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RUST-INHIBITING LUBRICANT

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1

The present invention relates to lubricant compositions, and more particularly to rust-inhibiting lubricants suitable for the lubrication of internal combustion engines, gears, cables, and other metal surfaces exposed to oxidizing conditions during use or storage.

It has been proposed heretofore to incorporate in engine lubricating oils, a small percentage of an alkaline earth metal sulfonate to function as a detergent and promote engine cleanliness. For ordinary use, quantities of the order of 0.25% to 1.5% of the sulfonate were effective to prevent deposition of oil sludge in the engines, but these percentages were insufficient to substantially inhibit or prevent rusting or corrosion of the internal metal surfaces of the engines. On the other hand, in the lubrication of heavy duty engines such as tractor, truck or bus engines, oils were employed which usually contained more than 1.5% of calcium sulfonate, i. e., of the order of 2% to 3% by weight, in addition to antioxidants or sludge inhibitors. Quantities of sulfonate within this range were sufficient, in general, to inhibit rusting of metal parts which were more or less continuously supplied with lubricant. However, for other purposes such as the lubrication of cables, gears, etc., and for coating the surfaces of machined, ground, stamped or rolled metal parts, oils containing as much as 3% of the sulfonate were not always capable of inhibiting or preventing rust, particularly when such metal objects were used or stored under humid atmospheric conditions.

I have found that the rust-inhibiting properties of oils containing an alkaline earth metal sulfonate, and particularly calcium sulfonate, may be markedly improved by the incorporation therein of a relatively small quantity of an alcohol, preferably an aliphatic alcohol containing at least 5 carbon atoms. Exemplary of the alcohols which may be employed are the amyl alcohols, the hexyl alcohols, the heptyl alcohols, the octyl alcohols, the nonyl alcohols, the decyl alcohols, and the higher homologues thereof which are soluble in hydrocarbon oil to an appreciable extent. Other alcohols which are useful in the practice of this invention are the phenols, the alkylated phenols and particularly those having side chains of 3 to 10 carbon atoms, hydroaromatic, heterocyclic, and naphthenic alcohols, and, in general, any relatively non-volatile alcohols which are compatible with oil-alkaline earth sulfonate mixtures. The quantity of alcohol to be employed many vary, depending to some extent upon the quantity of sulfonate uti-

2

lized, but I have found that from 0.01% to 3% of the alcohol or mixture of alcohols is usually sufficient to accomplish the desired result.

In preparing the rust-inhibiting lubricants of the present invention, I may subject a suitable lubricating oil stock to treatment with a sulfonating agent such as concentrated sulfuric acid, fuming sulfuric acid, sulfur trioxide, or chlorosulfonic acid, whereby through reaction with the oil, there are produced oil-soluble sulfonic acids and oil-insoluble acid sludge. After separation of the sludge, the oil containing the oil-soluble sulfonic acids may be neutralized with an aqueous slurry of lime or with dry lime in the presence of steam at an elevated temperature of, for example, 180° F. to 230° F. The neutralized oil containing calcium petroleum sulfonates may be freed of insoluble solids such as calcium sulfate, excess lime, etc., by filtration preferably after removal of moisture by air blowing at 180° F. to 220° F. If the resulting oil contains too little calcium sulfonate, concentration thereof may be effected by distillation at reduced pressure to remove a portion of the oil. Alternatively, if the oil contains too great a concentration of sulfonates, it may be diluted with additional oil to the desired concentration. To the resulting product is added a small amount of an alcohol of the character set forth hereinabove, and the mixture is agitated sufficiently to produce a homogeneous solution of oil, calcium sulfonate, and alcohol. In general, the rust-inhibiting lubricant thereby produced may contain from 0.25% to 3% of calcium sulfonate and 0.01% to 3% of alcohol. If desired, alkaline earth metal sulfonates other than calcium sulfonate may be employed, such as the oil-soluble sulfonates of barium, strontium, and magnesium. The lubricants of this invention may contain, in addition, fatty oils such as rapeseed oil, sperm oil, solubilized castor oil, etc., or such lubricants may be thickened to the consistency of grease by the incorporation of suitable soaps.

My invention may be further illustrated by the following examples, which, however, are not to be construed as limiting the scope thereof. The test employed to determine the rust-inhibiting properties of the lubricants comprised immersing a brightly abraded iron strip momentarily in a 0.1% aqueous solution of hydrobromic acid, and then immersing the strip, without drying, in a sample of the lubricant, and thereafter allowing it to drain for 4 hours in contact with the atmosphere. The base oil used was a solvent refined lubricating oil having a

Saybolt Universal viscosity of 503" at 100° F. and an A. P. I. gravity of 28°.

Base Oil	Per cent Ca sul- fonate	Per cent Hexanol	Per cent Decanol	Appear- ance of strip
503 Vis. Oil.....	0.00	0.00	0.00	rusted.
Do.....	0.25	0.00	0.00	Do.
Do.....	1.50	0.00	0.00	Do.
Do.....	0.25	0.25	0.00	no rust.
Do.....	1.50	1.50	0.00	Do.
503 Vis. Oil+1.5% Zn salt of a cyclo-hexyl ester of dithiophosphoric acid.	1.50	0.00	0.00	rusted.
Do.....	1.50	0.75	0.00	no rust.
Do.....	1.50	0.00	0.25	Do.
503 Vis. Oil+1.0% Zn salt of a cyclo-hexyl ester of dithiophosphoric acid.	0.25	0.00	0.00	rusted.
Do.....	0.25	0.00	0.01	no rust.
Do.....	0.25	0.00	0.05	Do.
Do.....	0.25	0.00	0.10	Do.
Do.....	0.25	0.00	0.25	Do.

Further examples of the lubricants of my invention are given in the following table. In this case, the test comprised immersing a brightly abraded iron strip in the test sample, then draining the strip for 16 hours, and immersing the strip in a 3.5% aqueous solution of sodium chloride for 20 hours. The oil employed was a solvent refined lubricating oil having a Saybolt Universal viscosity of 171" at 100° F. and an A. P. I. gravity of 31°.

Base Oil	Per cent Ca sul- fonate	Per cent Hexanol	Appear- ance of strip
171 Vis. Oil.....	3.00	0.00	rusted.
Do.....	3.00	0.75	no rust.

From the above examples, it will be seen that the addition of relatively small quantities of an alcohol to an oil containing an alkaline earth metal sulfonate renders the product capable of inhibiting rusting. The alcohol to be employed

will depend to some extent upon the service to which the oil will be put, i. e., for lubrication at ordinary temperatures the alcohol may be relatively low boiling, whereas for lubrication at high temperatures, a relatively high boiling alcohol is preferred.

I claim:

1. A rust-inhibiting lubricant comprising hydrocarbon lubricating oil, 0.25% to 3% of an alkaline earth metal petroleum sulfonate, and 0.01% to 3% of a pure aliphatic alcohol containing at least 5 carbon atoms.

2. A rust-inhibiting lubricant comprising hydrocarbon lubricating oil, 0.25% to 3% of calcium petroleum sulfonate, and 0.01% to 3% of a pure aliphatic alcohol containing at least 5 carbon atoms.

3. A rust-inhibiting lubricant comprising hydrocarbon lubricating oil, 0.25% to 3% of calcium petroleum sulfonate, and 0.01% to 3% of hexanol.

4. A rust-inhibiting lubricant comprising hydrocarbon lubricating oil, 0.25% to 3% of calcium petroleum sulfonate, and 0.01% to 3% decanol.

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