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ADHESIVE GREASE COMPOSITION

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The present invention relates to improved grease compositions and more specifically to lubricating soap greases having a marked "stringiness" or 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.

Adhesive greases hitherto known are characterized principally by a strong tendency to adhere to moving metal parts and to permanently string out, without separating from the metal surfaces, even under sudden shock and strong centrifugal forces. 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 then to permanently string out. They also differ from the buttery greases which, while not elastic, are also not adherent.

Rubber containing adherent greases which have been known to the art are not 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 tend to separate oil.

The present invention has for its object adhesive greases which show little or none of the above defects.

Another object of the invention is to prepare adhesive grease compositions which are extremely stable and water resistant, which have an increased adherence to metal surfaces and improved oiliness characteristics, which retain their strong adherent properties and which remain perfectly uniform over long periods of time.

The present grease composition is prepared by the addition of small amounts of high molecular weight soluble acrylic linear polymers to a hydrocarbon lubricating oil. The oil may be synthetic or natural and 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 on 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 35 to 5000 sec. Saybolt at 100° F., but for most purposes, it is preferable to use oils within the range of 40 to 2000 sec. at 100° F., varying the amounts 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 or more metals, e. g. sodium, calcium, barium 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 oleic 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 linear acrylic polymer of high molecular weight. Esters or ethers of acrylic or methacrylic acids, e. g. fatty alcohol esters such as lauryl methacrylate, cetyl acrylate, amino esters, etc. are examples thereof. There is, of course, an entire range of these polymers ranging from viscous oils to hard, hornlike solids. The low molecular weight polymers are definitely undesirable for this purpose and unfit for the present use because they have too great a softening effect and because the amount sufficient to impart somewhat of an adherent quality is excessive and incompatible with the amount of the soap used. Polymers which are suitable for the present invention fall within the range of molecular weights in excess of 30,000 up to say 200,000 or higher (as determined by the viscosity method). While the 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 this solvent in the 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 proportion depending on the molecular weight of the particular polymer. In general, the amount ranges from about 0.01 to 2%, which gives excellent results.

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 1

The following example is given to illustrate the method of preparing the grease and to show its composition. About 10% of polymerized lauryl acrylate of over 30,000 molecular weight is dissolved in a hydrocarbon mineral lubricating oil (50 sec. Saybolt viscosity at 210° F.) by heating to 150° F., while stirring. This cencentrated solution of the polymer in hydrocarbon oil is then worked into a mixed base grease consisting of aluminum and sodium stearate (dispersed in mineral oil of 210 sec. viscosity at 100° F. Saybolt) in a 1% concentration.

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

	Per cent
Mineral oil	85.9
Soap	14.0
Polymer	0.1

This compounded grease is considerably less susceptible to splattering as a result of sudden shocks which occur in automotive spring shackles than a similar grease not compounded with the above polymerized product.

Example 2

About 5.0% of a polymerized high molecular weight fraction of lauryl methacrylate of over 30,000 molecular weight is dissolved in a hydrocarbon mineral oil (50 sec. Saybolt viscosity at 210° F.) by heating to 150° F. while stirring. This concentrate of polymer and mineral oil is then worked into a lime soap grease immediately after making in a 2.0% concentration, i. e. 15 parts hog fat, 2.16 parts of hydrated lime and 41.42 parts of 40 Saybolt viscosity at 210° F. paraffinic mineral oil. The blend is heated to 300° F. for 3 hours. Some water (about 2 parts) is added to help saponification, and after saponification the lime soap oil mixture is cooled by adding 41.42 parts more of mineral oil. At 215° F., 2 parts of water are added and the grease structure forms immediately. After the formation of the grease structure, the polymer concentrate is added and completely incorporated into the freshly made grease by stirring. The grease is now withdrawn into containers, and has approximately the following composition:

	Per cent
Calcium soap	15.5
Mineral oil	82.3
Water	2.0
Polymer	0.2

Generally, commercial preparations of lauryl methacrylate, such as "Acryloid 100" are not suitable for the purpose of the present invention since they contain too high a concentration of low molecular weight polymers. However, these may be removed by fractionation with solvents and precipitants, and a high molecular weight fraction may be precipitated out which has a satisfactory "stringiness" effect on greases. This might be more clearly understood by the following example:

Example 3

About 31.5 grams of "Acryloid 100" are dissolved in 3120 cc. of benzol and cooled to 8° C. A mixture of 1000 cc. of 50/50 benzol-methanol is added and then 1000 cc. of methanol are gradually added with stirring while adding, when a turbidity appears. The mixture is then set for ½ hour preferably at a raised temperature (18° C.) until clear, and kept at 48° F. for 48 hours. The top layer is decanted from heavy gelatinous precipitate on the bottom of beaker. The latter is dried by heating on a steam bath and evacuating.

The precipitated high molecular weight fraction is then dissolved in a mineral lubricating oil (50 vis. at 210° F. coastal distillate) in 1.0% concentration, and 10% of this concentrate is added to a lime soap grease of 315 penetration at 77° F. When dispersed, it imparted a satisfactory string and adhesiveness to the grease.

One interesting and valuable property of this acrylic polymer of the type described is its stabilizing effect upon other high molecular weight polymers which have a tendency to "break down" in molecular weight when passed through an orifice (e. g. such as that present in the ordinary grease gun). Polyisobutylene and other soluble linear hydrocarbon polymers of over 30,000 molecular weight are excellent stringiness agents, but they tend somewhat to break down in molecular weight and lose their stringiness properties upon ejection through a nozzle. However, the addition of about 10–60% by weight (based on the total polymer mixture) of the acrylic polymers disclosed in this application, and preferably about 50%, appears to stabilize the polymer against such breakdown when passed through a pressure gun.

Other materials such as dyes, pour inhibitors, antioxidants, emulsifiers, emulsion stabilizers, and the like may be added to these compositions.

We claim:

1. A stabilized stringy adherent grease composition comprising a hydrocarbon lubricating oil, between 5% and 30% of a grease-forming soap of a metal selected from the group consisting of sodium, calcium, barium and aluminum, and between 0.01% and 5% of a mixture of polyisobutylene of over 30,000 molecular weight and an oil soluble high molecular weight linear acrylic polymer which in 2.8% solution by weight in tetrahydronaphthalene shows a viscosity of over thirty times more than that of water at 20° C., the amount of acrylic polymer being between 10% and 60% by weight of the total polymer mixture.

2. A composition according to claim 1 in which the amount of acrylic polymer is 50% by weight of the total polymer mixture.

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