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DRIVING JOURNAL LUBRICANT

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This invention relates to lubricants and has to do particularly with the preparation of stable lubricating greases comprising saponified palm oil as a soap ingredient. The invention is particularly applicable to the preparation of solid lubricants, such as driving journal compounds.

The principal object of the invention is to produce a solid lubricant which is relatively stable against deterioration on storage and in use. It has been observed that many lubricating greases, when subjected to air and high temperatures, tend to deteriorate and form reaction products which alter the texture and composition of the grease. For example, in the lubrication of locomotive driving journals and wherein hard soda soap grease of the dehydrated type is employed, it has been found that the greases often deteriorate as evidenced by changes in color and consistency and particularly by the formation of a hard crust-like layer at the surface of the grease cake. This is commonly termed "carbonization" and will sometimes prevent the grease from properly feeding onto the bearing, especially when fed through a perforated plate or screen as commonly used in the Elvin lubricator.

It has been found that this difficulty may be overcome by using palm oil as the soap base in the manufacture of the grease. Although the benefits of the invention may be observed by the use of any substantial amount of palm oil alone or in combination with other valuable materials in the preparation of the grease, it is intended that the palm oil soap shall comprise the soap constituent of the grease in place of the soaps of other fatty or fatty acid materials used heretofore, such as tallow, lard oil, stearic acid, etc.

"Carbonization" in driving journal compounds is believed to result from a partial oxidation of the grease constituents. While the invention is not based on any theory, it is believed that palm oil contains ingredients which are stable against oxidation or which serve as anti-oxidants and that many of the advantages resulting from the use of palm oil are due to the presence of these ingredients. In any event, it has been found that the tendency toward carbonization in driving journal compounds containing palm oil soap is greatly reduced.

Palm oil is commercially available under various trade names and grades, depending more or less on the purity. We have used successfully a light colored product known as "Port Lagos" palm oil and a dark colored oil called "Niger" palm oil. We have found the "Niger" palm oil to be particularly suitable for our purpose. In the selection of a palm oil it is important that the acid value be not too high since a high acid value product has been found to be unsatisfactory. We have used palm oils varying in acid values from around 40 to 130 and have found the higher acid values to be undesirable for making high quality driving journal compound. We have used palm oils having free fatty acid contents, figured as oleic acid, from 20–35% with good results and free fatty acid contents in the region of 65% have been found undesirable. We prefer to use "Niger" palm oil with a free fatty acid content of about 25 to 40% and preferably around 30%.

In the preparation of dehydrated driving journal greases we prefer to heat the palm oil, mixed with the mineral oil, to a high temperature and then effect saponification by slowly adding caustic soda solution. The method preferred is that commonly referred to in the art as the "high heat" method in which the molten, saponified mass is maintained at about 450–500° F. in a fire-heated grease kettle until the mass becomes quiescent and substantially free from foam, indicating substantially complete elimination of volatile products, such as water and glycerine.

It is also contemplated that greases may also be made in accordance with our invention by first liberating the glycerine from the palm oil, separating the fatty acids thus produced, and then utilizing these fatty acids in the preparation of the dehydrated greases of the invention. When prepared from these fatty acids the greases may be made in a steam-heated kettle by the well known fibre grease method, where the temperature of heating is insufficient to melt the grease mass but is sufficiently high to remove the water. By this method the greases are drawn from the grease kettle in a semi-fluid condition and when cooled are found to possess the usual fibre characteristics of greases made in this manner.

In order to illustrate the invention, the following example will be given of the preparation of driving journal compounds coming within the scope of the invention.

Example

Palm oil		40%
Free fatty acids	32.2%	
Saponification value	192	
Iodine value	55	
Cylinder stock		48.3%
Viscosity Saybolt Universal at 210° F	180	
Caustic solution		11.7%
Alkalinity as sodium hydroxide	47%	

The palm oil and the cylinder stock were heated together to about 485° F. and then were saponified with the caustic solution slowly added over a period of several hours at this temperature. The operation was carried out in an ordi-

nary fire heated grease kettle with stirring. The final product tested as follows:

Sodium soap per cent	46.1
Mineral oil per cent	51.7
Free fatty acid per cent	0.6
Melting point °F.	406
Penetration (modified A. S. T. M.) (after pressing)	81
Undetermined per cent	1.6

For purposes of making comparative tests, a sample of a commercial driving journal compound made by substantially the same method but from tallow was obtained. This product tested as follows:

Sodium soap	47
Free alkali	0.4
Mineral oil	52.0
Undetermined	0.6
Melting point °F	437
Penetration (modified A. S. T. M.) (after pressing)	88

The two products were tested on a driving journal for the same time and under similar conditions of temperature, load, etc. with the following results:

	Sample tested	
	Grease from tallow	Grease from palm oil
Time of test, hours	28	28
Penetration (modified A. S. T. M.) (after pressing):		
Original	88	81
Final	44	67
Decrease	44	14

The results show that the grease from palm oil decreases in penetration only 14 as compared with a decrease of 44 for a product from tallow and that, therefore, the hardening or tendency toward carbonization was much less in the product from palm oil than that from tallow.

In these specific examples the penetration or hardness of the resulting grease is expressed in each instance in terms of tenths of a millimeter penetration of an average sample as determined by the standard A. S. T. M. penetrometer and method for greases, and also with the same apparatus modified to the extent of having an extra weight of 475 grams placed within the penetrometer cone. Such latter reading is termed "Penetration (modified A. S. T. M.)". This modified penetration test has been used on samples of relatively hard products to penetrate more deeply and give a higher and perhaps more accurate reading than that obtained with the same apparatus without the added weight.

A description of the A. S. T. M. penetration test may be found in reports of A. S. T. M. Committee D—2 on petroleum products and lubricants and methods of test relating to petroleum products, under the heating "Tenative method of test for penetration of greases and petrolatum," test D—217—27—T. Melting points referred to herein were taken by the method described on pages 105–107 of the article entitled "Lubrication and lubricants" by G. R. Roland, Journal of the American Society of Naval Engineers, vol. 31, 1919. This method or slight modifications thereof has been widely used with success for many years by grease chemists, and is frequently referred to as the "drop point method."

For the purpose of driving journal lubrication we prefer to use greases containing from about 40—50% of soda soap, although in certain circumstances a smaller or larger proportion of soap may be found desirable.

The greases made in accordance with the invention have a very desirable texture and appearance. They possess good wearing qualities and give improved lubrication even under extraordinary conditions wherein excessive heat is developed, due to the high stability and resistance to oxidation of such greases. The feed rate of the lubricant is able to be maintained substantially constant thereby decreasing the wear and reducing the operating temperatures of the bearings. Furthermore, we have found that by using our product, the grease charge may be more completely consumed before the cake becomes hard or coated with carbonaceous material to the extent of impairing the feed to the bearing, whereby more efficiency and economy per unit operation is obtained.

In the appended claims, wherever the expression "consisting of" is used to define the grease as prepared from viscous hydrocarbon oil and soda soap of palm oil together with non-volatile non-saponifiable constituents of palm oil, it is to be understood that this includes such compositions in which the defined ingredients constitute the only ingredients of the grease as well as those compositions in which small proportions of coloring material, odorants, stabilizers and inhibitors may be added to the said compositions in accordance with the conventional practice in the art.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. A solid, dehydrated lubricant consisting essentially of about equal proportions of a heavy lubricating oil and palm oil saponified with caustic alkali, and substantially free from glycerine.

2. A solid, dehydrated lubricant consisting essentially of cylinder stock and sodium soap of palm oil free from glycerol, said cylinder stock and soap being present in about equal proportions and said grease containing non-volatile, non-saponifiable constituents of said palm oil and having a melting point of about 400° F. or above.

3. A high melting point, dehydrated lubricant comprising heavy viscous mineral oil and sodium soap of palm oil containing non-volatile, non-saponifiable constituents of palm oil, said palm oil having a free acid content, calculated as oleic acid, less than about 40%, said mineral oil and soap being present in large and approximately equal proportions, and the soap content of said grease consisting essentially of said sodium soap of palm oil.

4. A solid lubricating grease consisting essentially of the following ingredients in about the following percentages by weight:

Cylinder stock	51.7
Sodium soap of palm oil	46.1
Free fatty acid	0.6
Undetermined matter	1.6
	100.0

5. A solid lubricating grease of the character

of driving journal compound consisting essentially of cylinder stock and about 40–50% by weight of sodium soap of palm oil together with non-volatile non-saponifiable constituents of said palm oil, said grease being substantially free from glycerine and water and having a melting point in excess of 400° F.

6. The method in the manufacture of a hard high melting point dehydrated glycerine free grease of the character of driving journal compound, which comprises heating a heavy lubricating oil and a fatty material consisting predominantly of palm oil to an elevated temperature of the order of 450–500° F. with agitation, saponifying the mass by addition of caustic alkali and continuing to heat and agitate the saponified mass at said elevated temperature until it becomes quiescent and substantially free from foam, and then drawing the mass and allowing it to cool and harden, said grease having a palm oil soap content of the order of 40–50% by weight and a melting point in excess of 400° F.

7. The method in the manufacture of a hard high melting point dehydrated glycerine free grease of the character of driving journal compound, which comprises heating a mixture consisting essentially of a cylinder stock and palm oil having a free fatty acid content less than 40% by weight to an elevated temperature of the order of 450–500° F. with agitation, saponifying the mass by addition of caustic soda and continuing to heat and agitate the saponified mass at said elevated temperature until it becomes quiescent and substantially free from foam, and then drawing the mass and allowing it to cool and harden, said grease having a soda soap content of the order of 40–50% by weight which consists essentially of said palm oil soap and a melting point in excess of 400° F.

8. A hard driving journal grease consisting of viscous hydrocarbon oil and soda soap of palm oil together with non-volatile non-saponifiable constituents of said palm oil, said soap being in sufficient proportion to produce a solid grease, said grease being substantially free from glycerine and water.

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