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SHORT FIBER GREASE

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This invention relates to the manufacture of soda soap greases, particularly ball and roller bearing greases characterized by certain desirable properties including a short fibrous structure.

It is an object of the present invention to make new and improved wheel bearing greases, other ball and roller bearing greases, and similar short fiber greases containing soda soap with or without lime soap. Another object of the invention is to produce greases of the type mentioned which contain a substantially lesser amount of soap than that usually required for a grease of the same consistency and structure. A further object of the invention is to produce greases of the type mentioned which are characterized by a very low loss of consistency on working. A still further object of the invention is to produce greases of the aforementioned type which are notable for very low leakage of oil even at elevated temperatures. Other objects, advantages and uses of my invention will become apparent as the description thereof proceeds. Greases used for lubrication of automobile wheels and other greases of similar type have well known characteristics. These greases contain from about 10% to about 30%, and more usually from about 15% to about 20%, soda soap and may also contain a few per cent of lime soap. The remainder is wholly or mainly mineral oil.

The desired properties of such greases include a structure characterized by short fibers. They must be approximately neutral, should have as low a soap content as is consistent with the desired properties, should change their consistency a minimum amount on working and should be characterized by a minimum leakage of oil. Various attempts have been made in the past to meet these desired specifications by changes in formulae and by changes in manufacturing technique. However, all of the various methods heretofore used have involved one or more serious defects. Thus, for instance, certain greases made from soda fatty acid soap have desirable short fibers but work down very rapidly, i. e., lose consistency with great rapidity under the conditions prevailing in the bearings in which they are used. This can be cured to some extent by the use of soda tallow soaps or the like instead of soda fatty acid soaps, thereby obtaining a tough grease, but such products have long, "gummy" fibers which cause the grease to plug ball and roller bearings and cause the whole grease mass to rotate with the bearing in an undesirable manner. Reheating the finished grease gives a short-

er fiber structure but the product can no longer withstand temperatures around 200° F. without excessive leakage of oil from the bearing which is being lubricated. The use of a few per cent of lime soap with the soda tallow soap gives a short fiber grease which is slightly better in working properties than the soda fatty acid soap grease but such products lose consistency to an undesirable degree when worked.

I have found that these defects can be remedied and that a grease can be produced having all of the desired properties to a most unusual extent by making a grease under controlled conditions involving the use of excess caustic soda and then neutralizing this excess of caustic soda, at the proper stage in the grease-making operation, preferably by adding fatty acid. By this technique greases can be produced which work down only from 0 to 25 points (A. S. T. M. penetration increase) in 60 strokes of a grease churn as compared with typical short fiber prior art products which work down about 100 points or more under the same conditions. At the same time my products not only have great toughness but also a short fiber structure. They thus combine all the advantages and none of the disadvantages of the various prior art products.

The following formulae represent typical examples of greases to which my invention is applicable:

Example 1

	Per cent
Tallow	13.7
Stearic acid	4.4
NaOH	2.62
Lubricating oil, viscosity 300 seconds Saybolt at 100° F.	79.28

Example 2

	Per cent
Tallow	11.93
Standard (animal) fatty acids	6.68
NaOH	2.88
Lubricating oil, viscosity 900 seconds Saybolt at 100° F.	78.51

Examples 1 and 2 illustrate the general rule that higher proportions of fatty acids are desirable when high rather than low viscosity oils are used.

In making these products the fat and a portion of the oil (for instance, a quantity equal to the fat) are mixed together and sodium hydroxide is added sufficient to leave from about ½% to about 5%, for instance about 3%, of free sodium hydroxide in the mixture after saponification. This

mixture is heated to saponify it in the usual manner. The fatty acid used in the above formulae is held out and the result is a very alkaline short fiber grease base. The remainder of the oil is then graded in to give a soap content of about 15% and to lower the temperature to from about 225° F. to about 250° F. at which time enough fatty acid is slowly added to make the grease just neutral, very slightly alkaline or very slightly acid. Further oil can then be added. The final grease composition should lie within the range from about 0.25% free fatty acid to about 0.1% free sodium hydroxide.

Greases made in this manner stand up unusually well under wheel bearing tests at 200° F. or higher, giving no separation of oil and no leakage of grease from the bearing. Furthermore, at these temperatures the greases prepared in accordance with my invention show sufficient consistency so that they do not flow from the hub when the wheel is removed from it. Moreover, such a grease maintains the desired short fiber characteristics after prolonged use under these conditions while prior art short fiber greases become long and "gummy" under these circumstances. If the grease is not made on the alkaline side in the early stages these desirable properties are not obtained.

I prefer that the bulk of the fatty material used be fat and that the fatty acid be used only in the final neutralization following the manufacture of the grease base. However, fatty acid can be used instead of fat in making the base. The oil cannot all be added initially but part of it must be added after the grease base is made and before neutralization. Part can also be added after neutralization.

The grease base should be made with a soap content of from about 30% to about 70%, for instance 40% or 50%, and oil should then be graded in to give a soap content of from about 10% to about 25% (or 30% if a grease of very high soap content is desired) before the excess caustic is neutralized. When a grease having 15% or less of soda soap is to be made, I prefer that the neutralization step be carried out after the soap content has been reduced to about 15%, after which additional oil can be graded in if desired.

A minor proportion of lime or other soap can be used in addition to the soda soap but is not needed in my compositions. The lime is suitably present along with the soda during the saponification if lime is used.

The addition of fatty acid after the grease is made on the alkaline side is most important since the desired results are not obtained if all the fatty material (fat and fatty acid) is present during the original saponification. In fact, under these latter circumstances the grease produced has the combined disadvantages of the prior art products, while greases made in accordance with my invention have the combined advantages of the prior art products.

Although I have described my invention in connection with certain specific embodiments thereof, it is to be understood that these are by way of example and not by way of limitation and I do not mean to be limited thereby but only to the scope of the appended claims.

I claim:

1. A method of manufacturing a short fiber soda soap grease comprising saponifying fatty material in the presence of mineral oil under

conditions of at least 0.5% excess alkalinity, grading in additional mineral oil, and then neutralizing said excess alkalinity with a soap-forming fatty acid.

2. A method of manufacturing a short fiber soda soap grease comprising saponifying fatty material in the presence of lubricating oil by means of an amount of sodium hydroxide materially in excess of that required for said saponification, grading in additional lubricating oil, and then neutralizing at least the greater portion of such excess sodium hydroxide with a soap-forming fatty acid.

3. A method of manufacturing a short fiber soda soap grease comprising saponifying fat in the presence of mineral oil by means of an amount of sodium hydroxide adapted to give a grease base containing from about ½% to about 5% free sodium hydroxide, grading in additional mineral oil and subsequently adding a soap-forming fatty acid to yield a substantially neutral product.

4. A method of manufacturing a short fiber soda soap grease comprising saponifying fatty material in the presence of mineral oil by means of an amount of sodium hydroxide adapted to give a grease base containing from about ½% to about 5% free sodium hydroxide, cooling said grease base and grading in additional mineral oil, and then adding a soap-forming fatty acid to yield a substantially neutral product.

5. A method of manufacturing short fiber soda soap wheel bearing grease of the type containing from about 10% to about 30% of soda soap which comprises saponifying fat with caustic soda in the presence of mineral oil under conditions of at least 0.5% excess alkalinity, grading in additional mineral oil, and then neutralizing said excess alkalinity by adding a soap-forming fatty acid.

6. A method of manufacturing short fiber soda soap wheel bearing grease which comprises saponifying fat with caustic soda in the presence of mineral oil under conditions of at least 0.5% excess alkalinity to make a grease base of relatively high soap content, grading in additional mineral oil to reduce the soap content to from about 10% to about 25%, and then neutralizing said excess alkalinity with a soap-forming fatty acid.

7. A method of manufacturing short fiber soda soap wheel bearing grease of the type containing from about 10% to about 30% of a soda soap and a minor amount of a lime soap which comprises saponifying a fatty material in the presence of mineral oil with lime and caustic soda under conditions of at least 0.5% excess alkalinity, grading in additional mineral oil, and then neutralizing said excess soda with a soap-forming fatty acid.

8. A short fiber soda soap ball and roller bearing grease of stable consistency, free from oil leakage at elevated temperatures and having a consistency substantially unaffected by working, in which the soap is produced in a portion of the mineral oil under conditions of at least 0.5% excess alkalinity, and the grading in of additional mineral oil is followed by neutralization with a soap forming fatty acid to give a product containing not more than about 0.25% free fatty acid and not more than about 0.1% free caustic.

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