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LUBRICANT

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The present invention relates to an improved grease composition, particularly reversible greases which are water-resistant, transparent, temperature stable and adaptable for use in "lubricated for life" bearings. Reversible greases are those grease compositions which can be heated to above their melting point and cooled without the loss of their grease structure.

There are numerous types of grease compositions in common usage and of these numerous types each one will be found to vary greatly in composition. The lubrication problems to which the grease compositions are applied are almost as numerous as the compositions themselves. One troublesome problem presents itself with the attempt to lubricate bearings operated at temperatures in the neighborhood of the boiling point of water and often above, and especially those bearings which operate at a temperature between 140° F. and 200° F. in the presence of water. Greases for the most part are either dispersions or solutions of metallic soaps in a mineral lubricating oil. The soaps ordinarily used for the making of greases consist of the alkali metal soaps, alkaline earth soaps or mixtures thereof. Sometimes special soaps such as aluminum soaps are employed. In the preparation of the soaps an excess of the metal is sometimes employed which results in the production of a basic soap. In the lubrication of bearings operating at temperatures above 140° F. the ordinary type greases are found to have many imperfections. For instance, the lime soap greases require the presence or incorporation of a small amount of water in the composition to secure the grease-like structure. When temperatures above 212° F. are attained the water present in a lime soap grease evaporates and the lime soap which is insoluble in the oil precipitates out and the composition is converted into a layer of soap and a layer of mineral oil with no grease structure involved. Alkali metal soaps are readily water-soluble and when greases containing alkali metal soaps are used in the presence of water they are soon dissolved out and removed from the bearing. Basic barium soaps, although possessing relatively high melting points, often reaching as high as 400° F., depending upon the amount and kind of basic barium soap present in the oil lose their grease structure when subjected to temperatures in the neighborhood of their melting point and revert to a mixture of stratified oil and soap. After the melting point of a barium soap grease has been reached the only means of retaining the grease-like structure is to work the grease while it cools. Mixed alkaline earth soap greases such as the calcium-barium greases possess the faults of both the lime soap greases and the barium soap grease. Aluminum soap greases although often used in life-time bearings, tend to emulsify with water or become semi-fluid and rubbery at elevated temperatures, such as above 140° F. and cannot for these reasons be retained in the bearing. It is apparent that an improved grease devoid of these imperfections is especially desirable.

The principal object of this invention is the development of a metallic soap-oil composition having an excellent grease structure, easy to prepare and which can be melted and cooled repeatedly without the loss of the grease structure. These and other objects will be apparent to those skilled in the art upon reading the following description.

It has now been discovered that greases compounded of mixtures of neutral and/or acid barium soaps and aluminum soaps and mineral lubricating oils produce greases which are water-insoluble, transparent, temperature stable and reversible. These greases can be used at any temperature up to 212° F. in the presence of water without decomposition and at temperatures above the boiling point of water they may be liquefied and solidified innumerable times without the loss of lubricating quality or grease structure.

The total amount of soap in the grease will range from about 5% to 40% by weight based upon the total grease composition depending upon the properties desired in the finished grease, the viscosity of the oil used and the character of the fat or acid employed in the production of the soap. The ratio of barium soap to aluminum soap may vary between the limits of 1/1 to 10/1 with the ratio of 5/1 barium soap to aluminum soap being preferred.

Although a wide range of lubricating oils may be employed as the lubricant in the grease, in general the base oil comprises an oil having a S. S. U. viscosity in the range of from about 50 to 220 at 210° F. However, for the production of most greases of the type contemplated by this invention we prefer to use a base oil having a viscosity of from 100 to 2400 at 100° F.

The usual types of fats or fatty acids, such as animal or vegetable fats or commercial stearic, palmitic and oleic acids, as well as fatty acids split from hydrogenated fish oil acids which contain at least 9 carbon atoms to the molecule may be used for the production of the soaps useful for the purposes of this invention. Other additives, such as anti-oxidants, adhesives and rust-preventing agents, may be incorporated without departing from the scope of this invention.

Conventional methods for the manufacture of greases may be used in making the compositions of this invention with the exception and added advantage that after the soaps are completely incorporated in the oil the greases may then be placed in containers and permitted to cool without any further work being necessary. In general the neutral and/or acid barium soaps and the aluminum soaps used may be made separately and then incorporated in proper proportions in the hot oil; or, stoichiometrical proportions of organic acid can be dissolved in a portion of the lubricating oil, neutralized with either stoichiometrical proportions of hydrated barium oxide or slightly less than stoichiometrical proportions of hydrated barium oxide after which the remainder of the lubricating oil containing suspended aluminum soap is stirred in and the temperature raised to obtain a clear solution, and the composition then poured into containers to cool; or, stoichiometrical proportions of fats can be used instead of the acids in which case the composition must be heated to a temperature and for a time sufficient to completely saponify the fats.

It has further been discovered that a much more active hydrated barium oxide can be made if certain precautions are followed in its preparation. In the preparation of this more active type of hydrated barium oxide, equal weights of calcined barium oxide and water are reacted in an inert atmosphere. One method of securing an inert atmosphere is to place an amount of lubricating oil equal in weight to the combined weights of water and calcined barium oxide after which the moisture of barium oxide and water is stirred slowly so as to not cause the oil to be mixed in while the hydration of the barium oxide is proceeding. The reaction is exothermic and is accompanied by an expansion in volume which gradually includes the oil so that the finished product appears as a solid, smooth emulsion of hydrated barium oxide in oil. It has been found that this oil-barium hydroxide mixture is much more reactive than any commercially known type of hydrated barium oxide.

The following examples will serve as illustrations of typical compositions according to this invention:

Example 1

	Per cent
Animal fatty acids	6.76
Cotton seed fatty acids	6.72
Soya bean fatty acids	6.72
Hydrated barium oxide	12.00
Aluminum stearate	5.00
Lubricating oil 50 Vis./210° F. S. U. V.	62.80

The fatty acids are added to approximately ⅓ of the lubricating oil and heated with stirring to 150° F. The barium hydroxide is then added, stirring and heating continued until the temperature rises to 200° F. Approximately ⅓ more of the lubricating oil is then stirred into the mixture. The aluminum stearate dispersed in the remaining ⅓ of the lubricating oil is then added and the temperature raised to between 300 and 350° F. When the mixture becomes fluid and clear it is poured into containers and permitted to cool. The cooled grease has a penetration of 200 at 77° F. and an A. S. T. M. melting point of 265° F.

Example 2

	Per cent
Hydrogenated fish oil acids	20.00
Barium oxide-lubricating oil-water	[1]19.00
Aluminum stearate	3.00
Low cold test Coastal type lubricating oil	58.00

[1] 28.5% barium oxide; 28.5% water; 43.0% low cold test Coastal type lubricating oil.

This composition when compounded as outlined in Example 1, produced a product of the following specifications:

A. S. T. M. penetration at 77° F.	215
A. S. T. M. worked penetration at 77° F.	215
A. S. T. M. dropping point °F.	250

What is claimed is:

1. An anhydrous, reversible grease comprising lubricating oil, and grease-forming proportions of aluminum soap and a non-basic barium soap in which the ratio of non-basic barium soap to aluminum soap varies between from 1/1 to 10/1.

2. An anhydrous, reversible grease comprising about 60% lubricating oil and 40% of a mixture of aluminum and non-basic barium soaps in which the amount of barium soap is at least equal to and not more than ten times the amount of aluminum soap.

3. An anhydrous reversible grease comprising from 60–80% lubricating oil and from 20–40% of a mixture of aluminum soap and non-basic barium soap in which the ratio of non-basic barium soap to aluminum soap varies between from 1/1 to 10/1.

4. An anhydrous reversible grease comprising lubricating oil, and grease-forming proportions of aluminum soap and a barium soap resulting from the neutralization of hydrated barium oxide with at least equal molecular proportions of a fatty acid of at least 9 carbon atoms, in which the ratio of non-basic barium soap to aluminum soap varies between from 1/1 to 10/1.

5. An anhydrous reversible grease comprising from 60–80% lubricating oil and from 20–40% of a mixture of aluminum soap and a barium soap resulting from the neutralization of hydrated barium oxide with at least equal molecular portions of a fatty acid of at least 9 carbon atoms, in which the ratio of non-basic barium soap to aluminum soap varies between from 1/1 to 10/1.

6. An anhydrous reversible grease consisting of 62.8% of a paraffinic lubricating oil of 50 vis./210° F., 26.6% of a non-basic barium soap and 10.94% of aluminum soap.

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