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LUBRICANT COMPOSITIONS CONTAINING ORGANIC OXIDIZED AND SULFURIZED ESTERS

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This invention relates to organic oxidized and sulfurized esters and to compositions containing the same. More particularly, this invention is concerned with oxidized and sulfurized mono-esters of fatty acids useful as improvement agents for mineral oils, with methods of making such esters, and with compounded lubricants containing such esters.

In Patent 2,179,061 to Smith, there are described and claimed improved compounded lubricants comprising a mineral oil lubricating base and a minor amount of a sulfurized fatty mono-ester derived from an ester having the formula

$$R-\overset{\overset{O}{\|}}{C}-O-R_1$$

wherein R and R_1 represent aliphatic groups, at least one of said groups being unsaturated prior to sulfurization. The compounded lubricants of this patent are stable both in storage and use, are non-corrosive to metals and are valuable as extreme pressure lubricants.

In Patents 2,179,065 and 2,179,066 to Smith, there are described and claimed the sulfurized fatty mono-esters per se and methods of making the same.

In Patent 2,360,904 to Smith there is described and claimed an improved method of obtaining the sulfurized mono-esters which comprises reacting a sulfurized fatty glyceride with a monohydric aliphatic alcohol acidified with sulfuric acid to liberate completely the glycerine from said glyceride and to convert the same into sulfurized fatty mono-esters of the alcohol. The improved method of this patent greatly increases the number of source materials suitable for the manufacture of sulfurized fatty mono-esters and yields glycerine as a valuable by-product. In the above-described method, fatty oils having an iodine number below about 130 are generally more desirable as source materials for the manufacture of the sulfurized glycerides than fatty oils having a greater degree of unsaturation, because, in some cases, unless careful control is exercised, the sulfurized products of the more highly unsaturated fatty oils are high in viscosity and may be of such rubber-like consistency as to be difficult to handle. It has been found that this difficulty can be avoided by employing fatty oils having a degree of unsaturation within a preferred range of 70 to 130 iodine number. However, fatty oils meeting this requirement are not always available, and therefore, it becomes necessary to blend various fatty oils of differing degrees of unsaturation in order to obtain a fatty oil having a degree

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of unsaturation within the preferred range. Although this solution of the problem has produced satisfactory results, it would be highly desirable from a commercial standpoint to avoid the blending procedure and the maintaining of separate inventories and separate storage facilities for the variety of fatty oils required.

It is an object of this invention to provide a new improvement agent for mineral oils which imparts valuable oiliness, pressure carrying, anti-oxidant and anti-ring sticking properties to said mineral oils.

It is a further object of this invention to provide a new improvement agent for mineral oils from a single fatty oil having a high degree of unsaturation of the oil.

It is a further object of this invention to provide a new compounded mineral oil especially useful for lubricating metal surfaces.

These and other objects are achieved by the present invention wherein a fatty oil containing glycerides of unsaturated fatty acids is oxidized, the oxidized fatty oil is then sulfurized, and the oxidized sulfurized product is subjected to an alcoholysis with a monohydric alcohol to liberate completely the glycerine from the oxidized sulfurized glycerides and to form the mono-esters of the monohydric alcohol and the liberated oxidized sulfurized fatty acids. If desired, the alcoholysis with the monohydric alcohol may take place prior to sulfurization; that is, the fatty oil is first oxidized, then subjected to alcoholysis, and the resulting oxidized fatty mono-ester is then sulfurized. The oxidized sulfurized mono-esters obtained by either method are believed to be new compounds and are valuable improvement agents for mineral oils. We consider such new esters and the mineral oils containing them to be parts of our invention.

A wide variety of fatty oils containing glycerides of unsaturated fatty acids may be used as starting materials for our new oxidized sulfurized fatty mono-esters. Whereas, as pointed out hereinabove, fatty oils having an iodine number above about 130 may result in highly viscous or rubber-like products difficult to handle when only sulfurized, we have found that when the fatty oil is oxidized and sulfurized, in the manner about to be described, fatty oils of a high degree of unsaturation will yield valuable products without resorting to the blending procedure previously described. We have also found that fatty oils or mixtures of fatty oils having iodine numbers below 130, will yield oxidized sulfurized fatty mono-esters which exhibit to a greater extent

the properties making them valuable improvement agents for mineral oils than the same fatty oils which are only sulfurized to yield only sulfurized fatty mono-esters.

While we do not desire to limit ourselves to any specific degree of unsaturation of the fatty oil, we prefer to use as starting materials fatty oils or mixtures of fatty oils having a minimum iodine number of about 70, because the most valuable products are obtained from such fatty oils. Representative fatty oils useful in manufacturing the oxidized sulfurized fatty mono-esters of our invention are acorn, apricot kernel, beechnut, black walnut, castor, cod, corn, cottonseed, lard, linseed, menhaden, olive, palm, peach kernel, peanut, perilla, pumpkin seed, poppy, rapeseed, sardine, sesame, seal, shark, soya bean, sunflower, tung, walnut, whale, and mixtures thereof.

Oxidation of the fatty oil is accomplished by blowing with molecular oxygen, preferably with air, while the oil is at an elevated temperature. As used herein and in the appended claims, oxygen is intended to include air as well as pure molecular oxygen itself. Generally, the oil is heated to about 200° F., and air is then blown therethrough. Since the reaction between the fatty oil and oxygen is exothermic, the temperature of the oil tends to rise during this treatment, but the temperature may be controlled by adjusting the rate of air flow or by providing suitable cooling means in the reaction vessel. We have found that good results are obtained when the fatty oils are blown with air at temperatures varying from 200° to 300° F., but we prefer to employ temperatures within the range of 250° to 280° F. since the oils blown at the higher temperatures are more soluble in alcohols, and the derivatives obtained from such oils in accordance with our invention are more soluble in mineral oils. The exact nature of the changes occurring in the fatty oil upon blowing in the manner described is not fully understood. In any event it is certain that the double bonds in the glycerides of the unsaturated fatty acids are involved because the iodine number of the blown oil is substantially reduced. In general, in order to achieve the advantageous results of our invention, oxidation of the fatty oil by blowing should continue for a time sufficient to cause a substantial reduction in the iodine number of the fatty oil. When fatty oils having an iodine number above about 130 are used as starting materials, blowing should be continued until the iodine number has been reduced substantially below 130. At the same time, the iodine number should not be reduced to such a point that the oxidized fatty oil will have lost its capacity to be sulfurized. In general, since it is desirable that the oxidized sulfurized fatty mono-ester contain at least 2 per cent by weight of combined sulfur, the fatty oil should not be oxidized by blowing to such an extent that its iodine number is below about 50.

After the fatty oil containing glycerides of unsaturated fatty acids has been oxidized by blowing with air or oxygen as described above, the oxidized fatty oil is sulfurized. To this end, the oxidized fatty oils are reacted with the desired amount of finely divided sulfur at elevated temperatures, preferably between 320° and 400° F., the mixture being maintained at such temperatures until all of the sulfur has combined. This may be done by preheating the fatty oil to 300°–320° F. and then gradually adding the sulfur to the hot oil in small doses at such a rate as to maintain a steady increase in temperature to between 320° to 400° F. by the exothermic heat of reaction. The temperature may then be maintained within this range by suitable cooling means until sulfurization is completed. After all of the sulfur has been added and combined, the oxidized sulfurized glyceride is cooled, usually to approximately room temperature.

In performing the above described sulfurization, the amount of sulfur added is such as to saturate all or part of the residual double bonds in the oxidized fatty oil and to prevent the formation of any substantial amount of hydrogen sulfide. Accordingly, the amount of sulfur added does not exceed that required for complete saturation of all of the residual double bonds, and ordinarily, somewhat smaller amounts are employed.

The oxidized sulfurized glycerides of the fatty oils are converted into mono-esters corresponding to the oxidized sulfurized fatty acids of the glycerides by an alcoholysis or re-esterification reaction with an excess of a monohydric alcohol in the presence of an alcoholysis catalyst. Any suitable alcoholysis catalyst such as phosphoric acid (85–100 per cent) and concentrated sulfuric acid (85–105 per cent) may be used. In one procedure, the alcohol is mixed with a sulfuric acid alcoholysis catalyst and the acidulated alcohol is added to the oxidized sulfurized fatty oil with stirring. While continuing the stirring, the mixture is heated to temperatures between 230° to 270° F. until the reaction is complete. After the reaction is complete, stirring is discontinued and the mixture is settled and stratifies into two layers, an upper ester layer and a lower acid-glycerine layer. The two layers are separated and may be refined as hereinafter described.

In forming the oxidized sulfurized mono-esters, various monohydric alcohols may be used for the alcoholysis. Advantageous products are obtained with the aliphatic monohydric alcohols containing not more than twelve carbon atoms, such as methanol, ethanol, propanol, isopropanol, butanol, isobutanol, 2-methyl butanol, pentanol, diethyl carbinol, sec-amyl alcohol, hexyl alcohol, isohexyl alcohol, methyl-sec-butyl carbinol, the various heptyl and octyl alcohols, decyl alcohol and dodecyl alcohol. Particularly good products are obtained with butanol. Other monohydric alcohols, such as benzyl alcohol, cyclohexanol, allyl alcohol, crotonyl alcohol, dibromoethyl alcohol and dichloroethyl alcohol may be employed.

As previously stated, the alcoholysis reaction to form the mono-esters may take place with the oxidized fatty oil prior to sulfurization. In such case, the oxidized fatty mono-esters obtained are subjected to sulfurization as described above.

After the oxidized sulfurized mono-esters have been separated from the glycerine layer, they are usually further refined, as for example, by clay treating. In accomplishing such refining, an appropriate amount of activated clay, such as Filtrol, is added to the oxidized sulfurized mono-esters and the mixture is agitated. The clay treated mixture is then filter pressed to remove the clay and any other insolubles. To facilitate such removal, filter aids, such as Supercel and the like may be added to the mixture prior to filtering. Furthermore, in refining the oxidized sulfurized mono-esters, it may be advantageous to neutralize any residual mineral acidity, due to dissolved acid alcoholysis catalyst, prior to the clay treatment. In such case, lime, in excess of the amount necessary to neutralize the acidity,

may be added and the mixture stirred until substantially neutral. The resulting calcium sulfate, in the event sulfuric acid has been used as the catalyst, and excess lime may be settled out and filtered off prior to clay treatment. However, complete removal of these materials prior to clay treating is not essential, and in many cases, the liming and clay treatment may be combined in one operation. In such combination refining, a small amount of lime may be used and the activated clay added to the mixture after it is substantially neutral; then all of the insoluble matter is removed in one operation by filter pressing. If desired, mineral oils may be incorporated with the oxidized sulfurized mono-esters prior to the refining procedures set forth above.

In order to recover valuable by-product glycerine, the separated acid-glycerine layer referred to hereinabove may be neutralized and vacuum distilled to recover substantially pure anhydrous glycerine, or the glycerine may be refined in any other known manner.

The oxidized sulfurized mono-esters obtained in accordance with our invention have a combination of properties rendering them particularly useful as an ingredient of compounded lubricants. Thus, the mono-esters are very soluble in and compatible with all types and grades of mineral oils. When incorporated with mineral oils or mineral oil lubricants to form compounded lubricants, the mono-esters of our invention impart to said lubricating compositions valuable oiliness, pressure carrying, anti-oxidant and anti-ring sticking properties. A further advantage of these mono-esters in compounded lubricants is the fact that they increase the viscosity index of said lubricants.

The following examples are illustrative embodiments of the methods and products of our invention.

Example 1.—Into a suitable vessel equipped with means for agitating and for heating and cooling the reaction mixture, there were charged 40 pounds of rapeseed oil. The oil was heated to about 200° F. and then air was blown through the oil at a rate of about 7 cubic feet per hour. The temperature of the oil rose to about 270° F. and was maintained at that temperature by the rate of air flow stated. Blowing was continued for 45 hours thereby reducing the unsaturation of the oil about 40 per cent. The blown partially oxidized rapeseed oil was then heated to about 320° F. and 2.5 pounds of finely divided sulfur were added in small doses, the temperature rising to 370° F. The temperature was maintained at 370° F. for 2 hours and the sulfurization was then complete. The oxidized sulfurized glycerides so obtained (about 43 pounds) were cooled to approximately room temperature.

The oxidized sulfurized glycerides were charged into a suitable vessel fitted with an agitator and a reflux condenser, and while agitating the charge, a mixture of 10 pounds of normal butanol and 2 pounds of 96 per cent sulfuric acid were added and the mixture heated at 250° F. for 10 hours. Agitation was then stopped and the mixture stratified into two layers, an upper ester layer and a lower acid-glycerine layer, whereupon the acid-glycerine layer was drawn off and refined. The ester layer was neutralized with lime, contacted with 10 pounds of activated clay, and the mixture maintained at 275° F. for 2 hours with agitation. Thereafter, the mixture was filtered to remove the clay and other insoluble matter. The filtrate so obtained was the butyl esters

of the oxidized sulfurized rapeseed oil fatty acids and was a high grade improvement agent for lubricating oils and like lubricants. The detailed properties of the oxidized rapeseed oil prior to sulfurization and of the butyl mono-esters of the oxidized and sulfurized rapeseed fatty acids were as follows:

	Oxidized Rapeseed Oil	Butyl Esters of Oxidized Sulfurized Rapeseed Fatty Acids
Gravity, °API	14.5	17.2
Viscosity, SUV:		
100° F		331
210° F	1,003	64.3
Flash, OC, °F	470	325
Fire, OC, °F	625	475
Pour, °F	+45	+20
Color, NPA	4.25	8.0
Sulfur, B, per cent		5.0
Iodine No., Hanus	59.0	31.1

Example 2.—Another superior improvement agent comprising the butyl esters of oxidized sulfurized linseed oil fatty acids was prepared in a manner similar to that shown in the preceding example for the butyl esters of oxidized sulfurized rapeseed oil fatty acids. In a suitable vessel 40 pounds of linseed oil were heated to about 200° F. and air was blown through the heated oil at a rate of 7 cubic feet per hour which was sufficient to raise the temperature to 260° F. and maintain it at that point. Blowing was continued for 24 hours. To the blown linseed oil there were added 3 pounds of sulfur and the temperature was maintained at 360° F. for a period of two hours. After cooling, the oxidized sulfurized linseed oil was subjected to alcoholysis with 25 per cent by weight of butanol and 5 per cent by weight of 96 per cent sulfuric acid. The alcoholysis was conducted at 250° F. for 6 hours. The mixture stratified into an upper ester layer and a lower acid-glycerine layer which was drawn off and refined. The ester layer was neutralized and treated with activated clay in the amount of 2 pounds of clay per gallon of ester at a temperature of 275° F. The mixture was then filtered, annd there was obtained in the filtrate the butyl esters of oxidized sulfurized linseed oil fatty acids. The detailed properties of the oxidized linseed oil prior to sulfurization, and the butyl esters were as follows:

	Blown Linseed Oil	Butyl Esters of Oxidized Sulfurized Linseed Fatty Acids
Gravity, °API	19.6	14.9
Viscosity, SUV:		
100° F	152.7	269
210° F		51.9
Flash, OC, °F		340
Fire, OC, °F		380
Pour, °F	+35	+10
Color, NPA	4.5	4.75
Sulfur, B, per cent		9.06
Iodine No., Hanus	76.3	16.6

Example 3.—As an example of the alternative procedure of first alcoholyzing the oxidized oil and then sulfurizing, the blown linseed oil of Example 2 was subjected to alcoholysis with 25 per cent by weight of butanol and 5 per cent by weight of 98 per cent sulfuric acid at a temperature of 250° F. for 3 hours. The resulting mixture stratified, the lower acid-glycerine mixture drawn off, and the remaining butyl esters of oxidized

linseed fatty acids sulfurized with 9 per cent sulfur by weight at 400° F. The resulting butyl ester of oxidized sulfurized linseed oil fatty acids was then diluted with an equal weight of light Coastal oil, and the mixture treated with activated clay in an amount of 2 pounds of clay per gallon of oil for a period of 2 hours at 275° F. Properties of the butyl esters of oxidized linseed fatty acids, the butyl esters of oxidized sulfurized linseed fatty acids, the Coastal oil and the clay treated Coastal oil ester product were as follows:

	Butyl Esters of Oxidized Linseed Fatty Acids	Butyl Esters of Oxidized Sulfurized Linseed Fatty Acids	Coastal Oil	Clay Treated Coastal Oil Ester Mixture
Gravity, °API	25.1	14.9	24.5	21.5
Viscosity, SUV:				
100° F	53.4	269	105	175
210° F		51.9		
Flash, OC, °F		340	320	330
Fire, OC, °F		380	365	375
Pour, °F	+15	+10		
Color, NPA	3.75	7.5	4.0	7.0
Sulfur, B, per cent		9.0		4.45
Iodine No., Hanus		16.6		12.0

Example 4.—Another excellent improvement agent comprising the butyl esters of oxidized sulfurized lard oil fatty acids was prepared in a manner similar to that of Example 1, as follows: In a suitable vessel, 400 pounds of lard oil were heated to 220° F. and air was blown through the heated oil at a rate of 400 cubic feet per hour for 18 hours. The blown oil was sulfurized at 375° F. for 2 hours with 40 pounds of sulfur. After cooling, the oxidized sulfurized lard oil was subjected to alcoholysis with 110 pounds of butanol in the presence of 20 pounds of 96 per cent sulfuric acid. The alcoholysis was conducted at 250° F. for 2 hours. The mixture was allowed to settle into two layers, the lower acid-glycerine layer was drawn off, and the remaining butyl esters were treated with 100 pounds of acivated clay for 2 hours at 275° F. The mixture was then filtered, and the filtrate had the following properties:

	Butyl Esters of Oxidized Sulfurized Lard Oil Fatty Acids
Gravity, °API	19.6
Viscosity, SUV:	
100° F	121.5
210° F	45.4
Flash, OC, °F	375
Fire, OC, °F	425
Pour, °F	+40
Color, NPA	8.0
Sulfur, B, per cent	6.99
Iodine No., Hanus	16.6

In the above examples, other monohydric alcohols may be used in lieu of normal butanol, the proportions being suitably adjusted according to the particular alcohol employed. For example, isopropanol, ethanol or methanol may be used in the alcoholysis to produce excellent improvement agents. Also other fatty oils such as corn oil, tung oil, soya bean oil and others may be employed with good results. Mineral oils, such as the usual grades of lubricating oil, may be incorporated with the oxidized sulfurized fatty mono-esters during the processing. As shown in Example 3, such oils may advantageously be admixed with the oxidized sulfurized mono-esters prior to clay refining, as in this way, concentrated solutions may be prepared which are good lubricants and which are useful in preparing other lubricants containing smaller amounts of the improvement agent.

The oxidized sulfurized fatty mono-esters of our invention are excellent improvement agents for mineral lubricating oils and like lubricants. By adding a minor proportion of these mono-esters to mineral oil lubricants, say 0.1 to 20 per cent by weight on the mineral oil, a wide variety of excellent improved lubricants can be prepared. By way of example, the final products from Examples 1 to 4, inclusive, were incorporated in mineral lubricating oil in the proportion of 19 parts by weight of lubricating oil to 1 part by weight of improvement agent. The properties of such lubricants and of the original lubricating oil were as shown in the following table.

Properties	Mineral Lubricating Oil Base	Composition			
		No. 1	No. 2	No. 3	No. 4
Gravity, °API	23.9	23.8	23.1	23.1	23.8
Viscosity, SUV:					
100° F	506	477	459	459	417
210° F	56.3	56.0	54.9	54.9	54.1
Viscosity Index	47	56	52	52	60
Flash, OC, °F	405	400	400	400	395
Fire, OC, °F	465	460	450	450	450
Pour, °F	−25	−25	−25	−25	−25
Color, NPA	2.75	4.0	4.75	3.25	6.0
Sulfur, B, per cent		0.25	0.45	0.22	0.30
Carbon Residue per cent	0.04	0.07	0.08	0.08	0.07
Falex Wear Test:					
1000 Lb. Gage Load, Wear, No. of Teeth	15 min.: fails	6	7	7	3
Gage Load at Seizure, Lbs.		2,900	4,500+	4,500+	2,800

In the above table, the mineral lubricating oil base was a high grade naphthenic type lubricating oil and is included for purposes of comparison. Composition No. 1 comprises the base oil and the butyl esters of oxidized sulfurized rapeseed oil fatty acids prepared as in Example 1. Composition No. 2 comprises the base oil and the butyl esters of oxidized sulfurized linseed oil fatty acids prepared as in Example 2. Composition No. 3 comprises the base oil and the butyl esters of oxidized sulfurized linseed oil fatty acids prepared as in Example 3. Composition No. 4 comprises the base oil and the butyl esters of oxidized sulfurized lard oil fatty acids prepared as in Example 4. The remarkable improvement in oiliness and pressure carrying properties due to the oxidized sulfurized fatty mono-esters of our invention is clearly evidenced in the data shown under

the Falex Wear Test in the table. In addition, these compounded lubricants have excellent anti-oxidant and anti-ring sticking properties, and as shown in the table, improve the viscosity index. The above compositions are excellent motor oils. Other improved lubricants, such as gear lubricants, may readily be prepared by incorporating from 5 to 10 per cent of the oxidized sulfurized fatty mono-esters in a suitable base oil.

What we claim as our invention is:

1. The method of preparing an oxidized sulfurized fatty mono-ester which comprises oxidizing to an iodine number not below about 50 a fatty oil containing glycerides of unsaturated fatty acids and having an iodine number above about 70, reacting the oxidized fatty oil with sulfur to sulfurize the same, subjecting the oxidized sulfurized fatty oil to alcoholysis with a monohydric alcohol in the presence of an alcoholysis catalyst to liberate completely the glycerine from the oxidized sulfurized glycerides and to form the esters of said alcohol and the liberated oxidized sulfurized fatty acids and separately recovering the esters and glycerine so obtained.

2. The method of claim 1, wherein the oxidation is accomplished by blowing the fatty oil with oxygen at a temperature between about 200° and 300° F.

3. The method of claim 1, wherein the sulfurization is accomplished by reacting the oxidized fatty oil with sulfur at a temperature between about 320° and 400° F.

4. The method of preparing an oxidized sulfurized fatty mono-ester which comprises oxidizing to an iodine number not below about 50 a fatty oil containing glycerides of unsaturated fatty acids and having an iodine number above about 70, subjecting the oxidized fatty oil to alcoholysis with a monohydric alcohol to liberate completely the glycerine from the oxidized fatty oil and to form the esters of the monohydric alcohol and the liberated oxidized fatty acid, separating the glycerine and the esters so obtained, and sulfurizing the esters to obtain the oxidized sulfurized fatty mono-esters.

5. The method of preparing an oxidized sulfurized fatty mono-ester which comprises oxidizing to an iodine number not below about 50 a fatty oil containing glycerides of unsaturated fatty acids and having an iodine number above about 70, reacting the oxidized fatty oil with sulfur to sulfurize the same, subjecting the oxidized sulfurized fatty oil to alcoholysis with a monohydric alcohol in the presence of an alcoholysis catalyst to liberate completely the glycerine from the oxidized sulfurized glycerides and to form the esters of said alcohol and the liberated oxidized sulfurized fatty acids, separating the glycerine and the esters so obtained, dissolving said esters in a mineral lubricating oil, contacting the mineral lubricating oil solution of said esters with an activated clay, and recovering the solution of said esters in said mineral lubricating oil.

6. The method of preparing an oxidized sulfurized fatty mono-ester which comprises blowing a fatty oil containing glycerides of unsaturated fatty acids and having an iodine number above about 70 with oxygen at a temperature between about 200° and 300° F. until the iodine number of the fatty oil is substantially reduced but not below about 50, reacting the oxidized fatty oil with sulfur at a temperature between about 320° and 400° F. to saturate at least part of the residual double bonds in the oxidized fatty oil, subjecting the oxidized sulfurized fatty oil to alcoholysis with an aliphatic monohydric alcohol containing not more than twelve carbon atoms to liberate completely the glycerine from the oxidized fatty oil and to form the esters of the monohydric alcohol and the liberated oxidized sulfurized fatty acids, and separately recovering the esters and glycerine so obtained.

7. The method of claim 6, wherein the amount of sulfur is such that the oxidized sulfurized fatty mono-ester contains at least 2 per cent by weight of combined sulfur.

8. The method of claim 6, wherein the monohydric alcohol is butyl alcohol.

9. The method of claim 6, wherein the fatty oil has an iodine number above about 130.

10. The method of claim 6, wherein the fatty oil is rapeseed oil.

11. The method of claim 6, wherein the fatty oil is linseed oil.

12. The method of claim 6, wherein the fatty oil is lard oil.

13. As a new product, an ester of a monohydric alcohol and an oxidized sulfurized fatty acid derived from an unsaturated fatty oil having an iodine number above about 70, said esters containing at least 2 per cent by weight of combined sulfur.

14. The ester of claim 13, wherein the monohydric alcohol is an aliphatic monohydric alcohol containing not more than twelve carbon atoms.

15. The ester of claim 13, wherein the monohydric alcohol is butyl alcohol.

16. The ester of claim 15, wherein the unsaturated fatty oil is rapeseed oil.

17. The ester of claim 15, wherein the unsaturated fatty oil is linseed oil.

18. The ester of claim 15, wherein the unsaturated fatty oil is lard oil.

19. A lubricant composition comprising a major amount of a mineral lubricating oil and a minor amount, sufficient to confer improved pressure carrying properties on the composition, of an ester of a monohydric alcohol and an oxidized sulfurized fatty acid derived from an unsaturated fatty oil having an iodine number above about 70, said ester containing at least 2 per cent by weight of combined sulfur.

20. A lubricant composition in accordance with claim 19 wherein the monohydric alcohol is an aliphatic monohydric alcohol containing not more than twelve carbon atoms.

21. A lubricant composition comprising a major amount of a mineral lubricating oil and a minor amount, from 0.1 to 20 per cent by weight on the mineral oil, of an ester of an aliphatic monohydric alcohol containing not more than twelve carbon atoms and an oxidized sulfurized fatty acid derived from an unsaturated fatty oil having an iodine number above about 70, said ester containing at least 2 per cent by weight of combined sulfur.

22. A lubricant composition in accordance with claim 21, wherein the aliphatic monohydric alcohol is butyl alcohol.

23. A lubricant composition in accordance with claim 22, wherein the unsaturated fatty oil is rapeseed oil.

24. A lubricant composition in accordance with claim 22, wherein the unsaturated fatty oil is linseed oil.

25. A lubricant composition in accordance with claim 22, wherein the unsaturated fatty oil is lard oil.

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