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LUBRICANTS

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This invention relates to lubricants. More particularly the invention relates to greases having relatively small changes in viscosity with comparatively large changes in temperatures.

Most of the lubricating greases in use today are made of metal soaps gelled in mineral oil lubricants. Many greases contain naphthenic base lubricating oils because these oils have a much lower cold test than paraffin base oils. Soaps generally solidify at low temperatures even though they are dissolved in the naphthenic base mineral oils.

I have found that lithium base soaps, particularly the stearate, do not solidify at a temperature as low as minus 40° F. When such lithium soap is embodied in mineral oil lubricants the viscosity increases quite rapidly as its temperature is reduced below zero °F.

Mineral lubricating oils generally consist of a mixture of a large number of different hydrocarbons having different physical and chemical properties. Both the physical and chemical properties vary considerably from time to time even though the lubricating oils are made from the same type of crudes because the compositions of the crudes vary from time to time.

The primary object of the present invention is to provide a lubricating grease having relatively small changes in viscosity for large changes in temperature.

To avoid the variation in composition of the lubricating base the present invention contemplates the use of a synthetic chemical compound having fixed and uniform physical and chemical properties. Dibutyl phthalate has been found to be a compound having excellent lubricating properties and its viscosity does not undergo relatively large changes for large changes in temperature.

Another object of the invention is to provide a lubricating grease utilizing dibutyl phthalate as a lubricating base.

A further object of the invention is to provide a grease in which the advantageous properties of dibutyl phthalate and lithium soap may be combined.

With these and other objects and features in view, the invention consists in the improved grease hereinafter described and particularly defined in the claims.

Dibutyl phthalate is a water-white, stable, non-toxic oily liquid which is miscible with most organic solvents and animal, vegetable and mineral hydrocarbons. It has a comparatively high boiling and flash point and is capable of with-

standing comparatively high temperatures without decomposition. The phthalates are usually produced by a reaction between a corresponding aliphatic alkyl alcohol and phthalic anhydride. It has been found that most of the alkyl and aliphatic alcohols such as methyl, ethyl, butyl, propyl and amyl alcohols, may react with phthalic anhydride to produce the dialkyl phthalates and all of these phthalates have lubricating properties. The alkyl phthalates in which the carbon atoms of the alkyl molecule has more than three carbon atoms have the most desirable viscosity for use as lubricants.

It has been found that if extreme pressure addition agents, such as sulfurized tricresyl phosphite, are dissolved in the phthalates, the resulting lubricant will have excellent extreme pressure lubricating properties, from .5% to 2% of sulfurized tricresyl phosphite in the phthalates will produce an excellent extreme pressure lubricant. On the other hand a well known extreme pressure agent sold under the trade name "Polane," which is an ester of a fatty acid or a chlorinated ester of a fatty acid, such as ethyl laureate or chloromethyl stearate, does not impart extreme pressure qualities to the dibutyl phthalate to provide an extreme pressure lubricant. The sulfurized tricresyl phosphite above referred to is described in the patent to Engelke, No. 2,260,303, granted October 28, 1941.

The addition agent sold by the Monsanto Chemical Company, under the trade name "Santolube #261," which is described as a metallic derivative of a carboxylic acid containing compounds of tin and sulfur, is valuable in making a noncorrosive lubricant having good oiliness and lubricating qualities. From .5% to 2% of Santolube #261 may advantageously be used with the alkyl phthalates to produce a good lubricant.

Dibutyl phthalate has been found to have the following kinematic viscosity:

Temperatures		Viscosities
		<i>Centistokes</i>
Minus 40° C.		3.024
Minus:		
17.8° C.		228
37.8° C.		10.7
93.4° C.		1.26

It has been found that dibutyl phthalate will gel with lithium stearate to form an excellent grease. The gelling of the lithium stearate with the dibutyl phthalate is promoted, however, with alu-

minum stearate and when the aluminum and lithium stearates are used with the dibutyl phthalate the gelled mixture will not bleed or separate. An excellent grease has been produced with the products in the following proportions:

	Per cent
Dibutyl phthalate.....	93
Lithium stearate.....	6
Aluminum stearate.....	1
	100

In place of lithium stearate, sodium stearate may be used, but such a grease has a very much higher viscosity at the lower temperatures. The methyl, ethyl and propyl dialkyl phthalates may be substituted in the above formula for dibutyl phthalate.

For many lubricants it has been found to be desirable to add an addition agent to the phthalates before they are gelled with the stearates in making the grease so that the resulting grease will have extreme pressure lubricating properties.

In place of the lithium, sodium and aluminum stearates, the oleates and palmitates may be used

but the stearates seem to produce greases having the preferred characteristics.

The preferred form of the invention having been thus described, what is claimed as new is:

- 5 1. A lubricating grease comprising dibutyl phthalate 93%, lithium stearate 6%, aluminum stearate 1%.
- 10 2. A lubricating grease comprising 93% of dibutyl phthalate having a small amount of extreme pressure additive dissolved therein, lithium stearate 6%, aluminum stearate 1%.
- 15 3. A lubricating grease comprising about 6% of a lithium soap, about 1% of an aluminum soap, the remainder of the grease consisting essentially of dibutyl phthalate.
- 20 4. A lubricating grease comprising approximately 6% of a lithium soap, approximately 1% of an aluminum soap, the remainder of the grease consisting essentially of a dialkyl phthalate.
- 25 5. A lubricating grease comprising approximately 6% of lithium stearate, approximately 1% of aluminum stearate, the remainder of the grease consisting essentially of a dialkyl phthalate.

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