

UNITED STATES PATENT OFFICE

BRADFORD S. COVELL, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE MCKAY COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

PREVENTION OF CORROSION

No Drawing.

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This invention relates to a preparation for preventing corrosion and rust formation in the cooling systems of internal combustion engines.

In cooling systems such as automobile radiators, for example, there is considerable corrosion even when water alone is used, and this corrosive action is even more pronounced when using certain of the anti-freeze solutions which are often employed during cold weather. It is not uncommon for corrosion to take place to the extent that the radiator tubes become more or less plugged with rust or heavily coated, thereby reducing considerably the efficiency of the cooling system and in some cases necessitating repairs or replacements therein.

The preparation described in this invention provides a means of keeping the cooling system of a new automobile practically free from corrosion throughout the life of the automobile. In the case of a used car, the cooling system may be cleaned, and by using my preparation kept substantially corrosion-free thereafter.

My invention involves the use of small quantities of properly treated sulfonated fatty acids in the liquid of cooling systems. The treatment, described in detail in the following specification, involves the use of alkaline or basic elements or radicals for the purpose of neutralizing certain of the acids present in the sulfonated fatty acids.

The term "sulfonated fatty acids", as referred to in this specification and in the appended claims, includes vegetable, fish or animal oils, fats and waxes which have been sulfonated. These sulfonated fatty acids are also known as sulfonated oils. The various sulfonated fatty acids mentioned herein are in general of complicated chemical structure; in reality, each is generally a mixture of a number of sulfonated fatty acids.

The cooling medium of the system may be water, or may contain organic water-soluble anti-freeze solution, such for example as the alcohols, such as methanol, ethanol, denatured alcohol or diacetone alcohol and compounds of alcohols; also certain polyhydric

alcohols such for example, as glycerine, and ethylene glycol.

I prefer to use a sulfonated castor oil (also known as Turkey red oil) which has been partially neutralized by combination with an alkaline metal, such as sodium, potassium or the ammonium radical, (or as a substitute for the ammonium radical, various alkaline organic substituted ammonium radicals). This may be accomplished by adding to the sulfonated castor oil sufficient sodium, potassium or ammonium hydroxides or carbonates or suitable substituted ammonias of various types, including triethanolamine, so that the sulfonated castor oil compound thus formed dissolves in water to form a clear or only slightly opalescent solution. Partial neutralization by alkali, should be carried to such a point that the sulfuric acid content of the sulfonated oil is neutralized and the compound rendered water-soluble. However, I prefer to leave the major part of the fatty acids of the compound in an acid state, unneutralized by alkali. The addition of alkali should therefore be stopped at a point at which the compound is water-soluble and free from sulfuric acid, but yet contains substantial proportions of unneutralized fatty acid.

It is probably impossible to lay down a general rule whereby the quantity of alkali needed can be predetermined. Sulfonated castor oil not yet clarified may contain varying quantities of residual sulfuric acid, not removed by the usual washing treatment. The neutralization of the variable quantity of sulfuric acid will in general involve partial neutralization of the sulfonated fatty acid content; it is desirable to carry the neutralization no further than is needed to neutralize the sulfuric acid and render the compound water-soluble. These desired conditions may be ascertained for any given batch of material by usual chemical and physical tests. The proportion of free sulfonated fatty acid present in the partially neutralized product will of course vary to some extent with the amount of alkali required to free the sulfonated oil from sulfuric acid. The percentage of fatty acid remaining unneu-

tralized after this treatment should be from 60 to 90 per cent; I have found that the best results are obtained when from 70 to 80 per cent of the sulfonated fatty acids are left unneutralized. A dominant characteristic of my invention is therefore the provision in the cooling system of a corrosion-preventing agent containing an effective percentage of unneutralized sulfonated fatty acid.

The product is a transparent, amber-colored, oily liquid which maintains its clarity even when mixed with upwards of 30% of water; mixtures with large quantities of water, however, have a somewhat milky or opalescent appearance.

My product should be distinguished from a completely neutralized sulfonated fatty acid, since the latter would be apt to cause foaming, blowing off of the cooling liquid in an automobile radiator, and the formation of bubbles preventing efficient cooling action.

Sulfonated castor oil treated in accordance with this invention is not appreciably affected by the mineral salts ordinarily present in water, and has no injurious effect on the copper tubing of the radiators or on the other metals in the cooling system, and is also harmless to the rubber connecting hose or any other parts of the system with which the liquid comes in contact.

In carrying out my invention in connection with automobile cooling systems, I prefer to add to the cooling liquid approximately one-tenth of one per cent by weight of sulfonated castor oil which has been treated as described with potassium or sodium hydroxide. Ordinarily, this partially neutralized product is added in the form of a 75% (or thereabouts) mixture of the oil in about 25% of water, the water being introduced during the various prior steps of preparation, including the addition of the alkali hydroxide which is done ordinarily in a water solution, although dry alkali hydroxide may be used if desired. Obviously as far as effectiveness in the cooling system is concerned, the material of this invention may be employed diluted, more or less than this quantity, to any extent desired as long as the final solution in the system contains the requisite percentage of the non-corrosive oil. This percentage, while preferably around one-tenth of one per cent as already mentioned, may vary within fairly large limits as far as anti-corrosive effect is concerned. However, in order for a cooling system to work satisfactorily without overheating, the percentage of the oil of this invention should not exceed three or four per cent, nor should it, for the proper anti-corrosive results be less than five one-hundredths (.05) of one per cent by weight. This preferred product is not volatile, and therefore it does not need to be replenished. When the liquid in a cooling system becomes low, it is only

necessary to add water, or volatile anti-freeze solutions if such are being used.

The anti-corrosive material described in this invention may be added to concentrated anti-freeze solutions of the organic water-soluble type, for example those mentioned above, as they are put up for market, thus rendering the anti-freeze solution anti-corrosive, and making it unnecessary to add the two solutions separately, to the cooling systems. In making up anti-corrosive anti-freeze solutions in this way, it is obvious that a sufficient amount of the anti-corrosive material should be used to give proper protection to the cooling system.

In place of a sulfonated castor oil neutralized as described, it is possible to use other sulfonated fatty acids (such as sulfonated sperm, olive, rapeseed, neatsfoot, or coconut oils), partially neutralized in the same manner. However, since these other oils tend to form insoluble calcium and like soaps in hard water (causing an undesirable precipitate), their use is confined primarily to systems which employ soft water.

The product of the invention is suitable for use during the entire year. In summer it may be used with water alone in the cooling system; in winter it may be used with an anti-freeze in the system.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. An anti-corrosive liquid for cooling systems containing a sulfonated fatty acid partially neutralized to a point such that it is water-soluble and contains no free sulfuric acid, characterized by the presence therein of a substantial quantity of unneutralized soluble sulfonated fatty acid.

2. An anti-corrosive liquid for cooling systems containing sulfonated castor oil partially neutralized to a point such that it is water-soluble and contains no free sulfuric acid, characterized by the presence therein of a substantial quantity of unneutralized soluble sulfonated fatty acid.

3. An anti-corrosive liquid for cooling systems containing sulfonated castor oil partially neutralized and having from 60 to 90 per cent of its sulfonated fatty acid ingredient existing as free unneutralized sulfonated fatty acid.

4. An anti-corrosive liquid for cooling systems containing sulfonated castor oil partially neutralized and having from 70 to 80 per cent of its sulfonated fatty acid ingredient existing as free unneutralized sulfonated fatty acid.

5. An anti-corrosive solution for cooling systems including as ingredients sulfonated castor oil and an alkali adapted to neutralize

sulfuric acid in the solution, characterized in that the major part of the fatty acid constituent of the oil exists as unneutralized sulfonated fatty acid.

6. Art of preventing corrosion in cooling systems which comprises maintaining in the system a substantial concentration of a sulfonated fatty acid partly neutralized to render it water-soluble and to prevent the presence of free sulfuric acid, but incompletely neutralized so as to provide in the solution a substantial quantity of free soluble sulfonated fatty acid.

7. Art of preventing corrosion in cooling systems which comprises maintaining in the system a substantial concentration of sulfonated castor oil partly neutralized to render it water-soluble and to prevent the presence of free sulfuric acid, but incompletely neutralized so as to provide in the solution a substantial quantity of free soluble sulfonated fatty acid.

Signed by me at Boston, Massachusetts, this 3d day of December, 1931.

BRADFORD S. COVELL.