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MINERAL CASTOR OIL

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1

This invention relates to soap thickened hydrocarbon oils and to the method of preparing the same, and more particularly relates to improved mineral castor oils.

So-called mineral castor oils are hydrocarbon oils, such as petroleum oils containing dissolved or dispersed therein a basic aluminum soap of a higher fatty acid, such as oleic acid, stearic acid, palmitic acid, behenic acid, etc. The mineral castor oils, sometimes referred to as castor machine oils, are oils identified in the trade by their high viscosities and are used mainly as lubricants in equipment where high temperatures are not encountered. The viscosities of such oils range from about 100 seconds Saybolt Universal at 100° F. to about 1000 seconds or higher at 210° F. These oils, characterized by their stringiness, are used primarily for the lubrication of bearings, differentials, and other moving parts of machinery where it is desirable to employ oils of high stability. In order to stabilize mineral castor oils against separation, a small quantity of polyhydric alcohol is incorporated in the composition.

It has been observed that these soap thickened oils in many cases become rubbery and cohesive in structure and lack certain desirable flow properties essential to their proper application.

It is an object of the present invention to provide an improved soap thickened hydrocarbon oil which is not rubbery and cohesive in structure. Another object of the invention is to provide a stable soap thickened hydrocarbon oil having desirable flow characteristics. A still further object of the invention is to provide a method of preparing an improved mineral castor oil which is not rubbery and cohesive and which possesses improved flow characteristics. Other objects and advantages of the present invention will become apparent from the following description thereof.

We have discovered that the foregoing objects can be attained by incorporating in mineral castor oils, particularly those containing a polyhydric alcohol, a small amount of a metal soap of a preferentially oil-soluble sulfonic acid. The preferentially oil-soluble sulfonic acids employed in accordance with the present invention are preferably those obtained in the treatment of hydrocarbon oils, such as mineral or petroleum oils with strong, i. e. concentrated or fuming, sulfuric acid. However, for the purpose herein-described, we can use other preferentially oil-soluble sulfonic acids, such as those obtained by the sulfonation of olefin polymers having at least about 22 carbon atoms in the molecule or sul-

2

5 fonic acids obtained by the sulfonation of alkylated aromatics having at least 19 carbon atoms in the alkyl chain. The metal soaps of the preferentially oil-soluble sulfonic acids employed are preferably the alkali metal or alkaline earth soaps of such sulfonic acids, for example, the sodium, potassium, lithium, calcium and barium soaps thereof. Generally, only a small amount of the sulfonate, sufficient to impart to the mineral castor oil non-rubbery and non-cohesive properties need be employed, usually from about 0.005% to about 2.0% by weight, and preferably from about 0.01% to about 1% by weight of the sulfonate is sufficient. However, depending upon the aluminum soap content of the base and the viscosity of the oil used, smaller or larger amounts of the sulfonate can be employed.

The preferentially oil-soluble sulfonates employed in the present invention are suitably those obtained in the treatment of viscous petroleum oils with concentrated and/or fuming sulfuric acid. In the treatment of petroleum oils with strong, i. e. fuming or concentrated, sulfuric acid, two general types of sulfonic acids are obtained; those which are preferentially water-soluble and recovered from the acid sludge layer, and those preferentially oil-soluble and recovered principally from the oil layer. Depending upon the conditions of separation, small amounts of preferentially oil-soluble sulfonic acids are recoverable from the acid sludge layer. The sulfonic acids are recovered by extracting the acid-treated oil with about 60% alcohol, or the sulfonic acids in the oil layer can be neutralized and the soaps recovered from the oil by extraction with alcohol. The extracted sulfonic acids or sulfonates can be further purified by further extraction with alcohol of about 80% strength. These preferentially oil-soluble sulfonic acids or the soaps thereof, because of their characteristic reddish-brown color, are commonly referred to in the petroleum refining art as mahogany acids, or mahogany soaps. Depending upon the source of the petroleum oil treated and the amount of acid used in the acid treatment, the preferentially oil-soluble sulfonic acids having molecular weights ranging from about 350 to about 500.

As an example of the preferentially oil-soluble sulfonate suitable for the herein-described invention, is the soap of the sulfonic acid obtained by treating a petroleum distillate having a Saybolt Universal viscosity at 100° of about 60 to 800 seconds, with 5 pounds of fuming sulfuric acid per gallon of oil added in ½ pound dumps, and extracting the acid-treated oil, after separation of

the acid sludge, with 60% alcohol. The crude sulfonic acid obtained can be further extracted with 80% alcohol to obtain a purified mahogany acid. The alkaline earth soaps, for example the calcium soap of such purified mahogany acids, which have a molecular weight of about 430, are especially well suited for use in accordance with the present invention.

Another suitable sulfonate found to be well suited for the present invention is the alkali metal, such as sodium soap of preferentially oil-soluble mahogany acids having a molecular weight of in the range of about 470-500.

The addition of such sulfonates to mineral castor oils of the type herein-described lowers the viscosity of the product and in addition produces a change in structure, whereby the rubbery and cohesive characteristics of conventional mineral castor oils are modified so that a stringy adhesive structure is obtained. While the present invention is applicable to improve the properties of mineral castor oils in general, it is particularly effective in compounded mineral castor oils comprising aluminum soap, a small proportion of a polyhydric alcohol, and a major proportion of petroleum oil. Mineral castor oils having the following compositions in the following approximate proportions are illustrative of preferred embodiments of the invention:

	Permissible Range	Preferred Range
	Per cent	Per cent
Aluminum Soap	10.5-15	1.0-12.0
Polyhydric Alcohol	0.05-5.0	0.25-3.0
Metal Sulfonate	0.005-2.0	0.025-1.0
Hydrocarbon Oil	99.445-78.0	98.725-84.0

¹ Weight percentages.

The polyhydric alcohols employed in the preparation of the mineral castor oil include glycerine, ethylene glycol, diethylene glycol and propylene glycol. Other polyglycols or polyglycerols, including the derivatives of polyhydric alcohols, may also be employed.

Any hydrocarbon oil of suitable viscosity can be used; usually mineral oils ranging in viscosity from about 70 seconds Saybolt Universal at 100° F. to about 210 seconds at 210° F. can be employed.

The mineral castor oil improved by the herein-described invention may be prepared from the aluminum soap of fat or fatty acids which has been prepared by the double decomposition method, or it may be prepared from a soap made by direct saponification of a fatty acid with aluminum hydroxide, which is available in a reactive form known as gelatinous alumina. As noted above, the fat or fatty acids are the higher molecular weight fat or fatty acids, such as oleic acid, stearic acid, palmitic acid, behenic acid, or commercial so-called animal fatty acids composed mainly of stearic, palmitic and oleic fatty acids. The following example illustrates a method of preparing a mineral castor oil of the herein-described invention, and is given by way of illustration only and is not intended to limit the scope of the invention.

All of the aluminum soap, for example aluminum stearate, the polyhydric alcohol, such as glycerin, and the oil-soluble sulfonate, for example calcium mahogany soap and an amount of a petroleum oil, for example one having a Saybolt Universal viscosity at 100° F. of 80 to 85 seconds, equal in weight to the aluminum soap, are charged

to a mixer and the contents then agitated or stirred until a smooth paste is obtained. The paste is then heated to about 250-275° F. and maintained at this temperature until the soap is completely dissolved in the oil. If necessary, additional oil is graded in to lower the consistency of the base. When the soap is uniform and smooth, the balance of the oil is added rapidly, while regulating the temperature so that the batch finishes at a temperature of 180-220° F.

The present invention is not limited to mineral castor oils prepared by the above method, but is applicable to mineral castor oils prepared by other methods, such as for example mineral castor oils prepared by the method described in U. S. Patents 1,691,654 and 2,031,405. The mineral castor oil can also be prepared by a two-step method in which the first step comprises the manufacture of a base approximately 30 to 50% aluminum soap and the second step comprises compounding of the base with petroleum oil, and small amounts of the polyhydric alcohol and the oil-soluble sulfonate.

The effect of the oil-soluble sulfonate on the structure of the mineral castor oil is illustrated by the following data using as the control a mineral castor oil containing 5% aluminum stearate, 1% glycerin, and 94% of a petroleum oil having a Saybolt Universal viscosity at 100° F. of 80 to 85 seconds.

Asphalt Viscosity at 100° F., seconds

Control	737
Control+0.05% calcium mahogany soap ¹	246
Control+0.05% sodium mahogany soap ²	204

¹ Molecular weight of acid—approximately 430.
² Molecular weight of acid—approximately 470-500.

The effect of adding the mahogany soap is not merely one of lowering the viscosity since this could readily be accomplished by a decrease in the percentage of aluminum stearate; the addition of the oil-soluble sulfonate is necessary to obtain the desired structural effect. While the alkali metal or alkaline earth soaps of preferentially oil-soluble sulfonic acids can be used, we prefer to use the alkaline earth soaps of such sulfonic acids since they lower the viscosity of the product to a lesser degree than do the alkali metal soaps of the sulfonic acids. The calcium soaps of mahogany acids having a molecular weight in the range of about 400 to 450 are preferred.

Mineral castor oils of the present invention have much improved stability properties as illustrated by the data in the following table. The control used was a mineral castor oil comprising 5.0% aluminum stearate, 1.0% glycerine, and 95.0% petroleum oil having a Saybolt Universal viscosity at 100° F. of 80-85 seconds.

Samples	Asphalt Viscosity at 100° F.	
	When Made	Aged 6 Mos.
	Seconds	Seconds
A. Control	737	957
B. Control+0.05% Calcium Mahogany Soap	246	186

The slight decrease in viscosity of sample B upon aging is much more desirable and preferable to the large increase in viscosity of sample A. The following examples are illustrative of the

two grades of mineral castor oils prepared in accordance with the present invention:

	Sample A	Sample B
Aluminum Stearate.....per cent.....	7.0	2.5
Glycerine.....do.....	1.4	0.5
Calcium Mahogany Soap.....do.....	0.14	0.05
Petroleum Oil (S. U. Vis. at 100° F.=80-85 seconds).....per cent.....	91.5	97.0
Asphalt Viscosity at 100° F.....	400-600	100-200
Furoil Viscosity at 100° F.....		

The percentages given herein and in the appended claims are weight percentages unless otherwise specified.

The term "asphalt viscosity" is the viscosity at 100° F. obtained on a Saybolt Viscometer using the so-called asphalt tip.

It is to be understood that the foregoing references to preferred embodiments of our invention are not to be considered as limiting but merely as illustrative of the generic invention and that many variations may be made within the scope of the appended claims.

We claim:

1. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 0.5% to about 15% of an aluminum soap, from about 0.05% to about 5% of a polyhydric alcohol, and from about 0.005% to about 2% of a metal soap of a preferentially oil-soluble sulfonic acid.

2. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 0.5% to about 15% of an aluminum soap, from about 0.05% to about 5% of a polyhydric alcohol, and from about 0.005% to about 2% of an alkaline earth soap of a preferentially oil-soluble sulfonic acid derived from the treatment of petroleum oils with strong sulfuric acid.

3. A mineral castor oil as described in claim 2 in which the alkaline earth soap of the preferentially oil-soluble sulfonic acid is the calcium salt.

4. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 0.5% to about 15% of an aluminum soap, from about 0.05% to about 5% of a polyhydric alcohol, and from about 0.005% to about 2% of an alkali metal soap of a preferentially oil-soluble sulfonic acid derived from the treatment of petroleum oils with strong sulfuric acid.

5. A mineral castor oil described in claim 4 in which the alkali metal is sodium.

6. A mineral castor oil comprising a major proportion of a hydrocarbon oil from about 1% to about 12% of an aluminum soap, from about 0.25% to about 3% of a polyhydric alcohol and from about 0.025% to about 1% of an alkali metal soap of a preferentially oil-soluble sulfonic acid.

7. A mineral castor oil described in claim 6 in which the polyhydric alcohol is glycerin and the alkali metal soap is a sodium soap.

8. A mineral castor oil described in claim 7 in which the polyhydric alcohol is glycerin and the alkaline earth soap is a calcium soap.

9. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 1% to about 12% of aluminum stearate, from 0.25 to about 3% glycerin and from about 0.025% to about 1% of a calcium soap of a mahogany acid having a molecular weight of from about 400 to about 450.

10. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 1% to about 12% aluminum stearate, from about 0.25% to about 3% glycerin and from about 0.025% to about 1% of a sodium soap of a mahogany acid having a molecular weight of from about 470 to about 500.

11. A mineral castor oil comprising a major proportion of a petroleum oil, from 2.5% to about 7% aluminum stearate, from 0.5% to about 1.4% glycerin, and from 0.05% to about 0.2% calcium mahogany soap.

12. A mineral castor oil comprising a major proportion of a hydrocarbon oil, from about 1 per cent to about 12 per cent of an aluminum soap, from about 0.25 per cent to about 3 per cent of a polyhydric alcohol and from about 0.025 per cent to about 1 per cent of an alkaline earth soap of a preferentially oil-soluble sulfonic acid.

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