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NONCORROSIVE ANTIFREEZE LIQUID

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13 Claims. (Cl. 252—5)

The invention relates to alcohol antifreeze liquids of the type commonly employed as cooling fluids in internal combustion engines, and is particularly directed to the corrosion protection of metals in contact with such fluids.

Alcohols are now quite generally used as freezing point depressants in cooling fluids, and many different monohydric and polyhydric compounds have been proposed for this purpose. The more common of these include alcohols such as ethanol, methanol, propanol, ethylene glycol, other glycols and polyglycols, and glycerol. The inhibitor materials proposed by this invention are adapted to protect metal in contact with cooling fluids containing any of the well-known monohydric or polyhydric alcohols.

Alcohols are not considered inherently corrosive toward metals, but in their use as cooling fluids in dilution with water, they are normally subjected to operating conditions which usually induce in the fluids a more or less severe corrosive action toward metals. In an automobile cooling system this may be caused by such factors as aeration of the cooling fluid during circulation, adventitious addition thereto of exhaust gases and other impurities, localized overheating of the fluid, and other conditions difficult to avoid in the usual cooling system. It has therefore become customary to employ corrosion inhibiting materials with alcohol freezing point depressants, in an effort to retard or prevent this induced corrosive action. A large number of addition agents have been proposed for this purpose, but prior inhibitors have not been entirely satisfactory, due largely to their inefficient protection for all types of metals of the cooling system.

It is an object of this invention to provide new inhibitor materials more effective in their protective function for all metals of the usual cooling system, and improved alcohol cooling fluids in which induced corrosive action is repressed or prevented during normal usage and life of the fluid.

I have found a group of organic compounds all members of which appear to exert an excellent corrosion inhibiting action when added in small quantities to alcohol cooling fluids. These materials can be broadly classed as nitro-amine compounds, and more specifically they are compounds of a structure containing one or more nitro groups together with one or more amino, amido, or imino groups, which are either intact or substituted. The parent structure may be aliphatic or cyclic, including among the latter many benzene derivatives, and in the complete compound containing an amino group; this may be primary, secondary or tertiary. Representative compounds of the nitro-amine composition are such as m-nitroaniline, picramic acid or its sodium salt, nitrophenylglycine, m-nitrodimethyl aniline and 8-nitroquinoline. Typical nitro-amide compounds are nitrohippuric acid, nitrourea, and nitrobarbituric acid, and suitable nitro-imide compositions are, for example, materials like nitroguanidine. All of the materials specifically named have proven by test to be effective in repressing metal corrosion, and they are representative of many other compounds which are considered to have similar characteristics. To obtain proper protective action the compound must be soluble in the alcohol cooling fluid, and this type of inhibitor functions best in a neutral or slightly alkaline solution. In amounts of about 0.01% to 1.0% by weight of the cooling fluid, these inhibitors will satisfactorily protect iron, brass, copper, solder and aluminum.

An inhibitor formula especially effective in an ethylene glycol freezing point depressant comprises about 0.4% by weight of the alcohol of nitrourea, and sodium hydroxide in sufficient quantity to impart a pH value of about 7.0. This inhibited glycol in a 35% solution in water provides a cooling fluid which shows no appreciable metal attack on tests assimilating severe corrosive conditions, whereas a solution of similar concentration containing like quantities of sodium hydroxide, but no nitrourea, rapidly attacks a metal surface under the same test conditions. Similarly, the effectiveness of other compounds of the type mentioned has been demonstrated in various alcohol cooling solutions.

In the presence of these new inhibitors, satisfactory protection of iron, brass, copper, solder, and aluminum is achieved, but this does not exclude the use therewith, if desired, of other inhibitor materials, including, for example, materials such as an oil for the primary purpose of retarding leakage, an alkaline material like sodium hydroxide or sodium carbonate, for imparting to the solution a reserve alkalinity, or other compounds such as sodium nitrate which may furnish further specific protection for aluminum or other metals. Many modifications, particularly in a complete inhibitor mixture including other components, will be evident to those skilled in the art, but all mixtures including the nitro-amine, nitro-amide, or nitro-imide as the essential corrosion preventive are included within the

scope of this invention, which should not be limited other than as defined by the appended claims.

I claim:

1. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and a corrosion inhibitor comprising an alcohol-soluble organic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount about 0.01% to 1.0% by weight of the alcohol.

2. A noncorrosive antifreeze liquid comprising ing an aqueous solution of an alcohol freezing point depressor and a corrosion inhibitor comprising an alcohol-soluble aliphatic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount about 0.01% to 1.0% by weight of the alcohol.

3. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and a corrosion inhibitor comprising an alcohol-soluble cyclic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount about 0.01% to 1.0% by weight of the alcohol.

4. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and a corrosion inhibitor comprising an alcohol-soluble aromatic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount about 0.01% to 1.0% by weight of the alcohol.

5. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of an alcohol-soluble organic nitro-amine compound as the essential corrosion preventive.

6. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of an alcohol-soluble organic nitro-amide compound as the essential corrosion preventive.

7. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of an alcohol-soluble organic nitro-imide compound as the essential corrosion preventive.

8. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of nitro-urea as the essential corrosion preventive.

9. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of nitro-guanidine as the essential corrosion preventive.

10. A noncorrosive antifreeze liquid comprising an aqueous solution of an alcohol freezing point depressor and an inhibitor containing about 0.01% to 1.0% by weight of the alcohol of an alkali metal salt of picramic acid as the essential corrosion preventive.

11. A noncorrosive antifreeze liquid comprising an aqueous solution of an ethylene glycol freezing point depressor, and an inhibitor containing as the essential corrosion preventive a mixture of about 0.4% by weight of the glycol of nitro-urea, and sodium hydroxide, the latter component in an amount sufficient to impart to the solution a pH value of about 7.0.

12. 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 alcohol-soluble organic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount of about 0.01% to 1.0% by weight of the alcohol.

13. 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 alcohol-soluble aromatic nitro-compound including in its structure a group of the class consisting of amino, amido and imino groups, said nitro-compound being present in an amount of about 0.01% to 1.0% by weight of the alcohol.

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