

UNITED STATES PATENT OFFICE

2,587,546

RUST INHIBITING COMPOSITION

Alfred H. Matuszak, Jersey City, N. J., assignor
to Standard Oil Development Company, a corporation of Delaware

No Drawing. Application October 30, 1948,
Serial No. 57,620

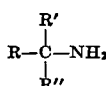
4 Claims. (Cl. 252—34)

1

This invention relates to rust preventing oil compositions and more particularly to mineral lubricating oil compositions which tend to inhibit rusting and corrosion of metal parts which are exposed to moisture.

A primary object of the present invention is the preparation of compositions which may be employed as internal combustion engine lubricants and which will also serve for the protection of exposed surfaces of such engines when the same are not in use. When operating engines in climates having a high humidity, rusting begins within a very short period of time after the engine is shut down. The compositions of the present invention are particularly valuable in preventing such rusting and they are valuable not only in the lubrication of internal combustion engines, but with oil bases of suitable viscosity they may be employed as turbine oils or as lubricants for fire arms, ordnance equipment, industrial machinery, etc., and in fact for any lubricating purposes where metal surfaces are exposed to humid air.

The corrosion preventing compositions of the present invention are formed by adding to a suitable oil base an additive which consists of a salt formed by the direct addition of a carboxylic acid to a hydroxyaliphatic amine of the formula



where one, two, or all three of the radicals R, R' and R'' are radicals of the structure—



where R''' is hydrogen or an aliphatic hydrocarbon radical containing 1 to 12 carbon atoms, and the latter may have attached one or more hydroxyl groups, and where the remaining radicals are hydrogen or aliphatic hydrocarbon radicals containing 1 to 8 carbon atoms, and the latter may also have attached one or more hydroxyl groups. The groups R, R', R'', and R''' may be alike or different and may consist of straight or branched chain radicals and may be saturated or unsaturated. Preferred compounds are those in which R, R', or R'' are methyl radicals or radicals of the structure—



where R''' is a hydrogen atom or a short chain

2

alkyl radical. The amine salt is formed by the direct addition of a carboxylic acid, either aliphatic or cycloaliphatic, containing 6 to 24 carbon atoms per molecule. Such acid may contain straight or branched chains and may be saturated or unsaturated and may contain one, two or more carboxyl groups.

Particularly suitable acids which may be employed in the formation of the salts of the present invention are lauric, palmitic, stearic, oleic, linoleic, ricinoleic, eleomargic, erucic, behenic, arachidic, lignoceric, and other fatty acids, also the naphthenic acids, as well as carboxylic acids derived by the oxidation of petroleum products or of aldehydes produced from olefins, carbon monoxide and hydrogen, and from olefins, carbon monoxide and water. Naturally occurring products or acids derived therefrom, such as tall oil, castor oil, soybean oil, linseed oil, olive oil, tung oil, rapeseed oil, menhaden oil and the like, may conveniently be employed.

The hydroxyaliphatic amines employed in the preparation of the additives of the present invention may be conveniently prepared by first reacting a nitroparaffin with an aldehyde in the presence of an alkali catalyst to form a nitroalcohol, and then reducing the nitroalcohol to the corresponding aminoalcohol or hydroxyaliphatic amine. The composition of the nitroalcohol obtained in the first reaction will be dependent on the temperature and the mol ratio of the reactants employed. For this reaction it is necessary to employ a nitroparaffin having a hydrogen atom attached to the carbon atom which is adjacent to the nitro group. In the reaction with the aldehyde this hydrogen atom is replaced by a hydroxyaliphatic group. When an aldehyde is employed which has one or more hydroxyl groups attached to the hydrocarbon chain, such hydroxyl groups remain as additional hydroxyl groups in the nitroalcohol which is formed and in the amine which is formed by reduction of the latter. Such hydroxyaldehydes may be formed by aldehyde condensation reactions. The hydroxyaliphatic amines prepared as described above are converted into salts by a simple addition reaction with a carboxylic acid, employing reaction temperatures not higher than about 140° C. in order to avoid any elimination of water. In certain instances it may be found to be more convenient and advantageous to form the amine salt in situ by adding the hydroxyamine and the carboxylic acid separately to the base oil which then may be heated and thoroughly mixed to insure

3

complete reaction of the hydroxyamine with the carboxylic acid.

Some of the more preferred examples of amine salts which are useful in accordance with the present invention, which are readily prepared from commercially available reagents and which possess particularly valuable rust inhibiting properties, are the oleic acid salts of monomethylol dimethyl amino methane, dimethylol methyl amino methane, and trimethylol amino methane.

The additives of the present invention may be advantageously employed with the petroleum fractions of a wide variety, although their preferred use is in lubricating oil bases to form lubricant compositions which also act as corrosion preventives. The base stocks may be derived from various types of crude petroleum and may consist of distillates or blends of various kinds which have been refined by any of the conventional methods. Synthetic oils may also be used such as those obtained by the polymerization of olefins, by the hydrogenation of coal or its products, or by the esterification of polycarboxylic acids or of polyhydroxyalcohols. In the case of lubricants the base stock chosen will normally be that oil which without the new additives gives the optimum performance in the service contemplated. The base oils may vary considerably in viscosity and other properties depending upon the particular use for which they are desired. For crankcase use they usually range from about 40 to 130 seconds viscosity Saybolt at 210° F. The viscosity index may range from less than 0 to 130 or even higher. Turbine oils usually have a viscosity of 40 to 60 seconds Saybolt at 210° F. Corrosion preventing compositions other than lubricating oils may comprise base stocks of a wide variety with respect to viscosity and may consist of mixtures of base stocks, as in slushing oils, which may consist of a mixture of naphtha and lubricating oil and may contain small amounts of petrolatum or a fatty compound such as degreas.

In addition to the materials to be added to the base stock according to the present invention, other agents may be present in lubricating compositions and other corrosion preventing compositions, such as heat thickened fatty oils, sulfurized oils, organo-metallic compounds, metallic or other soaps, sludge dispersers, antioxidants, thickeners, viscosity index improvers, oiliness agents, resins, olefin polymers, and colloidal solids, such as graphite or zinc oxide. Solvents and assisting agents such as esters, ketones, alcohols, aldehydes, halogenated and nitrated compounds and the like may also be employed.

For the purpose of the present invention the amine salts described herein are added to the base stock in proportions preferably ranging from 0.01% to 10% by weight, and in some cases larger proportions than those specified may be employed to advantage.

The following examples illustrate the application of the present invention to a lubricant suitable for use in an airplane engine, but these examples are not to be construed as limiting the invention in any way.

Example 1.—Monomethylol dimethyl amino methane oleate

A half mol (44.6 g.) of monomethylol dimethyl amino methane (2-methyl-2-amino-propanol) and a half mol (141.2 g.) of oleic acid were

4

mixed in an Erlenmeyer flask. The heat of the salt formation caused the temperature to rise to 63° C. The amine salt thus formed was a thick light brown colored liquid.

This salt was then evaluated to determine its rust inhibiting properties by employing it in a concentration of 0.5% by weight in a phenol extracted Mid-Continent lubricating oil base of 120 seconds viscosity Saybolt at 210° F. which was used as a crankcase oil in a single cylinder air cooled aviation type engine of 5.7 H. P. at 2400 R. P. M. speed, manufactured by the Wisconsin Motor Corporation. The engine was operated on 91 grade aviation gasoline containing 4 cc. tetraethyl lead per gallon. After running the engine for eight hours with this test oil, the stainless steel cylinder, which has the same composition as the cylinders of a full scale airplane engine, such as a Pratt and Whitney R1340 engine, was removed and stored in a humidity cabinet in which the temperature was caused to vary between 72° and 90° F. and the relative humidity between 94% and 53% during each 24 hour period. Typical conditions in a tropical climate were thus simulated. After each day the amount of rust present on the cylinder wall was observed and the storage period continued until a test period of ten days had been completed. A similar test was conducted by employing the same base oil without a rust inhibitor as the crankcase lubricant and similarly storing the cylinder in the humidity cabinet. The observations of the conditions of the cylinder are given in the following table:

CYLINDER RUSTING TEST
[Per cent of cylinder wall rusted.]

	Days of Storage									
	1	2	3	4	5	6	7	8	9	10
Uninhibited Oil.....	5	10	15	22	30	35	39	42	44	45
Same+0.5% Salt.....	8	10	12	12	13	13	14	17	19	20

Example 2.—Dimethylol methyl amino methane oleate

A half mol (52.6 g.) of dimethylol methyl amino methane (2 - methyl - 2 - amino - 1,3 - propane-diol) was heated in a beaker to 130° C. and then added to a half mol (141.2 g.) of oleic acid. The combined mass was then heated to 102° C. when the mass melted and the heat of the salt formation caused the temperature to rise to 115° C.

Blends containing 0.5% and 1% of this salt in the same base oil as that employed in the test described in Example 1 were evaluated as to their rust inhibiting properties by employing them as crankcase lubricants in a Wisconsin engine and subjecting the cylinder to the conditions existing in the humidity cabinet according to the method described above in Example 1. The observations of the rusting of the cylinders are given in the following table:

CYLINDER RUSTING TEST
[Per cent of cylinder wall rusted.]

	Days of Storage									
	1	2	3	4	5	6	7	8	9	10
Uninhibited Oil.....	5	10	15	22	30	35	39	42	44	45
Same+0.5% Salt.....	10	10	10	12.5	16	16	16	16	-----	-----
Same+1% Salt.....	0	1	2	2	2.5	4	5	6	6	6

5

Example 3.—Trimethylol amino methane oleate

One half mol (60.6 g.) of trimethylol amino methane (tris-(hydroxymethyl) amino methane) and one half mol (141.2 g.) of oleic acid were mixed and heated to 136° C. when the reaction mixture became a homogeneous liquid and the formation of the amine salt was completed.

A 0.5% blend of this amine salt in the same base oil as that employed in the test described in Example 1 was evaluated as to its rust inhibiting properties by employing the same in an engine and permitting the cylinder to rust in the humidity cabinet according to the method described above, and continuing the observations for a period of seven days. The observations of the condition of the cylinder are given in the following table:

CYLINDER RUSTING TEST
[Per cent of cylinder wall rusted.]

	Days of Storage						
	1	2	3	4	5	6	7
Uninhibited Oil.....	5	10	15	22	30	35	39
Same+0.5% Salt.....	0.5	4	6	10	10	10	11

What is claimed is:

6

1. A composition consisting essentially of a mineral lubricating oil and about 0.5% to 1% of an oleic acid salt of monomethylol dimethyl amino methane.

2. A composition consisting essentially of a mineral lubricating oil and about 0.5% to 1% of oleic acid salt of dimethylol methyl amino methane.

3. A composition consisting essentially of a mineral lubricating oil and about 0.5% to 1% of the oleic acid salt of trimethylol amino methane.

4. A rust inhibiting composition consisting essentially of a mineral lubricating oil and about 0.5 to 1% of a hydroxy-aliphatic amine salt selected from the group which consists of the oleic acid salts of mono-, di-, and tri-methylol amino methanes.

ALFRED H. MATUSZAK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,018,758	Ellis	Oct. 29, 1935
2,388,281	Orelup	Nov. 6, 1945
2,448,626	Schaeffer	Sept. 7, 1948