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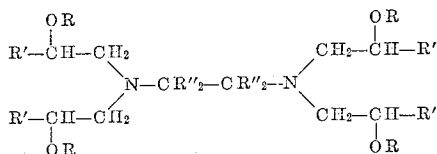
INHIBITORS FOR OLEAGINOUS COMPOSITIONS

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The present invention relates to the improvement of oleaginous compositions and more particularly to the preparation of improved mineral oil compositions, such as lubricating oils, heating oils and the like, by the incorporation therein of a new class of compounds which impart improved properties to such oleaginous compositions. The invention also relates to the new class of compounds per se.

In the development of petroleum lubricating oils the trend has been to use more and more efficient refining methods in order to reduce the tendency of the oils to form carbon and deposits of solid matter or sludge. While such highly refined oils possess many advantages, their resistance to oxidation, particularly under conditions of severe service, is generally decreased and they are more prone to form soluble acidic oxidation products which are corrosive. They are generally less effective than the untreated oils in protecting the metal surfaces which they contact against rusting and corrosion due to oxygen and moisture. In the prior art, compounds have been developed which, when added to refined mineral lubricating oils, inhibit the oxidation of these oils and prevent rusting and corrosion when employing these oils. Such additives have also been employed in other oleaginous compositions such as heating oils, Diesel oils, gasolines, fuel oils, asphalts, greases, waxes, synthetic lubricating oils and the like to also inhibit the oxidation of such compositions and to prevent rusting and corrosion when using such compositions. There is a continuing need for new and improved additives for such oleaginous compositions, which additives will inhibit oxidation, rusting and corrosion.

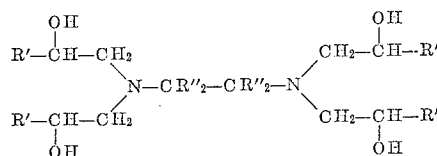
In accordance with the present invention, a new class of compounds has been found which when added to oleaginous compositions, such as mineral lubricating oils, heating oils and the like, in small proportions substantially reduce the tendencies of such compositions to oxidize and to rust and corrode metal surfaces. These compounds of the present invention have the following general formula:



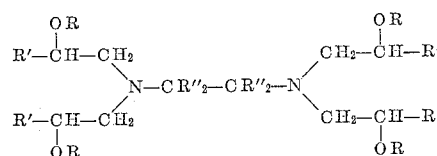
where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, R' is a member selected from the group consisting of hydrogen atoms and alkyl groups containing 1 to 2 carbon atoms, and R'' is a member selected from the group consisting of hydrogen atoms and methyl groups. The preferred compounds of the present invention are those in which all of the R' radicals are methyl groups and all of the R'' radicals are hydrogen atoms. More particularly, the compounds of this invention include (1) N,N,N',N' tetrakis (2-hy-

2

droxyalkyl) alkylene diamines which have the following general formula:



where R' and R'' have their aforementioned definitions and (2) esters of the N,N,N',N' tetrakis (2-hydroxyalkyl) alkylene diamines which have the following general formula:

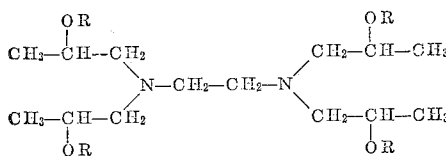


where R' and R'' have their aforementioned definitions and where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, at least one R being an acyl radical. The esters are particularly outstanding additives for oleaginous compositions.

The acyl radicals are derived from organic acids such as fatty acids, naphthenic acids or sulfonic acids. Acyl radicals derived from fatty acids, particularly those having 12 to 22 carbon atoms per molecule, are preferred. The fatty acids may be saturated or unsaturated. Specific examples of these fatty acids include undecanoic, lauric, oleic, linoleic, stearic, behenic and erucic acids. Monocarboxylic or polycarboxylic acids may be employed although monocarboxylic acids are preferred. Oleic acid is a particularly preferred fatty acid useful in forming esters of the present invention.

Specific examples of organic acids other than fatty acids which may be employed in this invention include the following: petroleum sulfonic, alkyl benzene sulfonic, and naphthenic acids derived from petroleum.

The preferred compounds of the present invention have the following formula:



wherein R is selected from the group consisting of hydrogen atoms and acyl radicals derived from fatty acids containing in the range of about 12 to 22 carbon atoms per molecule. A compound wherein all of the R's are hydrogen may be termed N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine. The esters of this invention may contain one, two, three or four acyl groups in the molecule. Particularly effective compounds of this invention are ones in which one of the R's is an acyl group derived from a fatty acid containing about 12 to 22 carbon atoms and the other three of the R's are hydrogen atoms. When the fatty acid portion of the molecule in such case is derived from oleic acid, a particularly effective and outstanding additive is formed which may be termed N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine monooleate.

The hydroxyalkyl alkylene diamines of this invention may be prepared by reacting an alkylene oxide containing 2 to 4 carbon atoms with an alkylene diamine such as ethylene diamine or propylene diamine. In this reaction, about 4 moles of the alkylene oxide will be reacted with each mole of alkylene diamine. Specific examples of the alkylene oxides which may be employed include ethylene oxide, propylene oxide and butylene oxide. Mixtures of these alkylene oxides may be employed if desired. Propylene oxide is particularly preferred. The reaction between the alkylene oxide and the alkylene diamine may be conveniently carried out at a temperature in the range of about room temperature to 250° C., preferably 100° C. to 200° C., and the reaction will be completed generally within about 4 to 6 hours, with or without the application of external pressure. An external pressure of 25-30 pounds per square inch is preferred.

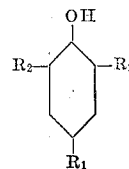
The hydroxyalkyl alkylene diamine esters of this invention are prepared by reacting about 1 to 4 moles of organic acid with 1 mole of the hydroxyalkyl alkylene diamine. Particularly useful compounds are prepared using about 1 mole of organic acid per mole of the hydroxyalkyl alkylene diamine. The esterification reaction may be conveniently carried out at a temperature in the range of about 75° C. to 250° C., preferably about 95° C. to 150° C., and the time required for completion of the reaction will generally be in the range of about 2 to 10 hours, or until water is no longer formed in the reaction product, the time required depending upon the number of OH groups esterified. The reaction is preferably carried out with stirring of the reactants and using a water entrainer such as heptane, benzene, xylene and the like since water is a by-product of this reaction. A catalyst may not be required, but if desired, an esterification catalyst such as phosphoric, sulfuric, toluene sulfonic or sulfosalicylic acid may be employed.

Specific examples of the compounds of the present invention include N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine; N,N,N',N'tetrakis hydroxy ethyl ethylene diamine; N,N,N',N'tetrakis 2-hydroxy butyl ethylene diamine; N,N,N',N'tetrakis 2-hydroxy propyl propylene diamine; N,N,N',N'tetrakis 2-hydroxy butyl 2,3-butylene diamine; N,N,N',N'tetrakis 2-hydroxy propyl 2,3-butylene diamine; N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine mono-oleate; N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine di-oleate; N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine tri-oleate; N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine tetra-oleate; N,N,N',N'tetrakis 2-hydroxy propyl ethylene diamine mono-laurate; N,N,N',N'tetrakis 2-hydroxy propyl propylene diamine naphthenate; and N,N,N',N'tetrakis hydroxy ethyl 2,3-butylene diamine sulfonate.

The hydroxyalkyl alkylene diamines and their esters may be added to oleaginous compositions in anti-oxidant proportions. The compounds of this invention are particularly effective as anti-oxidants in hydrocarbon products such as mineral oil compositions. Examples of such oleaginous compositions include mineral lubricating oils, heating oils, diesel fuels, residual fuel oils, kerosenes, gasolines, asphalts, greases and waxes. In general, the amount of the additives of this invention which will be added to the oleaginous compositions will be in the range of about 0.0005 to 5.0% by weight, based on the total composition. Preferred concentrations in mineral lubricating oils are about 0.01 to 1.0% by weight, based on the total composition. In the case of heating oils, diesel fuels and kerosenes, preferred proportions are in the range of about 0.0005 to 0.2% by weight.

It has been found that the present compounds are especially effective when used in combination with conventional anti-oxidants, particularly aryl naphthylamines and/or substituted phenols. More specifically, it has been found that the present compounds exhibit synergism with these two types of conventional anti-oxidants. Specific examples of aryl naphthylamines which may be employed

include phenyl alpha-naphthylamine and phenyl beta-naphthylamine. Phenyl alpha-naphthylamine is particularly effective. The substituted phenols which may also be employed in combination with the present compounds in oleaginous compositions have the general formula:



where R₁ is an alkyl radical containing about 1 to 8 carbon atoms, preferably about 1 to 4 carbon atoms, and where R₂ is selected from the group consisting of hydrogen atoms and alkyl groups containing 1 to 8 and preferably 1 to 4 carbon atoms, at least one of the R₂ radicals being an alkyl group. The trialkyl substituted phenols are particularly preferred. Specific examples of such substituted phenols include 2,6-ditertiary butyl para cresol and 2,4-dimethyl 6-tertiary-butyl phenol. A particularly preferred substituted phenol useful in this invention is 2,6-di-t-butyl para cresol.

When the hydroxyalkyl alkylene diamines of this invention and their esters are utilized in oleaginous compositions in combination with the aforescribed aryl naphthylamines and/or substituted phenols, it is preferred that the concentrations of the additives be in the range of about 0.01 to 1.0% by weight. More specifically in the case of lubricating oil compositions comprising a major proportion of a mineral lubricating oil, about 0.01 to 1.0% by weight, based on the total composition, of the hydroxyalkyl alkylene diamines or their esters will be employed in combination with about 0.01 to 1.0% by weight, based on the total composition, of aryl naphthylamine and/or substituted phenol, the weight ratio of the ethylene diamine derivative to conventional anti-oxidant being in the range of about 1:5 to 5:1. Particularly preferred concentrations are about 0.05 to 0.5% by weight of the additives, wherein the weight ratio of alkylene diamine derivative to the conventional anti-oxidant is in the range of about 1:3 to 3:1.

The products of the present invention may be employed in concentrations of about 0.001 to 5.0 wt. percent not only in ordinary hydrocarbon lubricating oils but also in the "heavy duty" type of lubricating oils which have been compounded with such detergent type additives as metal soaps, metal petroleum sulfonates, metal phenates, metal alcoholates, metal alkyl phenol sulfides, metal organo phosphates, phosphites, thiophosphates, and thiophosphites, metal xanthates and thioxanthates, metal thio-carbamates, and the like.

The lubricating oil base stock used in the compositions of this invention may be straight mineral lubricating oils or distillates derived from paraffinic, naphthenic, asphaltic or mixed base crudes, or, if desired, various blended oils may be employed as well as residuals, particularly those from which asphaltic constituents have been carefully removed. The oils may be refined by conventional methods using acid, alkali and/or clay or other agents such as aluminum chloride, or they may be extracted oils produced by solvent extraction with solvents such as phenol, sulfur dioxide, etc. Hydrogenated oils or white oils may be employed as well as synthetic oils resembling petroleum oils, prepared, for example, by the polymerization of olefins or by the reaction of oxides of carbon with hydrogen or by the hydrogenation of coal or its products.

For the best results the base stock chosen should normally be an oil which with the new additive present gives the optimum performance in the service contemplated. However, since one advantage of the additives is that their

use also makes feasible the employment of less satisfactory mineral oils, no strict rule can be laid down for the choice of the base stock. The additives are normally sufficiently soluble in the base stock, but in some cases auxiliary solvent agents may be used. The lubricating oils will usually range from about 40 to 150 seconds (Saybolt) viscosity at 210° F. The viscosity index may range from 0 to 100 or even higher. The preferred lubricating oils are mineral lubricating oils; however, the present compounds may also be employed in animal, vegetable and synthetic oils such as diesters (e.g. di-2-ethyl hexyl sebacate), complex esters, formals, polyethers and the like, or in mixtures of mineral, animal, vegetable and/or synthetic oils.

Other agents than those which have been mentioned may be present in the oil composition, such as dyes, pour point depressants, heat thickened fatty oils, sulfurized fatty oils, sludge dispersers, anti-oxidants, thickeners, viscosity index improvers, oiliness agents, resins, rubber, olefin polymers, and the like.

Assisting agents which are particularly desirable as plasticizers and defoamers are the higher alcohols having preferably 8 to 20 carbon atoms, e.g., octyl alcohol, lauryl alcohol, stearyl alcohol, and the like.

The present compounds are particularly useful as additives for lubricating oils used in turbines, compressors and similar equipment. In addition to being employed in lubricants, the additives of the present invention may also be used in other petroleum oil products such as motor fuels, heating oils, hydraulic fluids, torque converter fluids, cutting oils, flushing oils, turbine oils, transformer oils, industrial oils, process oils, and the like, and generally as anti-oxidants in mineral oil products. They may also be used in gear lubricants, greases and other products containing mineral oils as ingredients.

The compounds of this invention have been found to be particularly effective as anti-oxidants, corrosion inhibitors and sludge inhibitors in distillate fuels such as kerosene, heating oil, diesel fuel and similar products. More particularly, the present compounds have been found to be effective in low concentrations in mineral oil distillates having a boiling range of about 150° F. to 900° F., particularly about 300° F. to 700° F. The addition of about 0.0005 to 1.0% by weight, preferably about 0.0005 to 0.2% by weight, of the present compounds, particularly the fatty acid esters of hydroxyalkyl alkylene diamines will inhibit corrosion, sludge formation and oxidation during transportation and storage of the distillate. The present compounds are particularly desirable additives for such distillates since they are ashless and thus do not affect the burning qualities of the distillate or give rise to glowing ashes. The use of the present compounds in distillate fuels in conjunction with known ashless sediment inhibitors such as polymers of acrylic acid esters, high molecular weight aliphatic amines, or lecithin, is particularly effective, the combination of additives being ashless.

The invention will be more fully understood by reference to the following examples. It is pointed out, however, that the examples are given for the purpose of illustration only and are not to be construed as limiting the scope of the present invention in any way.

EXAMPLE I

The anti-oxidant properties of N,N,N',N'tetrakis (2-hydroxypropyl) ethylene diamine (hereinafter termed additive A) were evaluated in the well-known Staeger oxidation test, which is an accepted test for evaluating anti-oxidant properties of lubricating oils. In the Staeger oxidation test, a 200 cc. sample of lubricating oil is heated to 110° C. in a beaker containing a copper strip as a catalyst. During the test, air is passed continuously over the oil sample and the copper strip is replaced with a fresh strip every 72 hours. The life of the oil is de-

fined as the time required for a 0.2 increase in the neutralization number of the oil.

N,N,N',N'tetrakis (2-hydroxypropyl) ethylene diamine monooleate (hereinafter termed additive B) was also evaluated in the Staeger oxidation test. Additive B was prepared as follows: 292 g. of additive A (1 mole) and 282 g. of oleic acid (1 mole) were placed in a round bottom flask fitted with a stirrer and a reflux condenser with an attached finger to collect water. Heptane was used as a carrier for the by-product water of the reaction. No catalyst was required. The mixture was refluxed with stirring at a temperature of 200° C. until 1 mole (18 cc.) of water had been collected. The time required was about 2.5 hours. The heptane was then stripped off, leaving the product which was a clean, amber, slightly viscous fluid.

The effectiveness of 2,6-di-t-butyl para cresol hereinafter termed additive C) and of phenyl alpha-naphthylamine (hereinafter termed additive D) were also evaluated in the Staeger life test individually and in combination with additives A and B. The additives were evaluated in a mineral lubricating oil (hereinafter termed base oil) which had been refined by phenol extracting a distillate derived from a naphthenic crude oil and had an SSU viscosity at 210° F. of about 45 sec. The results of the Staeger life tests are shown below:

Table I
STAEGER LIFE TEST

Wt. Percent Additive ¹ in Base Oil	Staeger Life (Hrs.)
None	² 108
0.4% Additive C	112
0.4% Additive D	183
0.4% Additive A	127
0.2% Additive B	207
0.4% Additive B	225
0.2% Additive A+0.2% Additive D	177
0.2% Additive A+0.2% Additive C	238
0.2% Additive B+0.2% Additive D	² 249
0.2% Additive B+0.2% Additive C	² 305

¹ Additive A=N,N,N',N'tetrakis (2-hydroxypropyl) ethylene diamine. Additive B=N,N,N',N'tetrakis (2-hydroxypropyl) ethylene diamine monooleate. Additive C=2,6-di-t-butyl cresol. Additive D=Phenyl alpha-naphthylamine.

² Average of duplicate runs.

It will be noted that additive A increased the Staeger life of the base oil but that the increase was not nearly as great as that resulting when additive B was employed as the additive in the base oil. Additive B was substantially superior to additives A, C and D in the Staeger life test. It will also be noted that the combination of additive A with additives C and D and the combination of additive B with additives C and D gave a longer Staeger life than would be predicted from the Staeger lives of the individual additives. Particularly effective combinations were (1) the combination of additive A and additive C, (2) the combination of additive B and additive D and (3) the combination of additive B and additive C.

EXAMPLE II

Additive A in the base oil of Example I was also evaluated in an A.S.T.M. rust test (Test No. D665-50T). This A.S.T.M. rust test was carried out as follows: A polished steel test spindle, approximately 1/2 inch in diameter and 2.7 inches in length, and conforming to S.A.E. grade 1020 is immersed in a covered beaker containing 300 cc. of the oil and 30 cc. of either distilled water or synthetic sea water as the test prescribes. The specimen is kept in contact with the agitated oil, which is maintained at a temperature of 140° F. for 24 hours. At the end of this period the specimen is removed, washed with a solvent and the extent of rusting noted.

The results of the rust tests were as follows:

7

Table II

A.S.T.M. RUST TEST (140° F.)

Wt. Percent Additive in Base Oil	Rust Rating	
	Sea Water	Dist. Water
None.....	5.5 (95% rust)....	5.5 (95% rust)....
0.5% Additive A ¹	1.0 (no rust).....	1.0 (no rust)....

¹ N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine.

It will be noted that the base oil in the absence of an inhibitor gave a high amount of rusting whereas upon the addition of only 0.5% by weight of additive A no rust was produced in the A.S.T.M. rust test. Additive B is also an effective rust inhibitor in mineral lubricating oil compositions.

EXAMPLE III

Additive B in a heating oil was evaluated in a modification of the A.S.T.M. rust test (test No. D665-50T). The heating oil to which additive B was added was a mineral oil distillate having a boiling range of about 360° to 660° F. and was derived from a mixture of straight run and cracked distillates. The A.S.T.M. rust test was carried out as follows: The procedure followed was a modification of the one previously described (Example II), employing distilled water and a temperature of 77° F. instead of 140° F. prescribed in the previous test. The results of the rust test using additive B as an additive in heating oil were as follows:

Table III

A.S.T.M. RUST TEST (77° F.)

Wt. Percent Additive in Heating Oil	Test Results
None.....	Fail (99% rust).
0.004% Additive B ¹	Pass (no rust).
0.008% Additive.....	Do.
0.020% Additive.....	Do.

¹ N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine monooleate.

It will be noted that very small proportions of additive B in the heating oil reduced the amount of rusting from 99% to no rust.

EXAMPLE IV

Additive B was also evaluated in heating oil with respect to its sludge inhibiting and color stabilizing properties. The heating oil in this example was the same as that employed in Example III. The sediment test was carried out by heating 600 cc. of the test oil for 16 hours at 210° F., after which the test oil was filtered through a tared fritted glass crucible and the amount of the sludge collected on the filter weighed. The color of the test oil after heating for 16 hours at 210° F., but prior to filtration was noted and recorded. The following results were noted in these tests:

Table IV

STABILIZATION OF HEATING OIL

Wt. Percent of Additive in Heating Oil	Sediment (mg./600 cc.)	Color After Test
None.....	18	Almost black.
0.01% Additive B ¹	12	Light.
0.02% Additive.....	7	Do.

¹ N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine monooleate.

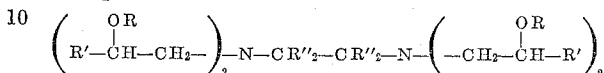
It will be noted that the addition of small amounts of additive B produced a heating oil composition which had a better color after heating than did the heating oil alone (ex additive B). Also, the addition of additive B to the heating oil decreased the amount of sediment formed in

8

the heating oil composition upon heating for an extended period of time. This color and sludge stabilization is unusual and unexpected since almost all known rust inhibitors increase the sediment.

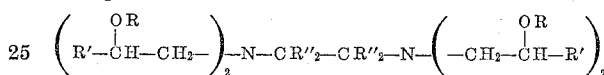
5 What is claimed is:

1. An oleaginous composition normally subject to deterioration by oxidation comprising a major proportion of a mineral oil and a minor, anti-oxidant proportion of a compound of the formula



where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, R' is a member selected from the group consisting of hydrogen atoms and alkyl groups containing 1 to 2 carbon atoms, and R'' is a member selected from the group consisting of hydrogen atoms and methyl groups.

2. A lubricating oil composition comprising a major proportion of a mineral lubricating oil and about 0.001 to 5.0% by weight, based on the total composition, of a compound of the formula



where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, R' is a member selected from the group consisting of hydrogen atoms and alkyl groups containing 1 to 2 carbon atoms, and R'' is a member selected from the group consisting of hydrogen atoms and methyl groups.

3. Composition according to claim 2 wherein at least one R is an acyl radical derived from a fatty acid containing 12 to 22 carbon atoms per molecule.

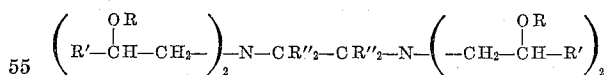
4. Composition according to claim 2 wherein all of the R' radicals are methyl groups.

5. Composition according to claim 2 wherein all of the R'' radicals are hydrogen atoms.

6. A lubricating oil composition comprising a major proportion of a mineral lubricating oil and about 0.01 to 1% by weight, based on the total composition, of N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine.

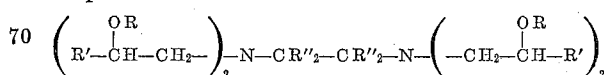
7. A lubricating oil composition comprising a major proportion of a mineral lubricating oil and about 0.01 to 1% by weight, based on the total composition, of N,N,N',N' tetrakis (2-hydroxypropyl) ethylene diamine monooleate.

8. An oleaginous composition normally subject to deterioration by oxidation comprising a major proportion of a mineral oil and a minor, anti-oxidant proportion of a compound of the formula



where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, R' is a member selected from the group consisting of hydrogen atoms and alkyl groups containing 1 to 2 carbon atoms, and R'' is a member selected from the group consisting of hydrogen atoms and methyl groups and a minor, anti-oxidant proportion of a compound selected from the group consisting of aryl naphthylamines and substituted phenols.

9. A lubricating oil composition comprising a major proportion of a mineral lubricating oil, about 0.01 to 1.0% by weight, based on the total composition of a compound of the formula

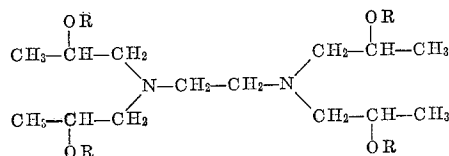


where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, R' is a member selected from the group consisting of hydrogen atoms

9

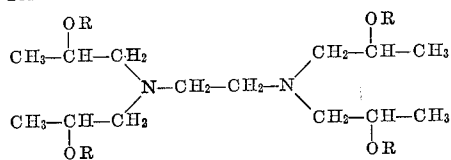
and alkyl groups containing 1 to 2 carbon atoms, and R'' is a member selected from the group consisting of hydrogen atoms and methyl groups and about 0.01 to 1.0% by weight, based on the total composition of a compound selected from the group consisting of phenyl alpha-naphthylamine and 2,6-di-t-butyl para cresol, the weight ratio of said first-mentioned compound to said second-mentioned compound being in the range of about 1:5 to 5:1.

10. A lubricating oil composition comprising a major proportion of a mineral lubricating oil, about 0.05 to 0.5% by weight, based on the total composition, of a compound of the formula



where R is a member selected from the group consisting of hydrogen atoms and acyl radicals, said acyl radicals being derived from fatty acids containing in the range of about 12 to 22 carbon atoms per molecule, and about 0.05 to 0.5% by weight, based on the total composition of a compound selected from the group consisting of phenyl alpha-naphthylamine and 2,6-di-t-butyl para cresol, the weight ratio of said first-mentioned compound to said second-mentioned compound being in the range of about 1:3 to 3:1.

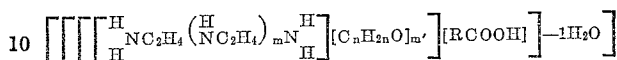
11. A heating oil comprising a major proportion of a mineral oil distillate and about 0.0005 to 0.2% by weight, based on the total composition, of a compound of the formula



wherein R is selected from the group consisting of hydrogen atoms and acyl radicals, said acyl radicals being derived from fatty acids containing in the range of about 12 to 22 carbon atoms per molecule, at least one R being an acyl group.

10

12. A fuel oil composition comprising a major portion of a hydrocarbon fuel oil, and a minor portion sufficient to stabilize the fuel oil against the formation of sludge and undesirable color bodies, of an esterified alkylene oxide addition product of a polyethylene amine formed by reaction involving equimolar proportions of the addition product and the higher fatty acid with elimination of one mole of water and conforming to the structure



in which m is zero; m' is a whole number equal to m plus 4; and n is a whole number varying from 2 to 4.

13. The composition of claim 12 with the proviso that n is 2.

14. The composition of claim 12 with the proviso that n is 2 and RCOOH is a saturated fatty acid.

15. The composition of claim 12 with the proviso that n is 2 and RCOOH is stearic acid.

16. A fuel oil composition comprising a major portion of a hydrocarbon fuel oil and a minor portion, sufficient to stabilize the fuel oil against the formation of sludge and undesirable color bodies, of an oil soluble and surface-active chemical compound which is an esterified alkylene oxide addition product of a polyamine formed by esterification of the addition product with a monocarboxy higher fatty acid and which compound has the following structural elements and characteristics: (a) two basic nitrogen atoms; (b) four alkyleneoxy radicals; (c) one acyl radical derived from a higher fatty acid having at least 12 carbon atoms; (d) one acyl radical being present as part of an ester radical; (e) said compound being free from any cyclic radical; (f) said compound being free from any acyl radical present as part of an amide radical.

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