

UNITED STATES PATENT OFFICE

2,340,073

LUBRICATING OIL

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No Drawing. Application March 2, 1942
Serial No. 433,019

8 Claims. (Cl. 252—37)

This invention relates to lubricating oils and more particularly to lubricating oils having good lubricating qualities and viscosities when used at low temperature and at comparatively high temperatures.

The aeroplane is an example of a machine that is required to be operated through a wide range of temperatures. Some of the parts and the instruments on the planes must be lubricated and freely movable at temperatures as low as -50° F. and as high as 200° F.

The primary object of the present invention is to provide a lubricant that is a mobile liquid and has lubricating qualities over a wide range of temperature and is particularly adapted for use at low temperatures.

Mineral oil lubricants which have a low pour test and especially those lubricants that are mobile liquids at -50° F. generally have a very low viscosity at temperatures of 200° F. It is desirable for machines and instruments that are to be lubricated when operating in this wide temperature range to have a lubricant that will provide a substantial lubricating film of oil on the parts throughout the temperature range of its operation.

Accordingly another object of the invention is to provide a lubricant that is a mobile liquid through a temperature range of approximately -40° F. to 200° F. and still have a tackiness or film forming characteristic that will coat the parts to be lubricated through the temperature range of use.

With these and other objects in view the invention consists in the improved lubricant hereinafter described and particularly defined in the claims.

The preferred lubricant is composed essentially of the following ingredients:

	Per cent by volume
Tributyl phosphate.....	78.00
Polymerized castor oil.....	20.00
Lead naphthenate.....	00.75
Polane.....	1.00
Santolube #261.....	00.25

In place of the tributyl phosphate, triethyl phosphate may be substituted in the above formula.

The tributyl and triethyl phosphates have lubricating characteristics and at the same time these liquids have a very low pour point characteristic. The mixture of the tributyl or triethyl phosphates with castor oil produces a product which has a pour point of -75° F. to -80° F.

The polymerized castor oil is a product of com-

merce which is an ordinary castor oil that has been given a heat treatment to polymerize a portion of the oil. The ordinary castor oil is insoluble in mineral lubricating oils but the polymerized castor oil is soluble in mineral lubricating oils. The heat treatment of the castor oil may be done under atmospheric pressure or under comparatively high pressure. In either case the heat treatment should be carried out so that the temperature of the oil will not be carried above 570° F. The heat treatment of castor oil is preferably carried out in an inert atmosphere, such as carbon dioxide, or nitrogen, and this tends to destroy those portions of the castor oil that readily becomes rancid. The polymerized castor oil has oiliness characteristics and extreme pressure characteristics. Furthermore it has pronounced film forming characteristics that provide a good coating or film on the parts to be lubricated.

The lead naphthenate is used in the above formula in a comparatively small amount and has the characteristic of giving the oil an adhesiveness or tackiness that helps it to adhere to the metal parts being lubricated to form a film. The mixture of tributyl phosphate and polymerized castor oil will adhere quite readily to metal parts at the low temperatures at which it is to be used, that is 0° to -40° F., but when it is heated to 200° F. the film becomes very thin or breaks. The presence of lead naphthenate tends to form a continuous film at the higher temperatures and seems to have a characteristic of maintaining a practically uniform thickness of film throughout the range of -40° F. to 200° F. Lead naphthenate is quite effective also in rendering the mixture of tributyl phosphate and polymerized castor oil non-corrosive.

The extreme pressure agent Polane, is a product sold under the name of Polane by the Patent Chemicals Company and is an ester of a fatty acid or a chlorinated ester of a fatty acid, such as ethyl laurate or chloromethyl stearate. The Polane is soluble in the tributyl phosphate and the polymerized castor oil and helps to give extreme pressure lubricating qualities to the product.

Santolube #261 is an additive commonly used in modifying the properties of lubricating oils. This additive is manufactured by the Monsanto Chemical Company and is described as a metallic derivative of an alkylated carboxylic acid containing compounds of tin and sulfur. This additive may be defined as a sulfurized tin salt of an alkyl phenol carboxylic acid. The percentage of tin and sulfur in the additive is 3.25 percent and

0.8 percent by weight respectively. This additive is a pour point depressant and an antioxidant and acts also as an inhibitor for preventing corrosion to the metallic parts being lubricated.

The lubricating oil containing tributyl phosphate as outlined in the formula above is a stable liquid at temperatures of 200° F. and above. This liquid has the following Saybolt viscosity characteristics:

	Degrees Fahrenheit
1350 seconds at-----	-40
270 seconds at-----	0
62 seconds at-----	77
52 seconds at-----	100
35 seconds at-----	200

The viscosity of the product containing triethyl phosphate is considerably lower throughout the temperature range of -40° F. to 200° F.

The preferred form of the invention having been thus described, what is claimed as new is:

1. A wide range of temperature lubricant consisting of a major portion of tributyl phosphate and polymerized castor oil inhibited against oxidation and corrosion.

2. A wide range of temperature lubricant consisting of approximately one part of polymerized castor oil to four parts of tributyl phosphate which is inhibited against oxidation and corrosion by a small amount of an ester of a fatty acid and a sulfurized tin salt of an alkyl phenol carboxylic acid.

3. A wide range of temperature lubricant con-

sisting of a major portion of triethyl phosphate and polymerized castor oil inhibited against oxidation and corrosion.

4. A wide range of temperature lubricant consisting of a major portion of tributyl phosphate and polymerized castor oil, a minor portion of an extreme pressure additive, said mixture being inhibited against oxidation and corrosion.

5. A wide range of temperature lubricant consisting of essentially tributyl phosphate and polymerized castor oil to which are added minor portions of lead naphthenate, an ester of a fatty acid and a sulfurized tin salt of an alkyl phenol carboxylic acid.

6. A wide range of temperature lubricant comprising tributyl phosphate 78 percent by volume, polymerized castor oil 20 percent by volume, lead naphthenate 0.75 percent by volume, an ester of a fatty acid 1 percent by volume, and a sulfurized tin salt of an alkyl phenol carboxylic acid 0.25 percent by volume.

7. A wide range of temperature lubricant having a pour point below -60° F. consisting of a mixture of tributyl phosphate and polymerized castor oil inhibited against oxidation and having a viscosity of approximately 1350 seconds at -40° F. and 35 seconds at 200° F.

8. A wide range of temperature lubricant consisting of a major portion of a trialkyl phosphate and polymerized castor oil inhibited against oxidation and corrosion and having substantial film forming characteristics in the temperature range of -40° F. to 200° F.

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