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NONCORROSIVE FLUID AND METHOD OF
COMPOUNDING THE SAME

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The object of this invention is to provide fluid glycerine compositions which are substantially non-corrosive with respect to metals during relatively long periods of usage.

The composition of this invention is useful under many conditions, but is particularly useful in those glycerine compositions which are employed in the cooling systems of the conventional internal combustion engines, as cooling media and freezing point depressants.

In the cooling system of the conventional internal combustion engine of the liquid cooled type, several different metals are commonly exposed to contact with the cooling medium employed, for example: iron in the engine itself, and copper or brass and solder in the radiator. It is a matter of common observation that water or aqueous compositions in an automobile circulating system almost invariably carry in suspension large quantities of rust if they have been in use for more than an extremely short period of time. This rust results from the corrosion of iron parts of the cooling systems, and the extent of this corrosion is dependent upon many factors, important among which are time of usage, temperature of usage, and degree of aeration of the cooling liquid. While the principal corrosive effect is on the iron and while this may result eventually in clogged radiator passages with consequent overheating of the engine because of restricted cooling area, it is to be understood that under certain conditions other metals of the cooling system are also corroded. Corrosion of other metals, such as, for example, the metallic elements of the radiator, is probably likely to result in more serious damage than the corrosion of iron which ordinarily occurs.

This corrosion of the metallic elements of a cooling system which ordinarily occurs with water or aqueous compositions, such as, for example, anti-freezing solutions, is undesirable for obvious reasons, and there have been many attempts to prevent or inhibit these corrosive processes. It is known that the corrosion of iron may be greatly reduced or completely prevented by maintaining a condition of slight alkalinity in the circulating liquid, but this results in corrosion of other metals of the cooling system, such as solder, and is likely to lead to more serious consequences than the corrosion of iron which ordinarily occurs. It will be obvious, therefore, that a wholly satisfactory cooling system liquid must give substantially complete protection against corrosion to all metals occurring in the system during long periods of operation, and it is an ob-

ject of the present invention to provide such an anticorrosion, anti-freeze solution.

The composition of my invention is particularly suited for use in the cooling systems of automotive vehicles, having conventional internal combustion engines of the liquid cooled type, both because of its anti-corrosion and anti-freeze properties. However, because my glycerine compositions also have boiling points above that of water and extending substantially up to the boiling point of pure glycerine, viz., 290 degrees C., they are adaptable for use as cooling media in the cooling systems of internal combustion engines operating at cooling system temperatures above that of the boiling point of water, toward which design there is increasing trend at the present time, particularly in aircraft engines of the liquid-cooled type. It is a further object of this invention to provide an anti-corrosion, anti-freeze solution having a boiling point above that of water.

Glycerine or glycerine solutions are commonly employed as the actuating liquid in hydraulic equipment, such as, for example, hydraulic presses and hydraulic shock absorbers. While the conditions of usage as regards corrosive action are not ordinarily as severe as when used as a coolant and freezing point depressant in automotive cooling systems, yet aqueous glycerine solutions produce the corrosive effects that water would under similar conditions. It has been common practice to use a non-aqueous solvent in preference to water in order that corrosive action be minimized. The passivity of my new composition toward metals makes them particularly useful in hydraulic equipment, at the same time permitting the economy of water as a diluent. Such compositions also have anti-freezing properties varying with the degree of dilution. It is, therefore, a further object of my invention to provide a non-corrosive, hydraulic liquid.

It is known that the production of an oil film on the metal surfaces of an automobile cooling system which come in contact with the cooling liquid decreases the rate of corrosion materially, and this knowledge has been utilized by introducing oil into the cooling systems of automobiles along with the circulating liquid which distributes it on the metal surfaces. This method gives some degree of protection against corrosion, but corrosion still takes place eventually, and under some circumstances proceeds at so rapid a rate as to constitute a serious problem in automobile operation.

I have found, however, that by introducing into

glycerine which has been diluted with water and which contains an oil, preferably partially emulsified, a very small amount of the chemical compound mercaptobenzothiazole, I can so completely deprive the glycerine solution of the ordinary corrosive influence involved in the operation of the cooling system that for all practical purposes corrosion is completely prevented for a relatively long time. Even in cases where corrosion is already far advanced, the use of the composition of this invention will delay the further progress of the corrosive action.

Mercaptobenzothiazole has very little power to prevent corrosion when employed with a glycerine composition which is free of a film-forming oil. It is my discovery that by combining mercaptobenzothiazole with a film-forming oil in a glycerine composition a very satisfactory anti-corrosion composition is produced, which is, for all practical purposes, passive with respect to metallic surfaces. The effect of either the oil film or the mercaptobenzothiazole when used alone is comparatively slight in corrosion inhibiting properties as compared with the surprisingly passive non-corrosive composition of my invention. I am unable to explain in any adequate manner the surprising and unexpected improvement obtainable by combining these two ingredients.

In formulating my new anti-corrosion solution, I may utilize a wide range of oils or oils in conjunction with a wide range of emulsifying agents. It is desirable, though not essential, that the oil and emulsifying agent shall be so proportioned to each other that a relatively impermanent or unstable emulsion is formed, since such an emulsion results in a more satisfactory film deposition, for my purpose, on the metal surfaces with which the liquid comes in contact.

Among the many oils which I may use are mineral oils of paraffin, naphthenic, or asphaltic base; and animal or vegetable oils, such as lard oil, pigfoot oil, and cottonseed oil, though in general animal or vegetable oils are preferably used only in conjunction with the mineral oils. It is, of course, understood that greases, such, for example, as lanolin, may be used. Combinations of these oils and likewise of oils and greases are useful for my purpose. Any of the above, or substances serving a similar purpose will be referred to hereinafter as "oils".

Among the emulsifying agents which I may use are the ordinary soda or potash soaps of fatty acids, the alkali soaps of naphthenic acids, such as are derived from petroleum oils, as well as sulphonation products commonly used as emulsifying agents, such as, for example, the sulphonated petroleum residues obtained in the manufacture of white medicinal paraffin oil. It is to be understood, however, that these examples of emulsifying agents and oils are illustrative and not limiting. These and any other substances serving to facilitate the forming of an emulsion-like dispersion will be referred to hereinafter as "emulsifying agents".

The chemical compound mercaptobenzothiazole, which is an essential part of the composition of this invention, is substantially insoluble in sixty per cent. glycerine or any other concentration commonly used for anti-freeze purposes, and it is, therefore, essential that the product shall be prepared in such fashion as to make possible relatively uniform dispersion of the mercaptobenzothiazole in the liquid. This dispersion may be effected by grinding, as, for example, in a colloid mill, but I have discovered that precipitation of the mer-

captobenzothiazole within the body of the liquid is a much more effective and convenient method of producing the essential result. This is accomplished by utilizing solutions of the alkali metal salts of mercaptobenzothiazole. These salts are readily hydrolyzed and upon dilution of their solutions with water more or less precipitation of free mercaptobenzothiazole occurs, depending on the degree of dilution and the hydrogen ion concentration of the solution. For my purpose, a twenty per cent. by weight solution of, for example, the sodium salt of mercaptobenzothiazole containing sufficient excess alkali to prevent precipitation of mercaptobenzothiazole at this dilution is very convenient to use. Such a solution when used in making my new anti-freeze composition is diluted when added to the aqueous solution of glycerine whereby the mercaptobenzothiazole is precipitated at least in part in a very finely divided form, which is readily dispersed in the solution. Hereinafter any compound which will set free mercaptobenzothiazole upon dilution with water, as explained above, I will refer to as a "soluble salt of mercaptobenzothiazole". Certain soluble compounds of mercaptobenzothiazole which are not hydrolytically attacked by water may also be used in this invention and the necessary dispersion be obtained by simple solution. Such compounds I will hereinafter refer to as "soluble mercaptobenzothiazole agents".

In producing the composition of this invention, I have also found that since mercaptobenzothiazole forms insoluble compounds with iron, copper and certain other metals, and since these insoluble compounds are unsatisfactory for my purpose, it is necessary to use a grade of glycerine substantially free from iron and copper, or other metals capable of forming insoluble compounds with mercaptobenzothiazole, such a requirement not having been considered an essential characteristic of anti-freeze glycerine heretofore.

In preparing my new anti-corrosion, anti-freeze solution, I may proceed as follows:

One thousand pounds of an aqueous solution containing sixty per cent. glycerine by weight are vigorously agitated in a vat or tank. One-half pound of potash soap made from coconut oil is added and when dissolved six pounds of a paraffin base mineral oil having a Saybolt viscosity of two hundred seconds at one hundred degrees Fahrenheit are added. Agitation is continued until a uniformly dispersed emulsion has been established. At this point five pounds of an aqueous solution containing twenty per cent. by weight of the sodium salt of mercaptobenzothiazole are run in gradually under agitation in such a manner as to be dispersed rapidly in the emulsified solution. When all has been added, the product may be packaged at once, in which case agitation is continued throughout the packaging operation to insure uniform distribution of the ingredients in the divided portions, which otherwise might not result because of the instability of the emulsion.

It will be seen that the amounts of emulsifying agent, oil, and sodium salt of mercaptobenzothiazole (dry basis) based on a sixty per cent. by weight glycerine solution in the foregoing illustration of my invention are respectively 0.05%, 0.6% and 0.1% by weight. This, in fact, constitutes a very effective anti-corrosion, anti-freeze solution illustrative of my invention, but it will be understood that the amounts of emulsifying agent, oil, and mercaptobenzothiazole may vary within wide

limits without departing from the effective application of my invention. It will be understood also that other emulsifying agents, other oils or combinations of oils, or combinations of oils and greases may be used to produce anti-corrosion, glycerine, anti-freeze solutions in varying degrees of effectiveness.

As illustrating my invention I have described above a sixty per cent. by weight glycerine solution, a concentration common in commerce at present as an anti-freezing solution. It will be understood, however, that glycerine of other strengths or even concentrated glycerine may be treated in a similar manner to produce anti-corrosion solutions and that the concentrated solutions so treated may be diluted with water. For example, I may proceed as follows: One thousand pounds of glycerine (99% glycerine by weight) are vigorously agitated. One pound of potash soap made from cocoanut oil and previously dissolved in two pounds of water is added, and when incorporated uniformly, ten pounds of a paraffin base mineral oil having a Saybolt viscosity of two hundred seconds at one hundred degrees Fahrenheit are added. Agitation is continued, and when a uniformly dispersed emulsion has been established seven and one-half pounds of an aqueous solution containing twenty per cent. by weight of the sodium salt of mercaptobenzothiazole are run in gradually under agitation in such a manner as to be dispersed rapidly in the emulsified solution.

It is to be understood that the foregoing examples describing the means of putting my invention into effect are not to limit my invention, the scope of which is to be limited only by the appended claims.

What I claim as my invention and wish to secure by Letters Patent is:

1. A composition of matter comprising glycerine, oil, an emulsifying agent, and mercaptobenzothiazole.

2. An anti-corrosion, anti-freeze solution comprising water, glycerine, oil, an emulsifying agent, and mercaptobenzothiazole.

3. An anti-corrosion, anti-freeze solution comprising water, glycerine, oil, an emulsifying agent, and a soluble mercaptobenzothiazole agent.

4. An anti-corrosion, anti-freeze solution comprising water, glycerine, oil, an emulsifying agent, and the hydrolytic disassociation products of a soluble salt of mercaptobenzothiazole.

5. An anti-corrosion, anti-freeze solution comprising water, glycerine, oil, an emulsifying agent, and minute particles of mercaptobenzothiazole.

6. An anti-corrosion, anti-freeze solution comprising oil, an emulsifying agent, mercaptobenzothiazole, water, and glycerine substantially free from metals capable of forming insoluble compounds with mercaptobenzothiazole.

7. The method of preparing an anti-corrosion solution which comprises mixing a relatively small quantity of a solution of a soluble salt of mercaptobenzothiazole with a relatively large quantity of glycerine containing an oil and an emulsifying agent.

8. The method of preparing an anti-corrosion, anti-freeze solution which comprises dissolving a relatively small quantity of mercaptobenzothiazole in glycerine, adding thereto an oil and an emulsifying agent, and then diluting with water whereby mercaptobenzothiazole is precipitated and dispersed.

9. The method of preparing an anti-corrosion, anti-freeze solution which comprises dissolving a relatively small quantity of mercaptobenzothiazole in glycerine, diluting the glycerine with water whereby mercaptobenzothiazole is precipitated and dispersed, and then adding to the whole an oil and an emulsifying agent.

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