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LUBRICATING COMPOSITION

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2 Claims. (Cl. 87—9)

This invention relates to lubricating compositions and particularly to the so-called extreme pressure lubricants.

The standard lubricants for heavy duty service, that is, in internal combustion engines, are mostly hydrocarbon oils. These mineral oils when properly refined are very stable under heat but they are deficient in oiliness and in the strength of the oil film which is formed between metal surfaces in bearings or at other points where lubrication takes place. Both factors of film strength and oiliness are of great importance in the lubrication of heavy duty bearings such as are encountered in modern internal combustion engines or in gear transmissions with high tooth pressures, for example hypoid gears. Insufficient film strength will result in metal to metal contact even when an adequate quantity of lubricant is supplied to the bearing and insufficient oiliness will prevent retention of an oil film in the bearing when for any reason a lubricant supply becomes insufficient. Both deficient oiliness and deficient film strength permit metal to metal contact which results in higher wear and also in the rapid development of heat. Modern high speed internal combustion engines operate at so close to the limit of bearing pressures and rubbing speeds that it has been necessary to change the material used in the bearing, for example, to substituted certain bearing metals such as alloys containing silver, cadmium and the like, for the standard Babbitt metals.

Film strength and oiliness are probably due to molecular forces in the oil film, the molecules of which have the property of wetting or adhering to the metal surface. An oil film is retained tenaciously even when the lubricant supply is interrupted for considerable periods of time.

In the past, the problem was first attacked by the incorporation of small amounts of fatty acids into the oil. These compounds did in fact increase the oiliness to some extent probably due to soap formation of the free acid with the metal of the bearing surface, but they did not produce films of high strength and corrosion and other difficulties rendered their use undesirable. Certain esters such as tricresyl and triphenylphosphate and chlorinated esters of fatty acids with mono or dihydric alcohols have been proposed and have achieved some commercial success, notably in the case of tricresylphosphate and chlorinated stearic acid esters. The presence of the acid radical even though combined in ester form was therefore considered to be a necessary characteristic of the compounds.

According to the present invention, I have found that certain halogenated compounds which are neither esters, acids or derivatives, possess the property of increasing film strength to an extraordinary degree and also improving the oiliness. These compounds are halogenated polynuclear phenols, particularly chlorinated naphthols. The products are relatively cheap, are neutral and do not present corrosion problems and a small addition on the order of 1% produces an extraordinary increase in film strength and a notable increase in oiliness, the film strength increase being markedly better than ester compounds such as tricresylphosphate.

The present invention is not limited to any particular quantity of added chlorinated polynuclear phenol. In general, from about ½ to 1% of the lubricating oil gives satisfactory results. Smaller amounts tend to lower film strength and oiliness and much larger amounts do not bring about an increase in film strength and oiliness sufficient to compensate for the additional cost.

While the invention is not limited to any particular halogenated polynuclear phenol, the chlorinated betanaphthol compounds give best results, although the alphanaphthols, anthranols, hydroxyphenanthrenes and the like show similar properties and can be used effectively.

Example 1

A standard mineral lubricating oil was admixed with .75% alphachlorbetanaphthol. When tested on the standard lubricant tester of the Bureau of Standards with a high speed test specimen at 2500 R. P. M. and low speed test specimen at 417 R. P. M. giving a speed ratio of 6:1 under 12.1 lbs. per second rate of loading and 75° F. oil temperature, the load carrying capacity was 345 lbs. as compared to 148 lbs. for the mineral oil without addition.

Example 2

.7% of polychlorbeta naphthol containing about 4 chlorine atoms was mixed with the same mineral oil as in Example 1 and tested under the same conditions by the Bureau of Standards. A load carrying capacity of 1125 lbs. was registered on the machine.

The above figures may be compared with a commercial product sold extensively on the market and using 1% of tricresylphosphate. This composition, which employed the same mineral oil when tested on the machine showed a load carrying capacity of 160 lbs. as against 148 for the oil without any tricresylphosphate. It will

be apparent that even the lowest chlorinated naphthol of the present invention increased the load carrying capacity of the film by more than 100% as against an increase of between 8 and 9% for tricresylphosphate and the most effective type of product of the present invention, namely polychlorbetanaphthol, increased the load carrying capacity nearly 800%.

Example 3

One percent of chloralphanaphthol was blended with a standard mineral oil and tested in an Amsler machine. The torque was 63 ft. lbs. under a load of 300 kilograms. This compares with a torque of 68 ft. lbs. for one percent tricresylphosphate solution with 160 lbs. load. In other words, chloralphanaphthol requires less torque under almost double the load.

The corresponding brominated compounds show good film strength but not enough higher than the chlorinated compounds to compensate for their much higher cost.

Increase in oiliness is practically impossible to measure quantitatively. The halogenated polynuclearphenols of the present invention show marked improvement in oiliness when used in amounts of about ½ to 1%.

I claim:

1. A lubricating composition comprising a mineral lubricating oil and a small amount of polychlorinated naphthol.

2. A lubricating composition comprising a mineral lubricating oil and a small amount of polychlorinated betanaphthol.

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