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SOLVENT DEGREASING, SELF-EMULSIFYING CLEANING COMPOSITION

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No Drawing. Continuation-in-part of application Ser. No. 391,341, Aug. 21, 1964. This application Aug. 26, 1966, Ser. No. 575,929

U.S. Cl. 252—118 4 Claims

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ABSTRACT OF THE DISCLOSURE

A self-emulsifying cleaning composition for removing undesired coatings from metallic and painted surfaces comprising: cyclohexanol; ethylene glycol monobutyl ether; diethylene triamine-diacetone condensate; diglycol oleate; ethanolamine oleate; surface active amine alkyl aryl sulfonate; sorbitan oleate and lauric acid mixed with an organic solvent.

This is a continuation-in-part of application Ser. No. 391,341, filed Aug. 21, 1964 now abandoned for Metal Cleaning Composition.

This invention relates to improvements in one class of self-emulsifying cleaning compositions for removing oils, greases, asphalt, tars and rust preventive compounds, other than wax type, from metallic and painted surfaces.

Cleaning compositions of this type are formulated as additive concentrates containing the condensate of diethylene triamine and diacetone alcohol, as disclosed in U.S. Patent 2,616,856, mixed with surfactants such as diglycol oleate and ethanolamine oleate to improve its solubility in oil.

A particularly effective solvent degreasing cleaner containing the above ingredients forms the subject matter of U.S. Patent 3,146,207, issued jointly to Myer Rosenfeld, the applicant herein, and to Robert E. Wagner, Jr., said cleaner being highly successful for removing lithium-base greases that are very resistant to water and organic solvent removal. This previous cleaner was also equally effective for the removal of aged preservative type compounds, sodium and calcium base greases, tars, asphalt and various other soils. The cleaner also displayed improved emulsifying properties whereby stable emulsions were readily obtained with only a small amount of agitation.

The previous additive concentrate as disclosed in the aforementioned patent contained the following ingredients in parts by volume:

	Parts
Cyclohexanol	1
Ethylene glycol monobutyl ether	0.5
Diethylene triamine-diacetone condensate	0.25
Diglycol oleate	1
Ethanolamine oleate	2.5–4.5
Surface active amine sulfonate	0.5–3
Sorbitan oleate	0.5–1.5

The above parts by volume were mixed with 100 parts by volume of an organic solvent to produce the final cleaning composition.

Although this previous composition has demonstrated the desired cleaning action against thick, resistant layers of grease, it was found to be corrosive to galvanic couples of magnesium, aluminum and steel. Further investigation of the various ingredients separately and in various combinations indicated that the surface active amine sulfonates used in the cleaner, although they offset some of the

corrosion inherent in the rest of the composition, were chiefly responsible for the galvanic corrosion action.

The reason advanced for the cleaner's corrosion problem was due to the difference in chemical potential set up between portions of metal which were substantially covered with adsorbed sulfonate and portions of metal which remain uncovered with adsorbed sulfonate.

Therefore, it is the object of this invention to provide an improved cleaning composition which can be used on installations and equipment in which light weight metals of magnesium and aluminum are present, even when galvanically coupled to each other or to steel.

Another object of this invention is to provide a corrosion inhibitor in the cleaner which will not interfere with any of the performance requirements previously introduced into the cleaner but which will overcome corrosion due to galvanic action.

In accordance with the invention, the solvent cleaner described above is improved considerably by incorporating lauric acid therein in concentrations of from about one to 10 grams per 100 ml. of final cleaner. The presence of gram lauric acid in the cleaner has been found to be effective in preventing corrosion. Furthermore, its presence will not interfere with any of the performance requirements built into the cleaner. In accordance with the present findings, lauric acid will afford the necessary protection if the amine sulfonate is present in concentrations not exceeding 1 part in 7.75 parts of additive concentrate by volume. The improved cleaning composition of this invention may be used for cleaning magnesium and aluminum parts, even when galvanically coupled together or to steel, without any detectable corrosion observed by its use.

That the invention is a fortuitous one may be explained from the various fatty acids (stearic, palmitic, myristic) which were tested but which were found to lessen the cleaning action. Fatty acid molecules having alkyl radicals of 13–17 carbon atoms were found to interfere with the removal of road tar. Also, shorter alkyl chains of less than that of the lauric acid molecule are ineffective for inhibiting galvanic corrosion because it is believed that reduced surface activity prevents penetration of the molecule into narrow channels between galvanically coupled metals.

In the practice of the present invention the addition of lauric acid in concentrations of 1 gram to 10 grams per 100 ml. of final composition is effective for inhibiting corrosion. When the surface active sulfonates are used in relatively low concentrations, as shown in Examples 1, 3, 5, 7, 8 and 9 in the table below, about 1 gram lauric acid is found effective for this purpose. In other examples which include about 1% sulfonate, not less than about 2 grams of lauric acid per 100 ml. of cleaning composition are needed to overcome corrosion. In all permissible sulfonate concentrations, however, up to 10 grams of lauric acid may be included without affecting the cleaning ability of the present composition.

The surface active amine sulfonates which are useful in the practice of the present invention have been designated as (1) the amine salt of alkyl aryl, sulfonate type, such as Emcol HB manufactured by Witco Chemical Co., Inc. and (2) aromatic acyclic amine sulfonate, such as Aromol 10 manufactured by Burkart-Schier Chemical Co. More specifically, the amine sulfonate may comprise an ammonium or amine dodecylbenzene sulfonate in which the dodecyl chain comprises a mixture of branched chains. Other sulfonates may include mixtures of the above compound with those containing the ammonium or amine n-dodecyl benzene sulfonate, and such a mixture may be for example in the weight ratio of 1:4, respectively.

Illustrative of compositions for which successful gal-

vanic corrosion inhibition is attained when the lauric acid is included therein are the following examples:

ADDITIVE CONCENTRATE—PARTS BY VOLUME

Ingredients	1	2	3	4	5	6	7	8	9
Cyclohexanol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Ethylene glycol monobutyl ether	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Diethylene triamine-diacetone condensate	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Diglycol oleate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Ethanolamine oleate	3.5	3.5	3.5	2.5	2.5	4.5	4.5	2.5	4.5
Amine sulfonate	0.5	1.0	.75	1.0	0.5	1.0	0.5	.75	.75
Sorbitan monooleate	0.5	0.5	1.0	1.5	0.5	1.0	1.5	0.5	1.5
Total parts by volume	7.25	7.75	8.0	7.75	6.25	9.25	9.25	6.5	9.5

The diethylene triamine-diacetone condensate is formed by adding 30.3 parts of diethylene triamine dropwise with vigorous stirring (air stirrer or other spark-free stirrer) to 69.7 parts of diacetone alochol. The addition is conducted at a rate so that the temperature of the mixture does not exceed 34° C. at any time. It has been found advantageous to carry out the addition at a rate of about 2 to 3 milliliters of diethylene triamine per minute for every liter of diacetone alcohol used in the reaction.

The ethanolamine olate may be conveniently prepared in high flash coal tar naphtha by mixing at room temperature the following ingredients in the order listed:

	Percent by volume
High flash coal tar naphtha	50.0
Mono-ethanolamine	7.7
Oleic acid	42.3

In preparing the present cleaning composition, the additive concentrate in parts by volume is added to 100 parts by volume of a suitable solvent. A solvent mixture of 70 parts by volume of high flash coal tar naphtha (minimum flash point 100° F.) and 30 parts by volume of kerosene may be employed to better advantage. Other solvents which may also be used are Solvesso 100 and Panasol AN1. The lauric acid is then dissolved in the final composition in about 1 to 10 grams/100 ml. of composition.

GALVANIC CORROSION TEST

Corrosion to galvanically coupled metals was tested by sandwiching a magnesium panel of larger area between an aluminum panel and a steel panel, FS1020 cold rolled steel. The panels were polished with No. 50 aluminum oxide cloth and with No. 320 Carborundum paper. The panels were then washed with 95% ethyl alcohol and dried with paper toweling. The magnesium panel was then placed between the aluminum and the steel panel, and three panels were then tied together with cotton string. The panels were placed in a glass container and covered with cleaning composition. Four sets were used for each composition tested. After 24 hours the panels were removed from the composition, washed with water, then with alcohol and dried. Each panel was then examined for pitting, for other types of corrosion and for discoloration. Cleaning compositions which contained the additive concentrate of Examples 1–9 and lauric acid therein in amounts of about 1–10 grams/100 ml. of composition were capable of inhibiting galvanic corrosion. When the identical cleaning composition was tested without the presence of lauric acid therein, there was visual evidence of corrosion on the aluminum and magnesium panels.

It will be apparent therefore from the foregoing description of this invention that the improved composition described herein provides satisfactory cleaning for systems containing aluminum, magnesium and steel alone or galvanically coupled.

The compositions shown are only exemplary and various modifications can be made within the scope of invention as defined in the appended claims.

What is claimed is:

1. A cleaning composition consisting essentially of:

(A) the following additive concentrate in parts by volume

Cyclohexanol	1.0
Ethylene glycol monobutyl ether	0.5
Diethylene triamine-diacetone condensate	0.25
Diglycol oleate	1.0
Ethanolamine oleate	2.5–4.5
Surface active amine alkyl aryl sulfonate	0.5–1.0
Sorbitan oleate	0.5–1.5

(B) a solvent of about 70 parts by volume high flash coal tar naphtha and about 30 parts kerosene, said solvent being present in 100 parts by volume, and

(C) lauric acid in a concentration of about 1 to about 10 grams per 100 ml. of said additive concentrate and said solvent.

2. A cleaning composition in accordance with claim 1 wherein said surface active amine alkyl aryl sulfonate is ammonium dodecylbenzene sulfonate.

3. A cleaning composition in accordance with claim 1 in which said sulfonate is present in a concentration of about 0.5 to 0.75 part by volume and said lauric acid is present in a concentration of about 1 gram per 100 ml. of said concentrate and said solvent.

4. A cleaning composition in accordance with claim 1 in which said sulfonate is present in a concentration of about 1 part by volume and said lauric acid is present in a concentration of about 2 grams per 100 ml. of said concentrate and said solvent.

References Cited

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