BASIC BARIUM-CONTAINING COMPOSITIONS

Inventor: William Monroe Lesuer, Cleveland, Ohio

Assignee: The Lubrizol Corporation, Wickliff, Ohio

Filed: Sept. 9, 1971

Appl. No.: 179,159

U.S. Cl. .................. 252/40.7, 252/18, 252/33.6, 252/40.5, 252/42.7, 252/51.5 A, 260/92.8, 260/414

Int. Cl. ................................. C10M 3/48

Field of Search ...................... 252/18, 40.5, 33.6, 252/40.7, 42.7, 51.5 A; 260/414

References Cited

UNITED STATES PATENTS

3,194,823 7/1965 LeSuer.......................... 252/18 X
3,065,179 11/1962 Morway.......................... 252/40.7 X
2,921,904 1/1960 Hotten.......................... 252/40.7 X

3,269,090 2/1965 Trautman ...................... 252/51.5 A
3,390,943 12/1945 Kavanagh ...................... 252/51.5 A
3,312,618 4/1967 LeSuer et al. .................. 252/33
3,372,114 3/1968 Rense ........................... 252/33
3,422,013 1/1969 Scher ........................... 252/19

Primary Examiner—Daniel E. Wyman
Assistant Examiner—H. M. S. Sneed

ABSTRACT

Compositions useful to improve power transmission in automatic transmission fluids, hydraulic fluids and the like as replacements for basic barium salts of sperm oil are obtained by reacting an excess of a barium base with the combination of a phenol (preferably an alkylphenol), a fatty acid and an alcohol, wherein the fatty acid and alcohol together contain at least 26 carbon atoms in straight-chain configuration. The compositions are preferably further reacted with carbon dioxide, and they may additionally be reacted with about 1–5% of anthranilic acid.

20 Claims, No Drawings
This invention relates to new compositions of matter suitable for use as lubricant additives, and to methods for their preparation. More particularly, it relates to oil-soluble, basic barium-containing compositions prepared by reacting (A) a barium base with a mixture comprising (B) a phenol, (C) at least one fatty acid and (D) at least one aliphatic monohydric alcohol, each of reagents C and D containing a straight chain of carbon atoms such that at least 26 carbon atoms in straight-chain configuration are present in the combination of said reagents C and D, the ratio of equivalents of reagent A to the combination of reagents B, C and D being at least about 1.5:1.

Basic barium salts of sperm oil have long been used as lubricant additives, particularly in automatic transmission fluids, hydraulic fluids and the like. They aid these lubricants to provide a smooth transmission of power between clutch plates and the like when the same become engaged, thus avoiding “squawking” noises and other problems. The preparation and use in this way of barium salts of sperm oil is described, for example, in U.S. Pat. No. 2,989,463.

The United States Government has recently taken action to prevent the killing of whales, from which sperm oil is obtained, to avoid their becoming extinct. The only source of sperm oil has therefore “dried up” and it has become necessary to find substitutes for the basic barium salts thereof, which can be cheaply and efficiently produced and which provide the same advantageous properties to lubricants.

A principal object of the present invention, therefore, is to produce useful lubricant additives. A further object is to produce lubricant additives which improve power transmission in automatic transmissions and the like.

A further object is to produce basic barium salts which, when incorporated in power-transmitting lubricants, improve their lubricating properties.

Still another object is to produce compositions which may be substituted for basic barium salts of sperm oil as lubricant additives, and which provide the same properties as the sperm oil salts.

Other objects will in part be obvious and will in part appear hereinafter.

Reagent A in the compositions of this invention is a barium base. It may be barium oxide, hydroxide, sulfide, hydrosulfide or the like; the oxide and the hydroxide are preferred.

Reagent B is a phenol. Unsubstituted phenol and lower alkyl-substituted phenols such as the cresols, ethylphenols, butylphenols and the like may be used, but it is preferable to use a phenol containing an alkyl substituent having at least about 6 carbon atoms such as heptylphenol, diisooctylphenol, n-decylphenol, tetrapropenylphenol, octadecylphenol, polyisobutene-substituted phenol and the like. Cycloalkyl-substituted phenols may also be used. The phenol may contain other substituent groups in addition to the alkyl or cycloalkyl groups; examples are halogen, nitro, ether, ester and similar radicals. Also useful are the aldehyde condensation products of the above-described phenols.

Reagent C is a fatty acid. As used herein, the term “fatty acid” means an acid which may be obtained by hydrolysis of a naturally occurring vegetable or animal oil. It may be a pure acid or a mixture of acids. Suitable acids include palmitic acid, stearic acid, oleic acid, linolenic acid, tall oil acid, acids derived from palm oil, soybean oil or animal fats and oils, and the like. Acids containing about 16-20 carbon atoms are preferred.

Reagent D is an aliphatic monohydric alcohol and is exemplified by n-decanol, isodecanol, dodecanol, tridecanol, tetradecanol, oleyl alcohol, stearyl alcohol, palmityl alcohol and mixtures of normal primary alcohols in the C12-20 range, such as may be obtained by the Oxo process.

The selection of reagents C and D is made so that at least 26 carbon atoms are present in straight-chain configuration in the combination of said components. Thus, if reagent C is palmitic acid, reagent D should contain a straight chain of at least 10 carbon atoms, and if reagent C is stearic or oleic acid reagent D should contain a straight chain of at least 8 carbon atoms.

As previously mentioned, the ratio of equivalents of reagent A (the barium base) to the combination of reagents B, C, and D in the reaction mixture leading to the products of this invention is at least about 1.5:1. Usually, it is at least 3:1 and it may be as high as 10:1. As used herein, the term “equivalent” is a weight of the reagent involved equal to its equivalent weight. For barium bases the equivalent weight is one-half the molecular weight, while for monohydric phenols and alcohols and monocarboxylic acids the equivalent weight is equal to the molecular weight.

The relative amounts of reagents B, C, and D may vary within wide limits. Generally, the weight ratio of each of reagents C and D to reagent B will be greater than 1; usually, it will be between about 1:1:1 and 4:0:1. The equivalent weight ratio of reagent C to reagent D is usually between about 0.5:1 and 2:1.

In addition to the reagents described hereinafore, the reaction mixture ordinarily contains a diluent which may be mineral oil, petroleum naphtha, kerosene, xylene or the like. Mineral oil is particularly preferred since the compositions are to be incorporated in mineral oil to prepare a lubricant. The reaction mixture may also contain a small amount of water (generally not more than about 5 percent, based on the weight of reagents C and D) which may be used in some instances) which aids in fluidizing the barium base. It is necessary to remove this water during the formation of the product. This is easily done since the reaction is ordinarily carried out at about 120-200° C., at which temperature the water distills. In addition to any water added to fluidize the barium compound, water present as water of hydration in reagent A is removed at these temperatures.

The order of reagent addition is not critical and may be widely varied. It is frequently convenient to add reagent A to a mixture of reagents B, C and D. However, it may sometimes be advantageous to add reagent C after reagent A, or to add reagents A and B portionwise in alternation. Inverse addition, wherein B, C and D are added to A either as a mixture or portionwise, may also be employed.

Following the preparation of a basic barium composition by the method described above, it is usually preferred to react said composition with carbon dioxide in order to reduce its titratable basicity. The carbon dioxide treatment is ordinarily effected at about 120-200° C. and is usually continued until the base number of the composition (phenolphthalein indicator) is below...
about 10. This treatment appears to have two beneficial effects: first, it clarifies the process mixture and renders it more oil-soluble, and second, it allows the incorporation of significantly more barium into the product. It is apparent that this latter effect can be realized only when there is present in the reaction mixture an appreciable quantity of oil-insoluble barium compounds. Thus, it is important that the carbonation step, if used, precede any separation (as by filtration) of oil-insoluble barium compounds from the reaction mixture.

It is also frequently advantageous to react the compositions of this invention, subsequent to their formation, with anthranilic acid at about 100°-140° C. The amount of anthranilic acid used is usually about 1-5 percent by weight, based on the amount of basic barium salt. Anthranilic acid treatment frequently improves the oxidation and corrosion inhibiting properties of the lubricants containing the compositions of this invention.

The preparation of the compositions of this invention is illustrated by the following examples. All parts are by weight.

EXAMPLE 1

A mixture of 2926 parts of mineral oil, 300 parts (1.56 equivalents) of heptylphenol and 347 parts (1.64 equivalents) of a mixture of normal C₁₂-₁₈ primary alcohols is heated to 152° C. under nitrogen, with stirring. Barium hydroxide monohydrate, 248 parts, is added with stirring over one-half hour while water is collected by distillation. When water evolution has ceased, the mixture is dried for 15 minutes at 137° C. There is then added 713 parts (2.6 equivalents) of a eutectic mixture of palmitic and stearic acids, followed by 1702 parts (total 20.6 equivalents) of barium hydroxide monohydrate, the latter being added portionwise over 3½ hours while water is again removed by distillation. The temperature is increased to 150° C. during the final portion of barium hydroxide addition. The mixture is then blown with carbon dioxide at 150° C. for 2½ hours and purged with nitrogen at 150° C. Finally, a filter aid material is added and the mixture is filtered, yielding a 53% solution in mineral oil of the desired basic barium salt which contains 37.06% barium sulfate ash.

EXAMPLE 2

A mixture of 1849 parts of the product of Example 1 and 111 parts of mineral oil is heated to 45° C., and 40 parts of anthranilic acid is added. The mixture is heated at 110°-120° C. for 1 hour and filtered with the addition of filter aid. The product contains 33.04% barium sulfate ash.

EXAMPLE 3

To a mixture of 142 parts (0.5 equivalent) of stearic acid, 134 parts (0.5 equivalent) of oleyl alcohol, 115 parts (0.6 equivalent) of heptylphenol and 110 parts of mineral oil is added slowly, at room temperature, 674 parts (8 equivalents) of barium oxide. An exothermic reaction takes place which causes the temperature to rise to 70° C. Water, 101 parts, is added gradually, whereupon the temperature rises to 120° C. The mixture is held for 4 hours at 130°-140° C. and then heated to 160° C. for ¾ hour to remove volatile materials. It is then blown with carbon dioxide at 145°-150° C. until it is neutral to phenolphthalein. Finally, it is filtered using a filter aid material. The filtrate is a 50% solution in mineral oil of the desired basic barium salt containing 34.99% barium sulfate ash.

EXAMPLE 4

A mixture of 368 parts (1.3 equivalents) of oleic acid, 150 parts (0.8 equivalent) of heptylphenol, 260 parts (1.3 equivalents) of tridecyl alcohol, 1515 parts of mineral oil and 32 parts of water is heated to 76° C., and 184 parts of barium hydroxide monohydrate is added over 7 minutes at 76°-92° C. Additional barium hydroxide monohydrate, to a total of 982 parts (10.4 equivalents), is added over about 2 hours. The mixture is then heated at 145°-157° C. and blown with carbon dioxide for 2 hours. After all water has been removed, the product is filtered, yielding a 54% solution in mineral oil of the desired basic barium salt which has a barium sulfate ash content of 36.2%.

EXAMPLE 5

Following the procedure of Example 4, a basic barium salt is obtained from 150 parts (0.8 equivalent) of heptylphenol, 368 parts (1.3 equivalents) of oleic acid, 982 parts (10.4 equivalents) of barium hydroxide monohydrate, 370 parts (1.75 equivalents) of a mixture of normal C₁₂-₁₄ primary alcohols, 1405 parts of mineral oil and 32 parts of water. The product contains 36.07% barium sulfate ash.

EXAMPLE 6

Following the procedure of Example 4, a basic barium salt is prepared from 760 parts (2.6 equivalents) of oleic acid, 347 parts (1.64 equivalents) of a mixture of normal C₁₂-₁₈ primary alcohols, 1950 parts (20.6 equivalents) of barium hydroxide monohydrate, 300 parts (1.56 equivalents) of heptylphenol, 2900 parts of mineral oil and 65 parts of water. The product is a 53% solution in mineral oil and contains 37.19% barium sulfate ash.

EXAMPLE 7

A mixture of 1845 parts of the product of Example 6 and 115 parts of mineral oil is heated to 45° C., and 40 parts of anthranilic acid is added. The mixture is then heated to 110°-120° C. for 1 hour and filtered. The product contains 33.89% barium sulfate ash.

EXAMPLE 8

Following the procedure of Example 4, a basic barium salt is prepared from 150 parts (0.8 equivalent) of heptylphenol, 368 parts (1.3 equivalent) of oleic acid, 982 parts (10.4 equivalents) of barium hydroxide monohydrate, 324 parts (1.3 equivalents) of oleyl alcohol, 1451 parts of mineral oil and 32 parts of water. The product, a 56% solution in mineral oil, contains 35.65% barium sulfate ash.

EXAMPLE 9

Barium hydroxide monohydrate, 1950 parts (20.6 equivalents) is added over 20 minutes to 3000 parts of mineral oil at 140° C., while water is removed by distillation. Tridecyl alcohol, 300 parts, is then added and the mixture is purged with nitrogen. A mixture of 720 parts (2.6 equivalents) of tall oil acid and 300 parts (1.56 equivalents) of heptylphenol is added slowly; at one point the addition thereof is interrupted and an ad-
ditional 220 parts of tridecyl alcohol (total 2.6 equivalents) is added. The mixture is heated at 150° C. for 2½ hours and is then blown with carbon dioxide at 150° C. After removal of all volatile materials, the mixture is filtered, yielding the desired 52% solution in mineral oil of a basic barium salt containing 33.75% barium sulfate ash.

**EXAMPLE 10**

A mixture of 1960 parts of the product of Example 9 and 40 parts of anthranilic acid is heated to 115°-120° C. for 1 hour and filtered, yielding the desired product which contains 33.63% barium sulfate ash.

**EXAMPLE 11**

Following the procedure of Example 4, a basic barium salt is prepared from 720 parts (2.6 equivalents) of tall oil acid, 300 parts (1.56 equivalents) of heptylphenol, 1900 parts (20.1 equivalents) of barium hydroxide monohydrate, 374 parts (1.64 equivalents) of a mixture of normal C_{12}-18 primary alcohols and 65 parts of water. The product, a 53% solution in mineral oil of the desired basic salt, contains 37.79% barium sulfate ash.

**EXAMPLE 12**

Following the procedure of Example 2, an anthranilic acid adduct of the product of Example 11 is prepared. It is obtained as a 50% solution in mineral oil and contains 33.58% barium sulfate ash.

**EXAMPLE 13**

A basic barium salt is obtained using the reagents and following the procedure of Example 11, except that 300 parts (3.2 equivalents) of phenol is substituted for the heptylphenol. A similar product is obtained.

**EXAMPLE 14**

A mixture of 300 parts (1.56 equivalents) of heptylphenol, 347 parts (1.64 equivalents) of a mixture of normal C_{12}-18 primary alcohols and 2000 parts of mineral oil is heated to 100°-105° C., and 1960 parts (20.7 equivalents) of barium hydroxide monohydrate is added over 18 minutes. The mixture is heated to 150° C. and water is collected by distillation. After 98 parts of water have been collected, 360 parts of tall oil acid is added over 20 minutes. Water distillation is continued for 2½ hours, and then an additional 360 parts (total 2.6 equivalents) of tall oil acid is added. After an additional ½ hour of heating, the mixture is blown with carbon dioxide at 145°-150° C. for 3 hours. The mixture is purged with nitrogen until substantially all volatile matter has been removed and then 1098 parts of mineral oil is added and the mixture is filtered, using a filter aid material. The filtrate is the desired 51% solution of a basic barium salt containing 36.6% barium sulfate ash.

**EXAMPLE 15**

To a mixture of 1789 parts of mineral oil, 182 parts (0.9 equivalent) of heptylphenol and 300 parts (1.5 equivalents) of a mixture of normal C_{12}-18 primary alcohols, at 135° C., is added 1135 parts (12 equivalents) of barium hydroxide monohydrate over 1 hour. Palmitic acid, 384 parts (1.5 equivalents), is then added over 1 hour at 140°-150° C. The mixture is heated at 150° C. for ½ hour and is then blown with carbon dioxide for 3 hours. Finally, it is purged with nitrogen at 150° C. to remove volatile materials and is filtered using a filter aid material. The product is the desired 50% solution in mineral oil of a basic barium salt having a barium sulfate ash content of 36.4%.

As previously mentioned, the composition of this invention are useful as additives to improve power transmission and prevent "squawk." As such, they can be employed in a variety of lubricating compositions based on diverse oils of lubricating viscosity, including natural and synthetic lubricating oils and mixtures thereof. The compositions contemplated include principally automatic transmission fluids, transaxle lubricants and hydraulic fluids, but other lubricating oil and grease compositions can also benefit from the incorporation of the present compositions.

Natural oils include animal oils and vegetable oils (e.g., castor oil, lard oil) as well as solvent-refined or acid-refined mineral lubricating oils of the paraffinic, naphthenic, or mixed paraffinic-naphthenic types. Oils of lubricating viscosity derived from coal or shale are also useful base oils. Synthetic lubricating oils include hydrocarbon oils and halogen-substituted hydrocarbon oils such as polyol esters and epoxy-esterified oils (e.g., phthalic acid, succinic acid, maleic acid, azelaic acid, suberic acid, sebacic acid, fumaric acid, adipic acid, linoleic acid dimer, etc.) with a variety of alcohols (e.g., butyl alcohol, hexyl alcohol, dodecyl alcohol, 2-ethylhexyl alcohol, pentaerythritol, etc.). Specific examples of these esters include dibutyl adipate, di(2-ethylhexyl) sebacate, di-n-hexyl fumarate, dioctyl sebacate, distearyl azelaate, distearylsalicylate, azelaate, diolyl phthalate, didecyloxyphthalate, diisocyanate sebacate, the 2-ethylhexyl diester of linoleic acid di-mer, the complex ester formed by reacting one mole of sebacic acid with two moles of tetraethyleneglycol and two moles of 2-ethylhexanoinic acid, and the like. Silicon-based oils such as the polyalkyl-, polyaryl-, polyalkoxy-, or polyaroyxy-siloxy oils and silicate oils comprise another useful class of synthetic lubricants (e.g., tetraethyleneglycol tetrasopropyl silicate, tetra-(2-ethylhexyl) silicate, tetra-(4-methyl-2-tetraethyl) silicate, tetra-(p-tert-butyphenyl) silicate, hexyl-(4-methyl-2-pentxyloxy)disiloxane, poly(methyl-siloxyanes, poly(methylphenyl)-siloxyanes, etc.). Other synthetic
lubricating oils include liquid ester of phosphorus-containing acids (e.g., triresyl phosphate, trioctyl phosphate, diethyl ester of decane phosphonic acid, etc.), polymeric tetrahydrofuran and the like.

In general, about 0.05–20.0 parts (by weight) of the composition of this invention is dissolved in 100 parts of oil to produce a satisfactory lubricant. The invention also contemplates the use of other additives in combination with the products of this invention. Such additives include, for example, detergents and dispersants of the ash-containing or ashless type, oxidation and corrosion inhibiting agents, pour point depressing agents, viscosity index improvers, extreme pressure agents, “slip” agents, color stabilizers and anti-foam agents.

The ash-containing detergents are exemplified by oil-soluble neutral and basic salts of alkali or alkaline earth metals with sulfonic acids, carboxylic acids, or organic phosphorus acids characterized by at least one direct carbon-to-phosphorus linkage such as those prepared by the treatment of an olefin polymer (e.g., polysobutene having a molecular weight of 1000) with a phosphorizing agent such as phosphorus trichloride, phosphorus heptasulfide, phosphorus pentasulfide, phosphorus trichloride and sulfur, white phosphorus and a sulfur halide, or phosphorothioic chloride. The most commonly used salts of such acids are those of sodium, potassium, lithium, calcium, magnesium, strontium and barium.

The term “basic salt” is used to designate metal salts wherein the metal is present in stoichiometrically larger amounts than the organic acid radical. The commonly employed methods for preparing the basic salts involve heating a mineral oil solution of an acid with a stoichiometric excess of a metal neutralizing agent such as the metal oxide, hydroxide, carbonate, bicarbonate, or sulfide at a temperature above 50°C and filtering the resulting mass. The use of a “promoter” in the neutralization step to aid the incorporation of a large excess of metal likewise is known. Examples of compounds useful as the promoter include phenolic substances such as phenol, naphtoh, alkylphenol, thiophenol, sulfonated alkylphenol, and condensation products of formaldehyde with a phenolic substance; alcohols such as methanol, 2-propanol, octyl alcohol, cellosolve, carbitol, ethylene glycol, stearyl alcohol, and cyclohexyl alcohol; and amines such as aniline, phenylelenediamine, phenothazine, phenyl-β-naphthylamine, and dodecylamine. A particularly effective method for preparing the basic salts comprises mixing an acid with an excess of a basic alkaline earth metal neutralizing agent, a phenolic promoter modifier, and a small amount of water and carbonating the mixture at an elevated temperature such as 60°–200°C.

Ashless detergents and dispersants are illustrated by the interpolymer products of an oil-solubilizing monomer, e.g., decyl methacrylate, vinyl decyl ether, or high molecular weight olein, with a monomer containing polar substituents, e.g., aminoalkyl acrylate or poly-(oxyethylene)-substituted acrylate; the amine salts, amides, and imides of oil-soluble monocarboxylic or dicarboxylic acids such as stearic acid, oleic acid, tall oil acid, and high molecular weight alkyl or alkkenyl-substituted succinic acid. Especially useful as ashless detergents are the acylated polyamines and similar nitrogen compounds containing at least about 54 carbon atoms as described in U.S. Pat. No. 3,272,746; reaction products of such compounds with other reagents including boron compounds, phosphorus compounds, epoxides, aldehydes, organic acids and the like; and esters of hydrocarbon-substituted succinic acids as described in U.S. Pat. No. 3,381,022.

Extreme pressure agents and corrosion-inhibiting agents are exemplified by chlorinated aliphatic hydrocarbons such as chlorinated wax; organic sulfides and polysulfides such as benzyldisulfide, bis(chlorobenzyl) disulfide, dibutyl tetrasulfide, sulfurized sperm oil, sulfurized methyl ester of oleic acid, sulfurized alkylphenol, sulfurized dipentene, and sulfurized terpene; phosphosulfurized hydrocarbons such as the reaction product of a phosphorus sulfide with turpentine or methyl oleate; phosphorus esters including principally dihydrocarbon and trihydrocarbon phosphites such as dibutyl phosphite, diheptyl phosphite, dicyclohexyl phosphite, pentyln phenyl phosphite, dipentyl phenyl phosphite, tridecy phosphite, distearyl phosphite, dimethyl naphthyl phosphite, oleyl 4-pentylphenyl phosphite, polypropylene (molecular weight 500)-substituted phenyl phosphite, disobutyl substituted phenyl phosphite; metal thiocarbamates, such as zinc dicylohexylthiocarbamate, and barium heptylphenyl thiocarbamate; Group II metal phosphorodithioates such as zinc dicyclohexylphosphorodithioate, zinc dicyclohexylphosphorodithioate, barium d(i-heptylphenyl)phosphorodithioate, cadmium dimethylphosphorodithioate, and the zinc salt of a phosphorodithioic acid produced by the reaction of phosphorus pentasulfide with an equimolar mixture of isopropyl alcohol and n-hexyl alcohol. It is possible to form the lubricating compositions of this invention by dissolving the various additives, or oil solutions thereof, directly in a mineral oil. However, it is generally more convenient and is preferred to prepare additive concentrates containing two or more of the desired additives, and to dissolve these concentrates in the mineral oil to form the final lubricating composition.

In addition to lubricating compositions comprising a minor amount of a lubricating oil and minor amounts of various additives producing the basic barium-containing compositions described herein, water-oil emulsion type hydraulic fluids are contemplated as being part of the present invention.

Typical lubricating compositions according to this invention are listed in Tables I and II. Compositions A–D, listed in Table I, are primarily useful as automatic transmission fluids. Compositions E–G, in Table II, are primarily useful as tractor hydraulic fluids. Composition H, in Table II, is an emulsion-type hydraulic fluid chiefly useful in vane-type pumps and the like. Amounts given are for actual chemicals and do not include mineral oil diluent. In all of these, the basic barium compositions of this invention provide properties similar to those previously provided by basic barium salts of sperm oil.

<table>
<thead>
<tr>
<th>TABLE I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts by weight</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>88.42</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>0.54</td>
</tr>
</tbody>
</table>

Mineral oil (automatic transmission fluid base)  
Product of Example 5  
Product of Example 8  
Product of Example 10  
Zinc salt of mixture of polysobutylene succinic acid and bis(chlorophenyl)phosphinodi-
thioic acid 2.08
Zinc salt of bis(Co alkylphenyl)phosphinodithioic acid 1.23
Oleanide-linoleamide mixture 0.26
Basic calcium bright stock sulfonate 1.09 1.09
Hydrocarbon resin seal swelling agent 3.52
Poly-(aminoalkyl methacrylate) viscosity index improver 4.09 8.48
Silicone anti-foam agent 0.02 0.02

TABLE II

<table>
<thead>
<tr>
<th>Parts by weight</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral oil (hydraulic fluid base)</td>
<td>90.05</td>
<td>90.16</td>
<td>93.64</td>
<td>57.86</td>
</tr>
<tr>
<td>Mineral oil (naphthenic)</td>
<td>40.00</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>2.27</td>
<td>2.38</td>
<td>2.17</td>
<td>0.39 20</td>
</tr>
<tr>
<td>Product of Example 6</td>
<td>2.34 2.34</td>
<td>1.06 1.06</td>
<td>1.03 25</td>
<td></td>
</tr>
<tr>
<td>Product of Example 14</td>
<td>2.16 2.16</td>
<td>2.16 0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zine diisooctylphosphorodithioate</td>
<td>1.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc bis(hexylphenyl) phosphorodithioate</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocarbon resin seal swelling agent</td>
<td>0.09 0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic bariam petroleum sulfonate</td>
<td>0.44 0.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture of polyisobutene succinic anhydride and polyoxy-ethylated sorbitan monolaurate</td>
<td>0.44 0.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C10+ tertiary alkyl primary amine mixture</td>
<td>0.44 0.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lechithin</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyisobutene</td>
<td>1.48 1.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terpolymer of vinyl acetate, ethyl vinyl ether and C12+ diakyl fumarate</td>
<td>1.48 1.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poly-(alkyl) methacrylate viscosity index improver</td>
<td>0.09 0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oleamide-linoleamide mixture</td>
<td>0.09 0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicone anti-foam agent</td>
<td>0.09 0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The compositions of this invention may also be used as stabilizers for vinyl chloride polymers.

What is claimed is:

1. An oil-soluble, basic composition containing barium as the only metallic element, said composition being prepared by reacting (A) a barium base with a mixture comprising (B) a phenol, (C) at least one fatty acid and (D) at least one aliphatic monohydric alcohol, each of reagents C and D containing a straight chain of carbon atoms such that at least 26 carbon atoms in straight-chain configuration are present in the combination of said reagents C and D, the ratio of equivalents of reagent A to the combination of reagents B, C and D being about 1:5:1.

2. A composition according to claim 1 which has been further reacted with carbon dioxide until the base number thereof (phenolphthalein indicator) is below about 10.

3. A composition according to claim 2 wherein reagent B is a phenol containing an alkyl substituent having at least about 6 carbon atoms.

4. A composition according to claim 3 wherein reagent C contains about 16-20 carbon atoms.

5. A composition according to claim 4 wherein reagent D is a mixture of normal C18-25 primary alcohols.

6. A composition according to claim 5 wherein reagent C is tall oil acid.

7. A composition according to claim 6 wherein reagent B is heptylphenol.

8. A composition according to claim 7 wherein reagent A is barium oxide or barium hydroxide.

9. A composition according to claim 8 wherein the ratio of equivalents of reagent A to the combination of reagents B, C and D is at least 3:1; the weight ratio of each of reagents C and D to reagent B is between about 1:1:1 and 4:1; and the ratio of equivalents of reagent C to reagent D is between about 0.5:1 and 2:1.

10. A composition according to claim 2 which has been further reacted with about 1-5% by weight of an anthranilic acid, based on the amount of said basic barium-containing composition, at about 100°-140°C.

11. A composition according to claim 4 which has been further reacted with about 1-5% by weight of an anthranilic acid, based on the amount of said basic barium-containing composition, at about 100°-140°C.

12. A composition according to claim 6 which has been further reacted with about 1-5% by weight of an anthranilic acid, based on the amount of said basic barium-containing composition, at about 100°-140°C.

13. A composition according to claim 8 which has been further reacted with about 1-5% by weight of an anthranilic acid, based on the amount of said basic barium-containing composition, at about 100°-140°C.

14. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 1.

15. A lubricating composition comprising a major amount of a lubricating oil and a minor amount of a composition according to claim 2.

16. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 4.

17. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 6.

18. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 8.

19. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 12.

20. A lubricating composition comprising a major amount of a lubricating oil and a minor effective amount of a composition according to claim 13.

* * * * *

*60*

*65*