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ALUMINUM SOAP GREASES

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9 Claims. (Cl. 252—35)

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This invention relates to improved aluminum base greases.

Aluminum base greases are widely used for lubrication purposes on account of their waterproof characteristics, their heat resistance within certain limitations, and their attractive appearance. However, these greases have certain disadvantages, notably their tendency to assume a jelly-like, rubbery texture upon heating above a certain critical temperature; their tendency towards syneresis, or bleeding out of oil in storage and use; and their somewhat granular and crumbling structure. Further, the oils contained in aluminum base greases must be of relatively high viscosity in order to form a stable grease.

Accordingly, it is an object of this invention to provide aluminum base greases which will have a smooth, unctuous and greasy texture, and which will retain this texture when heated to elevated temperatures.

Another object is to provide an aluminum base grease which will not separate oil upon standing.

Still another object is to provide an aluminum base grease in which a larger proportion of soap base can be incorporated than has hitherto been possible.

The above and other objects are attained by this invention in aluminum base greases which contain, in addition to aluminum soaps of saturated higher fatty acids, small proportions of nonaluminum soaps of certain heavy metals selected from the group consisting of iron, cobalt, nickel, zinc and copper. The added nonaluminum soaps serve to stabilize the colloidal structure of the grease, preventing syneresis thereof during storage and use, and restraining the tendency of the grease to assume a rubbery texture at high temperatures. Further, greases prepared according to this invention are characterized by having a smoother and more unctuous texture in comparison to aluminum base greases heretofore prepared, and likewise are capable of holding a substantially greater amount of soap for a given consistency than is possible with aluminum base greases heretofore prepared. The expressions "aluminum base greases" and "aluminum soap" as used herein are qualified in that, in each instance, the aluminum base or

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soap is that of an aluminum soap of a saturated higher fatty acid.

Except for the nonaluminum soap additive just mentioned, the greases of this invention will be constituted substantially the same as the aluminum base greases hitherto manufactured, containing in general between about 2% and about 15% to 20% of aluminum soaps of saturated higher fatty acids, the balance comprising essentially lubricating oils. The percentage of aluminum soap incorporated into the greases of this invention may be slightly higher than in the usual aluminum base greases in view of the softening tendency of the nonaluminum soap additive. The aluminum content of the aluminum soap may be varied between the usual limits and will generally be such that the washed ash determined upon the soap will lie between about 4% and about 12%. The fatty residues in the aluminum soap may be of the types customarily used in aluminum base greases, i. e., higher saturated fatty radicals on the order of palmitic, stearic, margaric, etc., radicals. The nonaluminum soap additives suitable for use in the practice of this invention are selected from the group consisting of the soaps of iron, cobalt, nickel, zinc and copper. The fatty radicals in this group of soaps may be those of the higher fatty acids having molecules containing upwards of 8 carbon atoms, and preferably upwards of 16 carbon atoms. Preferably, but not necessarily, the fatty acids should be saturated. A list of suitable fatty acids, the nonaluminum soaps of which may suitably be employed in the greases of this invention, includes palmitic, stearic, arachidic, lauric, margaric, oleic, eladic, erucic, and the like, fatty acids. Instead of the soaps of pure fatty acids, there may be employed soaps of suitable mixed fatty radicals coming within the requirements above set forth, such as the mixed fatty radicals derivable from the animal and vegetable oils, fats and waxes such as tallow, corn oil, cottonseed oil, hydrogenated fish oils, and the like. Likewise, the naphthenic acids are suitable components of the nonaluminum soaps incorporated into greases according to this invention. The mol ratio of metallic and of fatty radicals present in the said soaps may vary; in general, at least one of the valencies of the metal should be com-

bined with fatty radicals, but a higher ratio may desirably be employed. Usually, the neutral soap will be employed. It is, of course, not necessary to employ soaps of a single metal, but various combinations of the metallic soaps above indicated as suitable might be incorporated into the greases of this invention; for instance, mixed soaps of the aforementioned heavy metals may be used.

The amount of nonaluminum soap incorporated into the grease of this invention may vary, depending upon the properties desired in the final product, but in general this amount will be only a small fraction of the amount of the aluminum soap present. Roughly, the objects of this invention can be attained by the addition of from about 0.1% to about 5% of the suitable nonaluminum soap, and advantage can be taken of this fact to add a considerably greater total amount of soaps to the grease than has heretofore been possible with aluminum base soaps. The several types of nonaluminum soaps adapted for use in this invention can be listed, roughly in increasing order of their softening properties, as follows: iron, nickel, cobalt, zinc and copper soaps. In view of these foregoing considerations, it will be seen that the exact formulation of greases to be made according to this invention is best determined by experiment in each individual case, bearing in mind the purposes for which the grease will be employed.

The manner of preparing greases of this invention can follow any conventional practice, this not being critical to the invention. Conveniently, the aluminum soap, nonaluminum soap, lubricating oil and any other desired ingredients may be mixed and heated to a temperature sufficiently high to effect homogeneous blending thereof. Thereafter the product may be cooled and packaged for use.

Aluminum base greases prepared according to this invention are compatible with all the usual additives and modifying agents, such as latex, alkylated aromatics, etc., customarily added to such greases, and are improved and modified in the usual respects by such additives.

With the above discussion in mind, there are given herewith examples of greases prepared in accordance with this invention. All parts given are by weight:

Example I

	Parts
Aluminum stearate (8% washed ash)	13
Iron stearate (neutral)	2
Paraffin oil (100 sec. viscosity @ 100° F.)	85
	100

The above ingredients were heated to 150° C. with stirring, and slowly cooled to room temperature. The product was a hard grease having a smooth, nongranular texture and exhibiting no bleed. This grease was reheated to test out its behavior under high temperature conditions. Under such heating the grease gradually softened and melted, without passing through the rubbery stage usually assumed by aluminum base greases upon heating.

Example II

A series of greases was prepared from aluminum stearate with small additions of soaps of other metals. In each case there were employed:

	Parts
Aluminum stearate (8% washed ash)	11
Metallic soap (neutral stearate)	1
Paraffin oil (100 sec. viscosity @ 100° F.)	88
	100

The properties of these greases are tabulated herewith:

Grease No.	Metallic Soap Used	Description of Product
4	Cobalt	Medium grease: clear.
5	Copper	Medium grease: slightly cloudy.
6	Nickel	Hard grease: clear.
7	Zinc	Medium grease: slightly cloudy.

All of the greases prepared as just described were smooth in texture and free from bleeding. On reheating, they melted without passing through the rubbery stage.

Example III

	Parts
Aluminum stearate (8% washed ash)	20
Zinc stearate (neutral)	5
Paraffin oil (100 sec. viscosity @ 100° F.)	75
	100

A grease was prepared from the foregoing ingredients by the procedure of the preceding examples. The product was a medium grease which had the smooth, nonbleeding and nongranular characteristics of the other greases described above notwithstanding the presence of 20% aluminum stearate. This grease also avoided the rubbery stage upon heating both during the preparation thereof and upon reheating. This example illustrates the possibility of including large total amounts of soap (25%) in greases according to this invention without obtaining unduly hard greases.

From the above examples and discussion, it will be seen that the greases provided by this invention are distinguished from similar greases heretofore prepared in that they do not become rubbery upon heating. This is highly advantageous since the greases do not lose their lubricating properties upon overheating of the surfaces to which they are applied. Further, greases according to this invention possess a smoother and more unctuous texture than aluminum base greases heretofore prepared. Still further, the greases of this invention may have a higher net soap content, can be made from less viscous oils without danger of bleeding out of the oil, and exhibit a higher degree of water-resistance than aluminum base greases of the prior art. Finally, greases according to this invention are highly stable in storage and use against any separation or syneresis of the oils contained therein.

This application is a division of my application Serial No. 454,825, filed on August 14, 1942, now Patent No. 2,431,760, dated December 2, 1947.

I therefore claim:

1. A lubricating grease comprising mineral oil, 2% to 20% of an aluminum soap of a saturated higher fatty acid and 0.1% to 5.0% of a heavy metal soap selected from the group consisting of iron, cobalt, nickel, zinc and copper soaps of higher fatty acids, the quantity of heavy metal

soap being only a fraction of that of the aluminum soap.

2. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% of a heavy metal soap selected from the group consisting of iron, cobalt, nickel, zinc and copper soaps of higher fatty acids, the quantity of heavy metal soap being only a fraction of that of the aluminum stearate.

3. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% of a heavy metal soap selected from the group consisting of iron, cobalt, nickel, zinc and copper stearates, the quantity of heavy metal stearate being only a fraction of that of the aluminum stearate.

4. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% of a cobalt soap of a higher fatty acid, the quantity of the cobalt soap being only a fraction of that of the aluminum stearate.

5. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% of a nickel soap of a higher fatty acid, the quantity of the nickel soap being only a fraction of that of the aluminum stearate.

6. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% of a zinc soap of a higher fatty acid, the quantity of the zinc soap being only a fraction of that of the aluminum stearate.

7. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% cobalt stearate, the quantity of the cobalt stearate being only a fraction of that of the aluminum stearate.

8. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% nickel stearate, the quantity of the nickel stearate being only a fraction of that of the aluminum stearate.

9. A lubricating grease comprising mineral oil, 2% to 20% aluminum stearate and 0.1% to 5.0% zinc stearate, the quantity of the zinc stearate being only a fraction of that of the aluminum stearate.

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