various parts of the cable in relation to one another. In addition, the cables are frequently subjected to corrosive influences, especially at sea. The combined effect of the heavy load, the friction between the strands and the corrosion may seriously damage the ropes in a short time.

Lubricants for metal (wire) ropes must fulfill many requirements such as they must provide good lubricity, penetrability, adhesiveness, flexibility, corrosion inhibition, usefulness over a wide temperature range such as encountered in cold and tropical regions and lubricant should be easy to use and handle.

Generally, commercial wire rope lubricants lack one or more of the above-mentioned properties, but are particularly deficient when used under extreme cold or tropical temperature conditions, the lubricant in the former case becomes inflexible or brittle resulting in excessive stiffness and difficulty of handling of the rope or in tropical climates the lubricant tends to drip, which also presents undesirable problems. In either case, the life of known lubricants is very short, namely around two to three months. To see that the ropes are properly lubricated under such conditions is time consuming and expensive.

It is an object of the present invention to provide an improved metal rope lubricant suitable for use over a wide temperature range. Another object of the present invention is to provide a steel rope lubricant which is dripless and possesses good lubricity, adhesiveness, flexibility and corrosion inhibiting properties. These and other objects will be apparent from the description of the invention.

According to the present invention a lubricant which satisfies the above requirements comprises of a mixture of: (*a*) 20–30% by weight of a high-melting point microcrystalline paraffin wax, melt point 170–300° F., (*b*) 25–35% by weight of an aromatic extract of a residual mineral lubricating oil fraction having a viscosity of from about 1000 to 5000 seconds, Redwood I at 140° F., (*c*) 5–15% by weight of a fatty oil rich in cholesterol (15–40%), e.g., lanolin, (*d*) 5–15% by weight of oil-soluble alkali petroleum sulfonate, and (*e*) 25–50% by weight of an aromatic hydrocarbon volatile solvent.

The high melting microcrystalline paraffin wax may be obtained from suitable crudes such as East Texas or West Texas Ellenberger stocks or any other stocks by suitable means known in the art such as, for example, as described in U.S. Patent 2,668,140.

Microcrystalline paraffin wax useful in compositions of the present invention may have the following properties:

Color (ASTM D–1500)	2.0 max.
Penetration, 77° F	17 max.
Ref. Ind., 100° C	1.4390–1.4430
Melt point, ° F	172–180

A particular microcrystalline paraffin wax (A) useful in compositions of the present invention has the following properties:

Wax A

Color (ASTM)	1.5
Flash, ° F	535
Fire, ° F	585
Viscosity at 210° F. SUS	77.8
Penetration, 77° F	15
Melt point (ASTM), ° F	176.4
Ref. Ind., 100° C	1.4413

The lanolin may be in the crude or refined form or fractions thereof may be used. Thus instead of lanolin, degras, wool fat, cholesterol and esters thereof may be used. Preferred is lanolin, the properties of which are as follows:

Color (ASTM)	2–3½
Melting point, ° C	36–42
Sap value	85–105
Iodine value (Hanus)	18–36
Water, percent max	0.25
Ash, percent max	0.1

The oil-soluble alkali metal (Na or K) petroleum sulfonates having a molecular weight of 350–900, preferably 400–450, are well known in the art and are prepared by reacting a mineral oil with concentrated or fuming sulfuric acid to form oil-soluble sulfonic acids which are then recovered by treatment with an alkali metal base such as sodium hydroxide followed by extraction. These oil-soluble soaps are available as 30% to 70% concentrates in mineral oil.

The volatile solvent may be a well known aromatic solvent having a boiling point of 140–200° C. and an aromatic content of from 40–95% by volume. Such solvents include aromatic gasoline having an aromatic content of 40–50 and a boiling point of 140–150° C.

An example of an aromatic petroleum solvent is one having the following properties:

Flash point, ° F	107
Initial boiling point, ° F	300
Percent off at 330° F	50
Percent off at 350° F	90
Final boiling point, ° F	370

If desired, other volatile solvents may also be used, e.g., chlorinated hydrocarbons. Also, a small amount of dye may be added to compositions of the present invention.

The lubricant is simple to make and essentially comprises melting the ingredients together and thoroughly mixing them preferably at 100–120° C. without the aromatic solvent, such as aromatic gasoline. The aromatic solvent (gasoline) is then gradually added with stirring and gradually cooled to room temperature.

The lubricants according to the invention have a semi-fluid consistency. When applied to the ropes to be lubricated they readily penetrate into the rope between the various strands, a solid but very flexible coating of lubricant remaining behind as a result of the evaporation of the gasoline. This coating protects the rope against cor-

rosion and ensures a good lubrication for long periods of time (6–24 months).

An example of a composition according to the invention (X) is a mixture of (*a*) 24.5% by weight of high-melting microcrystalline paraffin wax having a melting point of 87° C., (*b*) 30.5% by weight of furfural extract of a deasphaltized paraffinic residual lubricating oil fraction having a viscosity of 1300 seconds Redwood I at 140° F., (*c*) 7.0% by weight of lanolin, (*d*) 7.0% by weight of sodium petroleum sulfonate (molecular weight 400–500), and (*e*) 31.0% by weight of gasoline having a boiling point of 140–200° C. and an aromatic content of 44 vol. percent.

The worked penetration of this product, determined with the tapered-hole disk according to the tentative ASTM method for the measurement of the consistency of semifluid lubricating greases (see ASTM Standards on Petroleum Products, 1955, page 918), was 130–140 at 25° C.

This product (example X) was used as rope lubricant under extreme load conditions and at temperatures varying from —30° C. to +25° C. in snow, rain and sunshine and in a tropical climate with continuous sunshine at an ambient temperature of 40° C. The mixture could be very readily applied to the ropes and had an excellent penetration into the interior of the rope. It continued to be very satisfactory for 6–12 months both as lubricant, and as regards its anti-corrosive properties, without the rope requiring fresh treatment. The color also remained remained very satisfactory and steel ropes treated with lubricants of the present invention are particularly useful in tropical climates.

I claim as my invention:

1. A metal rope lubricating composition comprising a mixture of (*a*) 20–30% by weight of a high melting point microcrystalline paraffin wax, (*b*) 25–35% by weight of an aromatic extract of a residual mineral lubricating oil fraction having a viscosity of from about 1000 to 5000 seconds, Redwood I at 140° F., (*c*) 5–15% by weight of lanolin, (*d*) 5–15% by weight of an oil-soluble petroleum sulfonate and (*e*) 25–45% by weight of a volatile aromatic hydrocarbon solvent.

2. The composition of claim 1 wherein the microcrystalline wax has a melt point of 170–300° F., the sulfonate is oil-soluble sodium petroleum sulfonate and the aromatic solvent is aromatic gasoline having a boiling point of 140–200° C.

3. A steel rope lubricating composition comprising a mixture of 24.5% by weight of high-melting microcrystalline paraffin wax having a melting point of 175° F., 30.5% by weight of furfural extract of deasphaltized paraffinic residual lubricating oil fraction having a viscosity of 1300 second Redwood I at 140° F., 7.0% by weight of lanolin, 7.0% by weight of sodium petroleum sulfonate having a moleculer weight of 400–500, 31.0% by weight of gasoline having a boiling point of 140–200° C. and an aromatic content of 44 vol. percent.

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