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PROCESS OF MAKING GREASE.

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The object of my invention is to produce a smooth and homogeneous grease having a high melting point and long life in use.

I have discovered that if a mineral oil, comprising mainly the lubricating constituents thereof, derived from certain sources is mixed with a powdered hard soap, or hard soap chips, derived from certain sources, which soap has not been hydrogenated, and if such mixture be heated to a minimum relatively high temperature, a grease will result having an unusually high melting point. I have observed that, in general, the higher the temperature to which the mixture is raised, the higher the melting point of the resultant grease, which melting point lags behind the treating point and, with a comparatively low percentage of soap, lags further behind as the treating temperature is raised. I have made the further important discovery that if the proportion of soap be raised to within a certain high range, and if the temperature of treatment be elevated to within a certain high range, the "lag" of the melting point behind the treating temperature will be much reduced; that, in other words, the melting point of the grease will be elevated to an unexpectedly high point. Such a grease, while not applicable for use for certain purposes, due to its high soap content and relative dryness, is admirably adapted for use under certain high temperature conditions that demand or permit the use of a high grade dry grease; my improved grease greatly outlasting ordinary commercial greases of analogous compositions.

In order that the process may be practiced by those skilled in the art without the necessity of experiment, I shall describe a specific way of carrying out the process and point out desirable variations therefrom in order to produce greases of variable characteristics.

The soap forming one of the two ingredients of the composition should be a hard coap, which is ordinarily produced, as is well understood in the art, by the treatment of the animal or vegetable base with caustic soda. Castile soap is an example of a permissible soap. While the soap may be derived from animal or vegetable sources, I have found that soap derived from most vegetable sources is not adapted for use in my process. I have successfully used soap made from cocoanut oil, provided, as before stated, that it is a hard soap. I have also successfully used hard tallow soap, but not tallow itself. These soaps are to be considered equivalents so far as my invention is concerned, and in claiming cocoanut soap I mean to include its equivalents. It is also apparently important that the soap should not be hydrogenated. The soap should be utilized in a divided state; for example, in the form of soap chips, or in a powdered or otherwise comminuted form. The finer the division of the soap, the more expeditiously and thoroughly will it mix or amalgamate with the mineral oil.

I have experimented with mineral oil of different derivatives and find that it is impracticable to use mineral oil having certain compositions or qualties, as, for example, an asphalt base oil. I have, however, successfully used paraffin base mineral oil. The mineral oil should be composed wholly or mainly of those higher boiling point constituents, known as lubricating fractions, which remain after the lighter constituents, such as naphtha, gasoline, kerosene and gas oil, are driven off. It is desirable, also, although not necessary, to use only the lubricating distillates, without retaining the ultimate residue resulting from complete distillation.

The soap and mineral oil are mixed in any suitable vessel and raised to a temperature not lower than 450° F. and preferably not below 480° or 490° F. The preferred temperature varies with the soap content. In general, the higher the soap content, the higher the temperature. Thus, with a minimum soap content of five or six per cent, the preferred temperature is about 500° F. With a maximum soap content of fifty per cent, the preferred temperature approximates 600° F. However, even with compositions containing a high soap content, the advantages of my invention exist, although not in the same degree, if the temperature is raised to within the range of 450° to 500°, and particularly if it be raised to a point rather closely approximating 500°. While it may seem desirable to raise the temperature of the composition of low soap content to a higher point than that prescribed as a permissible maximum, say about 500° F., I have found that, with a relatively low soap

content, the melting point of the grease is not substantially raised by heating above about 500° F., and, moreover, with a very low soap content, the danger of combustion or explosion increases with the lowering of the soap content and diminishes as the percentage of soap increases.

While my process, in its broadest aspect, is applicable to the production of grease having a low soap content, an important specific embodiment of my invention is a specific adaptation of my process that is applicable only to the production of greases having a soap content from between about thirty or thirty-five per cent to about fifty per cent. In the ordinary commercial process of making grease composed of animal or vegetable oil soap and mineral oil, the maximum heating temperature is about 350°. This produces a grease having a melting point of about 300°, which is not adapted for use under the high temperature conditions that exist in many machines. I have discovered, however, that, in greases having a relatively low soap content, the melting point of the grease is raised by heating the mixture of soap and oil to about 500° F., but that the melting point of the grease does not rise proportionately to the temperature to which the composition is heated. Thus, heating a mixture containing from about fifteen per cent to about twenty-five or thirty per cent of soap to about 450° F. gives a grease having a melting point of about 410–20° F., while heating the same mixture to about 500° will produce a grease having a melting point of about 450–5° F. In other words, the "lag" of the melting point behind the heating point seems to slightly increase with increase of the heating point up to about 500° F. The lower the soap content, the more pronounced seems to be the "lag". While such a grease is a substantial improvement on grease having a melting point of 300° F., it still does not respond to many requirements.

If, however, the soap content of the grease be increased to from about thirty or thirty-five to fifty per cent and if the temperature be increased to within the range of 450° to 600° F., the melting point of the grease more nearly approaches the heating temperature, and the "lag" of the melting point below the heating point seems to slightly decrease with increase of the heating point, provided the latter be above about 450° F. There seems to be a critical temperature, or a limited critical temperature range, at or within which the melting point of the grease is more or less suddenly raised relative to the heating temperature. Apparently this critical temperature, or temperature range, is not identical with all possible compositions and all high percentages of soap relative to mineral oil, and therefore it is impracticable to place such critical range within narrower limits than from 450° to 500° F. As an example, however, of the treatment of a mixture of soap and mineral oil of any of the compositions specified wherein the percentage of soap is about forty per cent, if the mixture be heated to 450° F., the melting point of the grease will be about 420–25°; if the mixture be heated to 500°, the melting point of the grease will be about 480°; and if the treating temperature be raised to 600° F., the melting point of the grease will be about 580° F.

My improved grease, and especially that containing a relatively high soap percentage and having a melting point of 480° F. or above, is destitute of the spongy or fibrous quality that is characteristic of analogous greases of relatively low melting point, and is smooth and homogeneous. Under high temperature conditions, it has extraordinary lasting qualities, and consequently the expense of maintaining lubrication is but a fraction of that incident to the use of ordinary commercial grease.

In fixing the high soap content range from at about thirty-five per cent up to fifty per cent and the low soap content range at about thirty per cent down to five per cent, it should be understood that the range is an approximate one, there being a "neutral zone" between soaps of high and low soap contents wherein the relation between temperature and melting point have not been so definitely determined as with compositions definitely within the temperature ranges specified. Moreover, the ranges definitive of high and low soap contents may vary somewhat with the particular soap used and with conditions of heating.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. The process of making a high boiling point grease which comprises mixing from five to fifty per cent of a hard cocoanut oil soap with from ninety-five to fifty per cent respectively of a paraffin base mineral oil, and heating the same to a temperature above 450° F.

2. The process of making a high boiling point grease which comprises mixing from five to fifty per cent of a hard cocoanut oil soap with from ninety-five to fifty per cent respectively of a paraffin base mineral oil, and heating the same to within a temperature range from about 450° F. to about 600° F., said temperature increasing with increase of the soap content from the minimum to the maximum proportions specified.

3. The process of making a high boiling point grease which comprises mixing hard cocoanut oil soap with a paraffin base mineral oil, the percentage of soap being substantially above thirty per cent and not more

than about fifty per cent and heating the same to a temperature not less than about 450° F.

4. The process of making a high boiling point grease which comprises mixing hard cocoanut oil soap with a paraffin base mineral oil, the percentage of soap being substantially above thirty per cent and not more than fifty per cent and heating the same to within a temperature range whose lower limit approximates 500° F. and whose upper limit approximates 600° F.

5. The process of making grease having a boiling point of not less than approximately 480° F., which comprises mixing hard cocoanut oil soap with a paraffin base mineral oil, the percentage of soap being not substantially less than about thirty per cent and not more than about fifty per cent and heating the mixture to a temperature of not less than about 500° F.

6. A grease comprising from five to fifty per cent of a hard cocoanut oil soap and from ninety-five to fifty per cent respectively of a paraffin base mineral oil, said grease having a melting point of not less than about 410° F.

7. A grease comprising a hard cocoanut oil soap in amount not less than from about thirty per cent and not more than about fifty per cent and a paraffin base mineral oil comprising substantially the remainder of the grease, said grease having a melting point of not less than about 480° F.

In testimony of which invention, I have hereunto set my hand, at Marcus Hook, Pa., on this 21st day of August, 1925.

JAMES McKEE.