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LUBRICANT

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This invention relates to improvements in lubricants and particularly to lubricants of the type of motor oils.

It is an object of the present invention to provide an improved motor oil having favorable temperature viscosity characteristics and greatly improved engine wear properties.

It is a further object of the invention to provide a motor oil having favorable stability, minimum resin, varnish and/or carbon formation.

A still further object of the invention is to provide a motor oil having, in addition to the foregoing advantages, excellent consumption characteristics.

I have discovered that a motor oil providing the above desired characteristics can be obtained by blending a narrow cut mineral lubricating oil, preferably a narrow cut solvent extracted mineral lubricating oil, and a synthetic lubricating oil of the type hereinafter described.

The narrow cut mineral lubricating oil is preferably a raffinate of a solvent extracted mixed base petroleum distillate which is distilled to produce a relatively narrow cut fraction. The raffinate may be obtained by any of the well-known solvent extraction processes, such as the furfural process, the phenol process, the sulfur dioxide process, the sulfur dioxide-benzol process, the nitro benzene process, the nitro benzene-sulfuric acid process or the Chlorex process.

In preparing the motor oils of the various grades it is the usual practice to prepare base oils of the 20 S. A. E. grade and of the 50 S. A. E. grade which are then blended in the proper proportions to produce intermediate grades of oils. In preparing the base oils in accordance with the present invention the solvent extracted distillate is distilled, preferably under reduced pressure, to remove both the light ends and the heavier ends of the fraction, the distillation being carried out so that the initial boiling point under 1 millimeter mercury pressure is at least about 400° F. and the difference in temperature between the initial distillation temperature at 1 millimeter mercury pressure and the temperature at which 90% distills under 1 millimeter mercury pressure is not grater than about 200° F. and preferably not greater than about 185° F. The term "narrow cut" as used herein and in the appended claims refers to distillates in which the difference between the initial distillation temperature and the distillation temperature at the 90% point, both at 1 millimeter mercury pressure is not greater than about 200° F. The 90% distillation temperature referred to herein is a measure of the tendency of lubricating oils to form carbon in internal combustion engines, and is determined by distilling a 200 cubic centimeter sample of the oil at 1 millimeter mercury pressure and determining the temperature of the vapor when 90% has distilled. The test is described in detail by W. H. Bahlke et al. in the S. A. E. Journal, vol. 29, 1931 (page 215). This 90% distillation point is also referred to as the Carbonization Index of the oil.

The elimination of the lighter and less volatile components of the raffinate oil effects a considerable improvement in oil consumption while the removal of heavier fractions from the raffinate reduces the combustion chamber carbon formation to a large degree, and furthermore, such carbon as is formed by a narrow cut raffinate oil is softer and more easily removed and is thus less liable to cause scratching of the piston rings, cylinder bores and the like of the engine.

Illustrative of suitable base oils of the improved motor oils prepared in accordance with the present invention are the 20 S. A. E. and the 50 S. A. E. oils having the following inspections:

	20 SAE	50 SAE
Gravity, °A. P. I.	28.3	26.8
Flash, °F.	415	510
Pour point, ° F.	−5	+10
Saybolt viscosity at 100° F. ..seconds..	382	1492
Saybolt viscosity at 210° F. ..seconds..	56.4	103
Viscosity index.	93	85
Carbonization index, ° F.	535	640
Initial distillation temperature, ° F.[1]	400	470

[1] At 1 m. m. of mercury absolute pressure.

The above oils are raffinates of Chlorex extracted distillates of a Mid-Continent crude oil.

The synthetic lubricating oil is preferably one obtained by polymerizing, in the liquid phase, an iso-mono-olefin such as isobutylene or a hydrocarbon mixture containing the same at a temperature of from about 0° F. to about 100° F. preferably at 32° F. in the presence of a catalyst such as boron fluoride, aluminum chloride, zinc chloride or other similar active halide catalyst of the type employed in the Friedel-Crafts reaction. I may also employ the co-polymers of iso-mono-olefins with normal olefins. In the preparation of the polymers I may employ, for example, liquid isobutylene or a hydrocarbon mixture containing the same such as a butane-butylene fraction recovered from petroleum gases, especially those gases produced in the cracking of petroleum oils for the manufacture of gasoline. This light fraction may contain from about 10%

to about 25% isobutylene, the remainder being principally butenes and normal butane. The hydrocarbon mixture containing 10% to 25% isobutylene is maintained under pressure sufficient to keep it in the liquid phase and cooled by suitable means to a temperature of for example, about 32° F. and from about 1/10% to about 2% boron fluoride based upon the isobutylene content of the material treated added with vigorous agitation. Excessive rise in temperature due to the heat of the reaction may be avoided by efficient cooling. After the polymerization of the isobutylene, together with a relatively minor amount of the normal olefins present, the reaction mass is neutralized and washed free of the acidic substances arising from the catalysts, the oily layer separated, and the polymer subsequently segregated from the unreacted hydrocarbons by distillation. The polymer mixture so obtained depending upon the temperature of the reaction varies in consistency from a light liquid to a viscous oil-like material and contains polymers having molecular weights ranging from about 100 to 1500. The polymer so obtained is then vacuum distilled to remove the lighter and heavier fractions therefrom and to produce a final product having a Saybolt viscosity at 210° F. of about 185 seconds to 500 seconds and a flash point of about 350° F. to about 440° F.

In accordance with the present invention an improved motor oil is obtained by blending a narrow cut raffinate oil with from about 1% to about 40% and preferably from about 3% to about 20% of an olefin polymer of the type described. To the blend I may add a small amount, 0.05% to 0.5%, of an anti-wear agent such as tributyl phosphite, diamyl sulfone, tributyl phosphate, methyl dichloro stearate, etc. Blends of this composition show improved resistance to oxidation, substantially reduce varnish formation in internal combustion engines, and markedly reduce engine wear.

In the following tables are presented data of various tests employing blends of a narrow cut raffinate oil and various concentrations of an isobutylene polymer. The control oil in each of these tests is a narrow cut raffinate having the following specifications:

Gravity	degrees A. P. I	28.3
Flash	degrees F	415
Pour point	do	−5
Saybolt viscosity at 100° F.	seconds	382
Saybolt viscosity at 210° F.	do	56.4
Viscosity index		93
Carbonization index	degrees F	535
Initial boiling point (at 1 m. m. of mercury absolute pressure)	degrees F	400

The isobutylene polymer used in the blends had the following characteristics:

Gravity	degrees A. P. I	32.7
Flash	degrees F	365
Pour point	do	−35
Saybolt viscosity at 100°	seconds	469
Saybolt viscosity at 210° F.	do	58
Viscosity index		75
Carbonization index	degrees F	470

The sludging time data of various blends of narrow cut raffinate oil and isobutylene polymers are tabulated in Table I. The sludging time is the number of hours required for the samples to form 10 milligrams and 100 milligrams of sludge when maintained at a temperature of about 341° F. while air is being bubbled therethrough.

Table I

Sample	Sludging time (hrs.)	
	10 milligrams	100 milligrams
(1) Control (narrow cut raffinate)	83	140
(2) (1)+3% isobutylene polymer	100	166
(3) (1)+5% isobutylene polymer	110	176
(4) (1)+10% isobutylene polymer	180	210
(5) (1)+15% isobutylene polymer	200–240	200–240
(6) (1)+20% isobutylene polymer	300+	300+
(7) (1)+50% isobutylene polymer	300+	300+

The above data show that increasing the concentration of isobutylene polymer produces an increase in the sludging time.

In motor oils it is highly desirable that there be a minimum increase in the viscosity of the oil as the oxidation of the oil proceeds, in other words, there should be a minimum increase in the viscosity of the oil during use. The effect upon the viscosity increase of blends of a narrow cut raffinate oil and an isobutylene polymer upon oxidation at 341° F. in the presence of air is shown by the data presented in Table II. Also in Table II, in parenthesis, are tabulated the viscosity indices of the control oil and the blends for the corresponding oxidation periods. The viscosity indices in Table II are determined by the Dean and Davis method described in the Oil and Gas Journal of March 31, 1932, page 92.

Table II

Sample	Saybolt viscosity at 100° F. (seconds) after oxidation at 341° F. for—		
	0 hrs.	48 hrs.	96 hrs.
(1) Control (narrow cut raffinate)	372 (94.2)	409 (92.5)	540 (77.2)
(2) (1)+3% isobutylene polymer	376 (92.8)	415 (92.4)	527 (71.5)
(3) (1)+5% isobutylene polymer	377 (92.5)	415 (92.4)	536 (86)
(4) (1)+10% isobutylene polymer	381 (91.0)	419 (90.0)	497 (89.2)
(5) (1)+15% isobutylene polymer	383 (90.3)	420 (93.0)	502 (94.3)
(6) (1)+20% isobutylene polymer	381 (91.0)	444 (84.0)	489 (90.5)
(7) (1)+50% isobutylene polymer	403 (85)		707 (81)

Blends containing more than 50% of isobutylene polymer show a marked decrease in the viscosity index, whereas blends containing less than 50% of the polymer show little change in the viscosity index. It will be observed that after 96 hours of oxidation the control oil showed a substantial decrease in the viscosity index, but blends of from about 10% to about 40% of the polymer showed only a very slight decrease in the viscosity index after oxidation for an equivalent period.

If desired other addition agents, such as pour point depressors, antioxidants, sludge dispersers and the like may be added, without departing from the scope of the present invention as defined by the appended claims.

I claim:

1. An improved lubricant comprising a narrow cut solvent extracted petroleum oil having a 90% distillation point under 1 millimeter mercury pressure not substantially greater than about 200° F. above the initial boiling point at 1 millimeter mercury pressure, and from about 1% to about 40% of an isobutylene polymer having a

Saybolt viscosity at 210° F. of about 185 seconds to about 500 seconds and a flash point of about 350° F. to about 450° F.

2. An improved motor oil comprising a solvent extracted petroleum oil having a 90% distillation point under 1 millimeter mercury pressure not substantially greater than about 200° F. above the initial boiling point at 1 millimeter mercury pressure and from about 3% to about 20% of an isobutylene polymer having a Saybolt viscosity at 210° F. of from about 185 seconds to about 500 seconds.

3. An improved motor oil which is substantially resistant to oxidation, substantially non-varnish forming, and which has low consumption and carbon forming characteristics comprising a narrow cut solvent extracted petroleum oil having a 90% distillation point under 1 millimeter mercury pressure not greater than about 200° F. above the initial boiling point at said pressure, from about 1% to about 40% of an isobutylene polymer having a Saybolt viscosity at 210° F. of about 185 seconds to about 500 seconds and a small amount of an anti-wear agent.

4. An improved motor oil as described in claim 3 in which the anti-wear agent is tributyl phosphite.

5. An improved lubricant comprising a narrow cut solvent extracted petroleum oil having a 90% distillation point under 1 millimeter mercury pressure not substantially greater than about 200° F. above the initial boiling point at 1 millimeter mercury pressure, and from about 1% to about 40% of an iso-mono-olefin polymer having a Saybolt viscosity at 210° F. of about 185 seconds to about 500 seconds and a flash point of about 350° F. to about 450° F.

EDWARD R. BARNARD.