Patented June 9, 1936 2,043,962

UNITED STATES PATENT OFFICE

2,043,962

LUBRICANTS

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No Drawing. Application March 21, 1934, Serial No. 716,647

3 Claims. (Cl. 87—9)

This invention relates to lubricants and more particularly to sulfurized oils such as cutting oils and extreme pressure lubricants.

It has been known heretofore that improved oils for use as cutting fluids and extreme pressure lubricants may be obtained by incorporating sulfur therein. A convenient method of adding the sulfur to the oil is through the agency of a sulfur base soluble in the oil and containing a high sulfur content.

In my copending application, Serial No. 660,441, filed March 11, 1933, I have disclosed how an improved sulfur base for sulfurized oils may be obtained by reacting sulfur with a terpene compound, such as pine oil, under the influence of heat and superatmospheric pressure.

I have now found that a further improved sulfur base may be obtained if a sulfurized pine oil is distilled to produce a distillate fraction and a residuum and I have discovered that when a sulfurized pine oil is distilled, the sulfur is not distributed equally through the various fractions obtained but a high concentration is found in the residuum. The residuum so obtained is largely soluble in hydrocarbon oil and constitutes an advantageous agency for incorporating the desired amount of sulfur into the oil to be sulfurized. I have found that best results may be obtained by distilling a pine oil which has been sulfurized in the presence of heat and while under a superatmospheric pressure although the invention is not limited thereto. The following example will illustrate one method of practicing the invention:

A sample of pale steam distilled pine oil having an iodine value of 100–125 was mixed with about one-third its weight of sulfur and heated in a closed grease kettle for about two to three hours at a temperature around 300°–400° F., and a pressure of approximately 100 lbs. per sq. in., gauge, was maintained during the operation. The sulfur was completely taken up by the oil to form a brownish product which was quite fluid and had a sulfur content of about 22%. The sulfurized oil so obtained was subjected to distillation and about 72% thereof was taken off under reduced pressure as a distillate fraction at a maximum temperature of about 388° F. The residue which constituted a sulfur base amounted to nearly 24% of the charge and contained in the region of 30% sulfur.

The sulfur base prepared as above may be mixed with lubricating oils in sufficient amount to give the oil a sulfur content of about 1–10%. Usually about 5–25% of a residuum containing 25–30% sulfur is sufficient. The residuum may be added to a light lubricating oil having a Saybolt universal viscosity of about 70 at 100° F. to produce a cutting oil, or to heavier oils, such as those having a Saybolt universal viscosity of 200 at 100° F. to 250 at 210° F., to produce gear lubricants having extreme pressure characteristics. I have found that a sulfur content in the finished oil of about 3–6% gives best results.

In the above example, pale steam distilled pine oil was used in order to produce a product of light color. It will be understood, of course, that other grades of pine oil may be useful. Also, instead of pine oil, other terpene-like compounds, such as pine tar, various terpenes, and terpineols, etc., are contemplated.

The conditions for the treatment of the pine oil with sulfur may also be varied and good results be obtained. Pressures within the range of 50–500 lbs. per sq. in. are usually satisfactory. The time of digestion may range between 1–5 hours, depending on the temperature, which may vary from 300°–500° F.

The extent to which the distillation of the sulfurized pine oil is carried may be left somewhat to the discretion of the operator. While the residuum in the above example amounted to about 22%, it is contemplated that other percentages may be more advantageous with other oils or different distillation conditions. The distillation should be discontinued while the residuum is still fluid and substantially soluble in hydrocarbon oils. In some cases it may be advantageous to conduct the distillation under vacuum. The skilled chemist will find no difficulty in obtaining a product of a predetermined sulfur content and of desired properties. I prefer that the distillation be controlled so that the residuum constitute about 20–25% of the charge although this percentage may vary from 15–50 with good results.

The use of a high sulfur content residuum for incorporating sulfur into lubricants has the advantage that such an oil is much less volatile than the original sulfurized pine oil from which it is prepared, and the low volatility produces minimized smoking during high speed metal cutting operations.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A sulfur base, largely soluble in hydrocarbon lubricating oils, consisting essentially of a residuum obtained from the distillation of a pine oil sulfurized under superatmospheric pressure, said residuum consisting of a minor portion of said sulfurized pine oil and containing about 25–30% sulfur.

2. A cutting oil comprising a light lubricating oil and a sulfurized pine oil residuum, said residuum consisting of the bottoms resulting from the partial distillation of a pine oil sulfurized under pressure and amounting to about 15–50% of the original pine oil.

3. A lubricant for extreme pressure use, comprising a heavy lubricating oil and 5–25% of a sulfurized pine oil residuum, said residuum consisting of a minor proportion of the original pine oil and resulting from the partial distillation to relatively non-volatile bottoms of a pine oil sulfurized under superatmospheric pressure.

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