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LUBRICANT

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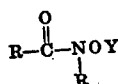
The present invention relates to improvements in hydrocarbon oil compositions and more particularly relates to stable, corrosion inhibiting hydrocarbon oil compositions.

It is known to incorporate in hydrocarbon oil compositions certain types of additives to impart to the hydrocarbon oil compositions certain desired properties. Thus, for example, certain types of additives are incorporated in hydrocarbon oil compositions to impart oxidation stability and others are added to impart to such oil compositions rust and/or corrosion inhibiting properties. Thus, for example, it is known to incorporate in turbine oils known antioxidants such as beta-naphthol to improve the oxidative stability of the oils. It is also known, for example, to add to turbine oils a corrosion inhibitor such as stearic acid to impart to the turbine oil rust inhibiting properties. However, it has been observed that frequently the addition of one type of additive affects the effectiveness of other additives which may be present in the oil.

It is an object of the present invention to provide a hydrocarbon oil composition containing in combination several types of compounds, each of which imparts a synergistic effect upon the other.

It is another object of the invention to provide a turbine oil resistant to oxidative deterioration and which is effective in inhibiting rusting and/or corrosion.

We have discovered that the foregoing objects can be obtained by incorporating in combination the following additives to hydrocarbon oil, particularly a mineral oil whether highly refined or pale oil: an antioxidant, for example, from about 0.001% to about 0.1% and preferably from about 0.01% to about 0.1% of an hydroxy condensed ring compound or alkyl derivatives thereof such as, for example, beta-naphthol, octyl beta-naphthol, amyl beta-naphthol, alpha-naphthol, cetyl alpha-naphthol and other alkyl derivatives of beta-naphthol and alpha-naphthol, and/or from about 0.001% to about 3% of N-phenyl-alpha-naphthylamine, from about 0.0005% to about 0.5% and preferably from about 0.001% to about 0.05% of a fatty acid, particularly stearic acid as corrosion and/or rust inhibitors, and from about 0.0005% to about 1% and preferably from about 0.001% to about 0.05% of an hydroxamic acid compound having the general formula:



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in which R is a substituent selected from the class consisting of hydrogen, alicyclic radicals, saturated aliphatic radicals, and mono-unsaturated aliphatic radicals, and Y is a substituent selected from the class consisting of H, NH₄ and amine substituents. The alicyclic radical is preferably a naphthene radical. The naphthenes are cyclo paraffins consisting of one or more cyclo paraffin rings which may contain alkyl or other substituent groups. The mono-unsaturated aliphatic radical is an unsaturated aliphatic radical containing only one ethylene linkage. The amine substituent can be a primary, secondary or tertiary mono-amine or a polyamine, or the corresponding substituted amines, preferably the alkyl substituted amines.

Examples of specific compounds coming within the foregoing formula are: naphthenohydroxamic acids, laurohydroxamic acid, behenhydroxamic acid, myristhydroxamic acid, oleohydroxamic acid, ammonium salts of these hydroxamic acids, and the amine salts of hydroxamic acid, such as the amyl amine salt of naphthenohydroxamic acid, lauryldiamine salt of naphthenohydroxamic acid and the like.

Each of the aforementioned components is a necessary constituent in order to obtain a product having the optimum oxidation and rust inhibiting characteristics although very satisfactory products are obtained by employing either N-phenyl-alpha-naphthylamine or the naphthol antioxidants, for example beta-naphthol and/or octyl beta-naphthol.

For the purpose of exemplifying the present invention, the same will be discussed as applied to steam turbine lubrication for which highly refined oils having Saybolt Universal viscosities at 100° F. of from about 150 seconds to about 350 seconds are employed, although it is to be understood that the invention is not limited to this embodiment. With the advent of drastic refining treatments to produce more highly refined turbine oils having improved color, sludge resistance, and emulsification properties, the desirable components of the oils responsible for preventing the oxidative deterioration of the oils and those compounds responsible for the wetting and therefore rust inhibiting qualities of the oil are removed. To overcome the susceptibility of such oils to oxidative deterioration, antioxidants are usually employed. While the addition of such antioxidants inhibits the oxidation of such oils, the rust inhibiting properties of the oils are not affected. In steam turbines rusting is usually encountered in the upper portions of the oil reservoirs and

other parts of the system caused by droplets of water coming in contact with the steel surfaces which have been covered by the oil and displacing it. An oil will provide adequate protection against rusting only if it wets the steel surfaces preferentially as compared with water. In the presence of oils which provide no protective coating the steel surfaces are attacked by the water with the resultant formation of ferric oxide and black magnetic oxide. As the rusting progresses the oxides scale off and may be carried in suspension in the oil, often scoring bearings, plugging oil lines, and causing faulty operation or sticking of the delicate governor parts. The need for non-rusting turbine oils as well as oxidation resistant oils is therefore great. To determine the effectiveness of the present invention in providing a turbine oil which is resistant to oxidation and which is effective in inhibiting rusting, a turbine oil comprising a highly refined mineral oil having a Saybolt Universal viscosity at 100° F. of about 160 seconds was compounded with 0.05% beta-naphthol, 0.025% N-phenyl-alpha-naphthylamine, 0.01% naphthenohydroxamic acid and 0.01% stearic acid, and subjected to the Proposed method of test for oxidation characteristics of steam-turbine oils, published on pp. 17-20 of A. S. T. M. Standards on Petroleum Products and Lubricants (September, 1943). The oil in this test had a life of 2950 hours, demonstrating the stability of the oil against oxidative deterioration. Furthermore, the iron wire used as a catalyst in the test showed no rusting at the end of this time under the very drastic conditions called for in the test, demonstrating the rust inhibiting properties of the compounded oil.

The presence of the fatty acid such as stearic acid in the oil composition not only is effective in inhibiting rusting and/or corrosion but in addition thereto imparts a synergistic effect to the oxidation stability of the oil. This is clearly shown by the following data obtained from the proposed A. S. T. M. turbine oil oxidation tests employing a pale oil containing various additives:

	Oil	Oil Life in Hours
A	Control	
B	Control+0.01% naphthenohydroxamic acid+0.01% stearic acid	210
C	Control+0.2% N-phenyl-alpha-naphthylamine	145
D	Control+0.1% N-phenyl-alpha-naphthylamine+0.01% naphthenohydroxamic acid	270
E	Oil D+0.01% stearic acid	450
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The above data are typical of many more which demonstrate that the combination of the fatty acid such as stearic acid and the hydroxamic acid such as naphthenohydroxamic acid contributes to the rust inhibiting and antioxidant synergism given by the above-disclosed additives.

While the present invention is particularly adapted to turbine oils, it is not necessarily limited thereto but can be applied in imparting to other types of hydrocarbon oils such as pale oils, transformer oils, synthetic oils, and the like oxidation stability and rust inhibiting characteristics. It is therefore to be understood that while we have described our invention in connection with a preferred embodiment thereof, our invention is not limited thereto except in so far as the same is defined by the appended claims.

We claim:

1. An oxidation stable and rust inhibiting hydrocarbon oil composition comprising a hydrocarbon oil normally susceptible to oxidation and lacking rust inhibiting properties and in combination therewith from about 0.001% to about 0.1% of a beta-naphthol, from about 0.001% to about 3% of N-phenyl-alpha-naphthylamine, from about 0.0005% to about 0.5% stearic acid, and from about 0.0005% to about 1% naphthenohydroxamic acid.
2. An oxidation stable and rust inhibiting hydrocarbon oil composition comprising a hydrocarbon oil normally susceptible to oxidation and lacking rust inhibiting properties and in combination therewith from about 0.001% to about 3% of N-phenyl-alphanaphthylamine, from about 0.0005% to about 0.5% stearic acid, and from about 0.0005% to about 1% naphthenohydroxamic acid.
3. A turbine oil resistant to oxidative deterioration possessing rust inhibiting properties comprising a highly refined mineral oil having a Saybolt Universal viscosity at 100° F. of from about 150 seconds to about 350 seconds and in combination therewith from about 0.01% to about 0.1% of a beta-naphthol, from about 0.01% to about 0.2% of N-phenyl-alpha-naphthylamine, from about 0.001% to about 0.05% stearic acid, and from about 0.0005% to about 1.0% naphthenohydroxamic acid.

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