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NONCORROSIVE ANTIFREEZE COMPOSITION

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10 Claims. (Cl. 252-5)

The invention relates to non-corrosive anti-freeze liquids of the type commonly employed as cooling fluids in automotive engines. It is particularly concerned with inhibitor materials adapted to suppress metal corrosion in fluid cooling systems employing alcohol anti-freeze liquids.

Many different alcohols have been proposed for use as freezing point depressants in cooling fluids. These have included both monohydroxy and polyhydroxy compounds, represented by alcohols such as methanol, ethanol, propanol, the polyhydroxy alcohols including ethylene and propylene glycol, diethylene glycol, other glycols and their mixtures, and glycerol. The present invention is applicable to the maintaining of non-corrosive conditions in solutions of any of these compounds, and where an alcohol is referred to broadly in the disclosure and claims it is intended to include any of the common monohydric and polyhydric freezing point depressants.

While alcohols themselves do not normally attack metals, their aqueous solution in a cooling fluid is usually subjected to operating conditions which influence the building up in the solution of a corrosive action toward metals. In automobile cooling systems this may be due to a number of circumstances, including unavoidable aeration during circulation of the cooling fluid, adventitious addition thereto of corrosive impurities, localized overheating of the fluid, and other factors, all of which are commonly encountered in modern cooling systems. It has, therefore, become quite customary to employ in alcohol anti-freeze solutions corrosion inhibitor materials to protect the metals of the cooling system. Many and various compounds have been proposed for this purpose, but most prior inhibitors have been only partially effective in their protection for all metals of the cooling system; the protection afforded has been more or less temporary; or they have been subject to other faults detrimental to an entirely satisfactory corrosion preventive.

It is an object of my invention to provide an improved corrosion inhibitor adapted to adequately protect all five metals commonly employed in the structure of a cooling system, and an anti-freeze liquid in which induced corrosive conditions are suppressed or prevented during normal life of the cooling fluid.

I have found a group of compounds which are adapted to provide excellent protection for iron, aluminum, copper, brass and solder, when added

individually to an alcohol cooling solution. As a class these materials may be termed organic nitro-compounds having the general structural formula



in which R represents an alkyl or alkoxy radical. Compounds of this type which are now commercially available, and which are especially preferred, include the lower alkyl nitrates such as ethyl nitrate and isoamyl nitrate, or the nitro-paraffin derivatives, as represented by nitromethane and nitro-ethane. In the latter compounds, the N is usually regarded as pentavalent and is assumed to be so for the purpose of this application. From numerous tests materials of this particular structure have proven to function as very satisfactory corrosion inhibitors, and the metal protection is maintained in both alkaline and slightly acid solutions. Specific and preferred amounts of the inhibitor may vary with the particular alcohol to which it is added, the degree of water dilution employed, and other circumstances. However, within the range of about 0.05% to 1.0% by weight of the alcohol there is shown a satisfactory inhibiting action. In ethylene glycol an amount of about 0.10% to about 0.50% of the organic nitrate or nitro-paraffine has proven especially effective in protecting all five metals of the cooling system.

Although other inhibitors are not essential to the complete protection of all metals, they may be used if desired in conjunction with the nitro-compound. Among these known to the art are included oils, materials for further specific protection of individual metals of the cooling system, basic compounds which may aid in maintaining a reserve alkalinity, leakage retardants and the like. The latter materials do not affect the primary inhibiting function of the nitro-compound, but they may act in cooperation therewith to provide desirable results for specific uses.

Many modifications will be evident in a formula including a plurality of components, and are intended to be included within the scope of this invention, wherein the organic nitrate or nitro-paraffine material functions as the important and essential corrosion preventive. Variations in the most suitable percentages of inhibitor material will also be evident, and constitute other modifications included within the limits of the invention as defined by the appended claims.

I claim:

1. A non-corrosive anti-freeze liquid comprising an alcohol and an inhibitor containing as the essential corrosion preventive about 0.05% to 5 gen-containing compound of the structure



- 10 in which R is an alkyl or alkoxy radical.

2. A non-corrosive anti-freeze liquid comprising an alcohol and an inhibitor containing as the essential corrosion preventive about 0.05% to 1.0% or an organic nitrogen-containing compound of the structure



- 20 in which R is an alkyl or alkoxy radical.

3. A non-corrosive anti-freeze liquid comprising an alcohol and an inhibitor containing as the essential corrosion preventive an alkyl nitrate.

- 25 4. A non-corrosive anti-freeze liquid comprising an alcohol and an inhibitor containing as the essential corrosion preventive a nitro-paraffine.

5. A non-corrosive anti-freeze liquid comprising an alcohol and an inhibitor containing as the essential corrosion preventive about 0.05% to 30 1.0% of a member of the group consisting of ethyl nitrate, isoamyl nitrate, nitro-methane and nitro-ethane.

6. A non-corrosive anti-freeze liquid comprising ethylene glycol and an inhibitor containing as

the essential corrosion preventive about 0.10% to 0.50% of ethyl nitrate.

7. A non-corrosive anti-freeze liquid comprising ethylene glycol and an inhibitor containing as the essential corrosion preventive about 0.10% to 0.50% of isoamyl nitrate.

8. A non-corrosive anti-freeze liquid comprising ethylene glycol and an inhibitor containing as the essential corrosion preventive about 0.10% to 0.50% of nitro-methane.

9. Method of inhibiting corrosion of metals by an alcohol cooling fluid in contact therewith, which comprises contacting said fluid with the metal in the presence of an inhibitor containing as the essential corrosion preventive an organic nitrogen-containing compound of the structure



in which R is an alkyl or alkoxy radical, said inhibitor being present in an amount about 0.05% to about 1.0% by weight of the alcohol.

10. Method of inhibiting corrosion of metals by an ethylene glycol cooling fluid in contact therewith, which comprises contacting said fluid with the metal in the presence of an inhibitor containing as the essential corrosion preventive a member of the group consisting of ethyl nitrate, isoamyl nitrate, nitro-methane and nitro-ethane, in an amount about 0.05% to 1.0% by weight of the alcohol.

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CERTIFICATE OF CORRECTION.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 4-5, claim 1, for "about 0.05% to gen-containing" read an organic nitrogen-containing; line 14, claim 2, for "or" read of; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of January, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.