Carpet Cleaning Composition and Method

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ABSTRACT
A fast-foaming, carpet cleaner containing water-soluble surfactant, silica, higher aliphatic alcohol, water and liquefied propellant. The composition which is dispensed from an aerosol container provides improved cleaning, exceptionally stable foam which prevents oversetting of the carpet and resoiling retardation.

9 Claims, No Drawings
CARPET CLEANING COMPOSITION AND METHOD

This is a continuation of application Ser. No. 20,398 filed Mar. 17, 1970 now abandoned.

This invention relates to a composition for cleaning carpets and more particularly to an aerosol carpet cleaner. Carpets are commonplace in the American household. They are made in numerous sizes, shapes, and fabrics. Most households have at least one of the many types available. Since vacuuming of the carpet only removes loose dirt, a more effective means is required to remove soil which is strongly attached to the carpet fibers. Although professional cleaning is quite effective in removing imbedded dirt and soil, it has its disadvantages, the most evident being cost. Equally burdensome is the necessity of removing the carpet and transporting it to the cleaning plant. This not only creates problems in removing and transporting the carpet, but it also leaves the floors uncovered for a long period of time giving a less attractive appearance to the home.

In view of both the economical and physical inconveniences, the need for a do-it-yourself carpet cleaning composition arose. In response to this need, many cleaning compositions were developed and commercially exploited. They were formulated in a variety of forms, i.e., dry powder, liquid, and aerosol. Although these compositions have served consumers, large expenditures on professional rug cleaning, many compositions require special equipment necessitating further expenditure of funds and equipment storage problems. Other problems resulting from the use of do-it-yourself compositions are the slow drying of the carpets after they have been shampooed, and theleaving of tacky, sticky residues which promote resoiling of the carpet. The slow drying of the carpet is the result of water, used in shampooing, permeating the backing of the carpet. Since the backing of the carpet is not exposed to the air, the soaked in water takes a long time to evaporate. Resoiling is also a major problem and although compositions are marketed containing detergents which do not leave a sticky or tacky residue, resoiling is not retarded and it is necessary then to clean the carpet more often.

The present invention resides in the provision of cleaning compositions for carpets wherein the foregoing and related disadvantages are eliminated or at least mitigated to a substantial extent.

The present invention is directed to a fast-foming aerosol cleaning composition for carpets which provides improved cleaning, retardation of the rate of resoiling, prevention of excessive wetting and promotion of faster water evaporation. The aforesaid aerosol composition is prepared primarily of water-soluble surfactant, higher aliphatic alcohol, silica, water, and propellant. The inventive composition is formulated by first preparing a concentrate which essentially contains surfactant, silica, long chain alcohol and water. The concentrate is then placed into a suitable aerosol container to which liquefied propellant is added in the conventional manner. This novel formulation prevents overwetting of the backing of the carpet because of the amazing, unique stable foam which is formed. The foam lattice holds back most of the water molecules from reaching the backing of the carpet thereby preventing saturation and concomitant shrinking of the carpet.

Even though compositions containing higher aliphatic alcohols have good foam stability, formulations containing in addition, silica, provide superior foam stability and antieetting properties. Foams not containing silica are wetter and therefore are not as effective as silica containing foams in preventing water from draining into and permeating the carpet's backing. The compositions of the present invention provide a drier foam mainly due to the fine dispersion of silica throughout the foam lattice. The dispersed silica augments the retaining ability of the foam achieving more efficient retention of the water molecules within foam structure. The silica also provides a greater surface area from which water may more readily evaporate with concomitant acceleration of the drying time of the carpet. Commensurate with the anti-wetting properties of the novel formulation is resoiling retardation. It is postulated in explanation thereof that the silica particles tend to embed themselves and fill the void and interstices present in the fibrous material comprising the carpet, in effect blocking those sites which would otherwise serve as reservoirs for soil, dust, grease and the like. As will be readily evident, the useful life of the fabric, in view of the "protective" foam lattice and particles, can be significantly enhanced. Moreover, actual carpet cleaning is greatly facilitated in view of the substantial reduction in actual embedding of dirt particles, the latter tending to agglomerate at the surface of the fabric being thus rendered more accessible to removal operations, e.g., vacuuming.

Reflectance data reveal the improved cleaning ability of compositions containing higher aliphatic alcohols in addition to suitable conventional detergents and surfactants. Also discovered is the further improved cleaning ability of compositions containing silica in addition to surfactants and higher aliphatic alcohols. These silica-containing compositions are superior to those which are devoid of this essential ingredient because of the abrasive action of the silica particles on the soiled fibers.

Contemplated by the present disclosed invention is a unique, novel composition of silica and higher aliphatic alcohol in combination with water-soluble surfactants in a water/propellant system. The long chain alcohols provide a uniquely structured foam lattice and the silica dispersed therein increases cleaning power, delays resoiling, prevents excessive draining of water to the carpet backing, and effectuates rapid evaporation of water from the carpet.

The higher aliphatic alcohols of the present invention which perform the critical role of foam builder and stabilizer are alcohols which are solids at room temperature. Alcohols with less than 14 carbon atoms in the aliphatic chains are undesirable since they leave a liquid residue on the carpet fibers. Alcohols with more than 20 carbon atoms in the aliphatic chain are also not beneficial since they form poor foams. Higher aliphatic alcohols having 14 to 20 carbon atoms are the preferred ones for use in the present invention. More particularly preferred are those alcohols with 16 to 18 carbon atoms in the aliphatic chain.

Since the solid long chain alcohols agglomerate by nature, they must be dissolved or dispersed in the product in a finely divided state. If not properly prepared, the alcohol moieties agglomerate to form groupings large enough to lodge in and eventually plug up the ap
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eratures of the aerosol actuator, causing cessation of the operation, thereby preventing the product from being dispensed. It has been found, and is contemplated, as within the scope of this invention, that to insure against agglomeration of particles, the long chain alcohol must be liquefied first, then heated along with the other organic components in the water to a temperature at which complete solution is obtained. If this is attempted in all or most of the formula water, inordinately high temperatures (approaching the boiling point of water and resulting in manufacturing difficulties and expenses) are required. If, however, 15 to 25 percent of the water of the formulation is used, the organic components are all in complete solution at 160°F., which is very reasonable for factory operation.

Unless the higher aliphatic alcohols are incorporated in the composition by the above stated method, clogging of the actuator and orifice of the aerosol button will occur. The above stated method provides sufficiently small particles of long chain alcohol which do not agglomerate and clog the actuator or orifice as would occur in compositions in which the organic alcohol is not so prepared.

The recommended content of higher aliphatic alcohol in the composition is between about 1/4 percent to about 2 percent by weight of the concentrate with a range of about 1/8 percent to about 1/2 percent being particularly preferred.

The water-soluble surfactants employable in the present invention may be selected from the variety of surface active materials conventionally employed in the preparation of carpet cleaning compositions. However, the use of such materials inherently involves certain disadvantages, the more problematical being those associated with the deposition of tacky or sticky residues. Accordingly, considerable caution should be exercised as regards surfactant selection; in any event, the surfactant material should exhibit the property of drying to a friable residue capable of ready removal by vacuuming. In general, surfactants of the anionic type are preferred for use. The alkaline metal alkyl sulfates and alkali metal alkyl sarcosinates are most preferred. Surfactant materials falling within the alkyl sulfates category may be represented, according to the following structural formula:

$$\text{R}, \text{O}, \text{X}$$

wherein R comprises an aliphatic hydrocarbon group i.e., alkyl and alkenyl, such group containing preferably from 10 to 18 carbon atoms, and X represents a watersolubilizing cation e.g., alkali metal such as sodium, potassium, lithium, ammonium, substituted ammonium, amine salts, etc.

Surfactant material falling within the alkyl sarcosinate category comprises the alkali metal alkyl sarcosinates which may be represented according to the following structural formula:

$$\text{R}, \text{H}, \text{CON}, \text{CH}, \text{CH}, \text{H}, \text{COO}, \text{X}$$

wherein R, comprises an aliphatic hydrocarbon group containing from 9 to 18 carbon atoms and wherein X has the above described significance.

The water-soluble surfactants are used in amounts of about 4 to 15 percent by weight of the concentrate composition. However, the preferred amounts being about 6 to 10 percent by weight of concentrate of the composition. Although any suitable surfactant may be used alone in the composition, mixtures of alkali metal alkyl sulfates and alkali metal alkyl sarcosinates are preferred. Although various ratios of sulfate to sarcosinate are operable, the preferred range of proportion of sulfate to sarcosinate being about 1:3 to about 3:1. It is preferred to have the sulfate present in greater proportion than the sarcosinate and in particular the ratio of 3:1 is eminently preferred.

The silica material preferred for use in accordance with the present invention has an average particle size ranging from about 0.007 to about 5 microns with a range of about 0.01 to about 2 microns being particularly preferred and most particularly preferred is a range of about 0.012 to about 0.05 microns. The density of the suitable silicas is in the range of about 2 to about 16 lbs/cu. ft. and more preferably 2 to about 6 lbs/cu. ft.

Colloidal silica is the ingredient of choice. It is available commercially in a wide variety of grades and forms depending upon the process of manufacture employed. Thus, the silica may be of the pyrogenic type, a suitable representative including Cab-O-Sil available commercially from the Cabot Corporation. A precipitated type of colloidal silica suitable for use herein is available commercially from the Philadelphia Quartz Company under the trademark designation "Quso;" suitable synthetic silicas include for example amorphous silica gel available commercially from W. R. Grace Company under the trademark designation "Syloid." In general, the particle size of the pyrogenic and precipitated silicas falls within the lower portion of the range stated while the synthetics are usually provided in the larger particle size range. Also suitable for use is aluminum oxide having the appropriate particle size and density to provide similar effects as does silica.

In order to assure the obtention of optimum results, it is recommended practice to utilize the silica material in amounts ranging from about 0.75 percent to about 5 percent by weight of concentrate. Silica in amounts less than 0.75 percent would have minimal effect and amounts greater than about 5 percent are difficult to disperse and may cause clogging of the actuator and orifice of the button of the aerosol container. To achieve maximum effects from the silica and to avoid problems of clogging, the preferred silica content of the cleansing composition is about 1 to about 2 percent by weight of concentrate.

In formulating the concentrate of the compositions of the present invention, the quantities of water employed vary from about 65 to about 95 percent by weight of concentrate. The concentrate of the present invention is employed in amounts of about 85 to about 95 percent by weight of the total composition.

The compositions of the present invention are provided in the form of an aerosol. In formulating such compositions, the quantity of propellant used is about 5 to about 15 percent by weight of total composition. It was found that the liquefied gas propellant isobutane provides the desirable low pressure sufficient to expel the composition from the container and also provides optimum control over the nature of spray upon discharge of the composition. Although isobutane is the propellant of choice, propellants which are normally gaseous, liquefied materials such as lower alkanes, such as propane and butane, lower alkyl chlorides and chlorinated and fluorinated lower alkanes are suitable for use. Also suitable are mixtures of the above propellants.
It is to be understood that optional ingredients of conventional types including preservatives, germicides, fluorescent brightening agents, anti-corrosion agents, etc. may be incorporated in the composition. The amount of any such ingredient employed is not of critical importance although recommended practice would suggest its use in small amounts i.e., from 0 to 1 percent by weight of total composition. It will be understood of course that optional ingredients in addition to those specifically enumerated may be employed in the composition provided herein, the salient requirement being, of course, that any such ingredient be completely devoid of any tendency to deleteriously affect or otherwise degrade the properties and characteristics of the parent composition.

The compositions of the present invention are particularly and beneficially adapted for use in the cleansing of formed textile fabrics and more particularly, to heavy durable fabrics having a nap or pile. Such compositions are particularly advantageous in the treatment of rugs and carpets. In any event, the formed textile fabric may be of vegetable, synthetic or animal origin including mixtures of same. The term “synthetic fibers” as employed in the context of the present invention has reference to a wide variety of materials, among which may be mentioned viscose rayon, acetate rayon, nylon, as well as fibers derived from polyester and acrylic type polymers.

In practice, the cleansing composition is applied to the surface to be treated imparting a layer of foam thereon. A wet sponge containing water is used to spread the foam evenly. The foam is worked until it disappears. The treated area is allowed to dry, then vacuumed to remove dried cleaner and loosened dirt. There is no need for application of heat or other excess energy.

The following examples are given for purposes of illustration only and do not constitute a limitation on the present invention. All percentages are by weight.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Concentrate</th>
<th>Example No. 1 wt%</th>
<th>Example No. 2 wt%</th>
<th>Example No. 3 wt%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium lauryl sulfate</td>
<td>3.5</td>
<td>10.5</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>Sodium lauroyl sarcosinate</td>
<td>3.5</td>
<td>3.5</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Cetyl alcohol</td>
<td>1.5</td>
<td>1.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Colloidal Silica</td>
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<td>1.0</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Brightening Agent</td>
<td>01</td>
<td>01</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>Anti-corrosion Agent</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>83.39</td>
<td>83.39</td>
<td>83.39</td>
<td></td>
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</tbody>
</table>

Aerosol Composition

<table>
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<tr>
<th>Concentrate</th>
<th>100.00</th>
<th>100.00</th>
<th>100.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propellant</td>
<td>94</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>Isobutane</td>
<td>6</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

The above formulations are adjusted to a pH of about 9.2, however a range of pH of 8.5–9.5 is suitable for practice of this invention. A composition of low pH is a less efficient cleaner and also causes corrosion.

It has further been found that certain of the fluorescent brighteners, which improve the appearance of carpeting further than the cleaning process, cannot be dissolved in the composition as described. For these, it becomes necessary, to first liquefy, the solid long chain alcohol, dissolve the brightener therein, and then add this to the organic-water mixture at 160°F, as previously described. The composition of the present invention provides superior cleaning activity while imparting to the carpet surface exceptional resistance to soilin despite immediate resumption of traffic. Also provided is a cleaning composition which does not overly wet the carpet backing, provides fast drying of the carpets by preventing water drainage and facilitates water evaporation.

Although the present invention has been described and illustrated, it is understood that modifications and variations of compositions and particulars are contemplated within the scope of the appended claims.

We claim:

1. A cleaning composition adapted for shampooing carpets and the like consisting essentially of

A. 4.0 to 15.0 percent by weight of a water soluble, organic surface active agent selected from the group consisting of sodium lauryl sulfate, sodium lauroyl sarcosinate and mixtures thereof; B. 0.25 to 2.0 percent by weight of cetyl alcohol; and C. 0.75 to 5.0 percent by weight of a finely divided water insoluble siliceous material in an aqueous medium.

2. A composition as defined in claim 1 wherein:

C. Is a colloidal silica.

3. The composition of claim 1 in a pressurized aerosol container wherein also present is a normally gaseous liquefied propellant.

4. A containerized aerosol composition as defined in claim 3 wherein ingredients A, B and C in an aqueous medium form a concentrate which is 85–95 percent by weight of the composition and wherein A is 4–15 percent by weight of the concentrate and is a mixture of equal parts of sodium lauryl sulfate and sodium lauroyl sarcosinate, B is cetyl alcohol and is 0.5–2 percent by weight of the concentrate and C is 0.75–2.5 percent by weight of the concentrate and is colloidal silica having a maximum particle size of about 5 microns; and said propellant is isobutane and is present in an amount from about 5–15 percent by weight of the composition.

5. In a process for making a composition as defined in claim 1, the steps consisting essentially of liquefying component B, then adding said liquefied alcohol to part of the water containing component A, and thereafter heating said mixture to a temperature sufficient to effect substantial solution of all components in the water and thereafter mixing component C with said clarified mixture and adding the balance of the formula water.

6. A pressurized aerosol package consisting essentially of a valveless container having therein about 85–95 percent by weight of a concentrate and 15 to 5 percent by weight of a liquefied normally gaseous propellant, said concentrate consisting essentially of:

A. 4–15 percent by weight of the concentrate, of a water-soluble anionic, organic, surface active agent selected from the group consisting of 1) alkyl sulfates represented by the formula ROH where R is an aliphatic hydrocarbon group containing 10 to 18 carbon atoms and X represents a cation selected from the group consisting of sodium, potassium, lithium and ammonium; 2) alkyl sarcosinates represented by the formula R,CON(CH3)2CH2COO where R is an aliphatic hydrocarbon group containing from 9 to 18 carbon atoms and wherein X represents a cation selected from the group consisting of sodium, potassium, lithium and ammonium; and 3) mixtures thereof; B. 0.25 to 2 percent by weight of the concentrate, of an aliphatic C8–C18 fatty alcohol; C. 0.75 to 5 percent by weight of the concentrate, of a finely divided water insoluble siliceous material
having an average particle size ranging from about 0.01 to about 2 microns;

and

D. 65 to 95 percent by weight of the concentrate, of water.

7. A package as defined in claim 6 wherein said surface active agent is a mixture of C_{16-18} alkyl sulfate and a C_{16-18} alkoyl sarcosinate.

8. A package as defined in claim 7 wherein said surface active agent is a mixture of equal parts of sodium lauryl sulfate and sodium lauroyl sarcosinate.

9. A package as defined in claim 6 wherein said alcohol is cetyl alcohol.