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LUBRICANT

Carl F. Prutton, Cleveland Heights, Ohio, assignor, by mesne assignments, to The Lubri-Zol Development Corporation, Cleveland, Ohio, a corporation of Delaware

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This application is a continuation in part of my co-pending applications Serial No. 737,070 filed July 26, 1934, and Serial No. 755,987 filed December 4, 1934.

This invention relates, as indicated, to lubricating compositions and more particularly to lubricating compositions capable of providing efficient lubrication under those conditions where a plain mineral lubricating oil is either unable to supply the necessary lubrication or where the use of plain mineral lubricating oil gives rise to objectionable conditions.

It is a principal object of my invention, therefore, to provide a compounded lubricating composition which consists principally of mineral lubricating oil but which has added thereto an agent or agents improving the properties of the composition in particular respects.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention, then, comprises the means hereinafter fully described and particularly pointed out in the claims.

The following description sets forth in detail certain approved combinations of ingredients embodying our invention, such disclosed means constituting, however, only certain of the various forms in which the principles of the invention may be used.

Broadly stated, this invention comprises lubricating compositions consisting mainly of mineral (petroleum) lubricating oil to which there are added various proportions of a calcium salt (soap) of an aromatic stearic acid whereby the properties of the mineral lubricating oil base are improved so that the resultant composition is useful for purposes for which the plain mineral oil would be unsuited and unsatisfactory. By a calcium salt of an aromatic stearic acid is meant a calcium salt of a stearic acid derivative containing an aromatic group.

More specifically, this invention relates to lubricating compositions containing calcium phenyl stearate.

Calcium phenyl stearate when used in minor amounts in a mineral lubricating oil base will be found to impart desirable properties, particularly when such compounded lubricant is used as the crank-case or upper cylinder lubricant in internal combustion engines which operate at unusually high temperatures, such as, for example, Diesel engines, and aviation engines.

It has been found that unusually desirable lubricating compositions may be produced by adding to mineral lubricating oil bases minor amounts of halogenated, or more specifically, chlorinated, calcium phenyl stearate either alone or in combination with plain calcium phenyl stearate.

It has also been found that calcium phenyl stearate, either plain or halogenated, when employed in conjunction with other suitable, non-volatile, oil-soluble, halogenated organic compounds, will produce a lubricating composition which is highly useful for certain purposes where increased film strength is a desired characteristic of the composition, in addition to the improvements resulting from the presence therein of the calcium phenyl stearate. It will be found that lubricating compositions containing this combination of addition agents have other desirable properties suiting the same for particular uses, which properties are the result of the combined presence of the two addition agents rather than the sum of the advantages which accrue from the independent use of such addition agents in different compositions.

Among the advantages accruing from the use of a lubricating composition comprising a mineral lubricating oil and a minor amount of calcium phenyl stearate are freedom from objectionable carbon deposits and sludge. The addition agent appears to have a solvent action upon the carbon binders thus rendering the deposits soft and facilitating their removal. Likewise, there is a similar action upon sludge whereby the gummy material which may contain small particles of grit is dissolved and rendered relatively unobjectionable. Sludge and carbon are particularly likely to form in engines operating under conditions of extreme pressure and temperature and it is therefore necessary that any addition agent introduced to remedy such a situation be itself stable under such conditions. Calcium phenyl stearate is eminently qualified for such a position. If it be halogenated it will in addition impart extreme pressure characteristics to the composition with resultant reduction in friction and wear. Similar advantages may be obtained by the combined use in the oil base of calcium phenyl stearate and a separate organic halogen compound.

Throughout the foregoing description of this invention I have referred to calcium phenyl stearate and halogenated calcium phenyl stearate as the principal addition agents. It has been found that addition agents of commercial purity are entirely satisfactory for this purpose and that chemically pure calcium phenyl

stearate or halogenated calcium phenyl stearate need not necessarily be employed.

Because of the stability of the addition agent and its general effectiveness in an upper cylinder lubricant a lubricating composition according to my invention is particularly suited to be added directly to internal combustion engine fuels, such as gasoline or Diesel fuel, or otherwise introduced as by a top-oiler.

The following is a list of various aromatic stearic acids, the calcium salts of which are particularly suited for use in accordance with the present invention:

Phenyl stearic acid
Phenyl mercapto stearic acid
Tolyl stearic acid
Xenyl stearic acid
Xylyl stearic acid
Naphthyl stearic acid
Anthracyl stearic acid

Although calcium phenyl stearate is referred to specifically throughout the specification it is understood that the same descriptions apply equally to the calcium salts of the other aromatic stearic acids.

But small quantities of the addition agent need be added to the mineral oil base in order to obtain the desired advantages. Concentrations of the new addition agent of from about 0.1% to about 2%, based on the amount of oil, are often quite sufficient, even for airplane or Diesel engines. For certain uses, it may be found desirable to employ up to about 10% or more.

When used in conjunction with a mineral lubricating oil and a liquid lubricant is desired it is obvious that generally only such amounts of the addition agent may be included as are soluble in the specified amount of oil. By the term "soluble" as herein used it is intended to indicate the ability to form not only true solutions but also any form of substantially permanently homogeneous solution when incorporated in mineral oil. With most of the compounds there is usually little difficulty, especially if the incorporation is effected in the manner described in Cornell Patent No. 2,042,880, and since quite small percentages often give remarkably improved results it is seldom of extreme importance that the addition agents be oil-soluble in all proportions. Also, certain of the compounds contemplated herein are of additional value as gelling or bodying agents when used in amounts greater than are strictly soluble.

When the above mentioned addition agent is used in conjunction with a separate organic halogen compound the latter should have a vapor pressure less than atmospheric at 140° C., and preferably at 170° C. About the same quantity of such compounds may be employed as of calcium phenyl stearate or relatively larger amounts if desired. The presence of the calcium phenyl stearate in certain proportions appears to render the halogen of the separate halogen-bearing organic compound more active and effective in affording extreme pressure characteristics to the lubricant.

If the calcium salt of the aromatic stearic acid be itself halogenated it is generally preferable that the halogen be attached to the ring structure rather than to the chain since it will be more firmly held and less easily hydrolyzed by small amounts of moisture although still available under conditions of high pressure and temperature. For the same reason halogenated ring compounds are generally preferred to halogenated open chain compounds when a separate halogen bearing organic compound is to be employed. Under certain conditions of use, however, (for example, where hydrolysis will not ordinarily take place or would not be objectionable) the halogen attached to the chain structure will be found quite satisfactory and even preferable.

Although chlorine is a most effective and easily obtainable member of the halogen family it is to be understood that the other members, namely fluorine, bromine, and iodine, while more expensive or less easily handled, are nevertheless satisfactory in contributing to the extreme pressure characteristics of the lubricant.

While mineral oil generally is the principal ingredient of my lubricant, it is not essential that it be the only ingredient other than the addition agent or agents herein specified provided that there should be no additional ingredient which is incongruous with such addition agent. It is within the contemplation of this invention to include, if necessary or desirable, such other addition agents as are commonly added to improve the viscosity index or cold test of the lubricant and a lubricating composition according to this invention which also has a separate oiliness increasing agent has been found to be unusually effective.

The composition comprising my invention has certain advantages when used as a lubricant, of which the following may be mentioned:

First: the calcium phenyl stearate reduces formation of sludge and hard carbon deposits.

Second: when a separate halogen-bearing organic compound is also employed and/or the calcium phenyl stearate is halogenated, it is found possible to extend the pressure range between the relatively moving metallic surfaces because of the reduced tendency for the surfaces so lubricated to become scored or to seize at higher pressures than are allowable with ordinary lubricants. The improvement in such extreme pressure characteristics is greater than that obtained when the separate halogen-bearing compounds above referred to are used alone.

Third: the friction between the relatively moving metallic surfaces is reduced, especially in the higher pressure range, below that obtained with ordinary lubricants.

Fourth: substantial reduction in wear taking place on relatively moving surfaces lubricated with these compositions is often noted.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the process herein disclosed or the materials employed in carrying out the process, provided the ingredient or ingredients stated by any of the following claims or the equivalent of such stated ingredient or ingredients be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A lubricating composition comprising a petroleum lubricating oil, a calcium soap of an aromatic stearic acid, and a separate halogen-bearing organic compound.

2. A lubricating composition comprising a petroleum lubricating oil, calcium phenyl stearate, and a separate halogen-bearing organic compound.

3. A liquid lubricating oil composition comprising a mineral oil base and from about 0.1%

to about 2%, based on the amount of oil, of a calcium soap of an aromatic stearic acid, and a separate halogen-bearing organic compound.

4. A liquid lubricating oil composition comprising a mineral oil base and from about 0.1% to about 2%, based on the amount of oil, of calcium phenyl stearate, and a separate halogen-bearing organic compound.

5. A lubricating composition comprising a mineral oil base and an effective amount to about 10%, based on the amount of oil, of a calcium soap of an aromatic stearic acid, and a separate halogen-bearing organic compound.

6. A lubricating composition comprising a mineral oil base and an effective amount to about 10%, based on the amount of oil, of calcium phenyl stearate, and a separate halogen-bearing organic compound.

7. A lubricating composition comprising a mineral oil base and an effective amount to about 10%, based on the amount of oil, of a calcium soap of phenyl mercapto stearic acid, and a separate halogen-bearing organic compound.

CARL F. PRUTTON.