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LUBRICATING COMPOSITION

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This invention relates to novel lubricating compositions. More particularly, it relates to lubricant compositions having superior non-corrosive and non-deposit forming properties.

Lubricating oils, under normal operating conditions, generally undergo oxidative deterioration resulting in the production of substances highly corrosive to metal parts of modern engine and like machinery. Particularly susceptible to such corrosion are the alloy metal (usually copper-lead) bearings employed in today's internal combustion engines.

Therefore, it is necessary to add to the lubricating oils, substances which act to reduce the corrosive effect upon the metal surfaces. Corrosion inhibitors which have been employed in the past have not been completely satisfactory. A number of additives have been employed that were not highly effective, thus allowing corrosion of the parts sought to be protected. Others, while quite effective initially, are used up rapidly in service and lose their effectiveness.

Another problem of many prior art anticorrosodents has been the fact that they could not be combined successfully in compositions with additives commonly used to effect wear inhibition, sludge inhibition, pour point depression, detergency, etc. Thus, a desirable inhibitor may be combined with these types of additives without adversely affecting the properties of either the anticorrosodent or the other additives.

Furthermore, many known corrosion inhibitors contain active sulfur and are thus undesirable for use with bearings containing silver and similar metals. The use of silver-containing bearings has greatly increased in such classes of engines as marine and locomotive diesels. Thus non-sulfur-containing lubricants possessing anticorrosodent properties are especially desirable.

The use of phthalic acids, especially isophthalic and terephthalic acids as corrosion inhibiting components of lubricant compositions is described in Stewart et al. U.S. Patent 2,809,160. These compounds represent highly effective corrosion inhibitors possessing many desirable characteristics such as the ability to be used in combination with numerous classes of both lubricating oil bases and lubricant additives of various types. However, in some applications, when these compounds are combined in lubricating compositions with certain nitrogen-containing detergents, while excellent anticorrosodent properties are displayed, a decrease in detergent activity often results. Thus their use in this commercially important class of detergent lubricant compositions results in an increase in the amount of varnish and other carbonaceous materials deposited upon piston valves and skirts and in piston ring grooves. These deposits are deleterious to engine operation and their elimination is a highly desirable objective evidenced by numerous advances recently made in producing better detergent-type additives.

It has now been found that a new and superior lubricating composition having excellent non-corrosive and non-deposit forming characteristics can be prepared from a major proportion of an oil of lubricating viscosity in combination with a high molecular weight nitrogen-containing detergent type additive, said combination being corrosive to metal surfaces in normal use, and a minor portion sufficient to inhibit corrosion of 2,4-dihydroxy benzoic acid.

The novel lubricating compositions of this invention are

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characterized by remarkable corrosion inhibiting properties over extended operational periods and by greatly improved lubricating of bearings and other sliding surfaces. An outstanding advantage of the particular inhibitor lies in the fact that its addition results in no increase in the deposit-forming characteristics of the compositions, a result common with the inhibitors of the prior art. As noted above, of particular advantage is the ability of these compositions to provide superior lubrication for particular bearings such as silver-containing bearings without the usually concomitant tendency to form underhead deposits in such heavy duty diesel service.

The corrosion inhibiting characteristics of 2,4-dihydroxy benzoic acid are obtained in particular in combination with recently developed nitrogen-containing non-metallic ashless detergents in lubricating oil compositions. Examples of such detergents are those derived from alkenyl succinic anhydrides having 30 or more carbon atoms in the alkenyl group and amine compounds, such as tetraethylene pentamine, N-aminoethyl piperazine, dimethylaminopropylamine, etc.

The detergent additive is obtained by heating an alkenyl succinic anhydride with at least 0.5 mole of an amine.

The substituted succinic anhydrides contemplated as reactants in the process can be readily obtained by heating maleic anhydride with a high molecular weight olefin or with a chlorinated high molecular weight olefin at a temperature from about 150–200° C. Typical high molecular weight olefins which can be employed are polyethylene, polypropylene, polyisobutylene, etc. Polyisobutylene is preferred.

Examples of suitable polyamine reactants are ethylenediamine, diethylene triamine, tetraethylene pentamine, and the like. Tetraethylene pentamine is a preferred polyamine reactant.

A preferred embodiment of the detergent additive is the product obtained by heating one mole of a polyisobutenyl succinic anhydride having about 65 carbon atoms in the olefin chain with 0.9 mole of tetraethylene pentamine.

The detergent additive is employed in the lubricant composition in an amount sufficient to impart detergency. Generally, amounts from 0.1 to 10% by weight are preferred.

The additives are a class of chemical compounds recognized in the art as possessing the ability to enable a lubricating oil medium to maintain oxidation products, resins, and other insoluble material in suspension or dispersed in the medium. Compositions in which these additives are employed are normally rendered more corrosive probably due to the removal of naturally formed protective films from bearings and other sliding surfaces. Thus, the use of a compatible and efficient corrosion inhibitor with these types of compounds is especially desirable.

The inhibitor of this invention is employed in an amount sufficient to inhibit corrosion. In general, amounts up to about 1.0% by weight are sufficient. A preferred range for most lubricant compositions is from about 0.01% to about 0.5% by weight.

Any of the well-known types of lubricating oils can be used as the base oils for the compositions of this invention. These oils are corrosive to metal surfaces under normal operating conditions. Examples of such base oils are naphthenic base, paraffin base, and mixed base mineral oils; synthetic oils, for example, alkylene polymers, such as polymers of propylene, butylene, etc., and mixtures thereof; alkylene oxide type polymers; dicarboxylic acid esters; phosphorous esters; silicon esters such as silicates and polysiloxanes; and alkyl aromatic hydrocarbons.

As previously mentioned, the corrosion inhibitor of this invention is effective in lubricant compositions containing additional conventional additives such as oxidation in-

hibitors, detergents or dispersants, sludge inhibitors, pour depressants, V.I. improvers, antifoaming agents, rust inhibitors, oiliness agents, wear inhibitors, dyes, etc.

The 2,4-dihydroxybenzoic acid corrosion inhibitor of this invention may be prepared by any suitable method and is commercially available, often being sold under the name resorcylic acid.

The following example is illustrative of the lubricating compositions of this invention.

EXAMPLE I

0.15% by weight of 2,4-dihydroxybenzoic acid was added to a lubricating composition comprising 3.0% by weight of a polybutenyl succinimide detergent type additive in a lubricating oil base which was a solvent refined paraffinic neutral oil of SAE 30 grade. The detergent was prepared by heating 1 mole of polybutenyl succinic anhydride having about 65 carbon atoms in the alkenyl chain with 0.9 mole of tetraethylene pentamine.

In order to demonstrate the effectiveness of 2,4-dihydroxybenzoic acid as a non-deposit forming anticorrosion, the lubricant composition prepared in Example I was subjected to the L-4 Engine Test and compared with a sample of base oil containing the same detergent and with a sample containing 0.15% by weight of terephthalic acid as a corrosion inhibitor.

In the L-4 test, the corrosion characteristics of a lubricant composition is determined in a Chevrolet standard 6-cylinder engine. Weighed copper-lead test bearings and new piston rings are installed. The test is run at a constant engine speed at about 3000 r.p.m. under a load of 30 brake horsepower for a period of 36 hours after a run-in period of 8 hours. The outlet temperature of the jacket coolant is about 200° F. and the oil sump temperature about 280° F. At the conclusion of the test the engine is disassembled and the pistons are removed and inspected for varnish deposits and rated for cleanliness on a basis of 0 to 10, 10 being perfectly clean. The bearings are weighed to determine total weight loss due to corrosion. Table I describes the results of tests performed comparing the additive of this invention with terephthalic acid.

Table I

L-4 ENGINE TEST

Inhibitor	Bearing Weight Loss (mg.)	Piston Varnish Rating
None.....	3,512	10.0
Terephthalic acid.....	282	8.6
2,4-dihydroxybenzoic acid.....	181	10.0

As shown by the above data, 2,2'-biphenyldicarboxylic acid compares favorably with terephthalic acid in its ability to reduce bearing corrosion with this type of lubricant composition. However, its great superiority lies in the fact that it does not contribute to lowering the varnish rating of the engine as does the terephthalic acid. Thus 2,4-dihydroxybenzoic acid provides excellent corrosion inhibition under actual engine operation and aids in maintaining extremely high engine cleanliness ratings.

The L-4 Engine Test is more fully described in the CRC Handbook, 1946 Edition, Coordinating Research Council, New York, New York.

I claim:

1. A lubricant composition comprising a major portion of an oil of lubricating viscosity in combination with a minor portion of an alkenyl succinimide lubricating oil detergent sufficient to impart detergency, said combination being corrosive to metal surfaces in normal use and a minor portion sufficient to inhibit corrosion, of 2,4-dihydroxybenzoic acid.

2. The lubricant composition of claim 1 wherein the minor portion of an alkenyl succinimide lubricating oil

3. The lubricant composition of claim 1 wherein the detergent additive is a polybutenyl succinimide prepared from a polybutenyl succinic anhydride having about 65 carbon atoms in the alkenyl chain and tetraalkylene pentamine, said detergent additive being present in an amount of from 0.1% to 10% by weight.

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