

[54] **LIQUID DETERGENT COMPOSITION**

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**252/DIG. 10; 252/DIG. 14**

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[58] **Field of Search** .... **252/545, 547, 528, DIG. 10,**  
**252/DIG. 14, DIG. 1, 142, 143, 526**

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[57] **ABSTRACT**

The present invention pertains to a liquid detergent composition with improved cleaning performance. Specifically, it pertains to a liquid, clear, concentrated, homogeneous, aqueous detergent composition, designed in particular for hand washing tableware, i.e. dishes, glasses, cutlery and the like, containing a carefully balanced mixture of elected nonionic and anionic surface-active detergents, preferably in admixture with an organic acid material, yielding improved cleaning performances over the usual built and unbuilt liquid detergent compositions.

**21 Claims, No Drawings**

# LIQUID DETERGENT COMPOSITION

## BACKGROUND OF THE INVENTION

Liquid detergent compositions in recent years have become widely accepted for hand-washing dishes, glasses, cutlery and the like, and have also been used for washing lightly soiled fabrics, in particular fine garments, embroidery and the like of man-made fibers. They are especially convenient for the hand-washing of tableware and garments, where their advantages of easy and rapid dispersion in the washing liquor and their convenience of handling are particularly valuable over granular and powdered detergent products. It has proven difficult, however, to formulate aqueous liquid detergent compositions, which do not only have cleaning power comparable with that of granular and powdered detergent products for washing tableware and soiled fabrics, but which are also clear, homogeneous, easily dispensable, stable to freeze-thaw conditions, and concentrated. Said many difficulties, associated with formulating a clear, homogeneous, stable, concentrated liquid detergent composition, increase seriously when a household hand-washing composition has to be formulated, which can be either acidic, alkaline or neutral, without losing its superior cleaning and sudsing properties.

## SUMMARY OF THE INVENTION

Accordingly, this invention pertains to a liquid, clear, homogeneous, easily dispensable, aqueous, stable, concentrated detergent composition, having superior cleaning and sudsing properties, particularly designed for hand-washing of tableware.

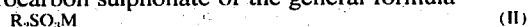
The liquid detergent composition of this invention contains; calculated on the total weight of the composition:

A. from about 4 to about 20% by wt of a hydrosoluble polyethylene glycol ether sulphate of the general formula



wherein  $R_1$  is a straight or branched, saturated or unsaturated hydrocarbon radical, having 8 to 20 carbon atoms;  $n$  is from 1.5 to 12;  $M$  is an alkali-metal, ammonium, and dimethyl-, diethyl-, trimethyl-, triethyl-, dimethanol-, diethanol-, trimethanol and triethanol ammonium salt;

B. from about 3 to about 25% by wt of an aliphatic hydrocarbon sulphonate of the general formula



wherein  $R_2$  is a straight or branched, saturated or unsaturated hydrocarbon radical, having from 8 to 20 carbon atoms;  $M$  has the meaning given above.

C. from about 3 to about 20% by wt of a nonionic surface-active detergent of which at least 20 and up to 100% by wt consists of a tertiary amine oxide of the general formula



wherein  $R_3$  is a straight or branched, saturated or unsaturated hydrocarbon radical having 8 to 20, preferably 12 to 16, carbon atoms;  $R_4$  and  $R_5$  represent each a methyl-, ethyl-, hydroxymethyl-, and hydroxyethyl radical; while the other 0 to 80% by wt of nonionic surface-active detergent is selected from the group consisting of polyethylene glycol condensation product having a molecular weight of from about 160 to 800; a condensation product of 3 to 15 moles of ethylene oxide per mole of aliphatic or arylaromatic compound

having 8 to 20 carbon atoms and at least one reactive hydrogen atom; a saccharide fatty acid ester; and a polyoxyethylene saccharide fatty acid ester;

D. from about 2 to about 15% by wt of a solubilizing agent selected from the group consisting of  $C_{1-4}$  alcohol; potassium, sodium and ammonium salt of  $C_{1-3}$  alkyl- and di- $C_{1-2}$  alkylphenyl sulphonic acid; and urea; whereby the weight ratio of (A) to (B) varies between 1 to 3 and 3 to 1, and the weight ratio of (C) to (A) + (B) varies between 1 to 10 and 1 to 1.

A preferred liquid detergent composition of this invention contains; calculated on the total weight of the composition:

A. from about 5 to about 15% by wt of a polyethylene glycol ether sulphate;

B. from about 8 to about 20% by wt of an aliphatic hydrocarbon sulphonate;

C. from about 3 to about 12% by wt of a nonionic surface-active detergent mixture;

whereby the weight ratio of (A) to (B) varies between 1 to 3 and 1 to 1, and the weight ratio of (C) to (A) + (B) varies between 1 to 5 and 1 to 2.

## DESCRIPTION OF THE INVENTION

The performance of a detergent composition is usually evaluated by the consumer in terms of sudsing. The liquid dishwashing detergent compositions presently on the market are, therefore, to a large extent, designed to fulfill said sudsing expectation connoting cleaning performance. The consumer accustomed to gauging the cleaning capacity of a washing solution by the amount of suds, and the persistence of said suds, is likely to be misled, because differently formulated dishwashing compositions having the same sudsing capacity do not necessarily have the same cleaning power. The fact that many food soils sustain the formation and persistence of suds generated originally by the surface-active detergents, may confuse the consumer even more. That the cleaning power of a dishwashing detergent composition can become insufficient towards the end of the washing cycle, although suds is still present, can for example be easily noticed when the last items of washed tableware are taken out of the washing liquor and put aside for dripping and air-drying.

Convinced that the role of the surface-active detergents in a liquid dishwashing composition should not be restricted to sudsing and initial removal of the soil from the tableware, Applicant reinvestigated the principles underlying the cleaning of tableware and the shortcomings of the presently marketed products, and found that the effectiveness of dishwashing compositions could be surprisingly improved by a carefully balanced mixture of elected nonionic and anionic surface-active detergents, having same or superior sudsing capacity when compared to known liquid dishwashing compositions, but also superior cleaning performances.

The liquid dishwashing compositions presently on the market mainly contain organic anionic surface-active detergents and in addition thereto some suds boosters and/or builders, the latter particularly to enhance the cleaning power of said organic anionic surface-active detergents. The most commonly used builder in liquid detergent compositions is potassium pyrophosphate because, although less effective than condensed or polyphosphates, it does not hydrolyze. It would, therefore, be logical to improve the effectiveness of dishwashing compositions by adding more effective builders or other additives performing the same function.

the more since unbuilt detergent compositions, including those containing even much higher amounts of surface-active detergents, seldom match the cleaning performances of built compositions, and generate many negatives such as oversudsing, even under mild agitations. Furthermore, highly concentrated compositions are sometimes harsh to the skin, and not effective against all food stains, in particular milk stains.

It is therefore very surprising that solely due to a carefully balanced mixture of elected nonionic and anionic surface-active detergents, a highly effective dishwashing composition could be formulated, which is at the same time liquid, clear, homogeneous, stable and concentrated.

As said hereinbefore, said improved performance has been obtained by giving special attention to the principles underlying the cleaning of tableware, especially dishes, glasses and cutlery which, after hand-washing, are put aside for dripping, optionally rinsing, and air-drying.

The cleaning performance of the compositions of the present invention can— and this is another valuable additional aspect of this invention — be adapted so that the detergent composition can be optimally used under specific circumstances, e.g. washing of tableware heavily soiled with fats, or washing of milk-stained glasses. Said optimization can be performed by carefully changing the balance of the nonionic and anionic surface-active detergents within very specific ranges, by electing particular nonionic and anionic surface-active detergents having a well-defined hydrophobic radical, and/or by the incorporation of some other specific ingredients in said detergent compositions, in relatively small but well-defined quantities.

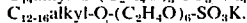
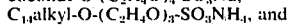
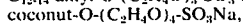
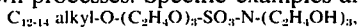
The elected nonionic and anionic surface-active detergents to be used in the formulation of a liquid detergent composition of this invention, and the other specific ingredients which can be added thereto are described hereinafter. If in said description of surface-active detergents and additional ingredients, reference is made to a salt of an anionic surface-active detergent or other acidic ingredient, then reference is made to either the sodium; potassium; ammonium; trimethyl-, triethyl-, dimethyl-, diethyl-, trimethanol-, diethanol-, triethanol-, and dimethanol ammonium salts, if not specified otherwise.

Elected, suitable surface-active detergents are:

1. polyethylene glycol ether sulphate as represented hereinbefore by the formula



which is the salt of a sulphuric acid ester of a reaction product of one mole of a straight or branched, saturated or unsaturated hydrocarbon compound having 8 to 20 carbon atoms and a reactive —OH group, preferably a higher fatty alcohol, e.g. tallow or coconut alcohol, and 1.5 to 12, preferably 2 to 6, most preferably 3 moles ethylene oxide, obtained according to well-known processes: Specific examples are



2. aliphatic hydrocarbon sulphate as represented hereinbefore by the formula  $R_2SO_3M$  (II), which is the salt of an organic sulphuric acid reaction product of a hydrocarbon of the methane series, including iso-, neo-, meso-, and n-paraffins, having 8 to 20 carbon atoms, preferably 13 to 18 carbon atoms; or of a hydrocarbon of the ethylene series, having 8 to 20, preferably

12 to 18 carbon atoms and 1 up to 4 double bonds, and a sulphonating agent, e.g.  $SO_3$ ,  $H_2SO_4$ , oleum, obtained according to known sulphonation methods, including bleaching and hydrolysis. Preferred are sulphonated  $C_{12-18}$  paraffins, alone or in combination with sulphonated  $\alpha$ -olefins containing in average 14 carbon atoms, whereby, if mixtures are used, the weight ratio of sulphonated paraffins to sulphonated  $\alpha$ -olefins is preferably of from 10 to 1 to 1 to 2, the lower limit on the amount of paraffin sulphonates being especially of importance when the pH of the washing solution is lower than about 6.5, i.e. between about 4 and 6.5.

3. nonionic tertiary amine oxide as represented hereinbefore by the general formula



whereby the arrow in said formula is a conventional presentation of a semi-polar bond, is generally prepared by direct oxidation of the appropriate tertiary amine.  $R_3$  is a high molecular hydrocarbon radical, preferably an alkyl radical having 8 to 20, preferably 12 to 16, most preferably 12 carbon atoms, or a mixture of dodecyl with decyl and tetradecyl radicals, whereby at least 50% of the radicals are dodecyl.  $R_4$  and  $R_5$ , which may be the same or different, represent each a methyl-, ethyl-, hydroxymethyl-, and hydroxyethyl radical. Specific examples of tertiary amine oxides are: dimethyl dodecyl amine oxide; diethyl tetradecyl amine oxide; bis-(2-hydroxyethyl)dodecyl amine oxide; bis-(2-hydroxyethyl)-3-dodecoxy-1-hydroxypropyl amine oxide; dimethyl 2-hydroxy-dodecyl amine oxide; diethyl eicosyl amine oxide. The cleaning performance of the liquid dishwashing detergent compositions according to the present invention can be enhanced, particularly in acidic formulae and acidic washing liquors, by using as nonionic surface-active detergents only tertiary amine oxides, preferably dodecyl amine oxides, most preferably dimethyl dodecyl amine oxides. However, the higher the pH of the washing solution, the less effective the removal of milk stains. The latter can be corrected by adding small amounts of an acid, preferably acetic or citric acid.

4. the other nonionic which can be present in the compositions of the invention, but, together with said amine oxide, is either:

a condensation product of ethylene oxide being a polyethylene glycol having a molecular weight of from about 160 to about 800, preferably about 400;

a condensation product obtained by condensing, in a manner known per se, 3 to about 15 moles ethylene oxide with one mole of an organic hydrophobic compound, aliphatic or alkyl-aromatic in nature, having 8 to 20 carbon atoms and at least one reactive hydrogen atom, preferably a reactive hydroxyl group. Preferred are condensation products of about 6 to about 12 moles ethylene oxide per mole of an aliphatic alcohol having 12 to 16 carbon atoms, in particular middle-cut coconut alcohol condensed with about 6 moles ethylene oxide and tallow alcohol with about 10 to 11 moles ethylene oxide. Other specific examples are  $C_{9-11}$  fatty acid esters esterified with a polyethylene glycol having a molecular weight of from about 300 to 800;

a saccharide fatty acid ester, being either a mono-, di-, and tri-fatty acid ester of a mono-, di-, tri-, and tetrasaccharide, and hydrosoluble polysaccharide and its anhydrides. Preferred are mono- and diesters of  $C_{12-18}$  saturated and unsaturated fatty acids

and mono- and disaccharides. Specific examples are: sucrose coconut fatty acid ester consisting of 80-50% by wt of monoesters and 50-20% by wt of diesters, sucrose monooleate, glucose mono-stearate, mannose mono-palmitate, xylose mono-oleate, sorbitol mono-stearate;

a polyoxyethylene saccharide fatty acid ester, being either a mono-, di-, or tri-fatty acid ester of a mono-, di-, tri-, tetra-saccharide and hydrosoluble polysaccharide, condensed with polymers of ethylene oxide consisting of approximately 15 to 40, preferably 20 oxyethylene units. Preferred are mono- and diesters of  $C_{12-18}$  saturated and unsaturated fatty acids of mono- and disaccharides. Specific examples are: sucrose mono-oleate (20) polyoxyethylene, sorbitan mono-palmitate (20) polyoxyethylene, sorbitan tri-stearate (40) polyoxyethylene.

Solubilizing agents to be used in the detergent compositions of the present invention are:

5. either hydrotropes or solvents selected from the group consisting of  $C_{1-4}$  alcohols, and sodium, potassium and ammonium salts of  $C_{1-3}$  alkylphenyl and  $C_{1-2}$  dialkylphenyl sulphonics acids, and urea. Only small amounts of said solubilizing agents are required to prevent phase separation and to promote the mutual solubility of the elected anionic and nonionic surface-active detergents. Even amounts below 2% by wt of solubilizing agents could be used by electing surface-active detergents having hydrophobic radicals with a specific number of carbon atoms, preferably between 12 and 14. The upper limit of 15% by wt is imposed only because too much solubilizing agent would adversely affect the viscosity of the compositions. Specific examples of solubilizing agents are: methyl-, ethyl-, n-propyl-, isopropyl-, tertiary butyl-, n-butyl-, isobutyl-, isoamyl alcohol; potassium and sodium toluene-, xylene-, and cumene sulphonate.

Suitable other ingredients or additional compounds which can be added to improve the cleaning performance of the compositions of the present invention are:

6. low molecular organic acid as acetic-, citric-, malic-, gluconic-, maleic- and lactic acid, and the less preferred because sparingly soluble p- and o-phthalic acid. Said acid can be substituted but only to a reduced extent by sulphuric and phosphoric acid or their partially neutralized salts. Said acid, preferably said highly soluble organic acid, can be added in an amount up to 14% by wt, while the less soluble one should only be added in amounts up to 3% by wt - calculated on the total weight of the composition. By adding said acid, preferably acetic or citric acid, particularly to compositions designed for washing milk-stained glasses, surprisingly clean glasses can be obtained without additional rinsing. Preferred amounts of acid are 5 to 5%. When corresponding salts are added as sodium and potassium citrate or acetate, the weight ratio of acid to salt should preferably be between 7/1 and 4/1.

7. another valuable ingredient which can be added, particularly in alkaline compositions to enhance the already superior cleaning performance is the sodium or potassium salt of meta-, ortho-, or pyroboric acid. Preferred is the potassium tetraborate which is particularly effective in alkaline compositions. Although said boric acid salts can be added in an amount up to 5% by wt - calculated on the total amount of the composition - the optimum effect which can be obtained by said salts lies between 2 and 3% by wt. The boric acid salts are pref-

erably used with triethanolamine in a weight ratio of triethanolamine to boric acid salt which varies between 1 to 2 and 1 to 4, and is preferably 1 to 3.

8. the compositions of the present invention may also contain minor proportions of other surface - active detergents as fatty alcohol sulphates, e.g. sodium and potassium dodecyl sulphates, triethanolamine salts of coconut alcohol sulphuric acid ester, which may only be used up to 50% by wt - calculated on the total amount of the polyethylene glycol sulphate (A) and aliphatic hydrocarbon sulphonate (B) - and up to about 10% by wt of the total composition; substituted methylaminoacetic acid or salt thereof, preferably sodium, potassium and ammonium coconut-sarcosinate, in amounts up to 3% by wt of the total composition; the sodium, potassium or ammonium salt of  $C_{12-18}$ , preferably  $C_{14-16}$  alkyl glyceryl sulphonic acid, in amounts up to 3% by wt of the total composition; mono- and diethanol amides derived from  $C_{8-24}$ , preferably  $C_{12-14}$  fatty acids in amounts up to 5, preferably 1 to 3, preferably 2% by wt of the total composition; and up to 2% by wt of the total composition of triethanolamine, particularly in alkaline compositions and washing liquors, having a pH of at most 9.

Additional compounds or ingredients which can be added to make the compositions of the present invention much more attractive are:

9. perfumes, dyes, fluorescers, tarnish inhibitors such as benzotriazole or ethylene thio-urea, bactericides.

As referred to hereinbefore, the outstanding properties of the compositions of the present invention are due to the carefully balanced mixture of elected nonionic and anionic surface-active detergents. The balance or ratio of said surface-active detergents to each other is of such an importance that compositions wherein the weight ratio of polyethylene glycol ether sulphates to hydrocarbon sulphonates being outside the range 1/3 and 3/1 lose most of their efficiency although the other imposed weight ratio of nonionic surface-active detergents to anionic surface-active detergents is met, and vice-versa.

The superior cleaning performance of the dishwashing compositions of the present invention is illustrated by the following tests.

#### TEST A

Two series, A and B, each of five dishwashing liquors, are prepared. Each dishwashing liquor of the series A contains 0.2% by wt per liter of a dishwashing composition formulated according to Example I, described hereinafter: and each of the dishwashing liquors of the series B contains 0.2% by wt per liter of a dishwashing composition, presently on the market, formulated as indicated below.

The water for preparing the dishwashing liquors is tap water having a water hardness of about 3.4 millimoles of  $CaCO_3$  per liter. Each washing bath contains about 9 liters. The temperature of all washing liquors or baths is kept at about 45°C during the test.

In each of said two series of five washing liquors, ten glasses (content: about 25 cl) stained by dry milk, obtained from a school restaurant, are immersed during 5 minutes. After being immersed for 5 minutes, all 100 glasses are rubbed, under water, with a conventional dishwashing towel, and then removed for dripping and air-drying (room temperature: about 23°C). Once the glasses are dry, three experimented graders individually compare the appearance of the glasses, comparing the

set of 10 glasses washed in the first liquor of series A with the set of 10 glasses washed in the first liquor of series B, the set of 10 glasses washed in the second liquor of series A with the set of 10 glasses washed in the second liquor of series B, etc.

Their appreciation as to difference in overall appearance is expressed in terms of: equal (0), better (+) and much better (++). Said results are tabulated in Table I.

TABLE I

| Series          | A  | B | A  | B | A  | B | A  | B | A  | B |
|-----------------|----|---|----|---|----|---|----|---|----|---|
| Washing Liquors | 1  | 1 | 2  | 2 | 3  | 3 | 4  | 4 | 5  | 5 |
| Grader 1        | ++ |   | ++ |   | +  |   | ++ |   | ++ |   |
| Grader 2        | +  |   | ++ |   | +  |   | +  |   | ++ |   |
| Grader 3        | ++ |   | ++ |   | ++ |   | ++ |   | +  |   |

The liquid dishwashing composition of series B, used as representative of a product now on the market, consists of the sodium salt of C<sub>10-16</sub> alkylbenzene sulphonate: 21% by wt; sodium salt of sulphated C<sub>12-16</sub> alcohol-ethylene oxide condensate (in average 4 ethylene oxide units): 15% by wt; C<sub>10-14</sub> mono-ethanol amide: 5% by wt; sodium salt of xylene sulphonate: 6% by wt; ethanol: 5% by wt; balance: water.

## TEST B

Two other series, C and D, each of five dishwashing liquors are prepared. Each five liquors of series C contains about 0.25% by wt per liter of a dishwashing composition formulated according to Example IV, described hereinafter; and each of the five liquors of series D contains about 0.25% by wt per liter of a dishwashing composition, presently on the market, formulated as indicated below.

The water for preparing the washing liquors is tap water having a water hardness of about 3.5 millimoles of CaCO<sub>3</sub> per liter. The temperature of all 7 liter baths or liquors is initially 48°C, the temperature at the end of the washing cycle varies between 23° and 31°C.

In each of the five washing liquors of the series C and D, 24 knives of stainless steel, obtained from a restaurant, soiled mainly by gravy, are immersed for 5 minutes, thereafter cleaned one by one by rubbing with a conventional dishwashing brush, and laid aside in a dripping basket for dripping and air-drying.

Once all knives are dry, each five sets of each 24 knives washed in the washing liquors of series C are compared with each five sets of 24 knives washed in the washing liquors of series D.

Four experimented graders are asked to judge the sets of knives as to spots and overall cleaning performance, expressing their appreciation as very good (++), good (+), acceptable (0), hardly acceptable (-) and not acceptable (—). Their appreciation is given in Table II.

TABLE II

| Series          | C  |    |   |    |    | D |   |   |    |   |
|-----------------|----|----|---|----|----|---|---|---|----|---|
| Washing Liquors | 1  | 2  | 3 | 4  | 5  | 1 | 2 | 3 | 4  | 5 |
| Grader 1        | +  | ++ | 0 | ++ | ++ | + | 0 | + | —* | 0 |
| Grader 2        | +  | +  | + | ++ | +  | 0 | + | 0 | —* | 0 |
| Grader 3        | ++ | ++ | + | ++ | ++ | + | 0 | + | 0  | + |
| Grader 4        | +  | ++ | + | ++ | +  | + | + | 0 | 0  | + |

\*graded as hardly acceptable because of white spots and stains on the blades of some of the knives.

The dishwashing composition of series D, used as a representative of a product now on the market, contains: sodium salt of C<sub>12-16</sub> alcohol sulphate: 14% by wt; sodium salt of sulphated C<sub>12-18</sub> alcohol-ethylene oxide condensate (in average 3 ethylene oxide units): 15% by wt; C<sub>12-14</sub> mono-ethanol amide: 2% by wt; sodium salt of toluene sulphonate: 3% by wt; balance: water.

The superiority in overall cleaning effect of the compositions formulated according to the present invention, is more than evident from said tests.

The following examples serve to illustrate, but not to limit the novel compositions of the present invention. All percentages are by weight.

## EXAMPLE I

|         |                                                                                     |
|---------|-------------------------------------------------------------------------------------|
| 7.0%    | C <sub>12-14</sub> alcohol-ethylene oxide (3)-sulfate sodium salt,                  |
| 4.0%    | C <sub>12-16</sub> alcohol sulfate ammonium salt                                    |
| 7.0%    | C <sub>12-18</sub> paraffin sulfonate sodium salt                                   |
| 4.5%    | dimethyl dodecyl amine oxide                                                        |
| 7.0%    | condensation product of tallow alcohol and 11 moles ethylene oxide per mole alcohol |
| 3.0%    | mono-ethanol coconut amide                                                          |
| 7.0%    | ethanol                                                                             |
| Balance | water.                                                                              |

## EXAMPLE II

|         |                                                                                      |
|---------|--------------------------------------------------------------------------------------|
| 6.0%    | C <sub>12-14</sub> alcohol-ethylene oxide (3)-sulphate sodium salt,                  |
| 5.0%    | C <sub>13-18</sub> paraffin sulphonate triethanol ammonium salt,                     |
| 5.0%    | C <sub>12-14</sub> α-olefin sulphonate triethanol ammonium salt,                     |
| 2.5%    | diethyl dodecylamine oxide,                                                          |
| 5.5%    | condensation product of coconut alcohol and 6 moles ethylene oxide per mole alcohol, |
| 4.5%    | isopropanol,                                                                         |
| Balance | water.                                                                               |

## EXAMPLE III

|         |                                                                                      |
|---------|--------------------------------------------------------------------------------------|
| 10.0 %  | C <sub>12</sub> alcohol-ethylene oxide (4)- sulphate ammonium salt,                  |
| 7.0 %   | C <sub>14-16</sub> alcohol sulphate ammonium salt,                                   |
| 7.0 %   | C <sub>13-18</sub> paraffin sulphonate ammonium salt,                                |
| 3.0 %   | C <sub>14-16</sub> alkyl glyceryl ether sulphonate ammonium salt,                    |
| 6.0 %   | dihydroxyethyl tetradecylamine oxide,                                                |
| 3.0 %   | condensation product of coconut alcohol and 6 moles ethylene oxide per mole alcohol, |
| 3.0 %   | condensation product of tallow alcohol and 11 moles ethylene oxide per mole alcohol, |
| 3.5 %   | acetic acid,                                                                         |
| 12.0 %  | ethanol,                                                                             |
| Balance | water.                                                                               |

## EXAMPLE IV

|         |                                                                                                             |
|---------|-------------------------------------------------------------------------------------------------------------|
| 7.5 %   | coconut alcohol-ethylene oxide (3)-sulphate ammonium salt,                                                  |
| 5.0 %   | coconut alcohol sulphate ammonium salt,                                                                     |
| 5.0 %   | paraffin sulphonate ammonium salt (average molecular weight of the hydrocarbon radical 196),                |
| 2.2 %   | coconut-glyceryl ether sulphonate sodium salt,                                                              |
| 4.5 %   | dimethyl dodecyl amine oxide,                                                                               |
| 7.0 %   | condensation product of C <sub>12-16</sub> fatty alcohol and about 9 moles ethylene oxide per mole alcohol, |
| 9.0 %   | acetic acid,                                                                                                |
| 3.0 %   | sodium acetate,                                                                                             |
| 1.0 %   | ammonium sulphonate                                                                                         |
| 10.0 %  | ethanol,                                                                                                    |
| Balance | water.                                                                                                      |

Replacing the 7.0% of the condensation product of 20 C<sub>12-16</sub> fatty alcohol and about 9 moles ethylene oxide per mole alcohol, by 5.5% sucrose mono-oleate ester, yields a composition having the same cleaning effect.

## EXAMPLES V - X

| Compositions particularly designed for cleaning glasses, cutlery of stainless steel and pans. |       |       |         |       |       |       |
|-----------------------------------------------------------------------------------------------|-------|-------|---------|-------|-------|-------|
|                                                                                               | V     | VI    | VII     | VIII  | IX    | X     |
| coconut alcohol-ethylene oxide (3)-sulphate ammonium salt                                     | 16.5% | —     | 8.0%    | 8.0%  | —     | 12.0% |
| coconut alcohol-ethylene oxide (3)-sulphate sodium salt                                       | —     | 8.0%  | —       | —     | 8.0%  | —     |
| C <sub>13-18</sub> paraffin sulphonate sodium salt                                            | 10.0% | 7.0%  | 14.0%   | 10.0% | 10.0% | 8.0%  |
| C <sub>12-14</sub> alcohol sulphate ammonium salt                                             | 6.0%  | 7.0%  | —       | —     | —     | —     |
| C <sub>12-14</sub> α-olefin sulphonate ammonium salt                                          | —     | 2.0%  | —       | 4.0%  | 4.0%  | —     |
| coconut glyceryl ether sulphonate sodium salt                                                 | 2.0%  | 3.0%  | 1.5%    | 1.2%  | 2.0%  | —     |
| N-methyl C <sub>10-16</sub> alkyl amino sarcosinate sodium salt                               | —     | 2.0%  | 2.0%    | —     | —     | 3.0%  |
| dimethyl dodecyl amine oxide                                                                  | 8.0%  | 7.0%  | 7.5%    | 7.0%  | 7.0%  | 6.0%  |
| coconut alcohol ethylene oxide (6) condensate                                                 | 8.0%  | 3.0%  | 6.0%    | 6.5%  | —     | 6.5%  |
| tallow alcohol ethylene oxide (11) condensate                                                 | —     | 3.0%  | —       | —     | 6.0%  | —     |
| acetic acid                                                                                   | 14.0% | 12.0% | 7.0%    | 7.0%  | 7.0%  | —     |
| sodium acetate                                                                                | 5.0%  | 4.0%  | 2.0%    | —     | —     | —     |
| lactic acid                                                                                   | —     | —     | 4.0%    | 5.0%  | —     | —     |
| sodium lactate                                                                                | —     | —     | —       | 1.5%  | —     | —     |
| glycolic acid                                                                                 | —     | —     | —       | —     | 6.0%  | —     |
| sodium glycolate                                                                              | —     | —     | —       | —     | 1.5%  | —     |
| citric acid                                                                                   | —     | —     | —       | —     | —     | 10.0% |
| sodium citrate                                                                                | —     | —     | —       | —     | —     | 3.0%  |
| potassium toluene sulphonate                                                                  | 4.5%  | —     | —       | —     | 2.0%  | —     |
| ethanol                                                                                       | 9.0%  | 5.0%  | 7.5%    | 4.5%  | 2.0%  | 6.0%  |
| water                                                                                         |       |       | balance |       |       |       |

The citric acid and sodium citrate of Example X can be substituted by the same amount of lactic acid and sodium lactate, or by the same amount of glycolic acid and sodium glycolate, to which 3% of a sucrose mono-oleate ester and 3% polyethylene glycol condensate (average molecular weight 400) can be added.

## EXAMPLES XI - XIV

|                                                                                | XI   | XII  | XIII | XIV  |
|--------------------------------------------------------------------------------|------|------|------|------|
| C <sub>12-16</sub> alcohol ethylene oxide (3)-sulphate triethanolammonium salt | 7.5% | 6.0% | 7.0% | 7.0% |
| coconut sulphate triethanol ammonium salt                                      | 2.0% | —    | —    | 2.0% |
| C <sub>13-18</sub> paraffin sulphonate                                         | 9.5% | 8.0% | 7.0% | 6.0% |

## EXAMPLES XI - XIV-continued

|                                                                                     | XI   | XII  | XIII    | XIV  |
|-------------------------------------------------------------------------------------|------|------|---------|------|
| sodium salt                                                                         |      |      |         |      |
| dimethyl C <sub>10-14</sub> alkylamine oxide                                        | 3.8% | 4.0% | 4.0%    | 4.0% |
| condensation product of coconut alcohol and 6 moles ethylene oxide per mole alcohol | 3.0% | 2.0% | —       | 2.5% |
| condensation product of tallow alcohol and 11 moles ethylene oxide per mole alcohol | 2.0% | 3.0% | 5.0%    | —    |
| potassium tetraborate                                                               | 3.0% | 3.0% | —       | 2.0% |
| triethanol coconut fatty acid amide                                                 | 1.0% | 1.0% | 1.0%    | 0.5% |
| boric acid                                                                          | —    | —    | 3.0%    | —    |
| potassium hydroxide                                                                 | —    | —    | 1.5%    | —    |
| C <sub>12-14</sub> alkyl sarcosinate sodium salt                                    | —    | 2.0% | —       | 2.0% |
| ethanol                                                                             | 3.0% | 3.0% | 3.0%    | 2.0% |
| water                                                                               |      |      | balance |      |

## EXAMPLES XV - XIX

|                                                                                            | XV    | XVI   | XVII    | XVIII | XIX   |
|--------------------------------------------------------------------------------------------|-------|-------|---------|-------|-------|
| coconut alcohol ethylene oxide (3)-sulfate sodium salt                                     | 12.0% | 16.0% | 10.0%   | 10.0% | 10.0% |
| C <sub>12-14</sub> alcohol sulfate sodium salt                                             | 4.0%  | —     | —       | —     | —     |
| C <sub>13-18</sub> paraffin sulphonate sodium salt                                         | 8.0%  | 6.0%  | 14.0%   | 14.0% | 14.0% |
| C <sub>12-14</sub> alkyl glyceryl ether sulphonate sodium salt                             | 3.0%  | —     | 2.5%    | 3.0%  | —     |
| coconut alcohol ethylene oxide (6) condensate                                              | 6.0%  | 6.0%  | 8.0%    | —     | —     |
| 65 parts dimethyl dodecyl amine oxide + 35 parts dimethyl decyl- and tetradecylamine oxide | 5.0%  | 8.0%  | 6.0%    | 3.0%  | 3.0%  |
| monoethanol C <sub>10-16</sub> fatty acid amide                                            | 4.0%  | 2.0%  | 3.0%    | 3.0%  | 3.0%  |
| sucrose mono-laurate sodium salt                                                           | —     | —     | —       | 6.0%  | 6.0%  |
| polyethylene glycol condensate (average molecular weight 400)                              | —     | —     | —       | —     | 4.0%  |
| ethanol                                                                                    | 8.0%  | 4.0%  | 2.0%    | 6.0%  | 6.0%  |
| water                                                                                      |       |       | balance |       |       |

The foregoing description and examples describe and illustrate certain preferred embodiments of the present invention. It is not intended that the invention should be so limited, since variations and modifications thereof will be obvious to those skilled in the art, all of which are within the spirit and scope of this invention.

What is claimed is:

1. A liquid, clear, homogeneous, easily dispensable, stable, concentrated, aqueous, detergent composition containing hydrosoluble surface-active detergents and usual minor additives, characterized in, that it contains, calculated on the total weight of the composition:

(A) from about 5 to about 15% by weight of a polyethylene glycol ether sulfate of the general formula  $R_1O(C_2H_4O)_nSO_3M$  (I)

wherein  $R_1$  is a straight or branched, saturated or unsaturated hydrocarbon radical having 8 to 20 carbon atoms;  $n$  is from 1.5 to 12;  $M$  is an alkali-metal, ammonium, and dimethyl-, diethyl-, trimethyl-, triethyl-, dimethanol-, trimethanol-, diethanol- and triethanol ammonium salt;

(B) from about 8 to about 20% by weight of an aliphatic hydrocarbon sulfonate of the general formula  $R_2SO_3M$  (II)

wherein  $R_2$  is a straight or branched, saturated or unsaturated hydrocarbon radical having 8 to 20 carbon atoms;  $M$  has the meaning given above;

C. from about 3 to about 12% by weight of nonionic surface-active detergent of which at least 20% and up to 100% by weight consists of a tertiary amine oxide of the formula

$R_3R_4R_5N \rightarrow O$  (III)

wherein  $R_3$  is a branched or straight, saturated or unsaturated hydrocarbon radical having 8 to 20 carbon atoms;  $R_4$  and  $R_5$  represent each a methyl-, ethyl-, hydroxymethyl- and hydroxyethyl radical; while the other 0 to 80% by weight of nonionic surface-active detergent is selected from the group consisting of polyethylene glycol condensation product having a molecular weight from about 160 to 800; a condensation product of 3 to 1.5 moles of ethylene oxide per mole of aliphatic or alkyl aromatic compound having 8 to 20 carbon atoms and at least one reactive hydro-

gen atom; a saccharide fatty acid ester, and a polyoxyethylene saccharide fatty acid ester;

D. from about 2 to about 15% by weight of a solubilizing agent selected from the group consisting of C<sub>1-4</sub> alcohol; potassium, sodium and ammonium salt of C<sub>1-3</sub> alkyl and di-C<sub>1-2</sub> alkyl-phenyl sulfonic acid; and urea;

E. from about 5 to about 9% by weight of an organic acid selected from the group consisting of acetic-, citric-, gluconic-, glycolic-, lactic-, malic, maleic-, o-phthalic-, and p-phthalic acid;

whereby the weight ratio of (A) to (B) varies between 1 to 3 and 1 to 1, and the weight ratio of (C) to (A) + (B) varies between 1 to 5 and 1 to 2.

2. A liquid detergent composition according to claim 1, characterized in that the organic acid is acetic acid.

3. A liquid detergent composition according to claim 2, characterized in, that it contains sodium, potassium, ammonium, and di- and triethanol ammonium salts of said acid.

4. A liquid detergent composition according to claim 3, characterized in, that the weight ratio of acid to salt varies between 7 to 1 and 4 to 1.

5. A liquid detergent composition according to claim 4, characterized in, that it contains up to 3% by weight of a substituted methylaminoacetic acid or the salt thereof, of the general formula

$R_6-CO-N(R_7)-CH_2-COOM$  (IV)

wherein  $R_6$  is a straight or branched, saturated or unsaturated hydrocarbon group having from 11 to 17 carbon atoms;  $R_7$  is —H or —CH<sub>3</sub>

and  $M$  is selected from the group consisting of hydrogen; alkali metal; ammonium; and dimethyl-, diethyl-, trimethyl-, triethyl-, dimethanol-, trimethanol-, diethanol-, and triethanol ammonium salt.

6. A liquid detergent composition according to claim 1, characterized in, that it contains 1 to 3% by weight of a mono- and diethanol amide, derived from C<sub>8-24</sub> fatty acid.

7. A liquid detergent composition according to claim 1, characterized in, that it contains 2 to 3% by weight of —Na or —K salt of meta-, ortho- or pyroboric acid.

8. A liquid detergent composition according to claim 7, characterized in, that it contains up to 2% by weight of triethanol amine.

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9. A liquid detergent composition according to claim 8, characterized in, that the weight ratio of triethanol amine to borate varies between 1 to 2 and 1 to 4.

10. A liquid composition according to claim 9, characterized in, that the hydrocarbon radical of the polyethylene glycol ether sulfate of the formula (I) is an alkyl radical having 12 to 14 carbon atoms.

11. A liquid detergent composition according to claim 10, characterized in, that in the general formula (I) of the polyethylene glycol sulfate,  $n$  is 2 to 6.

12. A liquid detergent composition according to claim 10, characterized in, that aliphatic hydrocarbon radical  $R_2$  of the sulfonate of the formula (II) is an alkyl radical containing 12 to 18 carbon atoms.

13. A liquid detergent composition according to claim 10, characterized in, that the aliphatic hydrocarbon sulfonate of the formula (II) is a 10 to 1 to 1 to 2 mixture of  $C_{12-18}$  alkyl and  $C_{12-16}$  alkenyl sulfonates.

14. A liquid detergent composition according to claim 13, characterized in, that it contains by weight 2 to 7% of  $C_{8-18}$  fatty alcohol sulfate.

15. A liquid detergent composition according to claim 14, characterized in, that it contains up to 3% by

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weight of a sodium, potassium and ammonium salt of  $C_{12-18}$  alkyl glyceryl ether sulfonic acid.

16. A liquid detergent composition according to claim 15, characterized in, that the  $R_3$  of the tertiary amine oxide of the general formula (III) is a  $C_{12-16}$  alkyl radical.

17. A liquid detergent composition according to claim 16 wherein a portion of the nonionic surface-active detergent is a polyethylene glycol condensation product having a molecular weight of about 400.

18. A liquid detergent composition according to claim 16 wherein a portion of the nonionic surface-active detergent is a condensation product of 6 to 12 moles of ethylene oxide per mole of  $C_{12-16}$  fatty alcohol.

19. A liquid detergent composition according to claim 16, characterized in, that the saccharide fatty acid ester is sucrose mono-laurate.

20. A liquid detergent composition according to claim 16, characterized in, that the polyoxyethylene saccharide fatty acid ester is a condensate of a sorbitan mono-laurate or a sorbitan monooleate with 15 to 20 moles of ethylene oxide.

21. A liquid detergent composition according to claim 20 wherein the solubilizing agent is ethanol.

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