United States Patent Office

3,239,468

Patented Mar. 8, 1966



3,239,468

# HARD SURFACE CLEANING COMPOSITIONS

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No Drawing. Filed May 26, 1961, Ser. No. 112,758
4 Claims. (Cl. 252—152)

The invention relates to new compositions of matter. More particularly, the invention relates to compositions for cleaning hard surfaces such as tile floors, painted surfaces and the like.

Generally, the new compositions of the invention comprise an alkyl aryl sulfonate, a non-ionic polyoxyalkylene alkylphenol condensate, at least one fatty acid-diethanolamine condensate and a liquid medium diluent therefor.

The total amount of active constitutents mentioned above can vary widely when employed in the new compositions disclosed and claimed herein and is restricted only by economic practicalities. Furthermore, the active constituents can be prepared without any added water or other vehicle, such as a liquid medium and subsequently diluted to use concentrations; or the active constituents can be prepared in a liquid medium, that is, in concentrate form and subsequently further diluted before application to a surface to be cleaned, this being preferred for sake of convenient handling. When mixed in a liquid medium, the total amount of active constituents utilized is generally in a range of about 5 to 20 percent, based on the total weight of the mixture, and preferably in a range of about 8 to 12 percent. Accordingly, referred to an anhydrous basis, that is, a composition containing only the active constituents in the absence of a liquid medium and/or aqueous diluent, the alkyl aryl sulfonate can be employed in a range of 15 to 25 percent (100% A.I.) by weight, the non-ionic polyoxyalkylene alkylphenol condensate in a range of 20 to 45 percent by weight and the fatty acid-diethanolamine condensate in a range of 40 to 55 percent by weight, all weight percents being based on the total weight of the active constituents. However, it is to be understood that although the active constituents are preferably mixed in amounts falling within the limits set out above on an anhydrous basis, the total amount of active constituents employed in a liquid medium can be less than 5 and more than 20 percent by weight.

The term "liquid medium" as used herein includes water, mixtures of water, ethanol, isopropanol or propylene glycol, and any of these containing perfumes, coloring matter and the like or other materials normally employed as vehicles or diluents and the like for compositions such as detergents, soaps, cleaning solutions and other materials in this general category.

Generally, before application to a surface for the purpose of cleaning, the composition containing the liquid medium and the active constituents is diluted with water to provide a cleaning solution of desired concentration to effect good cleaning of the surface to which it is applied. Here again, the total concentration of active ingredients is not critical but limited by economic practicalities. However, in the diluted solutions, concentrations of liquid medium plus active constituents of from about 0.75 to 2.5 percent by weight, based on the total weight of the diluted solution, and preferably from about 1.0 to 1.5 percent, are excellent for routine cleaning of hard surfaces although these limitations are not critical and greater or lesser amounts of active constituents plus liquid medium can be used in preparing a diluted solution. As a general rule, however, concentrations of active constituents plus liquid medium of about 0.75 to 2.5 percent by weight in a diluted cleaning solution provide adequate cleaning power for even the most difficult cleaning tasks.



Accordingly, referred to a basis of liquid medium and total amount of active constituents, the new compositions of this invention comprise by weight, based on the total weight of the composition, as little as 0.03 percent or less and as much as 0.50 percent or more of total active constituents in liquid medium in their final stages of dilution. However, the compositions preferably comprise from about 0.05 to about 0.30 percent by weight, based on the total weight of the composition, of active constituents in liquid medium. It is apparent that in concentrated compositions containing the preferred amounts of active constituents in liquid medium, that is, 8 to 12 percent, as mentioned hereinabove, the total amount of active constituents when such composition is diluted for use on a surface to be cleaned will fall within the preferred range of about 0.05 to about 0.30 percent by weight, based on the total weight of the composition, of active constituents in liquid medium. Specifically, therefore, the total amounts of active constituents in such compositions are about .06 to about 0.3 and preferably about 0.08 to about 0.2 percent by weight in the final stages of dilution.

The alkyl aryl sulfonates which can be employed in the new compositions of this invention are the water soluble mononuclear and polynuclear alkyl aryl sulfonates. The aromatic nucleus can be derived from benzene, toluene, xylene, phenols, cresols, naphthalene, etc. The alkyl substituents may vary widely as long as the desired detergent power of the active ingredient is preserved. Although the number of the sulfonic acid groups present on the nucleus can be varied, it is usual to have one such group present in order to preserve a good balance between the hydrophilic and hydrophobic portion of the molecule. Examples of suitable alkyl aryl sulfonates are water soluble salts of the higher alkyl aromatic sulfonates. The alkyl constituent can be either a branched or straight chain structure comprising such groups as decyl, dodecyl, keryl, penta-decyl, mixed long chain alkyl derived from long chain fatty materials, parafin wax olefins, polymers of lower monoolefins, etc. Preferred examples of this class of compounds are the higher alkyl mononuclear aryl sulfonates wherein the alkyl group contains 10 to 18 and preferably 12 to 15 carbon atoms and salts thereof, such as the alkali metals, ammonium and alkanolamine salts. Exemplative of such compounds are decyl benzene sulfonate, dodecyl benzene sulfonate, pentadecyl benzene sulfonate and the like. Generally, the alkyl aryl sulfonates are employed in an aqueous slurry for the sake of convenient handling. It is readily apparent that the concentration of sulfonate in the slurry can be adjusted to the desired level.

The non-ionic polyoxyalkylene alkylphenol condensates employed in the new composition of the invention are products such as the polyglycol ethers of alkylphenols wherein the alkyl group contains at least about 8 and generally from about 6 to 12 carbon atoms. The degree or proportion of hydrophilic groups, that is the alkylene oxide groups, will vary with the specific hydrophobic group, but generally will be sufficient to confer the desired water solubility and detersive properties. Usually at least about 5 and up to about 30 alkylene oxide groups can be present. Condensates derived from ethylene oxide are preferred although other lower alkylene oxides such as propylene oxide and butylene oxide and the like can also be utilized. Such compounds include polyoxyethylene nonylphenol, polyoxyethylene octylphenol, polyoxyethyl-

ene decyl phenol, polyoxyethylene dodecyl phenol and the like.

The fatty acid-diethanolamine condensates employed in the practice of this invention include diethanolamine condensates with fatty acids containing about 8 to 20 carbon atoms. Such compounds include caprylic acid diethanolamide, pelargonic acid diethanolamide, capric acid diethanolamide, undecylic acid diethanolamide, lauric acid diethanolamide, tridecoic acid diethanolamide, myristic acid diethanolamide, pentadecanoic acid diethanolamide, palmitic acid diethanolamide, margaric acid diethanolamide, stearic acid diethanolamide, arachidic acid diethanolamide and the like. Of these acids, the condensation products of diethanolamine with lauric, myristic and palmitic acids are preferred. Suitable sources of these acids are tallow, palm oil, coconut oils and the like and include the preferred acids in mixtures both saturated and unsaturated.

The new compositions of this invention, are prepared by mixing the active constituents together either in the absence or presence of water and/or liquid medium at room temperature, about 20° C., and agitating or stirring until a substantially homogeneous mixture results. On the other hand temperatures as low as the freezing point or as high as the boiling point of the mixture can be tolerated in formulating the compositions of the invention. Normally, however, good mixing is readily attained by agitation at room temperature.

In addition to the active constituents mentioned above, the compositions can benficially contain chelating agents, either organic or inorganic compounds, capable of complexing with iron and calcium ions and the like. Generally, the water soluble salts of ethylenediamine tetraacetic acid are preferred. Another good organic complexing agent is citric acid. Inorganic sequestering agents include alkalipolyphosphate and the like. Normally, such agents are employed in small amounts, generally about 0.2 to .5 percent by weight in compositions prepared in liquid medium in concentrated form. Dyes, perfumes and the like can also be utilized in small amounts where desired.

The following examples of the new compositions of this invention are merely illustrative and not limitative. In the examples all parts and percents are by weight unless otherwise stated.

## EXAMPLE I

To 2.50 grams of ethylenediamine tetraacetic acid in a beaker at about 20° C. there were added 30 grams of nonyl phenolethylene oxide condensate consisting of about 73% ethylene oxide. Next 45.0 grams of coconut fatty acid-diethanolamine condensate were added to the mixture. Finally 42.5 grams of an aqueous slurry containing approximately 20 grams of 100% active tridecylbenzene sulfonate were added to the mixture. The constituents were mixed at about 20° C. and stirred until a substantially homogeneous mixture was attained. The resulting composition was a clear, brown, viscous mixture. The composition had a viscosity of 20,000 centipoises when tested on a Brookfield viscometer with a No. 7 spindle at 20° C. and 20 r.p.m. The pH was 10.6. This example illustrates the preparation of a cleaning composition in a concentrated form in the absence of either a liquid medium or water as added diluent.

## EXAMPLE II

To 0.25 gram of a 50% solution of hydroxyethylethylene diamine triacetic acid (trisodium salt) at about 20° C., there were added 4.50 grams of coconut fatty acid diethanolamine condensate. Next 3.0 grams of nonyl phenol-ethylene oxide condensate consisting of about 73% ethylene oxide were added to the mixture. Subsequently, 4.25 grams of an aqueous slurry to yield 2.00 grams of sodium tridecylbenzene sulfonate were added to the mixture. Finally 90.25 grams of a liquid medium containing perfume and blue dye were added to the mixture. The mixture was stirred until a substantially clear solution was attained. The composition had a viscosity of about 35 centipoises on a Brookfield viscometer using a No. 1 spindle at 20° C. and 20 r.p.m. The pH was 10.2. This example illustrates the preparation of a cleaning composition in the presence of a liquid medium.

## EXAMPLE III

The solution prepared in accordance with the procedure of Example II was diluted with water at concentrations of 2% and 2.5% or total active constituents of about 0.2% and 0.25% respectively. Commercially available cleaning solutions and the new cleaning composition of this invention were then applied to vinyl tile squares (12" x 12") which had been waxed with a carnauba wax containing Tinopol RBS as an optical brightener which shines with a bluish glow under ultraviolet light. After waxing the tiles were aged for two days. Subsequently the tiles were washed with a sponge saturated with the cleaning solutions in a Gardner washability apparatus which moves the sponge across the tile in a straight line. 100 strokes of the sponge were applied to each tile and compared to an unwashed control tile to estimate the extent of wax removal by the difference in the bluish glow under ultraviolet light. The results are set out in the following table. The commercial cleaners are identified as A–D and the composition of this invention as Y.

A upon anlysis contains about 18.0% solids, in water, of which the major constituents are about 5.30% potassium soap and 3.6% sodium alkylaryl sulfonate.

B upon analysis contains about 14% solids, in water, of which the major constituents are about 4.2% fatty acid and 4.9% potassium soap.

C upon analysis contains about 24.0% solids, in water, of which the major constituent is about 14.7% potassium soap and unsaponified matter.

D upon analysis contains about 17.0% solids, in water, of which the major constituents are about 6.5% coconut fatty acid diethanolamine condensate and about 4.5% polyoxyethylene alkyl phenol condensate.

*Table*

| Cleaning composition | Percent Wax Removal Asphalt Tiles | | | |
|---|---|---|---|---|
| | 90–100 | 75–90 | 10–25 | 0–10 |
| 2.0% Conc. in $H_2O$ (about 0.2% total active constituents): | | | | |
| Control | | | | X |
| A | X | | | |
| B | X | | | |
| C | X | | | |
| D | X | | | |
| Y | | | | X |
| 2.5% Conc. in $H_2O$ (about 0.25% total active constituents): | | | | |
| Control | | | | X |
| A | X | | | |
| B | X | | | |
| C | X | | | |
| D | X | | | |
| Y | | | | X |

The data in the table clearly show that the compositions of this invention can be employed in varying concentrations without removing substantially any wax in comparison with substantially complete wax removal by other known cleaning compositions.

## EXAMPLE IV

A series of concentrated floor cleaning compositions were prepared in accordance with the procedure of Example II but containing varying amounts of specific active constituents. Subsequently the compositions were diluted to 2.0% solutions (about 0.2% total active constituents) as in Example III and applied to waxed tile squares such as those described therein. When tested in like manner substantially no removal of wax was noted. Moreover, the solutions were low foaming. The con-

centrations of the constituents in each composition are set out in the following table.

| | Percent Weight | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Coconut fatty acid Diethanolamine Condensate | 3.0 | 3.75 | 5.5 | 4.0 |
| Tridecyl Benzene Sulfonate | [1] 4.25 | [1] 4.25 | [1] 4.25 | [1] 4.25 |
| Nonylphenol polyoxyethylene Condensate (at 73% ETO) | 4.5 | 3.75 | 2.0 | 3.5 |
| Hydroxyethylene Diamine Triacetic acid (trisodium salt) | 0.25 | 0.25 | 0.25 | 0.25 |

[1] 2.0% A.I.

The new compositions of this invention present many additional advantages. For example, the compositions of the invention are relatively simple to prepare on present equipment without changes of design or incorporation of elaborate processing steps. Furthermore, the active constituents in the compositions are readily available through normal commercial channels at reasonable prices. In addition, the new compositions of the invention can be used on a wide variety of surfaces without damaging them in any way. Numerous other advantages of the invention will be readily apparent to those skilled in the art.

Numerous modifications and variations of the embodiments of this invention may be made without departing from the spirit and scope thereof. Accordingly, it is to be understood that the invention is not to be limited, except as defined in the appended claims.

What is claimed is:

1. A hard surface cleaning composition consisting essentially of by weight, based on the total weight of the composition, about 40 to 55 percent of at least one fatty acid-diethanolamine condensate containing about 8 to 20 carbon atoms in the fatty acid portion, about 15 to 25 percent of a water soluble salt of a higher alkyl aryl sulfonate having about 10 to 18 carbons in the alkyl group, and about 20 to 45 percent of a non-ionic polyoxyalkylene alkylphenol condensate containing about 5 to 30 alkylenoxy groups and about 6 to 12 carbon atoms in the alkyl group, said composition being characterized by a low foam level at use concentrations containing about 0.03 to 0.50 weight percent of the composition.

2. A hard surface cleaning composition consisting essentially of a liquid medium selected from the group consisting of water and mixtures of water-ethanol, water-isopropanol and water-propylene glycol, and about 5.0 to about 20.0 percent by weight, based on the total weight of the composition, of active constituents consisting of, by weight, based on the total weight of said active constituents, about 40 to 55 percent of at least one fatty acid-diethanolamine condensate containing about 8 to 20 carbon atoms in the fatty acid portion, about 15 to 25 percent of a water soluble salt of higher alkyl aryl sulfonate having about 10 to 18 carbon atoms in the alkyl group and about 20 to 45 percent of a non-ionic polyoxyalkylene alkylphenol condensate containing about 5 to 30 alkylenoxy groups and about 6 to 12 carbon atoms in the alkyl group, said composition being characterized by a low foam level at use concentrations containing about 0.03 to 0.50 weight percent of active constituents.



3. A hard surface cleaning composition particularly effective for the cleaning of waxed tiled surfaces consisting essentially of a liquid medium selected from the group consisting of water and mixtures of water-ethanol, water-isopropanol and water-propylene glycol, and about 8.0 to 12.0 percent by weight, based on the total weight of the composition, of active constituents consisting of by weight, based on the total weight of said active constituents, about 40 to 55 percent of at least one fatty acid-diethanolamine condensate containing about 8 to 20 carbon atoms in the fatty acid portion, about 15 to 25 percent of a water soluble salt of higher alkyl aryl sulfonate having about 10 to 18 carbon atoms in the alkyl group and about 20 to 45 percent of a non-ionic polyoxyalkylene alkylphenol condensate containing about 5 to 30 alkylenoxy groups and about 6 to 12 carbon atoms in the alkyl group, said ingredients being proportioned and exhibiting a low foam level at use concentrations containing about 0.03 to 0.50 weight percent of active constituents with effective cleaning of said waxed tiled surfaces without substantial removal of wax therefrom.

4. A hard surface cleaning composition particularly effective for the cleaning of waxed tiled surfaces consisting essentially of by weight, based on the total weight of the composition about 90.25 percent of a liquid medium selected from the group consisting of water and mixtures of water-ethanol, water-isopropanol and water-propylene glycol, about 4.50 percent coconut fatty acid-diethanolamine condensate, about 2.0 percent sodium tridecylbenzene sulfonate, about 3.0 percent nonylphenol-ethylene oxide condensate containing about 73 percent ethylene oxide and about 0.25 percent of a 50 percent solution of the trisodium salt of hydroxyethylethylene diamine triacetic acid, said ingredients being proportioned and exhibiting a low foam level at use concentrations containing about 0.03 to 0.50 weight per cent of active constituents with effective cleaning of said waxed tiled surfaces without substantial removal of wax therefrom.


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