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SOLID LUBRICANT

Gavin R. Taylor, Montreal West, Quebec, and Richard N. Smith, Toronto, Ontario, Canada, assignors to McColl-Frontenac Oil Co. Limited, Montreal, Quebec, Canada

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This invention relates to improvements in solid lubricants used for the lubrication of locomotive driving journals and other bearings operating at high speeds and high temperatures. For this service dehydrated lubricating compounds comprising mixtures of sodium soaps and viscous hydrocarbon oils in substantially equal proportions and having a water content less than one percent have been widely adopted. Due to their high melting points and low water content such compounds give better results than the cold made greases previously used for the same purpose.

Dehydrated lubricating compounds are usually applied in cake form to driving journals through a perforated screen or retaining plate which is in contact with the journal, the grease and the plate being forced upwardly towards the journal by suitable pressure applying means. It frequently happens that the grease, instead of feeding through the retaining plate in the desired manner, tends to feed part of the oil content of the surface layer of grease to the bearing under the influence of the heat generated. The grease below the perforated plate finally develops a layer which turns black in color and consists largely of partly carbonized sodium soap containing less than its normal proportion of lubricating oil. This is known as "carbonization of the grease" and since grease in this condition does not furnish sufficient lubricant to the bearing, frequent inspection is necessary to prevent continued operation of the bearings under conditions of inadequate lubrication with resultant damage to the bearings.

The present invention provides an improved dehydrated lubricating compound which is less subject to the condition described above owing to improved retention of the lubricating oil by the soap, especially at high temperatures. This result is largely accomplished by the use of a mixture of soaps and by the substitution of naphthenic lubricating oil for the paraffin base or mixed cylinder stock which is generally used in driving journal compounds of the dehydrated type. The most satisfactory lubricants produced in accordance with this invention usually contain from 30 to 45 percent sodium soap; from 3 to 15 percent lime soap; and/or 3 to 15 percent of aluminium soap with less than 1 percent water and from 0 to 5 percent glycerine; the balance of the compound being the oil which is preferably viscous naphthenic lubricating oil.

In the practice of this invention dehydrated lubricating compounds of improved lubricating and oil retaining properties have been successfully produced in accordance with the following formula:—

	Percent
Animal fat	43.5
Viscous naphthenic lubricating oil	43.0
Caustic soda	5.7
Calcium hydrate	0.8
Water	7.0
	100.0

The above ingredients are compounded in an open-top fire heated kettle in accordance with the following procedure:—We preferably melt all of the animal fat in a portion of the mineral oil and then add the caustic soda and calcium hydrate in solution, or suspension, in the minimum quantity of water. Agitation is applied and the mixture heated until the water content is less than one percent and the remainder of the mineral oil is then added gradually in order to keep the mixture in a fairly fluid condition. The mixture is then heated to approximately 400° F. and brought to the condition of a fibrous paste suitable for drawing from the kettle. The resulting product, in the cool state, comprises a solid having a consistency closely approaching that of hard soap and a tough fibrous structure. The analysis of the finished product as produced from the formula and by the method herein described is substantially as follows:—

	Percent
Sodium soap of animal fat	41.5
Calcium soap of animal fat	7.0
Viscous naphthenic lubricating oil	47.0
Glycerine	3.5
Free alkali	.5
Water	.5

For some purposes we have found it desirable to include a small quantity of aluminium soap in the finished product. The following is a typical formula which we have used in this connection:—

	Percent
Animal fat	39.4
Aluminium soap	4.7
Viscous naphthenic lubricating oil	43.0
Caustic soda	5.3
Calcium hydrate	.6
Water	7.0

The method of compounding the above ingredients is the same as that previously described

and the finished product has approximately the following analysis:—

	Percent
Sodium soap of animal fat	38.5
Calcium soap of animal fat	5.0
Aluminium soap	5.0
Viscous naphthenic lubricating oil	47.0
Glycerine	3.5
Free alkali	.5
Water	.5

In the foregoing description the term "naphthenic lubricating oil" is used in the sense in which it is commonly employed in the trade to indicate lubricants produced from naphthenic crude oils. It may also be explained that the viscosity characteristics of the naphthenic lubricating oil used in accordance with our invention are similar to lubricants manufactured from crude oils produced along the gulf coast of Texas, U. S. A. Such lubricating oils are characterized by a high viscosity at 100° F. for the same viscosity at 210° F. when compared with paraffinic lubricants. It is also important to note that whereas the lubricating oils previously used in the manufacture of dehydrated driving journal lubricants have a viscosity index varying from fifty (50) to one hundred (100) the viscous naphthenic lubricating oils which are preferably used in accordance with our invention have a viscosity index of from zero (0) to thirty (30). The term "viscosity index" is widely used by the industry to classify oils from varying crude oil sources by means of their viscosity characteristics and the particular method which we have used for determining the viscosity index of the naphthenic oils used in accordance with our invention is that described by Dean and Davis "Chem. and Met. Engineering" 36,618 (1929) and by Davis and McAllister in "Industrial and Engineering Chemistry" 22,1326 (1930).

Having thus described what we now consider to be the preferred embodiments of our invention it will be understood that some slight changes in the proportions of the ingredients and the method of compounding same may be resorted to within the scope and spirit of the appended claims.

Having thus described our invention, what we claim is:—

1. A solid dehydrated lubricating compound for locomotive driving journals comprising from 30 to 45% sodium soap; from 3 to 15% calcium soap; from 3 to 15% aluminium soap; less than 1% water; and from 1 to 5% glycerine, the balance of the compound being constituted by highly viscous naphthenic oil characterized by a viscosity index of from zero to thirty.

2. A solid dehydrated lubricating compound for locomotive driving journals having approximately the following analysis:

	Percent
Sodium soap of animal fat	41.5
Calcium soap of animal fat	7.0
Highly viscous naphthenic lubricating oil	47.0
Glycerine	3.5
Free alkali	.5
Water	.5

3. A solid dehydrated lubricating compound for locomotive driving journals having approximately the following analysis:

	Percent
Sodium soap of animal fat	38.5
Calcium soap of animal fat	5.0
Aluminium soap	5.0
Highly viscous naphthenic lubricating oil	47.0
Glycerine	3.5
Free alkali	.5
Water	.5

GAVIN R. TAYLOR.
RICHARD N. SMITH.