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LUBRICANTS

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This invention relates to novel lubricants and methods of preparing and using same, and more particularly it relates to chemically inert lubricants, especially such which are suitable for use at low temperatures at least as low as atmospheric temperature or below.

According to the present invention zinc stearate, or other metal soap as will be described later, is mixed with a liquid vehicle such as a petroleum distillate boiling above the naphtha boiling range, and highly refined so as to be substantially inert chemically, as may be obtained by treating the petroleum distillate with oleum (fuming sulfuric acid) or by concentrated sulfuric acid under strong treating conditions, such as by using a large amount of sulfuric acid or somewhat elevated temperatures, or both, or by treating with other chemical refining agents, such as aluminum chloride.

These oils should be of the kerosene to lubricating oil boiling range and should have a viscosity of about 30–400 seconds Saybolt at 100° F., and an A. S. T. M. pour point at least as low as 40° F., and preferably below 0° F., or lower, e. g. —40° F., —70° F. and even as low as —90° F., or lower. Either a single petroleum distillate may be used or a mixture or blend of several different distillates, providing that either each one separately, or the mixture thereof, has been highly refined to the extent of making the oil substantially chemically inert.

Oils of the desired type, which are generally known as mineral white oils, are available on the market in various grades classified chiefly according to viscosity and purity or inertness. For the purpose of the present invention it is preferred to use white oils which satisfy the requirements of the United States Pharmacopoeia, in other words, sufficiently chemically inert to permit their use for medicinal purposes as an internal lubricant. One such product which has been available on the market for many years is sold under the trade name "Nujol." The following is a list of additional U. S. P. oils with their approximate viscosity ranges:

U. S. P. white oils	Viscosity sec. Saybolt Univ. at 100° F.
Marcol	80–90
Wyrol	125–135
Fractol	200–210
Primol	320–330

The product called Nujol has a viscosity in the general viscosity of the Primol. Other oils of similar purity are available which have viscosities intermediate between those listed above.

In addition to the above-mentioned U. S. P. white oils, there are also a number of the white oils marketed commercially which are of a technical grade of purity, i. e., highly refined and substantially chemically inert, but not quite so absolutely inert as to warrant use for medicinal purposes as an internal lubricant. Such products are available under the general trade name "Bayol" and are available in various viscosities ranging from about 30–100 seconds, although generally sold to meet relatively narrow viscosity specifications, such as 30–35 seconds, 50–55 seconds, 65–75 seconds, 80–90 seconds, 95–105 seconds, etc. The above-described white oils ordinarily have pour points ranging from about +35° F. down to —90° F., depending upon the source of the crude petroleum from which they are derived, and, of course, depending to some extent upon the viscosity and boiling range of the particular distillate in question. For instance, a white oil made by treating a naphthenic type gas oil, and having a viscosity of about 35–40 seconds Saybolt at 100° F., generally has a pour point of —90° F. On the other hand Primol, which is a much higher boiling and higher viscosity fraction, generally has a pour point of —30° F.; Marcol having a viscosity of about 80–90 seconds at 100° F. has a pour point of about 0 to +10° F.; and yet a product sold under the trade name "Bayol F" and having a viscosity of about 50–55 seconds Saybolt at 100° F., has a pour point of +35° F. Obviously for the purpose of the present invention these and other similar white oils may, if desired, be blended together to obtain any desired combination of viscosity and pour point according to the requirements to which the lubricant will be applied in actual use.

The metal soap, which is the other main constituent of the low temperature lubricants of this invention, should be one which will serve as a satisfactory lubricant even if the major proportion, or even practically all, of the hydrocarbon constituent of the lubricant may be removed due to contact with the hydrocarbons being treated in the equipment being lubricated. Although it has been found that zinc stearate is a very satisfactory soap for the purposes of this invention, magnesium stearate is also suitable, and calcium stearate is fairly satisfactory. It is preferred to use soaps of metals of group II of the Mendeleeff Periodic Table. For instance, barium stearate may also be used. The acid radical of the soap is preferably a fatty acid and preferably a saturated fatty acid which will not react chemically with unsaturated hydrocarbons being treated in the equipment being lubricated nor be subject to polymerization or condensation due to the presence of Friedel-Crafts catalysts. Instead of preparing the soap from stearic acid, it may be made from synthetic acid made by the oxidation of paraffin wax or from acids derived from the non-drying vegetable or other fatty oils, or from fats. Mixtures of these various metal soaps may be used.

The proportions in which the two primary ingredients of the lubricants of this invention are to be mixed, namely, the white oil and the lubricating metal soap, will depend to some extent on the type of specific constituents being used and on the purpose for which the lubricant will be used. For example, when the grease is to be used in a grease gun, the soap, e. g., zinc stearate, should comprise about 25–35% by weight of the total grease composition, whereas if the grease is to be used in a grease cup, the amount of soap should be somewhat higher, such as about 40–50% by weight. Generally the amount of the lubricating metal soap to be used should be between the broader limits of about 10–60% by weight and the white oil about 40–90% by weight, the preferred limits being about 20–50% by weight of soap and about 50–80% of white oil.

In carrying out this invention, the soap, such as zinc stearate, may be mixed directly into the mineral white oil to be used, or if desired, the reverse procedure may be used, namely, by gradually mixing or milling the white oil into the zinc stearate. Although heating is not normally necessary, the mixture may be heated, if desired, to a suitable temperature, such as up to about 100° F. or 150° F. or so, in order to temporarily reduce the viscosity of the white oil to facilitate the dispersion of the soap therein.

In addition to the above two primary constituents, other addition agents may be used in minor amounts, such as dyes, anti-oxidants, pour depressors, etc.

The lubricating greases of this invention are substantially chemically inert and are especially suitable for lubricating chemical process equipment such as processes involving the treatment of petroleum hydrocarbons, such as unsaturated gases or liquids with catalysts of the Friedel-Crafts type, e. g., aluminum chloride, boron fluoride, etc., or other catalysts, such a sulfuric acid, etc. The invention is particularly suitable for use in conjunction with the manufacture of synthetic rubber, for instance, by lubricating bearings, stuffing boxes, valves, etc., with the substantially chemically inert lubricating greases of this invention. A particularly preferred method of using these greases is to impregnate an asbestos packing and then using the impregnated packing for lubrication of bearings, etc. Another very satisfactory application of this invention is the use of this grease for lubricating plug valves or cocks which require a film of the lubricant between the valve and body. In the manufacture of certain types of synthetic rubber, such as the one called butyl rubber, polymerizable, i. e., unsaturated, hydrocarbon gases such as isobutylene, butadiene, and isoprene, are treated at low temperatures, i. e., below −40° F. and generally at least as low as −70° F., e. g. −100° F. or even lower, with a Friedel-Crafts catalyst, especially aluminum chloride, dissolved in a solvent such as methyl chloride or ethyl chloride, this operation being ordinarily carried out in the presence of a liquefied gaseous hydrocarbon such as ethylene, ethane, or even methane serving as a diluent and/or refrigerant. In such a process difficulties have been experienced in obtaining satisfactory lubricants which are inert to the action of the catalyst and unsaturated hydrocarbons used in the process and at the same time which will remain sufficiently plastic for accomplishing the desired lubrication. The lubricating greases of this invention have been found to be very satisfactory for lubricating the valves, bearings and other moving parts of the equipment used in such a process.

Generally the lubricating greases of this invention should have a penetration of at least 50 (according to the standard A. S. T. M. procedure at 77° F.), and should have a consistency of less than about 1500 on the consistometer at 77° F. or a Saybolt viscosity of at least about 500 seconds at 77° F. In non-technical terms, the consistency should be approximately between that of a library paste and that of milk of magnesia, or very slightly thinner.

For the sake of illustration, the following specific examples are given:

Example 1

A Colombian gas oil was treated with fuming sulfuric acid, and after removal of the acid sludge and washing the acid treated oil with water and soda to remove the residual acid, the resultant mineral white oil had a viscosity of 37 seconds Saybolt at 100° F. and a pour point of −90° F. Similarly a higher boiling petroleum distillate of the lubricating oil boiling range was treated with fuming sulfuric acid and after removal of acid sludge and washing, the resultant mineral white oil had a viscosity of about 340 seconds Saybolt at 100° F. and a pour point of −30° F. These two light and heavy mineral white oils were blended together in suitable proportions, about 2:1, to obtain a blend having a pour point of about −70° F. It was then compounded with zinc stearate in the proportions of about 35% by weight of zinc stearate and 65% by weight of the white oil and the resultant grease was found very satisfactory for lubricating plug valves and other parts of equipment used in low temperature chemical processes.

Example 2

The procedure of Example 1 was repeated, except that a Winkler gas oil was used instead of a Colombian gas oil as the petroleum distillate from which the light mineral white oil was prepared. The finished lubricating grease was likewise very satisfactory for lubrication of equipment used in the manufacture of butyl rubber.

Example 3

About 55% by weight of the light mineral white oil prepared in Example 1 is compounded with about 45% by weight of zinc stearate to make a substantially chemically inert lubricating grease having the property of maintaining desirable plasticity at temperatures even substantially lower than those at which the lubricants of Examples 1 and 2 are suitable.

It is not intended that this invention be limited to the specific materials which are recited merely for the sake of illustration, but only by the appended claims in which it is intended to claim all novelty inherent in the invention as well as all modifications coming within the scope and spirit of the invention.

I claim:

1. A composition comprising essentially a mineral white oil having a viscosity of about 30–400 seconds Saybolt at 100° F. and about 10–60% of a lubricating metal soap, said composition having a grease consistency at temperatures at least as low as atmospheric temperature.

2. Lubricant according to claim 1 in which the soap is a fatty acid soap of a metal of group II of the periodic table.

3. Lubricant according to claim 1 containing a saturated fatty acid soap of zinc.

4. Lubricant according to claim 1 containing at least 10–60% by weight of zinc stearate.

5. A lubricant comprising about 20–50% by weight of zinc stearate and about 80–50% of a mineral white oil having a viscosity of about 30–400 seconds Saybolt at 100° F., said lubricant having a grease consistency at temperatures at least as low as atmospheric temperature.

6. Lubricant according to claim 5 in which the white oil has a pour point below −50° F.

7. Lubricant according to claim 5 in which the white oil has a pour point below −50° F. and consists of a blend of low boiling white oil having a viscosity of about 30–40 seconds Saybolt and a pour point of about −90° F. and a high boiling white oil having a viscosity of about 300–400 seconds Saybolt at 100° F. and a pour point of about −30.

8. A low temperature lubricant having a grease consistency comprising essentially a mineral white oil of the kerosene to lubricating oil boiling range, having a viscosity of 30–400 seconds Saybolt at 100° F. and a pour point at least as low as −30° F., and at least about 10% of a lubricating metal soap.

9. The method of lubricating chemical process machinery in which the lubricant comes in contact with active chemicals and in which the lubricant must remain plastic under the conditions of operation which comprises using as the lubricant therefor a chemically inert grease consisting essentially of about 40 to 90% of a mineral white oil having a viscosity of about 30–400 seconds Saybolt at 100° F., and about 10–60% by weight of an inert lubricating metal soap.

10. The method of lubricating machinery used in the manufacture of synthetic rubber which comprises using as the lubricant therefor a lubricating grease comprising essentially about 40–90% by weight of a mineral white oil having a viscosity of about 30–400 seconds Saybolt at 100° F. and about 10–60% of an inert lubricating metal soap.

11. Method according to claim 10 in which the grease contains about 20–50% of zinc stearate.

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