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TRANSMISSION OIL

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The present invention relates to gear lubricants, and more particularly to transmission oils.

In the past various kinds of oils and oil containing compositions have been used for transmission gears. However, with the advent of automatic transmission gears it has been necessary to improve the properties of the gear lubricants to a considerable extent. Whereas previously, the extreme pressure properties of the oil were of the utmost importance it is now essential to provide an oil having a high viscosity index and a low pour point as well. To obtain these additional qualities gear lubricants are at present prepared by admixing a heavy mineral oil having a viscosity index approaching that desired in the gear lubricant, an extreme pressure agent and a pour depressant to obtain the low pour point. Such lubricating compositions have a viscosity index of from about 70 to about 100 and a pour point from −15° F. to −25° F. Usually, however, it is difficult to obtain a low pour point when using an oil of desired viscosity having a high viscosity index. These lubricating compositions present various difficulties which seriously interfere with the proper lubrication of gears. The heavy oils used are susceptible to oxidation and give products which have little or no lubricating value.

It is an object of the present invention to provide a lubricant which avoids the above-mentioned difficulties. A further object is to prepare a gear lubricant which is not easily oxidized and therefore retains its lubricating properties.

Still another object of the present invention is to provide a lubricant which meets rigid specifications as to pour point, flash point, fire point, viscosity, extreme pressure properties, color and the like which, at the same time, is highly resistant to oxidation and carbon formation and has a high viscosity index.

According to the present invention the gear lubricant contains a comparatively light petroleum oil, an extreme pressure agent and a high molecular weight hydrocarbon oil. The latter component, because of its high molecular weight, appearance and physical characteristics is sometimes referred to as a "resin" or a "resinous oil" even though its chemical characteristics are far different from those materials more commonly and more properly known as resins. In order to distinguish the high molecular weight oil more clearly from the comparatively light petroleum oil in the following description, the former will be referred to hereinafter as a resin-like oil.

While light petroleum oils of differing characteristics may be used, depending on the nature and properties desired in the final product, it has been found that from about 55% to about 85% of an oil having a viscosity of from about 70 seconds Saybolt Universal at 100° F. to about 150 seconds Saybolt Universal at 100° F. and a viscosity index of less than 50 is suitable. Various types of extreme pressure agents, such as sulfurized sperm oil, sulfurized fatty oils, sulfurized fat, sulfurized isobutylene polymers, and other sulfur-containing extreme pressure agents may be used in quantities ranging from about 1% to about 15% of the total composition.

The resin-like oil has a molecular weight of from about 1000 to about 2000 and may be added in quantities ranging from about 10% to about 30% but preferably from about 17% to about 20% of the composition. This resin-like oil may be obtained preferably from a Pennsylvania cylinder stock which has been dewaxed at about −40° F. The dewaxed stock is then treated with four to ten volumes of propane at a temperature from about 160° F. to about 180° F. to produce two phases, a lighter propane-soluble phase and a heavy propane-insoluble phase containing the resin-like oils. The heavy fraction is then treated with additional propane at from 135° F. to 155° F., usually about 145° F., the ratio of propane to heavy oil being from about 5 to 1 to about 10 to 1, and usually about 7 to 1. By this treatment about 3% to about 3½% of the resin-like oil based on the original amount of dewaxed oil precipitates out from the propane-soluble constituents of the heavy oil. Although propane has been referred to as the refining agent it will be understood that the propane may contain or be replaced by other normally gaseous hydrocarbons, particularly ethane, isobutane, butane, propylene, butylene, etc. This resin-like oil is a substantially wax-free and asphalt-free product having a Saybolt Universal viscosity at 210° F. of from about 1000 to about 4000 or more seconds, a viscosity index of about 90 or more and a relatively high pour point. The characteristics of a specific example are as follows:

Gravity=A. P. I. 16.7
Flash point=615° F.
Fire point=720° F.
Viscosity at 210° F.=2910 seconds Saybolt Universal
Viscosity index=95
Pour point (natural)=60° F.

A resin-like oil having suitable characterics, similar to the foregoing may be obtained from a

mixed base oil such as Mid-Continent. Obviously in this case it would be necessary to deasphalt as well as dewax the oil before precipitation of the resin-like oil. When a Mid-Continent oil is used the asphalt may be removed by treatment with propane at temperatures of from 105° F. to 115° F., the oil-propane ratio being about 1 to 2.

A more detailed description of the process for obtaining the resin-like oil will be found in U. S. Patents 2,143,872 and 2,143,882.

An example of a transmission oil according to the present invention contains:

	Per cent
Oil (viscosity of 85 seconds at 100° F., V. I. less than 50 and 300° F. min. flash)	73
Resin-like oil	17
Sulfurized sperm oil	10
	100

A lubricant having the foregoing composition has the following properties and characteristics:

Saponifiable oil—per cent	7.6
Added sulfur—do	1.1
Total sulfur—do	2.2
Flash point—°F	320
Fire point—°F	370
Pour point (shock chilling)—°F	−25
S. U. vis. at 210° F	58
S. U. vis. at 130° F	176
S. U. vis. at 100° F	365
Viscosity index	108
Ash—per cent	0.015
Moisture—do	Trace
Almen failure (extreme pressure)	Passes maximum 30 lb. load
Copper strip (3 hrs. at 200° F.)	No corrosion
Heating test (125 hrs. at 200° F.):	
Evaporation loss—per cent	0.9
Residue ppt	None
Vis. incr. at 210° F	.7% decrease
Vis. incr. at 130° F	.5% decrease

It will be noted that this lubricant has an exceedingly high viscosity index, excellent extreme pressure properties and low pour point. In Table I below, the characteristics of three transmission oils without the resin-like oil are compared with a lubricant according to the present invention.

TABLE I

Characteristics of transmission oils

Composition	Viscosity at 100° F.	Viscosity at 210° F.	Viscosity index	Pour point
				°F.
88% oil No. 1 10% sulfurized sperm oil 2% pour depressant	422	55.2	71.8	−25
88% oil No. 2 10% sulfurized sperm oil 2% pour depressant	405.4	58.0	95.5	−15
88% oil No. 3 10% sulfurized sperm oil 2% pour depressant	465.2	63.1	103.5	0
73% oil No. 4 10% sulfurized sperm oil 17% resin-like oil	365	58	108.0	−25

The characteristics of base oils Nos. 1 to 4 inclusive are given in the following Table II:

TABLE II

Characteristics of base oils

Oil	Viscosity at 100° F.	Viscosity at 210° F.	Viscosity index	Pour point
				°F.
No. 1	312	48	Below 50	0
No. 2	314	50	64.7	+15
No. 3	368	55.5	92.4	0
No. 4	82	36.6	Below 50	−25

The pour depressant referred to in the above Table I is of the type obtained by the condensation of a halogenated long chain aliphatic hydrocarbon such as chlorinated paraffin wax, with an aromatic hydrocarbon such as naphthalene in the presence of a Friedel-Crafts catalyst such as aluminum chloride. It is clearly evident from Table I that whenever an effort was made to improve the viscosity index of the lubricant, the pour point rose above the minimum requirement. However, the lubricant containing the resin-like oil and without a pour depressant not only gives an excellent viscosity index but also meets the maximum pour point requirements.

With reference to the present invention attention is called to the application of Claron N. White and Frederick H. MacLaren filed June 30, 1941, Serial No. 400,460, entitled "Lubricants."

Although the present invention has been described with reference to specific examples, these are not to be construed as limitations. The scope of the present invention is defined by the appended claims.

I claim:

1. An extreme pressure lubricant suitable for use as a transmission lubricant containing from about 55% to about 85% of a mineral lubricating oil having a relatively low viscosity index and a viscosity of from about 70 to about 150 seconds Saybolt Universal at 100° F., from about 1% to about 15% of a sulfur-containing extreme pressure agent and from about 10% to about 30% of a resin-like oil obtained by treating a substantially asphalt-free, wax-free lubricating oil stock with a liquefied normally gaseous hydrocarbon to effect a phase separation of a light fraction soluble in said liquefied hydrocarbon and a heavy fraction containing the resin-like oil insoluble in said liquefied hydrocarbon, and precipitating the resin-like oil from said heavy fraction by treating said heavy fraction with further amounts of the liquefied normally gaseous hydrocarbon.

2. An extreme pressure lubricant suitable for use as a transmission lubricant as claimed in claim 1 wherein the percentage range of resin-like oil is from about 17% to about 20%.

3. An extreme pressure lubricant suitable for use as a transmission lubricant as claimed in claim 1 consisting of 73% of the mineral lubricating oil, 10% of sulfurized sperm oil and 17% of the resin-like oil.

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