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LUBRICANT

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This invention relates to lubricants and more particularly to extreme pressure lubricants.

It is known that the film strength or load-carrying capacity of plain mineral lubricating oils, which is ordinarily not sufficiently high for proper lubrication of moving metal parts which contact each other under high pressures, such as certain types of bearings, engines, hypoid gears, etc., can be greatly increased by adding thereto various chemical compounds or materials containing active halogen and/or sulfur and sometimes phosphorus. Such extreme pressure agents, as formerly made with only relatively low amounts of chlorine and sulfur, were soluble in almost all types of mineral lubricating oil base stocks; but when an attempt is made to use extreme pressure agents which contain large amounts of chlorine and sulfur, it is found that these compounds, especially those in which the chlorine and sulfur are both contained in the same chemical compounds, tend to be insoluble in certain types of mineral oils forming a hazy solution or precipitating partially out of solution upon cooling, and this is particularly true of paraffinic oils.

It has now been discovered that such extreme pressure agents containing more than 15% and even more than 45% of chlorine and more than 5% of sulfur are satisfactorily soluble in mineral lubricating oil base stocks having a viscosity index below about 50.

It has also been discovered that even highly paraffinic or other mineral lubricating oil base stocks in which such extreme pressure agents are normally insoluble may be used satisfactorily, or sulfurized with the extreme pressure agent, by adding thereto a substantial amount such as 5-50% or generally about 10-30% by volume, based on the volume of paraffinic oil, of a solvent extract obtained by treating a mineral lubricating oil base stock with solvents having a selective solvent action for aromatic and unsaturated hydrocarbons, for instance, by extracting a lubricating oil stock by phenol, liquid sulfur dioxide, furfural, cresol, nitrobenzene.

Extreme pressure agents within the scope of this invention may be chlorinated derivatives of aliphatic or aromatic hydrocarbons such as paraffin wax, kerosene, aromatic petroleum fractions or coal tar solvents. For instance, paraffin wax may be chlorinated by passing chlorine through the molten wax at an elevated temperature until the desired amount of chlorine has been incorporated. Temperatures up to about 175° F. are practical for chlorinating the wax to a content

up to about 45% chlorine although the chlorination is somewhat slow. More elevated temperatures such as 200° F. and 220° F. or higher permit chlorination in a much shorter time and therefore are more economical, and also enable the preparation of chlorinated derivatives containing up to about 60% of chlorine. The present invention is, therefore, particularly applicable to the use of extreme pressure agents comprising chlorinated derivatives made by chlorination at temperatures substantially above 175° F. and containing more than 45% chlorine.

As the sulfur-containing substituent of the extreme pressure agent one may use materials such as sulfurized fatty oils or sulfurized mineral oils or various organic sulfur compounds, such as sulfides, mercaptans, etc. However, it is preferable to use as the extreme pressure agent a single material in which both chlorine and sulfur have been incorporated into the same compounds and this may readily be accomplished by first chlorinating a suitable hydrocarbon material, such as the paraffin and kerosene described above, and subsequently sulfurizing the resultant chlorinated hydrocarbon derivatives, as by treating them with sulfur or an inorganic sulfide, such as sodium sulfide or polysulfide or a mixture thereof with sulfur and sodium hydroxide, a mercaptide or a thiocarbonate or xanthate.

One example of a suitable extreme pressure lubricating agent is made by chlorinating kerosene at a temperature of about 220° F. to a chlorine content of about 50-55% and treating the resultant chlorinated kerosene with sulfur, caustic soda, and sodium hydrogen sulfide to make a sulfurized chlorinated kerosene derivative containing about 20-50% of chlorine and about 4-10% of sulfur.

A sample of an extreme pressure agent made as just described is found to be partially insoluble in a paraffinic type of lubricating oil, having a viscosity index of about 100, intended for use as a gear oil, and having a viscosity of about 90 seconds Saybolt at 210° F. However, 10% by weight of this same extreme pressure agent dissolves satisfactorily at ordinary temperatures without formation of haziness in a coastal oil (a naphthenic base oil) having a viscosity index (V. I.) of 30 and even having a viscosity as light as 40 seconds Saybolt at 210° F.

As another and preferred modification of the invention, 100 parts by volume of the same paraffinic lubricating oil referred to above were blended with 10 parts by volume of a phenol extract having a viscosity index of -10 and a vis-

cosity of about 75-80 seconds Saybolt at 210° F. obtained from a paraffinic crude having a viscosity of about 55-60 seconds Saybolt at 210° F. 10 percent by weight of the extreme pressure agent described above was then incorporated into the resultant lubricating oil blend which had a viscosity index of about 75, and was found satisfactorily soluble therein.

These tests indicate that aromatic materials such as highly aromatic oils and aromatic solvent extracts of mineral oils are effected solubilizers for paraffinic lubricating oils and extreme pressure agents normally insoluble therein.

In preparing extreme pressure lubricants according to this invention, other known addition agents may be incorporated if desired, for instance, fatty oils, soaps of fatty acids or naphthenic acids, other materials having thickening, viscosity index improving and pour-depressing properties, anti-oxidants, oil-soluble metal soaps, dyes, etc.

It is not intended that this invention be limited to any of the particular examples which have been given merely for the sake of illustration but only by the appended claims in which it is intended to claim all novelty inherent in the in-

vention as well as other modifications coming within the scope and spirit of the invention.

We claim:

- 5 1. An extreme pressure lubricant comprising a major proportion of a paraffinic lubricating oil base stock, about 5 to 15% of a chlorine-sulfurized paraffinic hydrocarbon extreme pressure agent normally at least partially insoluble there-
10 in and containing more than 15% of chlorine and more than 5% of sulfur, said lubricant also containing a solubilizing amount of an aromatic solvent extract having a viscosity index at least as low as zero and obtained by treating a mineral lubricating oil base stock with a solvent having
15 a selective solvency for aromatic hydrocarbons.
2. Composition according to claim 1 in which the extreme pressure agent was obtained by chlorinating a refined kerosene at a temperature substantially above 125° F. to a chlorine content substantially above 25%.
- 20 3. Lubricant according to claim 1 in which the solubilizer is a phenol extract of a mineral lubricating oil base stock.

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