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STABLE WHITE OIL

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This invention relates to improved white oil products which are stable against the oxidizing action of air.

One object of the invention is to increase the value of highly refined white oils by rendering them resistant to oxidation when exposed to the air for a considerable length of time.

Another object is to prepare superfine lubricating oils for use in steam turbines or for similar applications.

Other objects and advantages will be apparent in the course of the following description.

In many uses of oil, acidity or acid formation on its prolonged contact with air are objectionable. It has been considered for a long time that the degree of refining of an oil is a measure of its stability. Gurwitch (Wissenschaftliche Grundlangen der Erdolverarbeitung (1924) pages 32–42) said that: "The resistance of a petroleum product to the action of the oxygen of the air is the greater the more thoroughly it has been refined with sulphuric acid". Nevertheless he also noticed the instability toward air and light of kerosene treated by oleum and filtered. Many other such observations have led Gurwitch to remark that "we are thus confronted by the paradox that under certain conditions too careful refining lowers the quality of an oil by making it more easily oxidizable."

It has been my experience with the highly refined white oils that they are especially easily attacked by the oxygen of the air and develop acidity much sooner than a similar oil which has not been refined so far. White oils, as known to those skilled in the art, are prepared by extensive treatment with strong sulphuric acid of the middle fractions of crude oils, such as gas oil, light lubricating oils, etc. I have found, for instance, that on blowing air through a sample of commercial grade of white oil kept at a temperature of 300° F. the acidity, expressed in milligrams of KOH per gram of the oil, increased about 3 points for every five hours of blowing while under the same conditions the acidity of a petrolatum oil increased quite inconsiderably, its value being somewhat less than ½ point after 20 hours of air blowing. It will be understood that the oxidation of the white oils proceeds at lower temperatures too although its rate decreases with decreasing temperature. However, these oils will develop acidity even at atmospheric temperature on long exposure to air, especially in summer time.

After having ascertained the great sensibility of white oils to oxidation by air, I discovered in my further experiments that the same oils can be rendered practically stable and non-oxidizable on exposure to air by the addition of small amounts of certain chemical compounds which may be termed "anti-oxidation catalysts". I have obtained some inhibitory action with various elements and compounds. But the most complete protection was obtained by the addition to the oil of higher mercaptans such as thio-beta-naphthol, $C_{10}H_7SH$. This compound is better called beta-naphthyl mercaptan since it does not contain the hydroxyl group and is therefore not a true naphthol. This compound gave complete protection from acidity when added in an amount of from 0.05–0.1%. The mercaptans of other condensed nuclei gave also good results. The expression of "complete protection" is intended to means that no acidity was developed on 24 hours oxidation by blowing air through the oil at 300° F.

The white oils thus stabilized against the oxidizing action show improved characteristics when such oils are used for various purposes. One specific use which is novel for such oils should be specifically pointed out. I have discovered that white oils having viscosities from 85 to 360 seconds at 100° F. may be used as superfine turbine oils when they contain a small amount of an anti-oxidation catalyst. They will not develop sludge and acidity even at high bearing temperatures and therefore can be used for a very long time so that shut-downs for cleaning are practically eliminated. The following physical characteristics of a white oil base turbine oil are given by way of illustration:

Gravity	29.3°–30.2° A. P. I.
Pour	20° F.
Visc. @ 100° F	150–160 sec. (Saybolt Universal)
Color	30+Saybolt

White oils having other characteristics may be compounded with the anti-oxidation catalyst. However, for many purposes, it is advantageous to use a white oil having a viscosity of not less than 85 and not more than 360 seconds at 100° F.

Other mercaptans than those of condensed nuclei may be used as anti-oxidation catalysts for turbine oils, if they have high molecular weights and high boiling points. High molecular weight compounds will not attack the copper and other metals in the turbine, and the high boiling points will insure the non-evaporation of the anti-oxidant. As an example of the lowest permissible molecular weight paraffinic mercaptan, I have found normal heptyl mercaptan to be a moderately good anti-oxidant.

In the following claims the term "high boiling mercaptan" is meant to designate a mercaptan which does not volatilize out of the white oil when the oil is used for the lubrication of the turbine.

Having thus described and illustrated my invention, I claim the following:

1. A stabilized petroleum white oil composition comprising a petroleum white oil in combination with a small amount of a compound selected from the class consisting of mercaptans having at least seven carbon atoms and substantially soluble in petroleum white oil.

2. A stabilized petroleum white oil composition, comprising a petroleum white oil and heptyl mercaptan.

3. A method of protecting a petroleum white oil against oxidation, which comprises mixing with said oil a small amount of a compound selected from the class consisting of alkyl mercaptans having at least seven carbon atoms and substantially soluble in petroleum white oil.

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