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Froehlich et al.

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[54] LIQUID CLEANING COMPOSITION

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[51] Int. Cl.² C11D 3/26

[58] Field of Search 252/90, DIG. 2, 88, DIG. 13

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[57] ABSTRACT

A liquid cleaning dispersion comprising a halogenated solvent and urea-formaldehyde polymer particles as the major components, also with small amounts of an antistatic agent and an antissettling agent and, optionally, chlorofluorinated propellant for aerosol application; useful for cleaning textiles.

3 Claims, No Drawings

LIQUID CLEANING COMPOSITION

BACKGROUND OF THE INVENTION

This invention concerns an all-purpose cleaning composition, in the form of a liquid dispersion, that is especially useful on carpets and upholstery.

Many known spot-removing compositions employ a solvent/absorbent substrate combination. The solvent mobilizes the soil and the adsorbent substrate attracts the soil and solvent to itself for removal from the fabric by, say, brushing or vacuuming. Detergents and/or surfactants are sometimes employed in such cleaning compositions. The surfactants are usually anionic or non-ionic in character. Examples of anionic surfactants include salts of fatty acids, alcohol sulfates and sulfonates, polyoxyalkylene alkyl carboxylates and polyoxyalkylene alcohol phosphates. Nonionic surfactants include polyethoxylated alcohols, amines, alkyl phenols, fatty acids and amides.

When textile products, particularly carpets and upholstery, are cleaned with such prior art compositions the very fine particles of adsorbent substrate tend to adhere to the textile fibers. This is particularly noticeable when the fibers and the particulates are non-conductive. The phenomenon is believed due to static attraction. The compositions of the instant invention solve the problem by including in the cleaner composition a cationic antistatic substance which promotes the removal of fine particulates by brushing or vacuuming the textile material. There is nothing in the art to suggest the particular combination of cleaning composition elements that are disclosed herein or to suggest employing such elements in the amounts and ratios taught herein.

SUMMARY OF THE INVENTION

This invention concerns a liquid cleaning composition comprising

- i. 5 to 30 parts of urea-formaldehyde polymer particles having a particle size of from 10 to 105 microns and an oil value of at least 90,
 - ii. 70 to 95 parts of halogenated solvent boiling at from 45° to 120°C.,
- the total of (i) and (ii) being 100 parts, and
- iii. 0.1 to 3.0 parts of finely divided silica antistatting agent,
 - iv. 0.1 to 2.0 parts of cationic antistatic agent, and
 - v. up to 125 parts of aerosol propellant selected from at least one of trichlorofluoromethane, dichlorodifluoromethane, 1,2-dichlorotetrafluoroethane, propane, isobutane and butane.

A preferred cleaning composition of this invention comprises

- i. 10 to 23 parts of urea-formaldehyde polymer particles,
- ii. 77 to 90 parts of halogenated solvent,
- iii. 0.5 to 1 part of finely divided silica,
- iv. 0.3 to 1 part of cationic antistatic agent, and
- v. up to 50 parts of aerosol propellant.

Minor amounts of additional solvents, as well as odorant and other additives can also be included in the cleaning compositions of this invention, as will be obvious to those skilled in the art.

The cleaning compositions of the invention can be dispensed as aerosols from pressurized cans. The proportion of cleaner and pressurizer can best be determined by experiment, but will generally be approxi-

mately a 50%—50% mixture. The pressurizing agents are best used as mixtures to obtain a favorable balance of properties.

In use, the novel textile-cleaning compositions are applied to a soiled area of a carpet or other textile by spraying or sprinkling, or from a cloth or sponge applicator, and rubbed or brushed into the substrate. After drying, which can take only seconds or a few minutes, depending on the amount applied and on atmospheric conditions, the residual particles can be vacuumed away or brushed into a dustpan. The soil, having been loosened by the solvent, is adsorbed on the urea-formaldehyde polymer particles and is removed therewith.

DETAILS OF THE INVENTION

All of the individual ingredients of the compositions of this invention are available commercially and are made by well-known methods. The cleaning compositions are prepared by thorough mixing of the ingredients in any order. For example, the solvent can be charged to a vessel and the antistatic and antistatting agents can be added followed by the addition of urea-formaldehyde polymer particulate material. The compositions can be packaged for use at a later date without diminution of their effectiveness. Settling may occur on standing, but stirring or shaking before use quickly restores the homogeneity of the mixture.

Urea-formaldehyde polymer particles of satisfactory porosity are made by reacting urea and formaldehyde in an aqueous mixture at a mole ratio of about 0.9 mole urea to 1 mole of formaldehyde. Urea can be introduced as a 20% aqueous solution and formaldehyde as a 37% aqueous solution.

The urea solution can be made up in a reactor and the pH of the solution adjusted to 5.6–5.8 by adding sulfuric acid. The formaldehyde is best added at once, resulting in a lowering of pH to about 3.9. Sulfuric acid is immediately added as catalyst, to bring the pH to 1.6–2.0. Polymerization starts at once, with evolution of heat. The charge is then heated at 55° to 60°C. for 2 hours, and the pH is adjusted to 7.0 to 7.5 by adding caustic soda solution. The solid particles can be removed by filtration, washed with water and dried at about 70°C. After grading to eliminate particles larger and smaller than desired, the particles are ready to use.

In order to function satisfactorily the polymer particles must have a particle size between 10 and 105 microns. If too small, the particles will be difficult to remove from the textile fibers. If too large they will not have the desired cleaning capacity.

The oil value of the particles, a function of their porosity, must be at least 90. Oil value can be determined according to Method D281 of the American Society for Testing Materials. In this procedure, raw linseed oil is gradually added to a weighed amount of dry, particulate material until there is obtained a stiff, putty-like paste that does not come apart easily. Oil value for cleaning particles is calculated as follows, with typical values for the specific gravity being around 1.4 g/cc:

$$\text{Oil value} = \frac{\text{Grams of Oil}}{\text{Grams of Particulates}} \times \frac{\text{Sp. Gr. of particulate material} \times 100}{1}$$

The halogen-containing solvents that are useful herein are those that readily dissolve oily and greasy materials and that have satisfactory volatility. They are

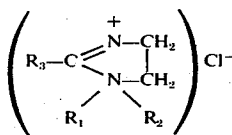
not so volatile as to evaporate before exerting their solvent property on the soil, but should volatilize in no more than a few minutes so that they do not prevent removal of the dried soil-particulate combination. These properties are provided by solvents having boiling points from about 45° to 120°C. Preferred solvents are methyl chloroform, perchloroethylene, trichloroethylene and 1,1,2-trichloro-1,2,2-trifluoroethane. Solvent freezing points must, of course, be low enough so that the solvent does not freeze at use temperatures. The most preferred solvent is 1,1,1-trichloroethane, commonly called methyl chloroform.

Contemplated chlorinated hydrocarbons are subject to decomposition upon contact with metal surfaces. It is therefore customary to add to these solvents small amounts of stabilizing agents. Effective stabilizers that can be used with the solvents described herein include 1,4-dioxane, secondary butylene alcohol, and 1,2-butylene oxide.

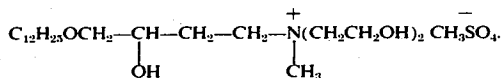
Cationic antistatic agents have a beneficial effect on particulate recovery in the compositions of the invention. Nonionic surfactants such as trialkylphosphates and ethoxylated alcohols have little or no effect. Likewise, anionic surfactants such as the amine salts of alcohol phosphates and alcohol sulfates do not improve particulate recovery performance.

The preferred cationic antistatic agents that are useful in the cleaning compositions of this invention are those that incorporate at least one C₁₂ to C₂₄ aliphatic group in a quaternary salt configuration. The aliphatic group can be a hydrocarbyl group or can include a linking oxygen or nitrogen atom in the chain. The most preferred agent is stearyltrimethylammonium chloride. Good results are obtained with similar compounds derived from C₁₀ to C₂₄ aliphatic straight chain amines.

Another series of effective antistatic agents has the general formula



where R₁ and R₂ are C₁ to C₄ alkyl and R₃ is a C₁₀ to C₂₄ alkyl group. An example of this group is the commercial product "Quaternary" 0 of the Ciba-Geigy Corporation. Another useful antistatic agent has the formula RN⁺R₁R₂R₃X⁻ where R is C₁₂ to C₂₂ alkyl; R₁=R₂=CH₃, CH₂CH₂OH, or CH₂CH(CH₃) OH; R₃ is CH₃, C₂H₅ or C₆H₅CH₂; and X is Cl, Br or CH₃SO₄. An example is "Arquad" 18 sold by Armour Industrial Chemical Company. Still another useful compound is



Satisfactory quaternary antistatic agents can employ as anions halides, CH₃SO₄⁻, C₂H₅SO₄⁻, H₂PO₄⁻ and others.

The relative effectiveness of the antistatic agents can be determined by preparing duplicate cleaning compositions distinguished only by the difference in antistatic agent employed, followed by application to a darkcol-

ored textile article (preferably a test piece of nylon carpet) and removal by vacuuming, each operation being performed in the same manner for each cleaning composition. Rubbing the toe end of the sole of a black shoe over the cleaned spot for about 10 strokes will cause the deposit of more or less polymer particles on the toe of the shoe depending on the efficiency of the antistatic agent.

As a result of the cationic antistatic component of the compositions, the particulate material does not adhere as tenaciously to the textile fibers as it would in the absence of the antistatic agent. Essentially all of the particles, even those extremely fine residual fragments which may have been deposited due to break-up during the rubbing or brushing, are readily removed by a vacuum cleaner or a brush. Where the antistatic agent is not included, these small particles adhere to the textile fibers and, if in sufficient amount, confer an undesirable change in appearance, a "frosty" look, to the substrate.

As an antisetling agent a very fine insoluble inorganic material is employed, exemplified by fumed silica which has a particle size of from about 0.01 to 0.007 micron. Such antisetling agent promotes the dispersion of the cleaning particulates in the solvent and aids in providing a uniform composition. As an additional antisetling aid there can, optionally, be included a small amount of ethylene glycol or a polyethylene glycol of up to about 1,000 molecular weight.

The following Examples illustrate the invention. They do not limit the invention.

EXAMPLE 1

Into a suitable vessel were charged 81.13 parts of 1,1,1-trichloroethane, with agitation. There was successively added 3.35 parts of 1,4-dioxane, 0.042 parts of secondary butyl alcohol, 0.042 parts of 1,2-butylene oxide, 0.626 parts of a 50% aqueous solution of stearyltrimethylammonium chloride, and 0.511 parts of fumed silica of particle size 0.01 to 0.007 microns, and the ingredients were thoroughly mixed. There was then added slowly, allowing each addition to wet out thoroughly, 18.87 parts of urea-formaldehyde particulates having an Oil Value above 90 and particle size between 10 and 105 microns. After thorough blending, the product was transferred to small containers for eventual use.

Several nylon carpets that were badly soiled were cleaned with the composition of this Example, in this manner:

The cleaner was applied to the spots by shaking through a 1/32 inch opening in a bottle top to cover the area of the spots. The cleaner was gently worked in with a nylon bristle brush. The application was repeated a second time, and 30 minutes allowed for the solvent to evaporate. The residual particulate material was removed by a conventional beater type vacuum cleaner, leaving no trace of the original spots. Addition of 0.12 parts of ethylene glycol to the composition was found to help keep the particulate material suspended in the liquid.

EXAMPLE 2

A composition of the invention was prepared in the following manner for dispensing as an aerosol spray. Into a vessel was placed 79.7 parts of inhibited methyl chloroform (95.9% 1,1,1-trichloroethane, 4.0% 1,4-

dioxane, 0.05% 1,2-butyleneoxide and 0.25% 2-butanol) and 0.64 part of a 50% aqueous solution of stearyltrimethylammonium chloride, 1.02 part of fumed silica (particle size 0.01 to 0.007 micron) and 20.3 parts of urea-formaldehyde polymer particles were added. After thorough mixing, the product was charged into a spray can cooled in a bath of frozen carbon dioxide and 25.4 parts of dichlorodifluoromethane was added. The can was then fitted with a spray head. The polymer particles were prepared in the same manner as described in Example 1. This composition was sprayed from the can on stained spots on carpets and chair upholstery and used as described in Example 1. Stained areas were cleaned so well that no trace of stain remained.

EXAMPLE 3

A composition was prepared as in Example 2 with the exception of certain proportions of materials that varied as follows:

89.8 parts of inhibited methyl chloroform, 0.64 part of 50% stearyltrimethylammonium chloride in isopropanol, 1.02 part of fumed silica and 10.2 parts of urea-formaldehyde polymer particles with 25.4 parts of dichlorodifluoromethane. This composition performed equally well when sprayed on textile stains and used as described in Example 1.

EXAMPLE 4

By the general procedure of Example 1, a preferred cleaning composition can be made containing 10 parts of urea-formaldehyde polymeric particles having a particle size between 10 and 105 microns, 90 parts of 1,1,1-trichloroethane, 1.0 part of stearyltrimethylam-

monium chloride cationic antistatic agent, and 1.0 part of fumed silica antisetling agent.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A liquid cleaning composition dispensible from a container under pressure comprising

i. 5 to 30 parts of urea-formaldehyde polymer particles having a particle size of from 10 to 105 microns and an oil value of at least 90,

ii. 70 to 95 parts of halogenated solvent boiling at from 45° to 120°C.,

the total of (i) and (ii) being 100 parts, and

iii. 0.1 to 3.0 parts of finely divided silica antisetling agent,

iv. 0.1 to 2.0 parts of cationic antistatic agent, and
v. up to 125 parts of aerosol propellant selected from at least one of trichlorofluoromethane, dichlorodifluoromethane, 1,2-dichlorotetrafluoroethane, propane, isobutane and butane.

2. A composition according to claim 1 comprising

i. 10 to 23 parts of urea-formaldehyde polymer particles,

ii. 77 to 90 parts of halogenated solvent,

iii. 0.5 to 1 part of finely divided silica,

iv. 0.3 to 1 part of cationic antistatic agent, and

v. up to 50 parts of aerosol propellant.

3. A composition according to claim 2 comprising

i. 10 parts of urea-formaldehyde polymer particles,

ii. 90 parts of 1,1,1-trichloroethane,

iii. 1.0 part of fumed silica, and

iv. 1.0 part of stearyl trimethylammonium chloride.

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