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GASOLINE-INSOLUBLE GREASE

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This invention relates to a lubricating grease which is insoluble in petroleum oils, particularly gasoline and the naphtha fractions of petroleum, and a method of preparing the same.

In the lubrication of valves, pumps, etc. handling gasoline or the naphtha fractions of petroleum, it is necessary to provide a lubricant which is substantially insoluble in, or inert toward, the oils and which will effectively lubricate at all temperatures to which the equipment is subjected. Also, the lubricant must effectively seal the moving parts so as to prevent the escape of the volatile naphtha and maintain the required pressure on the system.

The lubricants which have been used for this type of service are the so-called gasoline-insoluble greases which contain, as the principal ingredient, castor oil and/or the metal soaps of castor oil. These castor oil greases provide satisfactory lubrication and sealing at low temperatures but lose their efficiency as the operating temperatures increase. At high temperatures these greases tend to bleed excessively, lose their sealing power, and have to be replenished quite frequently. As a result, these greases are entirely inadequate for use in refining operations where the temperatures of the naphtha lines may be as high as 600° F.

The subject invention is directed to a lubricating grease which is insoluble in petroleum oils and which may be used in the lubrication of valves, pumps and other related apparatus handling gasoline and naphtha to provide efficient lubrication and sealing at temperatures which may substantailly exceed atmospheric temperature.

It has been found that a lubricating grease prepared from naphtha-insoluble synthetic organic acids is particularly well-suited for the lubrication of refining equipment handling the naphtha fractions of petroleum and provides excellent lubrication and sealing even at temperatures approaching 500–600° F.

The synthetic organic acids are those acids produced by the oxidation of high-molecular weight petroleum hydrocarbons which are then separated by the selective solvent action of naphtha into the naphtha-soluble and naphtha-insoluble components. The naphtha-insoluble components, with which the present invention is concerned, consists primarily of the highly oxygenated products such as the hydroxy acids which are obtained by extending the oxidation reaction beyond that required for the production of the simple carboxylic acids. These naphtha-insoluble components may also be obtained by extraction with other petroleum solvents such as propane, etc.

In the normal production of synthetic organic acids of the fatty acid series which are used in the preparation of soap and oil-soluble greases, the oxidation reaction is halted just short of the point of incipient formation of the naphtha-insoluble acids and any naphtha-insoluble components which may be formed are removed as impurities. The amount of naphtha-insoluble acids produced from the oxidation of petroleum hydrocarbons varies with the particular oxidation processes used. In general, the proportion of naphtha-insoluble to naphtha-soluble material will increase as the oxidation is extended beyond that required for the formation of carboxylic acids of the fatty acid series. When oxidizing to prepare naphtha-insoluble acids as the principal component it has been found advisable to increase the rate of oxidation and the contact time. The rate of oxidation may be increased by increasing the rate of flow of the oxidizing gas, raising the temperature in the reaction vessel, and increasing the pressure on the reaction. Any or all of these conditions will increase the proportion of naphtha-insoluble material produced.

In accordance with the invention a gasoline-insoluble grease is prepared by partially saponifying the naphtha-insoluble synthetic organic acids with a metal hydroxide, preferably an alkali metal hydroxide such as caustic soda, to form a homogeneous grease composition comprising a mixture of naphtha-insoluble synthetic organic acids and a metal soap of said acids.

The soap content of the grease made in accordance with the invention may vary from a fraction of a percent to as high as approximately 100% in which case the consistency of the resulting grease will range from a semi-fluid state to a very hard solid. It is preferable, however, to saponify the synthetic organic acids so as to produce a product having a soap content which may range from about 10% to upwards of 50% by weight of the finished product.

In preparing a lubricating grease according to the present invention, a petroleum stock obtained from a solvent refined distillate was oxidized in a stainless steel reaction kettle with an air rate of 3.7 cu. ft. per hour per lb. for 72 hours at a temperature of 250° F. using 1% manganese naphthenate as the catalyst. The oxidized mass which consisted of around 96% of the reaction mixture tested as follows:

Neutralization number	124
Saponification number	282
Non-saponifiable ——per cent	21.3

This oxidized mass was then treated with 200% by weight of Stoddard solvent and allowed to settle for a few hours. The naphtha-insoluble material was decanted off and the residue washed with additional Stoddard solvent and decanted off. The insoluble layer containing solvent was

then steam stripped at 340° F. Approximately 50% of the oxidized mass was recovered as naphtha-insoluble acids which tested as follows:

Neutralization number	141
Saponification number	314
Non-saponifiable—per cent	9.7

This naphtha-insoluble material was then placed in a grease kettle and warmed sufficiently to melt it completely. The caustic for saponification was then added in an amount sufficient to convert 35% of the acids present to soap. During the saponification step the mass was then dehydrated by slow heating up to 260° F. requiring about 8 hours to increase in temperature from 240° F. to 260° F. in order to avoid foaming. After dehydration, the mass was cooled down to a plastic condition and then extruded in stick form. It was then dipped into melted paraffin to retain the grease in its dehydrated condition. The tests on the finished grease are as follows:

Theoretical soap—per cent	35
Neutralization number	54.5
Saponification number	165
Penetration at 77° F. (A. S. T. M+475 grams added weight)	47
Penetration at 210° F. (A. S. T. M.+475 grams added weight)	197
Melting point—°F	500+

The foregoing grease composition was tested in competition with a recognized commercial product recommended as a gasoline-insoluble grease under various conditions and temperatures in refining equipment. The temperature in the various installations ranged from 100° F. to approximately 600° F. In every instance the lubricating grease of the present invention afforded excellent lubrication and sealing over extended periods of time whereas the commercial product failed after a few days of operation. In one instance on a hot naphtha line where the temperatures ranged from 112° F. to 475° F. the commercial product failed in from one to three days and the grease prepared in accordance with the foregoing example required no replenishment and gave perfect sealing of vapors for a period of 41 days.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof and, therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A lubricating grease comprising essentially a mixture of naphtha-insoluble synthetic organic acids and the soda soap of naphtha-insoluble synthetic organic acids, said organic acids being derived from the oxidation products of petroleum hydrocarbons.

2. A lubricating grease comprising essentially the reaction product of the partial saponification of the naphtha-insoluble synthetic organic acids obtained by the oxidation of petroleum hydrocarbon.

3. A lubricating grease comprising essentially a mixture of naphtha-insoluble synthetic organic acids and 10–50% of a soap of naphtha-insoluble synthetic organic acids, said organic acids being obtained from the oxidation products of petroleum hydrocarbons.

4. A lubricating grease comprising essentially a substantially dehydrated mixture of naphtha-insoluble synthetic organic acids and the soda soap of naphtha-insoluble synthetic organic acids, said organic acids being derived from the oxidation products of petroleum hydrocarbons.

5. A method of preparing a gasoline-insoluble lubricating grease which comprises oxidizing petroleum hydrocarbons, treating the oxidation product with naphtha, separating the naphtha-insoluble portion thereof, saponifying said naphtha-insoluble portion with sufficient caustic to convert from 10–50% of the acids present to the soda soap and dehydrating the resulting mixture.

6. A method of preparing a gasoline-insoluble lubricating grease which comprises oxidizing high-molecular weight petroleum hydrocarbons, treating the oxidation product with naphtha, separating the naphtha-insoluble portion thereof and saponifying said naphtha-insoluble portion with sufficient caustic to convert from 10–50% of the acids present to the soda soap.

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