

UNITED STATES PATENT OFFICE

2,239,841

LUBRICATING OIL AND LUBRICATION
THEREWITHElmer William Cook, New York, N. Y., assignor to
Tide Water Associated Oil Company, Bayonne,
N. J., a corporation of DelawareNo Drawing. Application December 12, 1938,
Serial No. 245,218

7 Claims. (Cl. 252-51)

This invention relates to mineral oil compositions comprising petroleum oils of a viscous or lubricating nature as contrasted with non-viscous hydrocarbons of the character of gasoline or kerosene. It is particularly concerned with mineral oil compositions comprising lubricating and like oils having incorporated therewith small but sufficient amounts of an organic morpholine derivative effective to inhibit or retard deterioration and deterioration effects in service.

Under conditions of both storage and service petroleum lubricating oils having a tendency to undergo various physical and/or chemical changes with resultant oxidation and formation of acids, increase in viscosity and increase in carbon residue. These deterioration tendencies are amplified many fold at increasingly higher temperatures. Metals, likewise, seem to increase the susceptibility of petroleum lubricating oils to deterioration of the aforesaid character. It is a primary object of the present invention, therefore, to inhibit or retard the above and other deteriorating influences by the addition to lubricating and like oils of a small amount of an oil-soluble organic morpholine derivative.

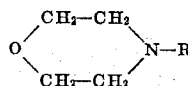
The present application is a continuation-in-part of my copending application Serial No. 158,918, filed August 13, 1937, now Patent No. 2,139,726 issued December 13, 1938, for improvements in Lubricating oil and lubrication therewith; and in one important embodiment the present invention is concerned with lubricants intended for service in the lubrication of internal combustion engines. These now are frequently equipped with bearings comprising or surfaced with cadmium-silver, cadmium-nickel, copper-lead or like alloys having substantially the corrosion susceptibility of the stated alloys. Such harder, higher melting alloys are in certain respects better adapted to the requirements of modern internal combustion engines than the conventional Babbitt metal bearings, in view of greatly increased bearing pressures and the high temperatures which may obtain at bearing surfaces during operation. The mechanical superiority of cadmium-silver and other special alloy bearings is largely offset, however, by a marked susceptibility to corrosion under service conditions by many available lubricating oils—particularly oils which by nature or refining are of the character generally regarded as superior lubricants by conventional criteria (e. g., high viscosity index, substantially or reasonably free from sludge-forming tendencies, etc.).

Under service conditions the presence of cad-

mium-silver and like alloys appears to catalyze reactions tending toward lubricant degradation. Such alloys likewise seem to be particularly susceptible to corrosion by lubricants which have undergone deterioration in service. It has been suggested that corrosion of bearing metals in internal combustion engines involves a cyclic action or chain of reactions in the course of which the catalytic effect of the bearing metal accelerates oil deterioration and the products of deterioration in turn attack the bearing surfaces with resultant corrosion thereof.

The invention, however, is concerned with retarding lubricant deterioration and deterioration effects without limitative regard to the foregoing or other theory which may be advanced to explain causes or results. It has been found that organic morpholine derivatives comprise a class providing compounds effective to inhibit oil deterioration and deterioration effects. According to the invention, service degradation of oils is retarded and the corrosiveness of motor oils to cadmium-silver and like alloys markedly diminished by dissolving in the oil prior to use small but sufficient proportions of an organic morpholine derivative inhibitor. It is, therefore, an object of the invention to improve, and to prepare improved, lubricating oils of petroleum origin by incorporating therein an organic morpholine derivative inhibitor in small but effective proportions. In a special aspect, the invention may be regarded as encompassing a novel method of lubricating bearings surfaced with an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel or copper-lead alloys by applying to the bearing surfaces lubricant comprising mineral hydrocarbon oil normally tending to corrode such alloys and having incorporated therein corrosion retarding proportions of an organic morpholine derivative inhibitor.

Inhibitors according to the invention are compounds conforming to the general formula



wherein R is either alkyl or aryl and may carry one or more substituent groups such as alkyl, aryl, alkoxy, hydroxy and amino groups. Among the compounds wherein R is an alkyl group, those having from 1 to about 10 carbon atoms in the alkyl residues are presently preferred and the aliphatic chain may be either straight or branched. Where R is aryl, phenyl and naphthyl groupings are preferred. Inhibitors selected

from the defined class need not consist of one or another pure organic morpholine derivative, mixtures being effective.

Illustrative of the organic morpholine derivatives which may be regarded as encompassed within the scope of the present invention are the following:

p-Ethoxy phenyl morpholine
4-phenyl morpholine
o-Hydroxy phenyl morpholine
p-Hydroxy phenyl morpholine
a-Naphthyl morpholine
b-Naphthyl morpholine
p-Tolyl morpholine
Amino phenyl morpholine
Methyl amino phenyl morpholine
Ethyl amino phenyl morpholine

The individual effectiveness of organic morpholine derivative inhibitors will vary somewhat as might be expected, some being more effective than others in given proportions. In general it is preferred to use those having greatest inhibitor effectiveness at small concentrations.

As indicated hereinbefore, organic morpholine derivative inhibitors have proved markedly effective in retarding the corrosion of bearing metals by lubricating oils normally corrosive thereto under high temperature service conditions obtaining in internal combustion engines. Concurrent oil deterioration as evidenced by undesirable increases in viscosity, carbon residue, neutralization number and Indiana precipitation number also is retarded in beneficial degree by the use of inhibitors as herein disclosed. Generally, the circumstances giving rise to the need for inhibitors in motor oil service, particularly the problem of bearing corrosion, include high operating temperatures, for example 300° F.-400° F. or even higher in certain localized areas. The present invention provides an adequate overall improvement in lubricants and in lubrication for such service.

Thus it will be seen that the invention supplies inhibitors of broad utility in mineral oil environment. Mineral oils of lubricating viscosity are definitely improved for a wide range of services by the addition thereto of an organic morpholine derivative inhibitor in small but sufficient proportions to retard oil deterioration and deterioration effects.

The proportion of an organic morpholine derivative inhibitor necessary to accomplish the objects of the present invention is quite small, percentages of the order of 0.05%-0.2% by weight or even less dissolved in mineral lubricating oil exhibiting a marked inhibiting effect. Larger proportions within the limit of solubility for a given morpholine derivative may be used if desired but the smaller proportions ordinarily are wholly sufficient and, in the interest of economy, preferable. The inhibitors may be, and are intended to be, employed in any inhibiting proportion.

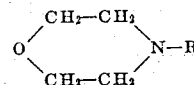
I claim:

1. Method of lubricating bearing surfaces, at least one of which comprises an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel and copper-lead alloys, which comprises applying to the bearing surfaces lubricant having incorporated therein a sufficiently oil-soluble organic morpholine derivative in corrosion inhibiting proportions.

2. Method of lubricating bearing surfaces, at least one of which comprises an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel and copper-lead alloys, which comprises applying to the bearing surfaces lubricant having incorporated therein a sufficiently oil-soluble aryl morpholine derivative in corrosion inhibiting proportions.

3. Method of lubricating bearing surfaces, at least one of which comprises an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel and copper-lead alloys, which comprises applying to the bearing surfaces lubricant having incorporated therein a sufficiently oil-soluble alkyl morpholine derivative in corrosion inhibiting proportions.

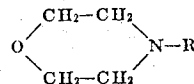
4. Method of lubricating bearing surfaces, at least one of which comprises an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel and copper-lead alloys which comprises applying to the bearing surfaces lubricant having incorporated therein, in corrosion inhibiting proportions, a sufficiently oil-soluble organic morpholine derivative corresponding to the following general formula:



wherein R is either alkyl or aryl and may carry one or more substituent groups such as alkyl, aryl, alkoxy, hydroxy and amino groups.

5. Method of lubricating bearing surfaces, at least one of which comprises an alloy having substantially the corrosion susceptibility of cadmium-silver, cadmium-nickel and copper-lead alloys, which comprises applying to the bearing surfaces lubricant having incorporated therein corrosion inhibiting proportions of 4-phenyl morpholine.

6. Mineral oil composition containing a small amount of a sufficiently oil-soluble morpholine derivative having the following formula:



wherein R is either alkyl or aryl and may carry one or more substituent groups such as alkyl, aryl, alkoxy, hydroxy and amino groups.

7. Mineral oil composition containing a small amount of 4-phenyl morpholine.

ELMER WILLIAM COOK.