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JOURNAL GREASE

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This invention relates to a hard high melting point grease of the type used by railroads for lubricating driving journals. This so-called "journal grease" usually contains about 50% of a soda soap and a large proportion of a heavy viscous mineral oil. Heretofore the soap generally used for this grease had been soda stearate soap prepared by the neutralization of crude stearic acid with sodium hydroxide. Soaps of oleic acid and other liquid fatty acids are unsuitable because of the softness of the resulting greases.

Journal greases are characterized either by a fibrous structure or by a spongy structure, depending upon the method of preparation, temperatures, etc. Sponge grease is objectionable because it disintegrates and is consumed very rapidly. Fibrous structures heretofore used are also objectionable because of their coarseness and the consequent tendency of the fibers to pull out, thereby causing excessive grease consumption. The object of my invention is to provide a journal grease which is not spongy and will not disintegrate, and which at the same time will not be rapidly consumed by the pulling out of fibers. In other words, the object is to provide a grease having a uniform fibrous structure that will withstand severe operating conditions (heavy loads, high temperatures, etc.) and at the same time resist consumption; a grease which will wear three or four times as long as any other grease under the same operating conditions.

A further object is to simplify the method of making these greases. Heretofore a careful and critical regulation of the stirring at certain temperatures was necessary to obtain desirable fiber characteristics. In my improved process little attention is required in this step and at the same time uniform greases are produced.

I accomplish my purpose by the use of specially treated or highly purified ingredients which apparently produce a different fiber structure than has been heretofore known. Instead of using a soda soap of commercial stearic acid I use a hydrogenated fatty acid soap. My hydrogenated acid is obtained by hydrogenating vegetable or animal oils, which consist chiefly of unsaturated components having at least 18 carbon atoms, to form a saturated or hardened fat and saponifying or splitting the hydrogenated fat to convert it into a hydrogenated fatty acid and glycerine. I have discovered that the hydrogenation of these oils yields a product which combines with sodium hydroxide to produce a highly improved fiber structure. The invention will be more clearly understood from the following description wherein I have described in detail a preferred embodiment of the invention.

The following example is an illustration of a formula which I use for making my improved journal grease, the proportions being expressed as percents by weight:

	Percent
Heavy black oil	5.9
Heavy steam refined oil (530° F. flash)	34.4
Hydrogenated fatty acid	40.5
Sodium hydroxide (48° Bé.)	13.1
Lard oil	6.1

The hydrogenated fatty acid is melted in the heavy mineral oil at 220–300° F. in a mixer, the sodium hydroxide is added thereto with constant stirring until complete neutralization has been effected and the batch has become heavy and dry. The acidity or alkalinity of the batch is then determined and more acid or alkali is added to bring the mixture to about .02% free sodium hydroxide. The lard oil is next added and worked in with stirring at a temperature below the melting point of the grease. If the temperature is raised too high and the grease is melted, the proper fibrous structure may be obtained by a gentle stirring of the grease as its temperature is diminished, about a .03 or .04% of water being added if necessary to replace the water which has been driven out.

This general method is substantially the same as the method heretofore used except that the speed of stirring and the temperatures are not so critical and do not have to be regulated so carefully as in processes heretofore used. The ingredients are substantially the same as those heretofore used except for the substitution of hydrogenated fatty acid for the oleic or stearic acids now in common use. This substitution, however, brings about a complete change in the nature of the fibrous grease structure so that by the inclusion of this new element the entire combination is changed. Comparative tests have shown that under identical operating conditions this grease will wear three or four times as long as greases made with commercial oleic or stearic acids. The greases are furthermore characterized by high melting points and low penetrations, and they are more uniform than greases heretofore produced.

The hydrogenated fatty acids may be obtained by splitting hydrogenated vegetable or fish oils. Examples of suitable vegetable oils are cottonseed oil, rapeseed oil, etc., and examples of animal oils are lard oil and menhaden oil. On hydrogenation and saponification, lard oil and cottonseed oil yield chiefly stearic acid while rapeseed oil yields chiefly erucic acid, a 22 carbon atom acid and menhaden oil yields about 40% of 20 and 22 carbon atom acids.

After hydrogenation the fats are split preferably by the Twitchell process in which sulfonated fat-splitting agents are used, although any conventional means may be employed for convert-

ing the glycerides into glycerine and fatty acids. The hydrogenated fatty acids are composed chiefly of saturated straight-chain hydrocarbons having 18 carbon atoms or more. While saturated acids are particularly desirable, it is important that the acids contain at least 18 carbon atoms, as I have found that mixtures of palmitic acid (16 carbon atoms) with stearic acid do not give a desirable fiber structure. The commercial steric acid commonly used contains from 50–60% of palmitic acid, and this may account, in part, for its undesirable qualities.

Carefully controlled experimental tests were made on a heavily loaded journal bearing using the regular commercial stearic acid soda soap grease in comparison with the hydrogenated fatty acid soda soap grease. In a standard operation, the consumption of the former grease was 60–100 grams, whereas with the latter grease only 15–20 grams were consumed. Lubrication was equally effective with the smaller quantity of grease. These results have been repeatedly checked.

A number of explanations have been suggested to account for the above phenomenon, but it is difficult with the amount of data available to definitely establish any one of them. The effect may be the result of more complete saturation of the fatty acid than has hitherto been obtained in journal grease manufacture. Again, it may be the result of a lower palmitic acid content, since the natural stearic acid heretofore used has always been contaminated by large amounts of palmitic acid. In this connection it is to be noted that the fatty oils which I employ in making my hydrogenated fatty acid soap are characterized in that they contain substantially no palmitic acid or substances which will yield palmitic acid on hydrogenation and saponification.

Another explanation offered to account for the unusual results which I obtain is that the mixed fatty acids resulting from the hydrogenation of the fatty oils which I employ contain substantial quantities of acids of more than 18 carbon atoms, such as erucic and behenic acids. It is to be expected that these long chain fatty acids exert a marked influence on the fiber structure of the finished grease product.

Whatever may be the correct explanation for the low consumption of my improved journal grease, I find that if it is made in the manner I have set forth, advantageous results will be obtained, and while I have described a preferred embodiment of my invention it is understood that I do not limit myself to the details therein set forth except as defined by the following claims.

I claim:

1. A journal grease of about the following formula:

	Per cent
Heavy black oil	5.9
Heavy steam refined oil (530° F. flash)	34.4
Hydrogenated fatty acid	40.5
Sodium hydroxide (48° Bé.)	13.1
Lard oil	6.1

2. A driving journal grease of the type characterized by a uniform fibrous structure which comprises a hydrogenated fatty acid soap processed with a heavy mineral oil and only sufficient water to give a fibrous, substantially glycerine-free journal driving grease characterized by low consumption in effecting lubrication under severe operating conditions.

3. A driving journal grease of the type characterized by a uniform fibrous structure which comprises substantially equal portions of heavy mineral oil compounded with a hydrogenated fatty acid soap and only sufficient water to give a fibrous, substantially glycerin-free lubricant for use on journals carrying heavy loads, which lubricant is characterized by short fiber length.

4. The method of making fibrous driving journal grease which comprises melting hydrogenated fatty acid composed chiefly of acids with 18 carbon atoms with heavy mineral oil at a temperature of about 220 to 300° F., adding sodium hydroxide thereto with constant stirring until substantially complete neutralization has been effected, maintaining a very small amount of water in the batch and regulating the temperature and final stirring of the grease to produce a heavy driving journal grease of fibrous structure.

5. The method of making fibrous driving journal grease which comprises melting hydrogenated fatty acid composed chiefly of acids with 18 carbon atoms with heavy mineral oil at a temperature of about 220 to 300° F., adding sodium hydroxide thereto with constant stirring until substantially complete neutralization has been effected, adding a small amount of lard oil and working said lard oil into the composition by stirring at a temperature below the melting point of the grease, whereby the finished lubricant is characterized by a short-fibrous structure which gives effective lubrication under severe operating conditions and with minimum consumption.

6. In the process of making fibrous driving journal lubricants wherein heavy mineral oil is compounded with soap at temperatures of about 220 to 300° F. and wherein the finished lubricant contains sufficient water to allow the formation of a fibrous structure when the grease is finally cooled and stirred, the method of obtaining uniformity of product and of obtaining a short fibrous structure which will withstand wear under severe operating conditions which comprises using a hydrogenated fatty acid soap wherein the acid radical contains an average of at least 18 carbon atoms instead of animal and vegetable fatty acid soaps wherein the acid radical is unsaturated or contains less than 18 carbon atoms and instead of compounds which would cause the formation of substantial amounts of glycerin in the finished product.

7. A fibrous driving journal lubricant which comprises a heavy mineral oil processed with a soap prepared by neutralizing acids split from hydrogenated fats and containing an average of at least 18 carbon atoms, said lubricant containing a small amount of uncombined animal fat and a trace of water and being characterized by a fibrous structure which resists consumption under severe operating conditions.

8. A lubricant for use under heavy loads and severe operating conditions which consists of a fiber grease containing about equal parts of heavy oil and soda soap with only enough water to give the fibrous structure, the acid radical of the soap being a saturated radical containing an average of at least 18 carbon atoms.

9. The fiber grease of claim 8 wherein the acid radical is prepared from a hydrogenated fat.

10. A fiber grease as defined by claim 8 which also includes a small amount of unsaponified fatty oil.

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