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LUBRICATING OILS

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3 Claims. (Cl. 252—51.5)

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The present invention relates to the improvement of lubricating oils.

It is among the objects of the present invention to provide improved lubricating oils which will have a decreased tendency toward sludge formation and which will have lessened tendency to cause corrosion of metallic surfaces with which such lubricating oils may come in contact.

Still further objects and advantages will appear from the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only, and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

It has been found that aryl phosphites, triphenyl phosphites and hydroxy and/or amino aromatic compounds do not function most satisfactorily in lubricating oils to inhibit the formation of sludge and to reduce the tendency of the lubricating oil toward producing corrosion on metal surfaces.

It has however been found that combinations of lecithin with certain aromatic hydroxy compounds and amino compounds and particularly hydroxylated and alkylated, polyhydroxy, polyamino and aminohydroxy compounds are most effective and surprisingly active in stabilizing lubricating oils at elevated temperatures.

Although it is preferred to use the polyhydroxy, polyamino, alkylhydroxy and hydroxyamino nuclear compounds, it also has been found satisfactory to use even poly-nuclear monohydroxy or monoamino compounds.

Among the preferred compounds that may be employed in combination with the lecithin for addition to the lubricating oil followed by an elevated temperature treatment are compounds generally included in the groups of the alkyl phenols, alkyl naphthols, di-substituted hydroxylated or aminated benzenes or naphthalenes, alkoxy phenols or naphthols, di and poly phenyl, toluyl, naphthyl or other aryl amines, amino phenols, alkylated or alkoxylated or hydroxylated toluenes or zylenes.

Less preferably there may be employed polynuclear aromatic hydrocarbons or their derivatives, such hydrocarbons containing at least 3 nuclei or even hydrocarbons of the nature of the naphthalenes or terpenes or their various carboxylated, hydroxylated, alkylated or alkoxylated derivatives. The preferred compounds are, however, hydroquinone, pyrogallol, ethyl or butyl

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pyrogallol, guaiacol, quinone, phloroglucinol, catechol or pyrocatechin, tributyl catechol, triamyl catechol, eugenol, vanillin, carvacrol, thymol, tannins, gallic acid, gallo-tannin, tannic acid, alphanaphthol, betanaphthol, ortho or para cresol, naphthoquinone, phenylbetanaphthylamine, alpha or beta naphthylamines, p-aminophenol, p-aminosaligenin, 2,4-di-aminophenol, monobenzyl-p-aminophenol, diphenylethylenediamine, benzyl-m-phenylenediamine, p-aminodimethylaniline, m-toluidine, diphenylhydrazine and tyrosine. These various materials are included in the expression "substituted aranes."

Less preferably, aromatic acids may be utilized, particularly aromatic carboxy acids containing one or more amino groups or hydroxy groups either in the nucleus or in aliphatic side chains, such as cinnamic, benzoic, salicylic or phthalic acids.

It is, of course, possible to use derivatives of the above identified compounds in which one or more of the hydrogen atoms in the benzene or naphthalene nucleus or in the aliphatic side chain or in the amino or hydroxy groups, is or are replaced by alkyl, aryl, hydroxy, amino, alkoxy, keto, aldo or nitro groups although this is usually not preferred.

This lecithin preferably should be added to or combined with the aromatic compounds in amounts varying from 5 to 30 parts of lecithin for each 20 parts of the aromatic compound.

The lecithin when mixed with the aromatic compounds should preferably contain between 10% and 60% of a glyceride oil, preferably a vegetable glyceride oil.

This combination of lecithin and the aromatic compounds, and preferably the glyceride oil, with or without heating before addition, is mixed with the lubricating oil and thoroughly dispersed therethrough, the lubricating oil during the addition or after the addition being heated with agitation to a temperature in excess of 350° F. and desirably to between 400° F. and 600° F.

It has been found that the interaction of the lubricating oil, lecithin and the aromatic compound is not most satisfactorily obtained unless the high heat treatment is applied to the lubricating oil after or during addition of the combination of lecithin and the aromatic compound, and it has been particularly found desirable that such heat treatment should be conducted with substantial agitation for a period of at least 10 minutes and the treatment may be conveniently continued for as long as several hours or more.

This is quite surprising due to the fact that

normally lubricating oils, as well as lecithin, are decomposed or broken down and rendered more subject to deterioration as a result of being subjected to such elevated temperatures. In accordance with this invention it is necessary for the lubricating oil to be subjected to the elevated temperature in excess of 350° F. together with and after having had thoroughly admixed therein the combination of the lecithin and the aromatic compound in order to develop the desired effect upon the lubricating oil.

It is not known whether the heat treatment of the lubricating oil containing the lecithin and the aromatic compound results in a chemical action between the lecithin and aromatic compound or the lubricating oil or whether a special kind of catalytic action takes place, but the heat treatment is necessary in order to obtain the desired effect upon the lubricating oil to retard sludge formation and corrosive tendencies of the oil.

It has been found most satisfactory to add the combination of lecithin and the aromatic compound in amounts varying from 0.075% to as much as 0.75% although generally between 0.2% and 0.4% are sufficient to show a marked effect upon the lubricating oil that is treated at the elevated temperature with the combination of lecithin and the aromatic compounds.

Preferably an equal mixture of the lecithin and the aromatic compound by weight is employed rather than other proportions as it has generally been found that where an equal mixture of the lecithin and the aromatic compound is prepared and added to the lubricating oil during or followed by the elevated temperature treatment, the most desirable effect on the lubricating oil is obtained.

Although it has been found that polyhydroxy, polyamino, alkylhydroxy and/or aminohydroxy compounds of mono-nuclear or poly-nuclear nature or monoamino or monohydroxy compounds of poly-nuclear nature are most satisfactorily employed, it is also possible to use in combination with or in lieu of such compounds with the lecithin the following compounds:

(*a*) Monohydroxy-aryl compounds such as phenol and its derivatives;

(*b*) Monoamino-aryl compounds such as aniline, diphenylamine, acetanilide, acetalaniline, dimethylaniline, amino-diphenyl, benzidene and their derivatives;

(*c*) Amine condensation products with aldehydes and ketones, such as benzalanilines, formylalphanaphthylamine, butyraldehyde-aniline, aldolaniline and their derivatives;

(*d*) Nitrogen or oxygen ring compounds, such as furfural, furfuryl alcohol, fureic acid, diphenylguanidine, p-dimethylamino - phenyl - p-phenetidylguanidine, pyridine, acridine, triazine, piperidine, quinoline, uric acid, urea, morpholine and their derivatives;

(*e*) Sulphur compounds such as thiodiphenylamine, methyl, ethyl, benzyl or phenyl sulphides or mercaptans, phenyl disulphide, benzyl sulphide and their derivatives;

(*f*) Cyanide compounds such as ethyl, butyl, benzyl or phenyl cuanides and cyanogen and their derivatives;

(*g*) Aliphatic amines such as dimethylamine, glutamic acid, glycine, triamylamine, n-butyldiamylamine, benzyldiethylamine and their derivatives;

(*h*) Small amounts of crude petroleum and preferably a crude petroleum with a naphthenic base, or such fractions or portions of crude petroleum as may be obtained by distillation or solvent extraction which will be high in non-saturated or non-hydrocarbon components, such as, for example, extracts which may be obtained with chlorinated or nitrated aliphatic or aromatic hydrocarbons such as nitrobenzene, chlorinated ethane, chlorinated ethyl ether or low boiling point aliphatic hydrocarbons such as liquefied propane or butane, liquefied sulfur dioxide, phenol, furfural, etc. Extracts may also be made to obtain similar compositions from coal tar or asphaltic or bituminous materials or residues, the preferred compound in such extracts or fraction preferably consisting of normally liquid yet relatively high molecular weight unsaturated ring compounds.

(*i*) Terpenes or lignin materials such as terpentine, pinene, abietic acid or various crude mixtures containing the same such as tallol, pine oil, rosin oil or their derivatives.

(*j*) Small amounts of esters or salts in which a metal forms part of the acid radical, for example, such compounds as the phenyl, benzyl, toluyl, cresyl, ethyl, amyl, butyl, propyl and other aryl or alkyl esters or acids including antimony, bismuth, tungsten, chromium, vanadium, thorium, molybdenum, tantalum, columbium, manganese and, less preferably, metals such as iron, lead, tin, or zinc, these metals in all cases preferably all being in a state less than their maximum oxidized state and in "ous" condition so as to form "ites" although in some instances the "ic" acids may be utilized which will form the "ates."

Although these compounds preferably have an oxygen atom linking the metal to the carbon of the alkyl or aryl group, it is also possible to use similar compounds in which the carbon is linked directly to the metal atom or in which the intermediate linkage is by way of a sulfur atom rather than an oxygen atom.

Although lecithin is preferred for use in accordance with this invention, it is possible to use cephalin and other similar phosphatides of plant or animal origin. There may also be utilized nerve or brain tissues and meat scrap residues, alcohol and hydrocarbon soluble extracts of crude sugars such as crude cane or beet sugar or their residues such as blackstrap molasses, for combination with the aromatic compound and lubricating oil.

The stabilizing procedures of the present invention are most applicable to non-volatile high molecular weight aliphatic hydrocarbons, and these procedures may also be utilized with high boiling liquid hydrocarbon mixtures derived from other sources than petroleum and even in some instances they may be used with solid high molecular weight hydrocarbon mixtures.

Less preferably, these stabilizing procedures may be employed with non-aliphatic hydrocarbons of high boiling point and still less preferably with high molecular weight glyceride oils, particularly the triglycerides of high molecular weight fatty acids having 12 to 36 carbon atoms, which acids may contain if desired one or more double bonds or hydroxy groups.

The invention is not as desirably applicable to hydrocarbons of vegetative origin such as rubber or latex and is not particularly applicable to hydrocarbon compounds of volatile nature or having a flash point less than about 200° F. to 250° F.

The present application is a division of ap-

plication, Serial No. 359,105, filed September 30, 1940, now Patent No. 2,339,797, granted January 25, 1944.

Having described my invention, what I claim is:

1. A process of improving lubricating oils to decrease sludge formation and also to decrease their tendency to cause corrosion of metal surfaces which comprises treating the entire body of such oil with a relatively small amount of phosphatide and a mononuclear aromatic sulfur containing compound sufficient to decrease sludge formation of the said oil.

2. A process of improving lubricating oils to decrease sludge formation and also to decrease their tendency to cause corrosion of metal surfaces which comprises treating the entire body of such oil with a relatively small amount of a phosphatide and thiodiphenylamine sufficient to decrease sludge formation of the said oil.

3. A process of improving lubricating oils to decrease sludge formation and also to decrease their tendency to cause corrosion of metal surfaces which comprises treating the entire body of such oil with a relatively small amount of a phosphatide and phenyl sulphide sufficient to decrease sludge formation of the said oil.

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