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ADHESIVE GREASE COMPOSITION

John C. Zimmer, Hillside, and Arnold J. Morway,
Roselle, N. J., assignors to Standard Oil De-
velopment Company, a corporation of Delaware

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The present invention relates to improved grease composition, and more specifically to a lubricating grease which has a marked adhesive quality, capable of sticking closely to metal surfaces in motion even under sudden shock, with a strong tendency to string out, and with resistance to the action of water. The composition and its method of production will be fully understood from the following description.

Adhesive greases have been known to the art, but none of them have been fully satisfactory. They are characterized principally by a strong tendency to adhere to moving metal parts and to permanently string out, without separating from the metal surfaces. This particular property insures good lubrication where there is sudden shock which is apt to cause spattering of ordinary greases, and where there is sufficient centrifugal force to throw ordinary greases away from the metal surfaces to be lubricated. Such grease compounds are to be carefully distinguished from the strongly coherent greases, which are elastic and which show a greater tendency to separate from the metal parts and to ball than to permanently string out as has been described above. They also differ from the buttery greases which, while not elastic, are also not adherent.

Heretofore rubber has been used in preparing adherent greases, but such compositions are not very stable during storage and tend to deteriorate quite rapidly when left in open containers or in use; also they have been found to become gummy and resinous and separate oil.

The greases described in the present specification show little or none of the above defects. They are extremely stable and retain their strong adherent properties. They are also water-resistant and remain perfectly uniform over long periods of time.

The present grease composition is prepared by the addition of several substances to a hydrocarbon lubricating oil. The oil may be derived from any suitable source, but is preferably a paraffinic or mixed base petroleum fraction, either distillate or residual. The particular oil naturally depends upon the type of grease desired; the light and softer greases being prepared from the lighter and less viscous oils; while the heavier and harder greases are usually prepared from the more viscous oils. Oils of almost the entire lubricating viscosity range may thus be used say from 75 to 2000 seconds Saybolt at 100° F., but for most purposes, it is preferable to use oils within the range of 200 to 500 sec-

onds at 100° F., varying the amount of the other ingredients slightly so as to give the particular qualities desired for any specific use. While any type of lubricating oil may be used, it will be understood that in preparing the better grades of grease, the more refined and better grades of oil should be used.

To the oil is added soap of one of the metals calcium or aluminum which may be in proportion from say 3 or 4 to 30%, but for most purposes the amount will vary between about 5 and 15% by weight. To some extent the amount of the soap will depend upon the particular fat or fatty acid employed in its production, although all of the usual soap stocks are satisfactory, for example, animal fats, such as tallow, horse fat and the like; vegetable fats and oils such as cotton seed oil; fish oils, and the fatty acids of commerce, such as stearic and palmitic or mixtures thereof. Synthetic acids produced by the oxidation of hydrocarbon oils or waxes and the like may also be used. The soap may be prepared separately, and added to the oil, or, as is preferable in the case of lime soaps, the saponification may occur after the admixture of the fatty acid or other fatty compound with the hydrocarbon oil. Saturated fatty acids are preferable, although small amounts of unsaturated acids such as oleic may be added if desired.

The third essential ingredient of the present composition is a small amount of a highly polymerized oil soluble product of isobutylene or equivalent materials produced by the polymerization of hydroxy acids such as hydroxy-stearic acid. Both of these polymers are of the linear type, the former produced at extremely low temperatures, say below -40° C. by the action of boron fluoride, and the latter at about 200° C. with a small amount of adipic acid as a catalyst. There is, of course an entire range of isobutylene polymers, from viscous oils to hard, horn-like solids. The low molecular weight polymers are definitely undesired and unfit for the present purposes because they have too great a softening effect and because an amount sufficient to give the desired adherent quality is incompatible with the amount of the soap used. Suitable polymers of either of the above types fall within the range of molecular weights in excess of 30,000 or 40,000 up to say 300,000 or higher. While molecular weight of such materials is often difficult to determine accurately, it is possible to determine their thickening effect on tetrahydronaphthalene and suitable high molecular weight polymers when dissolved in that solvent in proportion of

2.8% concentration by weight are found to produce a solution having a viscosity, as measured at 20° C., from 30 to 200 times as viscous as water at 20° C. Polymers having less thickening power than this are of little or no value for the present purposes. The amount of polymer used is in all cases less than about 5% and the amount may vary depending on the particular quality desired in the final product and on the molecular weight or thickening power of the particular polymer. In general, the amount ranges from about 0.1 to 2%, which gives excellent results, and of the two types of polymers mentioned, those made from isobutylene are definitely preferable. The greases containing lime soaps are also preferable to the aluminum soap greases, in particular because of the water resistant properties of the former.

Other materials may be added to the grease for various purposes. For example, glycerine up to 1-5% of the amount of soap, or glycols or higher alcohols, especially with lime soaps; wax or petrolatum and solid fillers such as chalk or graphite. Ordinarily a small amount of water is present, as in most lime soap greases, say 0.2% to 4 or 5% of the whole, in order to produce a smoothly emulsified product. Glycerol is undesirable in the aluminum soap grease.

Example I

The following example is given to illustrate the method of preparing the grease and to show its composition. 8.9 parts by weight of a paraffine base oil (300 seconds Saybolt at 100° F.) are heated to about 200° F. and .89 part by weight of horse fat is thoroughly incorporated therein. Then .13 part of hydrated lime is slowly added and the fat is saponified by heating to about 350° F. and time is provided for thoroughly dehydrating the mass which is then cooled while stirring, to about 200° F., and .05 part by weight of water is then added. The mass is continuously cooled to about 125° F. at which point about .40 part by weight of a mixture of an isobutylene polymer in lubricating oil is added. The particular polymer added had an average molecular weight of about 50,000 and the mixture added contained 25% of the polymer and 75% of a paraffinic oil. The mixture was then thoroughly stirred to uniformity and stored to use.

The grease made up in the previous manner had approximately the following composition:

Mineral oil	85.5
Lime soap	12.0
Glycerine	1.0
Polymer	1.0
Water	.5

Example II

Greases were made up of substantially the same formula except that one part contained aluminum soap with rubber and the isobutylene polymer respectively and the other part with lime soap and rubber and the polymer respectively. The amounts of the rubber and polymer were .5%.

These four samples were then left in open containers and inspected each day. The inspection was to test the permanence of the adhesiveness. After 4 days the lime soap-rubber grease had badly deteriorated and was no longer adhesive. The aluminum soap-rubber grease deteriorated to about the same extent in 6 days, but the two samples containing the isobutylene polymer even after standing 4 months had apparently lost none of their adhesiveness.

On placing fresh samples of these greases in closed cans it was found that the rubber greases developed hard non-adhesive skins within a short time but the isobutylene polymer greases showed no such tendency.

This invention is not to be limited by any theory or the examples given by way of illustration, but only by the following claims in which it is our intention to claim all novelty inherent in the process.

We claim:

1. A grease composition comprising a lubricating oil, less than 30% of a soap of a metal selected from the group consisting of calcium and aluminum and less than 5% of a linear polymer, selected from the group consisting of polymerized isobutylene and polymerized hydroxy-stearic acid, having an average molecular weight in excess of 30,000.

2. An adherent grease composition comprising a lubricating oil, less than 30% of a lime soap and an oil soluble linear polymer of isobutylene having a molecular weight in excess of 30,000, in proportion from 0.1 to 2%, in uniform admixture.

3. A composition according to claim 2 in which the lime soap is present in amount from about 5 to 15%.

4. An adherent grease composition comprising a mineral oil, less than 30% of an aluminum soap and an oil soluble linear polymer of isobutylene having a molecular weight in excess of 30,000 in proportion of about .1 to 2.0%, in uniform admixture.

5. A composition according to claim 4 in which the aluminum soap is present in amount from about 5 to 15%.

JOHN C. ZIMMER.
ARNOLD J. MORWAY.