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MAGNESIUM AND ALUMINUM SOAP GREASE

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This invention relates to improved aluminum soap greases and the principal object of the invention is to provide means whereby such greases, such as those derived from the admixture of aluminum stearate with mineral oil and containing substantial amounts of soap, will be free of the usual objectionable tendency to assume a rubbery or gel-like structure when employed for lubrication at temperatures elevated somewhat above normal.

Aluminum soap greases are well known in the art and are desirable in commerce because of their smooth, transparent chcaracteristics and high compatibility with the oil used and also because they are resistant to the action of water and have melting points higher than the water-resistant calcium soap greases, thereby distinguishing from calcium soap greases by reason of said higher melting point and from sodium soap greases by reason of their resistance to water. However, aluminum soap greases, even when containing small quantities of soap, such as 2% or 3% of aluminum stearate, tend to assume a gel-like or rubbery structure when heated to temperatures of 160° F. to 180° F. and when subsequently cooled, are granular or rubbery for a period of from 12 to 24 hours before reassuming their typical grease body. This is very objectionable and tends to impair the lubricating efficiency of the grease more especially when large proportions of the soap, such as 10% or more, are used.

I have discovered that by incorporating small percentages of magnesium soap into lubricants containing aluminum soap, this objectionable tendency to gel or form a rubbery structure at slightly elevated temperatures can be overcome. For example, such tendency toward gelation or the development of a rubbery structure may be overcome by the addition, for example, of from 0.1% to 5% of magnesium stearate to greases containing from 2% to 15% of aluminum stearate, the greases being compounded with any appropriate mineral lubricating oil in accordance with ordinary or preferred procedures. Furthermore, I have discovered that when using a mixture of aluminum and magnesium soaps in the preparation of a grease, it is necessary to employ a slightly greater proportion of soap to mineral oil in order to obtain greases of the same stiffness or, in other words, of the same A. S. T. M. penetration, as greases compounded from mineral oil and aluminum stearate alone. I have discovered that, as a result of being able to increase the soap content, the resultant magnesium-aluminum soap greases possess a greater degree of water resistance than similar greases prepared by the use of aluminum stearate alone.

The present invention may, therefore, be stated as residing in aluminum soap greases containing a smaller proportion of magnesium soap than aluminum soap, such proportion depending upon the percentage of total soap in the finished grease and upon the characteristics desired in the finished product. The invention may be otherwise stated as comprising a lubricant containing as essential constituents mineral lubricating oil, aluminum soap to thicken the oil and produce a grease-like composition, and further containing a proportion of magnesium soap normally less than the proportion of aluminum soap to overcome tendencies of the aluminum soap to form gel-like or rubbery masses at slightly elevated temperatures, such as may normally be encountered in use.

In practicing the invention, the grease will contain aluminum soap, such as aluminum stearate or aluminum oleate, and magnesium soap, such as magnesium stearate, the latter being in smaller proportion than the aluminum soap but in a quantity sufficient to completely overcome or partially overcome the gelation tendency of the aluminum soap, the total proportion of the combined aluminum and magnesium soaps being that required to yield the grease consistency desired. One desirable method of manufacture consists in incorporating powdered magnesium soap in desired proportion into powdered aluminum soap before addition to oil to yield grease. The powdered soap mixture, after thorough blending of the two soaps, is then admixed in the desired proportion in a suitable mineral lubricating oil, as by means of agitation at ordinary temperatures. After uniform mixing and the elimination of any soap lumps which may form, the oil-soap mixture is then heated to an elevated temperature until an apparently clear solution is formed. Such a temperature may be around 320° F. or within a range of about 280° F. to 350° F. as understood in the art. The hot grease product is then drawn into appropriate receptacles and cooled to room temperature.

Again, it is possible to prepare a hot oil and aluminum soap mixture and add to this the required quantity of magnesium soap, the mixture being agitated and heating being continued until a suitable product is formed. Again the aluminum soap, the magnesium soap and the lubricating oil may all be introduced into a compounding kettle, mixed at atmospheric temperature and then heated, for example to around 300° F.,

for 30 minutes or until an apparently clear solution is formed.

In operating the soap ratios would be adjusted according to the results required. For example about 0.1% of magnesium stearate may be introduced into a light aluminum soap grease containing, for example, 4% of aluminum stearate and the soap product formed as above indicated, with the resultant formation of a light grease substantially free from the above mentioned gel type structure. Again a heavier grease containing 15% soap may be so produced, of which aluminum stearate will constitute about 13% and magnesium stearate about 2%. A smaller quantity of magnesium stearate will result in a product having some tendency to become rubbery, whereas 3% or 4% of magnesium stearate will completely inhibit the gelation tendency with some consequent decrease in the thickening power of the aluminum soap.

The aluminum soap selected may be any appropriate aluminum soap such as aluminum stearate, aluminum oleate, aluminum naphthenate, aluminum palmitate or other suitable soap; and the magnesium soap may be magnesium stearate, magnesium naphthenate, magnesium oleate, magnesium palmitate or other appropriate oil-soluble magnesium soap. The lubricating oil may be any ordinary or preferred type of lubricating oil of paraffinic or naphthenic or mixed base type, although, ordinarily, I prefer to use naphthenic base or western mineral lubricating oils because of their superior soap-dissolving characteristics. However, satisfactory greases have been prepared by compounding a mixture of aluminum and magnesium soaps with crystal oil. The ability of the aluminum soap greases to receive materials, such as rubber latex or high molecular weight hydrocarbon polymers, in small amounts (e. g. 0.1%) to give a final product having a "stringy" characteristic, is not affected by the presence of the magnesium soap hereof.

As an example of greases which may be prepared by the present invention, the following ingredients were thoroughly admixed in the proportions indicated at atmospheric temperature, and then heated, while stirring, to approximately 300° F., at which temperature the batch was maintained for about 30 minutes and then drawn into pans and cooled to room temperature:

Aluminum stearate	per cent	13.0
Magnesium stearate	do	2.0
Naphthenic-base lubricating oil	do	85.0

The characteristics of the mineral oil were as follows:

Gravity, °A. P. I.	18.5
Saybolt Universal viscosity at 210° F. seconds	67
Color, N. P. A.	7

The product was allowed to cool to room temperature over a period of about 12 hours and was then worked through a gear pump whereupon it possessed an A. S. T. M. penetration at 235 at 77° F., as against an A. S. T. M. penetration of 195 for the unworked grease at 77° F.

As another example, the following ingredients were compounded in a manner similar to that described above for the purpose of producing a grease in accordance with this invention:

Aluminum stearate	per cent	11.0
Magnesium stearate	do	1.0
Crystal oil (ultra heavy)	do	88.0

The characteristics of the crystal oil were as follows:

Gravity, °A. P. I.	26.4
Saybolt Universal viscosity at 100° F. seconds	340

The A. S. T. M penetration of the worked grease was 330 at 77° F.

The above disclosures are furnished as illustrative of the generic invention and are not intended as necessarily limiting.

I claim:

1. A lubricating grease comprising as important constituents mineral lubricating oil, aluminum soap in quantity to thicken the oil and impart grease-like characteristics, and magnesium soap in proportions smaller than the aluminum soap and sufficient to control gelling tendencies of the alumium soap.

2. A lubricating grease comprising a major proportion of mineral lubricating oil, a minor proportion of aluminum stearate to thicken the oil and impart grease-like characteristics, and magnesium soap in proportions less than that of the aluminum soap to reduce the tendency of the aluminum soap to impart gel characteristics, the grease having improved water-resisting characteristics over greases containing aluminum stearate alone.

3. A grease comprising a naphthenic base mineral lubricating oil, aluminum soap sufficient to thicken the oil to grease consistency, and a smaller porportion of magnesium soap to reduce the gelation tendency of the aluminum soap.

4. A grease comprising as important constituents a mineral lubricating oil, between about 2% and 15% of aluminum soap to thicken the oil and impart grease-like characteristics, and btween about 0.1% and 5% of magnesium soap to reduce the tendency of the aluminum soap to impart gel characteristics.

5. A lubricating grease comprising as principal constituents mineral lubricating oil, between about 2% and about 15% of an aluminum soap to thicken the oil and impart grease-like characteristics with gelling tendencies, and magnesium soap approximating one-tenth of the aluminum soap to overcome the gelling tendencies of the aluminum soap.

6. A lubricating grease comprising as important constituents mineral lubricating oil, a quantity of aluminum stearate sufficient to impart grease-like characteristics and at the same time impart gelling tendencies and, a minor proportion of magnesium stearate with respect to the aluminum stearate to overcome gelling tendencies imparted by the aluminum stearate, the soaps being present in the order of between about 3% and about 4% of magnesium stearate in a total soap content of about 15%.

7. A lubricating grease comprising as important constituents a major proportion of mineral lubricating oil, a minor proportion of aluminum stearate to thicken the oil and impart grease-like characteristics, and a minor proportion of magnesium stearate to control gelling tendencies of the aluminum stearate within ratio limits between about 2 parts of magnesium stearate to 13 parts of aluminum stearate and 5 parts of magnesium stearate to 15 parts of aluminum stearate.

8. A method for preparing aluminum stearate grease substantially free from gelling tendencies and containing magnesium stearate comprising commingling aluminum stearate with magnesium

stearate at normal temperatures, admixing mineral lubricating oil with said soap at normal temperatures, heating the oil-soap mixture to a temperature within a range between about 280° to 350° F. and drawing the grease, the aluminum stearate being in quantities sufficient to impart grease-like consistency to the oil, and the magnesium stearate being in smaller amount to reduce the tendency of the aluminum stearate to impart gel characteristics.

9. A grease according to claim 1 containing a small proportion of a high molecular weight hydrocarbon polymer to impart stringy characteristics.

10. A grease according to claim 4 containing a small proportion of a high molecular weight hydrocarbon polymer to impart stringy characteristics.

11. A grease according to claim 6 containing a small proportion of a high molecular weight hydrocarbon polymer to impart stringy characteristics.

12. A grease according to claim 3 to which a minor proportion of rubber latex has been added to impart stringy characteristics.

13. A grease according to claim 7 containing rubber latex in the order of 0.1% to impart stringy characteristics.

14. A grease according to claim 2 containing in the order of 0.1% of a high molecular weight hydrocarbon polymer to impart stringy characteristics to the product.

15. A grease according to claim 5 containing in the order of 0.1% of a high molecular weight hydrocarbon polymer to impart stringy characteristics to the product.

16. A grease according to claim 7 containing a small proportion of a high molecular weight hydrocarbon polymer capable of imparting stringy characteristics.

17. A grease comprising as important constituents mineral lubricating oil, aluminum soap to thicken the oil and impart grease-like characteristics, and a minor proportion of magnesium soap to control gelling tendencies of the aluminum soap in the proportion of about one-twentieth to one-third of the magnesium soap based on the aluminum soap.

18. A grease according to claim 17 containing a small proportion based on the soap of a constituent to impart stringy characteristics selected from the class consisting of rubber latex and high molecular weight hydrocarbon polymers.

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