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LUBRICATING OIL COMPOSITION AND OIL ADDITIVE

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This invention relates to lubricating oils and to processes for improving their properties and more particularly to the production of lubricating oils having reduced pour tests.

Lubricating oil stocks, particularly those derived from paraffinic and mixed base crudes, contain appreciable amounts of wax and, therefore, have a relatively high pour test unless a substantial amount of this wax is removed. The wax may be removed by various methods such as cold settling, filtration or centrifuging. However, such processes are expensive and even after such processes have been practiced, lubricating stocks may still retain appreciable amounts of wax and may have pour tests above 15° F. and even up to about 50° F. The removal of additional quantities of wax from these stocks necessitates further expensive processing. Furthermore, complete removal of wax from an oil frequently causes the removal of other materials valuable as lubricants, as well as causing an undesirable increase in the rate of change of the viscosity of the oil with temperature, that is, such removal of wax results in a lower viscosity index of the oil. It is therefore of advantage to add to the oil a material which will reduce the pour test without it being necessary to remove all or substantially all of the wax. Materials such as wax, which are generally presumed to cause high pour point tests in lubricating oil, apparently act by partly crystallizing from the remainder of the oil in such a way that a lattice or honeycomb interlacing or interlocking structure is formed which prevents the free flow of the oil.

One method of lowering the pour point of oil depends not on removing the materials responsible for such lattice structure, but on adding to the oil containing all or only part of them, such a material as will completely or partially inhibit or interfere with the formation of such a structure and thus permit the oil to flow freely at lower temperatures than it would without the added materials.

Although it is believed that the foregoing discussion is a reasonably accurate explanation of the function of pour depressants, it is not desired that this invention be limited to this theory of how the materials covered in this invention act to lower the pour point. The use of addition agents within the scope of this invention is contemplated particularly for lowering the cold test of partially dewaxed oils, although the additive materials herein described are suitable for use in any hydrocarbon oil whether wholly dewaxed or whether containing all of its natural wax content, for the purpose of reducing the pour test of the oils, improving the viscosity index, inhibiting corrosion, improving resistance to oxidation deterioration and enhancing the film strength. For example a substantial lowering of the cold test of the oil may be obtained relatively economically by pressing the wax bearing oil at a relatively high temperature, such as for example, approximately 60° F. whereby a portion of the wax is removed and then adding material prepared in accordance with this invention to reduce the pour test of the pressed oil. The refrigeration required to obtain this temperature in commercial practice is not particularly great. A large lowering of the cold test of the oil may be obtained in this way at little expense in contrast to the considerably increased cost of lowering the cold test by operating the pressing process at a sufficiently low temperature to obtain the same pour test. It is obvious that greater quantities of the addition agents will be required to lower the pour point of a wholly undewaxed oil than for one which has been partially dewaxed. Thus in the preferred embodiment of the invention it is preferred to partially dewax the oil by pressing at relatively high temperature or centrifuging or some other conventional method, since the cost of the high temperature dewaxing operation plus relatively large quantities of pour depressant is usually much less than the cost of low temperature dewaxing operations plus relatively small quantities or no pour depressant. Rather than process at low temperature, it is preferred to add one or more of the addition agents herein described so as to obtain the same lowering of the pour point by this less expensive method and without loss of yield of lubricating constituents.

An object of the present invention is to provide lubricating oils of low pour test.

Another object is to provide new pour point depressing materials to be added to lubricating oils.

Other objects and advantages will appear from the detailed description which follows.

It has now been discovered that the pour test of oils normally having relatively high pour tests such as Pennsylvania oils and some Mid-Continent oils may be greatly reduced by blending therewith the products obtained by reacting sulfur with certain fatty oils. The use of sulfurized fatty oils for the purpose of imparting extreme pressure properties to mineral lubricating oils is well known, but it has now been found when sulfur is reacted with certain fatty oils, highly efficacious pour depressors are obtained. The sulfurized fatty oils are incorporated in small amounts in hydrocarbon oils of relatively high pour point such as Pennsylvania or Mid-Continent lubricating oils and under such conditions effect a depression of the pour test of the oils of as much as 50 or 60° F. or more.

Fatty compounds suitable for use in accordance with this invention are, generally speaking, non-drying vegetable and animal fatty materials and more particularly those animal and vegetable fats, oils and waxes which come within classes I, II, IV, VIII, IX, X and XII of the table entitled, "Constants of vegetable and animal oils, fats and waxes," on pages 858 to 863 of the 23rd edition of the Handbook of Chemistry and Physics, published by the Chemical Rubber Publishing Company. These classes are therein given the following descriptive names: Non-drying vegetable oil of the olive oil type, non-drying vegetable oil of the rape oil type, non-drying animal oil, vegetable fat, animal fat, sperm oil and animal waxes.

Fatty oils within the foregoing classification which have been found to be particularly suitable for the preparation of pour depressors include prime lard oil, No. 1 lard oil, edible lard oil, neat's-foot oil, acidless tallow, oilve oil, peanut oil and rapeseed oil. Other oils within the indicated classification which have been sulfurized and which have been found to possess pour depressing properties, are teaseed oil, cocoanut oil, palm oil, wool grease and sperm oil. It is, of course, apparent that mixtures of one or more of the foregoing oils may likewise be employed.

Pour depressors useful in accordance with this invention may be prepared by simply reacting one or more suitable fatty compounds with sulfur at elevated temperatures. The particular temperature employed may be varied within rather wide limits depending upon the particular fatty compounds used, the amount of sulfur which it is desired to react and time in which the reaction is to be completed. Generally speaking, elevated temperatures of about 250 to 500° F. will be found satisfactory, although higher temperatures may be used in some cases provided undesirable decomposition of the fatty compounds does not thereby result. In no case should the temperature employed be sufficiently high to cause substantial decomposition of the fatty compounds. The reaction of the fatty compound with sulfur may be satisfactorily conducted at atmospheric pressure or superatmospheric pressures. The desired reactions proceed readily in open vessels in contact with air although, if desired, they may be carried out in closed vessels with or without an inert atmosphere such as nitrogen or carbon dioxide.

As might be expected from a review of the properties of the fatty compounds which are suitable for use in accordance with this invention, the time required to react the various fatty compounds with sulfur will vary between rather wide limits depending upon, among other things, the chemical characteristics of the particular fatty compound employed. This time may range from about an hour to as much as 32 hours, and is usually about three to nine hours, but in no case should the heating time be less than that required to obtain a satisfactory corrosion test as determined by immersion of a brightly polished copper strip in the reaction mixture at reaction temperature for a period of three minutes. To be satisfactory, the copper strip should show not more than a slight discoloration. Blackening or scaling of the strip is an indication of an unsatisfactory test. It has been noted, however, that maximum pour depressing properties are not always obtained as soon as a satisfactory corrosion test is evidenced in accordance with the aforementioned procedure. In order to determine the period of heating required to produce a pour depressor having optimum pour test depressing properties, it is necessary to heat the reaction mixture until a satisfactory corrosion test is obtained and then continue the heating for the period of time required to produce a maximum reduction of pour test in a base oil of known pour point. This can best be determined by taking periodic samples from the reaction mixture, blending them with the base oil and noting the heating time on that sample which produces the maximum reduction in pour point. This time ordinarily amounts to about three to five hours after a satisfactory corrosion test has been obtained.

The amount of sulfur which it is necessary to react with the fatty compounds also varies with the particular fatty compound employed, but in general is between approximately 3% and 9% by weight of sulfur. Low proportions of sulfur do not generally produce depressors which are as effective as higher proportions, for example, proportions of the order of 5 to 9% by weight. However, the depressors containing the lower proportions of sulfur are, generally speaking, lighter in color and more soluble in mineral lubricating oils than those containing the greater amounts. Sulfur in excess of 9% by weight may sometimes be reacted with the fatty compounds and excellent pour depressing properties obtained, but in these cases it will generally be found that the depressor is of very limited solubility in mineral lubricating oils particularly those of the Pennsylvania type. The solubility of such depressors may frequently be improved by treatment thereof with a suitable solvent such as paraffinic petroleum naphtha of the Stoddard solvent type or by filtration through clays such as are used for decolorizing petroleum oils. The naphtha solution is separated from any residual material and the naphtha separated by distillation from the pour depressor. The depressor remaining after distillation has materially better solubility in Pennsylvania type mineral lubricating oils than the original product.

The effect of the amount of sulfur reacted with a commercial grade of prime lard oil upon the pour depressing properties of the depressors thereby produced is shown by the results in Table I.

Table I

Percent oil	Percent by volume of pour depressor	Composition of depressor	A. S. T. M. pour test
			°*F.*
100	0		+30
99	1	Prime lard—3% S	+20
99	1	Prime lard—5% S	+10
99	1	Prime lard—7½% S	−20
99	1	Prime lard—9% S	−30

The pour depressors used in obtaining the data shown in Table I were all prepared by the same method. This method consisted of mixing prime lard oil with elementary sulfur and heating the mixture at a temperature of 330° F. with continued agitation until a satisfactory copper strip corrosion test was obtained. In every case the heating was discontinued as soon as the copper strip indicated a satisfactory corrosion test. The depressors were all blended with separate samples of the same Pennsylvania 180 Saybolt viscosity at 100° F. neutral oil. It will be noted that the depressors prepared by reacting 7½% or 9% by weight of sulfur with the prime lard oil were materially better than those depressors in which 3% or 5% by weight of sulfur was employed.

The effect of the time at which the reaction mixture is maintained at reaction temperature is clearly demonstrated by the data in Table II.

Table II

Percent by weight of sulfur	Hours of heating at 330° F.	A. S. T. M. pour test
		Degrees
5	5	+10
5	10	−10
5	15	−25
5	20	−20
5	25	−20
7½	9½	−20
7½	12	B−30
7½	15	B−30
7½	20	B−30
9	25½	B−30

B=below.

In order to test the stability of the pour test of blends of mineral oil and pour depressors in accordance with this invention, a blend of 1% by volume of pour depressor prepared by reacting 7½% elementary sulfur with prime lard oil at a temperature of 330° F. by heating for a period of twenty hours was added to 99% of the same Pennsylvania neutral oil and the blend placed in a refrigerated container at a temperature of −35° F. to −40° F. and maintained at this temperature for a period of 300 hours. During this time the blend was examined periodically and was found to pour at a temperature of below −35° F. in every case. After completion of the 300 hours of exposure at the aforementioned low temperatures, the sample was warmed to room temperature and an A. S. T. M. pour point then determined. This was found to be below −35° F.

In order to test the stability of oil blends containing the same pour depressor at high temperatures, separate blends of the same depressor and neutral oil as described in the low temperature stability tests were used as crank case lubricants in one-cylinder Lauson engines operated at an oil sump temperature of 200° F. At the same time a comparison of the corrosion inhibiting properties of these depressors with a well-known commercial pour depressor was made. These results are tabulated in Table III.

Table III

Lubricant	A. S. T. M. pour test	A. S. T. M. pour test after 12 hrs. in engine	A. S. T. M. pour test 24 hrs. after engine run	Loss in grams of connecting rod bearing inserts
1% Commercial pour depressor; 99% 180 viscosity neutral	−20	−20	−20	0.0178
1% sulf. lard oil; 99% 180 viscosity neutral	−30	B −30	B −30	0.0046

B=below.

The data in Table II show the pour tests on blends of 1% by volume of pour test depressors in the same Pennsylvania neutral oil which was used in the examples shown in Table I. The depressors were prepared by heating separate samples of the same prime lard oil with the amounts of elementary sulfur for periods of time shown in the various examples. The heating time employed was sufficient to produce a good copper strip corrosion test in all cases. The data further show that while a pour depressor could be prepared by heating 5% of elementary sulfur with prime lard oil at 330° F. for a period of five hours, the pour depressing characteristics of the material was materially enhanced by continuing the heating time up to fifteen hours. The depressor prepared by heating for five hours with 5% of sulfur reduced the pour test of the neutral oil from +30° F. to 10° F., whereas the same amount of depressor prepared by continuing the heating up to a period of fifteen hours reduced the pour test on the same neutral oil to −25° F. A somewhat similar improvement was effected by continuing the heating of prime lard oil containing 7½% by weight of sulfur from 9½ hours, the time required to obtain a good copper strip corrosion test, to twelve hours.

It will be seen from the foregoing data that 1% of the same pour test depressor that was employed in the low temperature stability tests reduced the pour test on the same Pennsylvania neutral oil to −30° F., whereas an equal amount of the commercial pour depressor, which is a well-known pour depressor, reduced the pour test to only −20° F. The pour tests on the blend containing Paraflow and on the blend containing the sulfurized lard oil depressor subsequent to the engine run were both as good as the original material prior to the engine test, although in the case of the oil blend containing the sulfurized lard oil depressor, the pour test after the engine run was somewhat lower than the test obtained prior to the engine run. The actual pour test was not determined since no refrigerated bath of sufficiently low temperature was conveniently available for determining the pour test in accordance with A. S. T. M. procedure. Further merit of the sulfurized lard oil depressor is shown by the much smaller loss in weight of the connecting rod bearing inserts when this depressor was used. The loss in weight was approximately one-fourth as great as the loss in weight which occurred when the commercial pour depressor neutral oil blend was used. This data clearly demonstrates the corrosion inhibiting properties of the sulfurized depressor.

In the course of carrying out experimental work in connection with the preparation of sulfurized lard oil pour depressors, it was noted that those depressors prepared from lard oil of low free fatty acid content were superior to the depressors prepared from lard oil of higher free fatty acid content unless long heating time was resorted to. No satisfactory explanation for this peculiarity has been found but the results shown in Table IV clearly demonstrate this effect of the free fatty acid content of the lard oil.

Table IV

Depressor added to oil	Hours of heating	Per cent free fatty acid in prime lard oil	A. S. T. M. pour test
1%	9½	1.0	−20
½%	9½	1.0	−5
¼%	9½	1.0	+10
1%	9½	0.4	−30
½%	9½	0.4	−25
¼%	9½	0.4	−15
1%	20	1.0	−30
½%	20	1.0	−30
¼%	20	1.0	−25
1%	20	0.4	−30
½%	20	0.4	−30
¼%	20	0.4	−25

The data in Table IV show that when 1% of the sulfurized lard oil depressor, in which the prime lard oil contained 0.4% of free fatty acid, was added to the same Pennsylvania neutral oil as was used in all of the preceding tests, the pour test was reduced to −30° F., whereas the same amount of depressor prepared in exactly the same manner from prime lard oil containing 1% of free fatty acid reduced the pour test to −20° F., which is 10° higher than the pour test obtained when using the prime lard oil having the low free fatty acid content.

In order to determine when fatty compounds were satisfactory for use in the preparation of pour depressors in accordance with this invention, numerous fatty compounds were tested. A number of specific examples of materials tested are listed.

EXAMPLE 1

Edible lard oil was treated with 7½% by weight of elementary sulfur at a temperature of 330° F. for a period of 12½ hours. This was the time required to obtain a satisfactory copper strip corrosion test. The material was further heated for a period of 7½ hours in order to determine the extent, if any, of further improvement in pour depressing properties which could be effected. These results are shown in Table V.

Table V

Per cent by volume of depressor	Heating time	A. S. T. M. pour test
	Hours	
1	12½	−20
½	12½	−20
1	20	−20
½	20	−25

These data clearly show the excellent pour depressors obtained by sulfurizing edible lard oil. The pour tests shown in each case are on blends of the various depressors with the same Pennsylvania neutral oil as was used in all of the preceding tests.

EXAMPLE 2

Neat's-foot oil was reacted with 7½% by weight of elementary sulfur by heating at 330° F. for a period of time sufficient to obtain a satisfactory copper strip corrosion test. The pour tests obtained by incorporating the depressors thus prepared in the same Pennsylvania neutral oil are shown in Table VI.

Table VI

Per cent by volume of depressor	Heating time	Per cent free fatty acid	A. S. T. M. pour test
1	20 hours to good corrosion	4.5	−20
½	do	4.5	+15
1	12 hours to good corrosion	1.0	−30
½	do	1.0	−10

The data in Table VI show that satisfactory pour depressors can be prepared from neat's-foot oil. The data further show the superiority of depressors prepared from neatsfoot oil containing 1% of free fatty acid as compared to depressors prepared from neat's-foot oil containing 4.5% of free fatty acid. It will further be noted that only 12 hours were required to obtain a satisfactory corrosion test on the depressor prepared from neat's-foot oil of 1/ free fatty acid content, as compared to 20 hours required when neat's-foot oil containing 4.5% of free fatty acid was used. The solubility of the product prepared from the neat's-foot oil of low free fatty acid content was also superior to that prepared from the neat's-foot oil of high free fatty acid content. In both cases the pour depressing effect was stable over a long period of time.

EXAMPLE 3

Commercial acidless tallow was reacted with elementary sulfur by heating at 330° F. for a period of time at least sufficient to produce a satisfactory corrosion test. The pour tests obtained by blending depressors thus prepared with the same Pennsylvania neutral oil used in the preceding tests are shown in Table VII.

Table VII

Per cent by volume of depressor	Per cent sulfur	Heating time	A. S. T. M. pour test
		Hours	
1	5	7½	−10
½	5	7½	−10
1	5	12½	−10
1	7½	12	−15
½	7½	12	−25
¼	7½	12	−15
1	7½	17	−10
½	7½	17	−20
1	9	25	−20
1	9	30	−20

In Table VII the minimum heating time shown for samples of a given sulfur content are the heating times required to produce a satisfactory corrosion test on the reaction mixture. The oil blends containing the depressors shown in Table VII have shown no separation over a period of several weeks, with the exception of those blends containing a depressor prepared by using 9% by weight of sulfur. The latter blends have clouded slightly and a small fraction of the material has separated.

EXAMPLE 4

Commercial olive oil, a non-drying vegetable oil, was reacted with 5, 7½ and 9% by weight of elementary sulfur at a temperature of 330° F. The pour test results obtained by blending pour depressors thus prepared with the same Pennsylvania neutral oil are shown in Table VIII.

Table VIII

Per cent of depressor added	Per cent sulfur	Heating time	A. S. T. M. pour test
1	5	5 hours good corrosion	+20
1	5	10 hours	+20
2	5	do	+10
1	7½	6½ hours	0
1	7½	6½ hours + 4 hours at 400° F.	−15
1	7½	6½ hours + 8 hours at 400° F.	0
1	7½	6½ hours + 8 hours at 400° F. + 7½ hours at 330° F	0
1.5	7½	do	−20
2.0	7½	do	−30
1	9	4½ hours at 400° F. (good corrosion at 330° F.)	0
1	9	14½ hours at 400° F	−10
2	9	do	−35

The foregoing results show that satisfactory pour depressors may be obtained from olive oil, although in general the efficacy of depressors prepared from this material is not as great as that of depressors prepared from animal fatty compounds such as lard oil.

EXAMPLE 5

A sample of commercial peanut oil was reacted with elementary sulfur by heating at 330° F. until a satisfactory corrosion test was obtained and the pour depressors thus prepared blended with the same Pennsylvania neutral oil used in the preceding tests. The pour tests thus obtained and the effect of varying the heating time and amount of sulfur used are shown in Table IX.

Table IX

Depressor	Per cent sulfur	Heating time	A. S. T. M. pour test
1%	5	7½ hours good corrosion	−10
1%	5	12½ hours	−25
1%	7½	8 hours	−30
½%	7½	do	−5
1%	7½	13 hours	−30
½%	7½	do	−15
1%	9	11 hours	−30

The neutral oil blends containing the depressors prepared using 5% by weight of sulfur remained clear upon standing for a period of over nine weeks. The blends containing depressors in which larger amounts of sulfur were used were not as soluble and small fractions of the depressor separated after standing for a period varying from 24 hours for those of the highest sulfur content, to a period of two weeks for those of intermediate sulfur content. In all cases, however, the pour test remained substantially the same even though some material had separated.

EXAMPLE 6

A sample of petroleum oil-miscible castor oil was reacted with 7½% by weight of elementary sulfur by heating at 330° F. until a satisfactory corrosion test was obtained. The finished material was substantially insoluble in the same Pennsylvania neutral oil as was used in the preceding tests. The castor oil was, therefore, entirely unsatisfactory for use in the preparation of a pour depressor.

EXAMPLE 7

Corn oil was reacted with 7½ by weight of elementary sulfur at a temperature of 330° F., and the heating continued until a good corrosion test was obtained. The finished product was only partially soluble in the same Pennsylvania neutral oil and failed entirely to lower the pour test. Corn oil is, therefore, unsatisfactory for the preparation of pour depressors in accordance with this invention.

EXAMPLE 8

Soya bean oil was reacted with 7½% by weight of elementary sulfur by heating at a temperature of 330° F. until a satisfactory corrosion test was obtained and was blended in varying amounts with the same Pennsylvania neutral oil. The depressor as thus prepared was slightly more soluble than that prepared from corn oil but was entirely unsatisfactory in that it did not reduce the pour test of the Pennsylvania neutral oil.

EXAMPLE 9

Several samples of rapeseed oil were reacted with 7½% by weight of elementary sulfur at a temperature of 330° F., the heating being continued until satisfactory corrosion tests were obtained. Pour depressors as thus prepared were blended with the same Pennsylvania neutral oil as was used in the preceding tests. The pour tests on these blends are shown in Table X.

Table X

Heating time	Saybolt viscosity at 210° F. of sulfurized rapeseed oil	Neutral oil+1% depressor	Neutral oil+½% depressor	Neutral oil+¼% depressor	Neutral oil+⅛% depressor
	Seconds	*Degrees*	*Degrees*	*Degrees*	*Degrees*
5½ hours	864	−30	−30	−25	+5
10 hours	1,852	−30	−30	−20	−15
15 hours	2,900	−30	−30	−20	−15
20 hours	3,450	−30	−25	−15	−5

The foregoing tests show that excellent pour depressors may be prepared from rapeseed oil. only those blends containing ⅛% by volume of sulfurized rapeseed oil depressor remained entirely clear. The time required to form a cloud in the remaining samples was in general proportional to the viscosity of the sulfurized rapeseed oil. With rapeseed oil it does not appear to be advantageous to heat longer than required to obtain good corrosion. Separate samples of pour depressors were prepared from these samples of rapeseed oil using 5% by weight of elementary sulfur and a material improvement in the solubility of the sulfurized depressors in the Pennsylvania neutral oil was noted. At the same time excellent pour depressing properties were obtained, as evidenced by the fact that one per cent by volume of a depressor prepared from rapeseed oil treated with 5% of sulfur for twenty hours at 330° F., reduced the pour test of the Pennsylvania neutral to −30° F. Samples of rapeseed oil reacted with 1% by weight of sulfur showed only very slight pour reducing properties.

The effect of the amount of sulfur reacted with rapeseed oil is shown in Table XI. The depressors were prepared by reacting the rapeseed oil samples with elementary sulfur at a temperature of 330° F., the heating being continued until a satisfactory corrosion test was obtained, and the resultant material blended with the same Pennsylvania neutral as was used in the preceding tests.

Table XI

Per cent by weight of sulfur	Heating time	Neutral oil+1% depressor	Neutral oil+½% depressor	Neutral oil+¼% depressor	Neutral oil +⅛% depressor
	Hours	*Degrees*	*Degrees*	*Degrees*	*Degrees*
1	1	+20			
	3	+15			
	8	+10			
	14	+10			
	20	+15			
3	2	+15			
	5	+10			
	7	+10			
5	4	0			
	9	−15			
	15	−25			
	20	−30			
7½	2½	−20	−10	−5	+10
	5½	−30	−30	−25	+5
	10	−30	−30	−20	−15
	15	−30	−30	−20	−15
	20	−30	−25	−15	−5
9	6	−30	−25	−10	0

From the data in Table XI it appears that the optimum amount of sulfur which should be reacted with rapeseed oil to obtain maximum pour depressing characteristics is between approximately 5 and 9% by weight.

The effect of sulfurized lard oil on the viscosity index of a high grade Pennsylvania oil is shown in Table XII. The sulfurized lard oil was prepared by heating prime lard with 7.5% by weight of elementary sulfur for a period of twenty hours. 1% by volume of the sulfurized additive was incorporated in 180 Saybolt viscosity at 100° F. neutral oil.

Table XII

	Neutral oil	Neutral oil +1% sulfurized lard oil
Gravity	32.0	31.5
Saybolt viscosity at 100° F	185.4	193.4
Saybolt viscosity at 210° F	45.5	47.0
Viscosity index	100	112
A. S. T. M. pour test °F	+30	B−30

B=below.

From the foregoing test data presented it will be seen that not all fatty materials will react with sulfur to produce products which function as pour depressors in mineral lubricating oils. It is only when the fatty materials are selected from the groups hereinbefore set forth that satisfactory depressors are obtained. The data presented further show that when fatty materials within the scope of this invention are reacted with sulfur that unusually effective pour depressors are obtained.

The amount of sulfurized fatty material used to impart pour depressing characteristics to mineral oils is of the order of 0.05% to 10% by volume although ordinarily the most effective amounts to meet commercial requirements are between 0.1% and 2%.

While the preferred embodiments of the invention have been described in detail, it should be understood that the invention is not limited to the specific details given herein by way of example and it is to be limited only as defined by the following claims.

What is claimed is:

1. A pour point depressor for wax-containing mineral oils prepared by heating a material selected from the group consisting of prime lard oil, No. 1 lard oil, edible lard oil, neat's-foot oil, acidless tallow, olive oil, peanut oil and rapeseed oil with in excess of 3% and not more than 9% of sulfur to a temperature between 250 and 500° F., sufficiently high and for a period of hours between 1 and 32, sufficiently long so that the reaction product has substantially reached its maximum pour depressing ability, and cooling the reaction product, said depressor having the ability to lower the pour point of Pennsylvania neutral oil having a viscosity of 180 seconds Saybolt at 100° F. and a pour point of 30° F., more than 50° F. when added thereto in amounts of 1 per cent by volume.

2. A pour depressant in accordance with claim 1 in which the material is lard oil.

3. A pour depressant in accordance with claim 1 in which the material is neat's-foot oil.

4. A pour depressant in accordance with claim 1 in which the material is rapeseed oil.

5. The method of depressing the pour point of wax-containing mineral oils which comprises adding thereto from 0.1 to 2 per cent by volume of a pour point depressor defined in claim 1.

6. A lubricant comprising wax-containing mineral lubricating oil and from 0.1 to 2 per cent by volume of a pour depressor prepared by heating a material selected from the group consisting of prime lard oil, No. 1 lard oil, edible lard oil, neat's-foot oil, acidless tallow, olive oil, peanut oil and rapeseed oil with from 5 to 9 per cent by weight of sulfur to a temperature between 250 and 500° F., sufficiently high and for a period of hours between 1 and 32, sufficiently long so that the reaction product has substantially reached its maximum pour depressing ability and then cooling the product, said product having the ability when added to Pennsylvania neutral oil of 180 Saybolt viscosity at 100° F. and 30° F. pour point, in an amount of 1 per cent by volume to reduce the pour point thereof at least 50° F.

7. A lubricant in accordance with claim 6 in which the material is lard oil.

8. A lubricant in accordance with claim 6 in which the material is neat's-foot oil.

9. A lubricant in accordance with claim 6 in which the material is rapeseed oil.

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