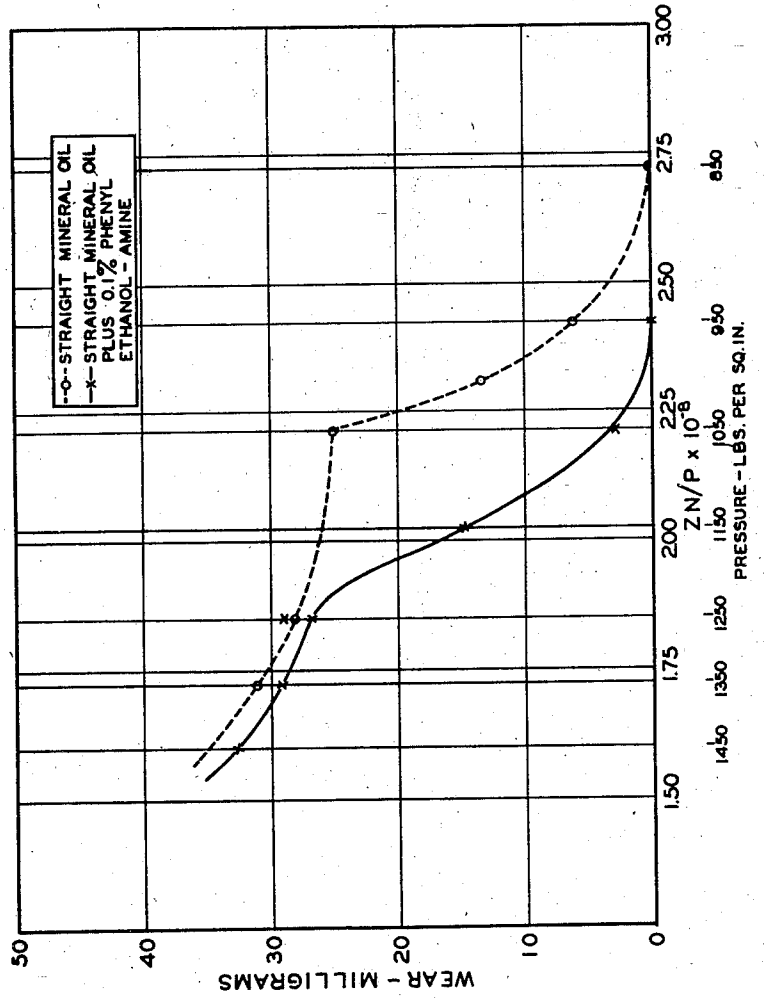
July 27, 1943. J. V. MONTGOMERY ET AL 2,325,533

LUBRICANT

Filed Oct. 7, 1940



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Patented July 27, 1943 2,325,533

UNITED STATES PATENT OFFICE

2,325,533

LUBRICANT

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Application October 7, 1940, Serial No. 360,172

4 Claims. (Cl. 252—51)

This invention relates to improved lubricating oils and particularly to addition agents for lubricants for improving the characteristics thereof.

It is known that certain oiliness or film strengthening agents added to lubricating oils and greases decrease wear during the starting of cold motors, lessen wear during operation by decreasing bearing temperatures, tend to prevent ring-sticking and cylinder scoring, and reduce internal friction in some cases. Many of these addition agents, while having the above-mentioned beneficial effects, have deleterious effect on the corrosiveness or stability of the lubricant and thus their use is of questionable overall value.

An object of this invention is to provide a lubricant having high oiliness properties.

Another object of this invention is to provide a method of increasing the oiliness of an oil or grease and at the same time reducing the corrosiveness and oxidation tendencies of the oil.

Still other objects and advantages will be apparent to those skilled in the art from a study of the following disclosure.

We have found that aryl-alkyl amino compounds containing a hydroxyl group have a marked effect in improving the oiliness characteristics of lubricants when added in relatively small proportions without injuring other qualities of said lubricants, but rather improving them. A very small amount of the aryl-alkyl amino hydroxyl compound when added to the oil or grease is sufficient to effect very definite improvements in the oil, for example, it inhibits metallic corrosion and reduces oxidation within the oil.

A series of comparative tests was made on an acid and clay treated Mid-Continent straight residual mineral oil of 60 seconds Saybolt Universal viscosity at 210° F., and on the same straight mineral oil plus additive, using a modified Timken Bearing Wear Test Machine. This machine consists essentially of a polished steel journal rotating against a section of a commercial babbitt-lined connecting rod bearing insert. A loading arm is so connected as to provide a means of varying the pressure of the rotating journal against the section of the connecting rod bearing insert. The oil to be tested is fed to the surface of the bearing insert at a predetermined rate and temperature. A series of 15 minute runs was made, with a shaft speed of 220 R. P. M., and an oil temperature of 130° F., each run under different pressures. Z N/P (viscosity times speed divided by pressure, wherein viscosity is measured in pound-minutes per square inch, speed in R. P. M., and pressure in pounds per square inch of projected bearing area, as given in Hershey; Theory of Lubrication, published in 1938, by John Wiley & Sons, Inc., New York City) values were calculated for each pressure used and plotted against the corresponding wear (loss of weight in milligrams) of the bearing insert to obtain curves which illustrate transition from fluid film lubrication with attendant low wear to thin film lubrication with attendant high wear. A shift in this transition point toward low Z N/P values is an indication of increased oiliness.

Figure 1 is a plot of curves showing the relation of Z N/P values to bearing wear in milligrams for a straight oil and this same oil plus additive.

Under the conditions of the test Z (viscosity) and N (speed) are regarded as constant, and are known. The pressure P is varied, starting with relatively low pressures, and making 15 minute runs at graded increments of pressure. The wear is measured by loss in weight of the bearing insert during the 15 minute run, and the results, that is, the loss in weight in milligrams are plotted as shown on the curve. The pressure is increased until a range is reached wherein the wear rapidly increases, with wear figures which are erratic and difficult to check. This is the transition range. As the pressure is further increased, the wear figures become orderly, and increase in proportion to the pressure, again giving a smooth curve at much higher wear figures than before. This portion of the curve is beyond the transition point. The transition point is normally taken as the mid-section of the transition range portion of the curve wherein the break occurs.

Referring to the figure of transition point curves, the straight mineral oil curve shows a transition from fluid film to thin film lubrication at a Z N/P value of 2.3×10^{-8}, while the same mineral oil containing 0.1% by volume of phenyl ethanol amine shows a transition point from the said fluid film to thin film lubrication

at a Z N/P value of 2.05×10^{-8}. As a matter of comparison, under similar laboratory conditions a sample of a commercial motor oil containing a chlorinated ester showed a transition point value of 2.15×10^{-8} and a sample of the above mentioned straight mineral oil plus 0.25% castor oil showed a transition point value of 2.00×10^{-8}.

Thus, it is evident that a mineral oil containing our additive will continue to furnish fluid film lubrication with attendant low wear, under conditions of higher load, lower speed, or higher temperature (which decreases the viscosity of the oil) than the same straight mineral oil without our addition agent. A lubricant containing a small quantity of our additive becomes a tenacious lubricant in that it more readily wets, lubricates and adheres to the metallic surface to be lubricated and is resistant toward removal therefrom.

While the lubricating properties of an oil containing 0.1% by volume of phenyl ethanol amine is illustrated in the accompanying figure, we do not wish to be limited by the use of this amount of film strengthening additive since the use of large quantities, for example up to 0.2% by volume, as well as smaller volumes, have been found to give results comparable to those illustrated in the figure.

The anti-oxidation and anti-corrosion effects which are exerted by our compounds are probably due to the fact that our compounds contain an amino group and therefore are basic in nature. Being basic, they tend to react with the acidic oxidation products of the oil as fast as these are formed during oxidation of the oil with use. In this manner, the well known auto-catalytic effect of these products toward oxidation is prevented. Likewise, the reaction products of our basic compounds with organic acids are neutral in nature and therefore non-corrosive.

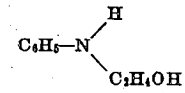
Our compounds retain their oiliness properties during use, and this is probably due to the fact that the reaction products of our basic compounds with oxidation products from the oil are in themselves oiliness imparting agents.

The original oiliness imparting properties of our compounds are probably due to the fact that our compounds are highly polar and contain the favorable combination of an amino group, a hydroxyl group, and an aromatic group in the same molecule. The presence of the aromatic group serves to make our compounds highly miscible with the mineral oil, and thus we avoid the use of auxiliary solvents.

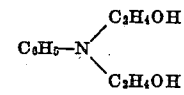
Our compounds are high boiling and stable, and thus remain in the oil at elevated temperatures. For instance, the boiling range of the commercial phenyl ethanol amine used in the above cited example was:

	Degrees F.
Initial boiling point	506
5%	520
50%	526
End point	534

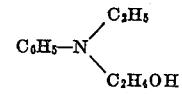
A sample of commercial phenyl ethanol amine of the above given distillation characteristics is composed mainly of the compound phenyl ethanol amine, having the structural formula



and two impurities present in lesser amounts, one of which is phenyl diethanol amine, having the formula



and phenyl ethyl ethanol amine, having the formula



We do not wish to be restricted by any theories as to the reasons for the beneficial results obtained by the use of our compounds in lubricating oils but only by the limitation of the following claims.

We claim:

1. An improved lubricant of the class consisting of oils and greases having incorporated therein as a film strengthening agent phenyl ethanol amine in amount less than 0.2%.

2. An improved lubricant of the class consisting of oils and greases having incorporated therein phenyl ethanol amine to improve the film strength of the lubricant.

3. An improved lubricant of the class consisting of oils and greases having incorporated therein commercial phenyl ethanol amine to improve the film strength of the lubricant.

4. An improved lubricant of the class consisting of oils and greases having incorporated therein as a film strengthening agent commercial phenyl ethanol amine in amount less than 0.2%.

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