Patented June 15, 1943 2,322,184

UNITED STATES PATENT OFFICE

2,322,184

LUBRICATING COMPOSITION

Ellis R. White, Albany, Calif., assignor to Shell Development Company, San Francisco, Calif., a corporation of Delaware

No Drawing. Application January 21, 1941, Serial No. 375,245

6 Claims. (Cl. 252—32)

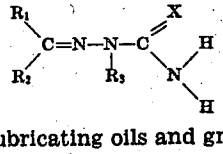
This invention relates to improved compositions of matter comprised of normally liquid or solid organic substances containing an added ingredient which improves their properties in one or more important respects. More particularly it relates to improved lubricating oils and greases.

Within recent years many different substances have been added to lubricating oils and greases to impart to them properties not ordinarily possessed by such materials or to improve certain characteristics already possessed by them or to inhibit the development of undesirable properties latently present in the oil. It is customary, for example, where the lubricating oil is subjected to oxidizing conditions as in an automobile crankcase, to add an agent which will inhibit oxidation of the oil. It is also customary to improve the protective effect on rubbing surfaces by the addition of certain substances which reduce corrosive or abrasive wear, or both, scuffing, and seizure which normally follow a break in the continuity of the lubricating films due to extreme pressure or unfavorable speed conditions.

I have discovered that semicarbazones and certain related compounds are useful in bringing about various improvements in hydrocarbon oils when added thereto in relatively small amounts.

Therefore, it is an object of this invention to provide oil-soluble addition agents which when dissolved in lubricating oil will reduce wear, scoring, and seizure of metal bearing surfaces. Another object is to reduce corrosiveness of hydrocarbon oils and to provide hydrocarbon oils of high stability which resist breakdown and sludge formation under severe oxidizing conditions.

According to this invention, semicarbazones or thiosemicarbazones having the general formula



are added to lubricating oils and greases. In this formula X represents oxygen or sulfur, R_1, R_2 and R_3 may be hydrogen or aliphatic, alicyclic, aromatic or mixed hydrocarbon radicals which may form ring structures. Compounds in which R_1 and R_2 form a ring structure are particularly effective as anti-wear compounds and are in this respect superior to the corresponding compounds which do not possess such ring structure.

The hydrocarbon radicals may contain preferably not more than one polar, neutral or basic substituent. Suitable substituents are, for example, —CN, —OH, —OR', —COR', —COOR', —NH_2, —NHR', —NR'R'', —NO, —NO_2, —SR', wherein R' and R'' are hydrocarbon radicals such as alkyl, aryl, aralkyl and cyclo-alkyl radicals.

To be useful, it is normally desirable that the compounds of this invention be soluble in the material to be improved. This requires the presence in the molecule of oil-solubilizing radicals. Some of the compounds otherwise complying with the above general formula are only slightly soluble in mineral oils under normal conditions because they possess oil-solubilizing radicals which are too small or which are present in insufficient numbers.

Effective oil-solubilizing radicals are in general hydrocarbon radicals possessing at least 6 and preferably 10 or more carbon atoms such as tetradecyl, ercosyl, tetracosyl, and diethyl cyclononyl, etc. radicals.

Solubility, however, is not always essential. For example, compounds having extreme pressure properties may merely be suspended in lubricating oils and yet be effective. Suspensions of little-soluble or insoluble addition agents may be particularly useful in greases, such as soda soap greases, calcium soap greases, aluminum soap greases, petrolatum greases, etc., with which they may form stable plastic mixtures.

The amounts of my compounds to be added to the hydrocarbon oils effectively to improve their properties will vary with the type of improvement to be achieved. In general, when added to lubricating oils to improve wear resistance, the amounts required normally vary from .1% to 10% preferably .5% to 5% depending upon the conditions to be met. If complete solubility of the addition agent is required, its solubility limits frequently set the upper limits of the amount which can be safely incorporated.

Specific compounds of this group are methyl heptadecyl semicarbazone, palmitone semicarbazone, stearone semicarbazone, lauryl phenyl semicarbazone, diphenyl semicarbazone, the semicarbazone produced by condensation with a high molecular weight cyclic ketone obtained in the polymerization of mesityl oxide, etc.

The semicarbazones are prepared by the reaction of aldehydes or ketones such as methyl heptadecyl ketone with semicarbazide.

If desired, oils containing the semicarbazones or thiosemicarbazones may in addition also contain other addition agents normally added to hydrocarbon oils. Thus, the compounds of this invention may be used, for example, in lubricating oils together with conventional antioxidants, blooming agents, anti-corrosives, extreme pressure compounds, detergents, wedging compounds, long chain polar compounds, etc.

The effects of semicarbazones on lubricating oils are further illustrated by the following example.

Example

A sample of Poso raffinate, SAE 20 grade, was divided into two portions. 1% by weight of a semicarbazone produced by condensation with a C_{18} cyclic ketone (which in turn was obtained by polymerizing mesityl oxide under conditions to split off water and hydrogenating the resulting product to eliminate olefinic double bonds) was dissolved in the second portion. The doped and undoped oils were then tested on the Multiple four-ball machine similar in principle to the Boerlage apparatus described in the magazine, Engineering, vol. 136, July 14, 1933.

This apparatus consists of six sets of four steel balls, each set arranged in pyramid formation. The top balls are rotated by spindles against the three bottom balls, which are clamped in a stationary ball holder. Each set of three lower balls is immersed in the oil to be tested. The wear is measured by the average diameter of the scars worn in the lower balls.

The tests were run at 130° C. at 700 R. P. M. under a vertical load of 7 kg. for a period of 2 hours.

Results were as follows:

Material	Average diameter of scars, mm.
Undoped oil	0.67
Oil+C_{18} ketone semicarbazone from mesityl oxide	0.40

The oil-improving agents contemplated by this invention may be individual compounds or mixtures thereof.

I claim as my invention:

1. An improved lubricant comprising predominantly a mineral lubricating oil having admixed therewith a minor proportion of an addition compound selected from the group consisting of semicarbazones and thiosemicarbazones.

2. The lubricating oil of claim 1 which contains .1% to 10% by weight of the addition compound.

3. An improved lubricating oil composition comprising predominantly a lubricating oil having admixed therewith a small amount of a semicarbazone produced by condensing semicarbazide with a high molecular weight cyclic saturated ketone.

4. An improved lubricating oil composition comprising predominantly a lubricating oil having admixed therewith a small amount of a semicarbazone produced by condensing a semicarbazide with the C_{18} cyclic ketone obtained by polymerizing mesityl oxide.

5. An improved lubricating oil composition consisting essentially of a mineral lubricating oil having dissolved therein a small amount of an oil-soluble semicarbazone.

6. An improved grease composition comprising predominantly mineral lubricating oil, a soap and admixed therewith a small amount of a semicarbazone.

ELLIS R. WHITE.