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LUBRICATING OIL

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10 Claims. (Cl. 252—56)

This application is a division of my pending application Serial No. 489,238, filed May 31, 1943, and relates to an improved lubricating oil.

In my parent application for patent above referred to I have disclosed a new type of polyester products of high molecular weight consisting of polyesters of a resinous or semi-resinous character, that can be produced or prepared by an esterification reaction in which two different types of alcohols enter into combination with a polybasic $\alpha\beta$ unsaturated, carboxylic acid or anhydride. The two types of alcohols consist of:

(*a*) Unsaturated aliphatic or cyclo-aliphatic alcohols; and

(*b*) Saturated long chain aliphatic alcohols.

My present invention consists of a new composition composed of or comprising a relatively small amount of a condensation polymer of the kind described in my parent application above referred to, and a lubricating oil.

In my co-pending application Serial No. 489,237, filed May 31, 1943, there are described certain new polymerized esters which are prepared from unsaturated aliphatic or cyclo-aliphatic alcohols and $\alpha\beta$ unsaturated, carboxylic acids in approximately equimolal quantities. The compounds used in the new composition of matter constituting my present invention may be looked upon as being derived from certain of the compounds of my said co-pending application Serial No. 489,237. Specifically, they may be looked upon as being the most complete esters of polymerized acidic fractional esters derived by condensing a polybasic $\alpha\beta$ unsaturated acid (or anhydride) with approximately an equimolal quantity of an unsaturated aliphatic or cyclo-aliphatic alcohol, the alcohol used to form the final esters being a saturated aliphatic alcohol.

The compounds employed in my herein described new composition may, perhaps, be best described in terms of a method of preparation. The required reactants are:

(1) A polybasic (including dibasic) $\alpha\beta$ unsaturated, carboxylic acid or anhydride;

(2) An unsaturated aliphatic or cyclo-aliphatic alcohol; and

(3) A saturated, long chain aliphatic or alkyl cyclo-aliphatic alcohol.

The total moles of (2) and (3) used should approximately equal the equivalents of (1) with respect to carboxylic acid groups, while the ratio of moles of (2) to moles of (3) may vary from about 0.2 to 5.0.

Examples of suitable reactants of class (1), above, are $\alpha\beta$ unsaturated, carboxylic acids and anhydrides, such as: maleic acid, fumaric acid, citraconic acid, aconitic acid, itaconic acid, mesaconic acid, maleic anhydride, citraconic anhydride, itaconic anhydride, and the like. The preferred class of acids and anhydrides are those containing less than 10 carbon atoms, such as the examples just recited. Because of their availability, relatively low cost, and marked reactivity, maleic anhydride, fumaric acid, and citraconic anhydride, are especially useful, and products obtained with these reactants will be used below to illustrate the present invention.

Alcohol reactants of class (2), above, which are suitable for use in preparing the present products, are the aliphatic and cycloaliphatic monohydric alcohols in which the ethylenic carbon atom nearest to the hydroxyl group is separated from the carbon atom attached to said hydroxyl group by at least three singly bonded carbon atoms. Such alcohols may contain one or more carbon-to-carbon double bonds, but all must satisfy the above requirement as to proximity to the hydroxyl group. When the alcohol contains two or more double bonds, these may be either conjugated or non-conjugated. My preferred class of unsaturated aliphatic and cycloaliphatic alcohols is composed of those having 8 or more carbon atoms (and less than 32 carbon atoms), and are exemplified by the following: Octene-3-ol-8, decene-1-ol-10, oleyl alcohol, erucyl alcohol, linoleyl alcohol, eicosene-10-ol-1, p-vinyl cyclohexanol, citronellal, rhodinol, abietyl alcohol, dihydroabietyl alcohol, crude sperm oil alcohols, crude jojoba oil alcohols, and the like.

Alcohol reactants of class (3), above, which are suitable for preparing products of the present invention, are the saturated aliphatic or alkylcycloaliphatic alcohols containing 8 or more carbon atoms and less than 32 carbon atoms, and preferably, the normal, primary alcohols containing 8 or more carbon atoms. Examples of suitable alcohols are: 2-ethyl hexanol, 5-ethyl-nonanol-2, 7-ethyl-2-methylundecanol, 3,9-diethyltridecanol-6, and the like. Examples of the most preferred alcohols are: n-octanol, n-decanol, lauryl alcohol, myristic alcohol, cetyl alcohol, stearyl alcohol, 1-eicosanol, 1-docosanol. Other useable alcohols include propylcyclohexanol, octylcyclohexanol, decylcyclohexanol, etc.

One method of preparing the new products used in the composition constituting my present invention, is to mix the three desired reactants of the kinds described above in the desired proportions, keeping these proportions within the limits previously specified. This mixture is then heated and stirred at a temperature in the range from about 100° C. to about 250° C. for a period of several hours. The exact temperatures and heating periods employed will depend upon the specific reactants employed, as well as upon the use to which the product is to be put. During the heating period the viscosity and average molecular weight of the product increase. For certain purposes, as for use as a pour point depres-

sant for lubricating oils, a material of average molecular weight in the range of 1,200 to 5,000 may be desirable; so the reaction may be stopped when a sample removed from the reaction mass is found to have this molecular weight. Actually, for control purposes, measurements of viscosity at some standard temperature can be used, instead of molecular weight, as these two properties may be correlated for a given combination of reactants reacted under specific conditions.

Although the present compounds may be prepared by reacting at temperatures of from about 100° C. to about 250° C., I generally prefer to carry out the reaction in the temperature range from about 150° C. to about 210° C. The reaction involved is not completely understood, but appears to involve both esterification and addition of the unsaturated constituents. Conventional esterification catalysts such as sulfuric acid, beta camphor sulfonic acid, para toluene sulfonic acid, hydrochloric acid, etc., may be employed. Also olefine condensation catalysts such as sulfuric acid, benzoyl peroxide, hydrogen peroxide, etc., may also be employed. However, none of these catalysts is necessary for preparation of the compounds, as appreciable reaction and polymerization may be obtained simply by heating the reactants at the proper temperature for a period of several hours.

To obtain the highest rate of reaction and polymerization, I have found that certain conditions of reaction are particularly desirable. The discovery of these reaction conditions actually constitutes an invention within an invention, in that it makes possible the preparation of the most desirable products with the minimum of time and effort. In particular, I have found that reaction is promoted by passing through the mixture, during reaction, a slow stream of oxygen or oxygen-containing gas, such as air. The beneficial effect of this operation appears to arise directly from the oxygen in the gas used. If nitrogen, hydrogen, or other inert oxygen-free gas is passed through the reaction mixture, the rate of reaction appears not to be appreciably increased. When oxygen or an oxygen-containing gas is passed through the reaction mixture, temperature may be maintained at any point over a rather wide limit; but as remarked above, I obtain best results using a temperature of reaction in the range from about 150° C. to about 210°. With reactants that boil within the temperature range, it is desirable that the materials be reacted under pressure, or that the reaction be conducted for a while at a lower temperature until esterification of the reactants has produced an intermediate of higher boiling point. The temperature may then be gradually increased to a higher value, in order to increase the rate of the reaction. At extremely high temperatures, however, decomposition and oxidation of the product may occur to an objectionable degree.

The time of reaction will depend, of course, upon the reactants themselves and upon the temperature at which the reaction is carried out, as well as upon the use to which the material is to be put. Ordinarily this time of reaction will be several hours, and perhaps as much as 48–72 hours. To prepare pour point depressants, I have found that a typical set of conditions may involve a reaction temperature of about 200° C. and a reaction time of about 24 hours. If the product is to be used as a viscosity index improver, a material of higher molecular weight is required and the reaction in this instance might be continued for as long as 48 hours, or even longer.

Although the present compounds have been described in terms of their preparation from three classes of reactants, it should be pointed out that the reaction may be carried out in a series of steps. The first step might involve reacting only two of the reactants; and this product then may be further reacted with the third material. For example, in preparing a pour point depressant from reactants such as maleic anhydride, abietyl alcohol, and stearyl alcohol, the maleic anhydride and abietyl alcohol may be condensed first to give a semiresinous polmer ester of the type disclosed in my aforementioned co-pending application Serial No. 489,237. This product may then be mixed with stearyl alcohol about equivalent to the free carboxylic acid content of the polymer, and further heated and esterified to complete esterification. Ordinarily, however, it is more convenient and simpler to combine all of the reactants at once to prepare the desired compound.

The following examples will serve to illustrate the methods of preparation which may be employed. The parts are by weight:

Example 1

17 parts of maleic anhydride, 45 parts of commercial oleyl alcohol (iodine No. 67) and 45 gms. of commercial stearyl alcohol were heated and stirred in an open flask. The temperature was raised over a period of four hours to 240° C. and was held at 240° C. for 12 hours.

The product was a dark red, viscous fluid at room temperature. It had an average molecular weight, as determined in benzol, of 1820. It was clearly soluble in lubricating oil. The product had a finite, but low, acid value.

Example 2

14 parts of maleic anhydride and 50 parts of commercial oleyl alcohol were heated and stirred in a flask attached to a reflux condenser. The temperature was held at 200° C. to 225° C. for 11 hours. The mixture was then cooled and to it were added 26 parts of stearyl alcohol. A water trap was placed between the flask and condenser and heating was resumed. The temperature was raised to 240° C. and held for three hours, after which time, water evolution had ceased.

The product was a red, opaque syrup at room temperature. It apparently contained some unreacted stearyl alcohol. Its average molecular weight in benzol was 945.

Example 3

14.0 parts of maleic anhyride, 37.5 parts of commercial oleyl alcohol and 37.5 parts of commercial stearyl alcohol were placed in a glass vessel equipped with stirrer, gas inlet tube, water trap, and condenser. The mixture was heated while stirring to 175° C. and held for two hours. After that time, a slow stream of air was introduced through the gas inlet tube under the surface of the liquid mixture; the temperature was increased to 190° C. and held at 190–195° C. for 18 hours.

During the reaction period about 2.4 parts of water were collected in the trap. Some water was probably lost in the air stream.

The product was a light red, transparent, waxy, solid at room temperature. It was clearly soluble in lubricating oil. The product had an iodine No. (Wijs) of 16.9.

Example 4

14 parts of maleic anhydride, 37.5 parts of commercial oleyl alcohol and 25 parts of commercial lauryl alcohol were heated and stirred in the apparatus of Example 3. The temperature was raised to 180° C. and held for about 3 hours. A slow stream of air was then introduced through the gas inlet tube and the temperature was raised to 200° C., where it was held for 30 hours.

The product was a viscous, red oil at room temperature and was clearly soluble in kerosene and lubricating oils.

Example 5

12.5 parts of commercial lauryl alcohol, 18.8 parts of commercial stearyl alcohol, 37.5 parts of commercial oleyl alcohol, and 14.0 parts of maleic anhydride were reacted, using the apparatus and procedure of Example 3.

The product was a viscous red oil having an iodine No. (Wijs) of 24.8.

Example 6

16.5 parts of fumaric acid were substituted for the maleic anhydride of Example 5. The product was substantially identical with that of Example 5.

Example 7

20 parts of dihydroabietyl alcohol, 29 parts of commercial stearyl alcohol, 20 parts of commercial lauryl alcohol and 14 parts of maleic anhydride were reacted, using the apparatus and procedure of Example 3.

The product was a viscous red oil.

Example 8

16.5 parts of fumaric acid were substituted for the maleic anhydride of Example 7.

Example 9

Linoleyl alcohol was substituted for the oleyl alcohol in Example 5.

Example 10

16 parts of citraconic anhydride were substituted for the maleic anhydride of Example 5, and heating and stirring in the presence of an air stream and at a temperature of 190–195° C. was continued for 36 hours.

It will be noted that in some of the above examples mixtures of saturated alcohol have been employed instead of a single species of saturated aliphatic alcohol. The use of such mixtures is considered the equivalent of using a single species of alcohol. If desired, mixtures of unsaturated alcohol may also be employed, instead of one unsaturated alcohol; and the same analogous condition applies to the use of the $\alpha\beta$ unsaturated polycarboxylic acid.

Although it has been stated that the present compounds are made from a mixture of $\alpha\beta$ unsaturated polycarboxylic acid and certain saturated aliphatic alcohols and certain unsaturated aliphatic or alkylcycloaliphatic alcohols, in which the modes of alcohol are equivalent to the number of carboxylic acid groups present, it is not absolutely necessary that the hydroxyl and carboxyl groups be exactly equivalent. In fact, in some instances, it may be desirable to use a small excess of unsaturated acid over that required to esterify all of the alcoholic hydroxyl groups. When this is done, the final product may have a small acid number; and for certain uses, a polymeric product with a small acid number is desirable. For example, the residual carboxyls of such reagent may be neutralized with alkalies or amines or heavy metal oxides to yield polymeric salts which have useful properties in addition to those of the polymers alone. For example, salts such as the sodium salts may be used as sludge dispersers or detergents in lubricating oils. Certain amine salts may be used to inhibit the oxidation of lubricating oils. By the proper balance of carboxyl groups to molecular weight, it is possible to prepare poly-functional lubricating oil additives, i. e., materials which have more than one function; for example, they may be both pour point depressants and antioxidants. In general, however, it is desirable that the number of residual carboxyls in the polymer product not be sufficient to give the product a neutralization equivalent of less than about 3,000.

The nature of the reaction which results in the formation of the present products is not clearly understood, but it is believed that the $\alpha\beta$ unsaturated polycarboxylic acid esterifies the hydroxyl groups of the alcohols and also adds, by proton transfer, to the unsaturated alcohol at an ethylenic carbon atom of same, or at a carbon atom near the double bond. The unsaturated alcohol undergoing condensation with a molecule of ethylenic acid is probably esterified by a different molecule of ethylenic acid; so a type of linear polyester is formed. The saturated alcohol employed in the reaction mixture is also esterified by carboxyl groups of the polybasic acid; the final product thus being a complicated type of polyester. When the double bond of the unsaturated alcohol is nearer to the hydroxyl group than allowed by the conditions previously given, good yields of the desired products do not seem to be obtainable. It is believed that this may result from the formation of stable cyclic inner esters, rather than linear polyesters. This postulated reaction may be exemplified, in part, by the reaction between oleyl alcohol, stearyl alcohol and maleic acid. With these reactants it is believed that the product may be a polymerized, substituted, succinic acid ester, or possibly, a polymerized, substituted, fumaric acid ester. Conceivable reactions are as follows:

$$\underset{\text{Oleyl alcohol}}{n C_{18}H_{35}OH} + \underset{\text{Stearyl alcohol}}{n C_{18}H_{37}OH} + \underset{\text{Maleic acid}}{n C_4H_4O_4}$$

$$\left[-C_{18}H_{34}-\underset{\displaystyle COOC_{18}H_{37}}{\underset{|}{CH}}-CH_2-COO-\right]_n + 2nH_2O$$

or

$$\left[-C_{18}H_{35}-\underset{\displaystyle COOC_{18}H_{37}}{\underset{|}{C}}=CH-COO-\right]_n + 2nH_2O$$

In the above formulae, no attempt has been made to define the carbon atom of the oleyl alcohol residue to which the maleic acid residue becomes attached. Probably, a carbon atom near the double bond, or a double bonded carbon atom itself, is involved. It becomes impractical to attempt to show in detail all of the conceivable reactions of the above types which may occur.

The present products will be referred to herein and in the claims as condensation polymers, this term being used in the sense as defined in Gilman "Organic Chemistry," 2nd edition, page 702. However, as pointed out above, their formation is believed also to involve addition of one olefinic molecule to another olefinic molecule, thus, in the strictest sense, the resultant compounds may be looked upon as being both condensation and addition polymers.

The compounds of the present invention are herein called polymers, but the use of this term is not intended to imply that the compounds are necessarily of extremely high molecular weight. Some very useful products have average molecular weights no greater than 2,000. The term is intended to imply that the compounds contemplated have molecular weights larger than the simple monomeric ester formed by esterification of the ethylenic polycarboxy acid with the alcohol reactants. As prepared, the crude products, in many instances, undoubtedly contain some monomeric ester as impurity, but such monomer is not contemplated herein, and, in fact, is an objectionable diluent. When the preparation reactions are carried out, as described, the amount of monomer present is usually quite negligible.

Because of the uncertainty as to the mechanism of the reaction, as well as to the large variety of possible reactions which could be postulated, no effort will be made to describe the present products in terms of conventional chemical formula.

My present invention consists in using products of the kind previously described, to lower the pour point or increase the viscosity or viscosity index of lubricating oils, or consists of a new composition of matter, composed of a relatively small amount of such a condensation polymer and a lubricating oil. The following are examples of my new composition.

Example I

0.25 gm. of the product of Example 1 was dissolved in 100 ml. of a 20 S. A. E. viscosity Gulf Coast lubricating oil. This mixture had a pour point of 25° F., in comparison with a pour point of 20 for the original oil.

Example II

The product of Example 3 was dissolved in varying proportions in the lubricating oil of Example I. Pour points of the various mixtures are shown in the table below:

Concentration of product in oil	Pour point of oil
Per cent	° *F.*
0	+20
1/24	−5
1/12	−20
1/6	−30
1/3	−30

Example III

The product of Example 5 was blended in varying amounts with an S. A. E. 10 Mid-Continent motor oil. Pour points of the resulting blends are shown below:

Concentration of product in oil	Pour point of oil
Per cent	° *F.*
0	+15
0.025	+10
0.065	+5
0.125	−30
0.190	−40

Example IV

The product of Example 3 was added in the amount of 2% to a Gulf Coast lubricating oil having a viscosity index of 55. The resulting blend was clear and light in color and was found to have a viscosity index of 85.

In general, the percentage of the present compounds which will be required to depress the pour point of oils sufficiently to be of practical interest, will vary from as little as 0.025% to as much as 1%, or even 2%. The amounts required to increase the viscosity index by appreciable amounts will vary from as little as 0.25% to as much as 5%, or even more, depending upon the compound and the character of the oil to which it is added.

Thus, one object of my invention is the preparation of improved lubricating oils or lubricating oil compositions adding not less than about 0.025% or more than about 5% of the herein described compounds to lubricating oils which are used in an internal combustion engine or as lubricants for moving machinery.

The present products are in general unsaturated, as reaction does not remove all of the olefinic groups of the unsaturated reactants. If desired, these products may be hydrogenated to remove olefinic double bonds. Other chemical reactions may also be employed to modify the properties of the polymers. For example, they may be treated with sulfur at elevated temperatures to form sulfurized polymers; or they may be treated with chlorine to remove the unsaturation and otherwise modify their properties; or they may be treated with sulfur chloride to give products of somewhat different properties. The introduction of sulfur into the present compounds does not appear to change their pour point depressant properties, while at the same time it improves their resistance to oxidation and also imparts to them film strength improving properties.

Previous reference has been made to the fact that one may employ either aliphatic or cycloaliphatic alcohols of the kind described. Although, ordinarily speaking, aliphatic alcohols and alkylcycloaliphatic alcohols are not necessarily the obvious equivalent of each other, yet in light of what has been said above, it is obvious that they are the functional equivalent in the present instance. In the hereto appended claims reference to an aliphatic alcohol is intended to include the alkylcycloaliphatic alcohols. Reference to a straight chain alcohol must, of course, contemplate only the acyclic type.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A composition of matter, comprising a lubricating oil and a relatively small amount of a saturated alcohol-$\alpha\beta$ unsaturated polybasic carboxylic acid-unsaturated aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing less than 32 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

2. A composition of matter, comprising a lubricating oil and a relatively small amount of a

saturated alcohol-$\alpha\beta$ unsaturated polybasic carboxylic acid-unsaturated aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

3. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-$\alpha\beta$ unsaturated polybasic carboxylic acid-unsaturated aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

4. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-$\alpha\beta$ unsaturated polybasic carboxylic acid-unsaturated straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

5. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-$\alpha\beta$ monoethylenic polybasic carboxylic acid-unsaturated straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

6. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-α,β monoethylenic dibasic carboxylic acid-unsaturated straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atoms to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

7. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-$\alpha\beta$ monoethylenic dibasic carboxylic acid-unsaturated straight chain aliphatic monoethylenic alcohol condensation polymer; said saturated alcohol containing at least 8 and not more than 32 carbon atoms; said acid having less than 10 carbon atoms and said unsaturated alcohol containing at least 8 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group was attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

8. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-maleic acid monoethylenic straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 12 and not over 22 carbon atoms, and said unsaturated alcohol containing at least 12 and not over 22 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group is attached and the nearest ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

9. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-fumaric acid monoethylenic straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 12 and not over 22 carbon atoms, and said unsaturated alcohol containing at least 12 and not over 22 carbon atoms and having at least 3 intervening carbon atoms between the carbon atoms to which the hydroxyl group is attached and the nearer ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

10. A composition of matter, comprising a lubricating oil and a relatively small amount of a straight chain saturated alcohol-citraconic acid monoethylenic straight chain aliphatic alcohol condensation polymer; said saturated alcohol containing at least 12 and not over 22 carbon atoms and said unsaturated alcohol containing at least 12 and not over 22 carbon atoms and having at least 3 intervening carbon atoms between the carbon atom to which the hydroxyl group is attached and the nearer ethylenic carbon atom; said polymer being present in an amount varying from 0.025% to about 5%, on the basis of the lubricating oil with which it is admixed.

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