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LIQUID DETERGENT COMPOSITION

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5 Claims

ABSTRACT OF THE DISCLOSURE

Liquid detergent composition consisting essentially of one or more soaps of fatty acids having from 8 to 22 carbon atoms, the cations of said fatty acid soaps being potassium and a cation selected from the class comprising sodium, ethanolamine and mixtures thereof, a solvent comprising water and a hydrotropic substance selected from the class comprising lower saturated monohydric alcohol having 1 to 4 carbon atoms, potassium para-toluenesulphonate and mixtures thereof, and wetting or fluidifying agent selected from the class comprising glycerol, ethylene glycol and polyethylene glycol with a molecular weight from 200 to 600. The liquid detergent composition contains also sequestering agents, emulsifying agents and defoaming agents, and inorganic and organic salts.

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a continuation-in-part application of the following applications: Ser. No. 500,320 filed on Oct. 21, 1965, now abandoned, Ser. No. 595,616 filed on Nov. 21, 1966, now abandoned, Ser. No. 643,414 filed on June 5, 1967, now abandoned, Ser. No. 774,188 filed on Nov. 11, 1968, now abandoned.

BACKGROUND OF THE INVENTION

In my copending application Ser. No. 774,188, filed Nov. 11, 1968 I have disclosed a liquid detergent composition consisting essentially of:

(a) From 25 to 54%, by weight of the composition, of soap of fatty acids selected from the group consisting of saturated fatty acids having from 8 to 22 carbon atoms, unsaturated fatty acids having from 14 to 22 carbon atoms and mixtures thereof, said soap of fatty acids being selected from the group consisting of potassium soap, sodium soap, ethanolamine soap and mixtures thereof, said potassium soap being present in a quantity from 50 to 100% by weight of said soap of fatty acids, said sodium soap being present in a quantity up to 30% by weight of said soap of fatty acids and said ethanolamine soap being present in a quantity up to 50% by weight of said soap of fatty acids;

(b) From 28 to 60%, by weight of the composition, of a solvent consisting of water and a hydrotropic substance selected from the group consisting of lower saturated monohydric alcohol having from 1 to 4 carbon atoms, potassium para toluenesulphonate and mixtures thereof; the ratio by weight of said hydrotropic substance to water being from 1:30 to 3:1; and

(c) From 1 to 15%, by weight of the composition, of a fluidifying agent selected from the group consisting of glycerol, ethylene glycol, polyethylene glycol having a molecular weight from 200 to 600 and mixtures thereof.

I have disclosed in my above said copending application 53 examples and 18 tests of my above defined liquid detergent composition.

It is known that addition of salts in liquid detergent compositions of the above described kind improves the quality and properties of the composition. However, here-

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tofore the adverse effect of salts within such a composition was the increase in the viscosity thereof, so that it was deemed to be not convenient heretofore to add salts beyond certain percentages, even if otherwise a greater quantity of salts could favourably influence the quality and the properties of the composition.

SUMMARY OF THE INVENTION

An object of the invention is to provide a potassium soap based liquid detergent composition including at least two selected salt components which will diminish the increase in the viscosity thereof due to addition of salts.

Another object is to provide a potassium soap based liquid detergent composition including at least two selected salts, in which the selected salt components will display buffer and fluidifying actions on the liquid detergent composition allowing thereby to adjust the pH value thereof to the desired use of the liquid detergent composition.

Another object is to provide a potassium soap based liquid detergent composition including at least two selected salts, in which the selected salts will perform a synergetic action with each other and with the other components of the composition.

Another object is to provide a potassium soap based homogeneous liquid detergent composition including at least two selected salts, which will be limpid, will have a good fluidity and in which no separation of phases will occur not even at near to 0° C. temperatures, and in which there is a stable equilibrium among the components thereof.

Another object is to provide a liquid detergent composition which will be technically and economically satisfactory both for manual use and use in washing machines of industrial and household kind.

Another object is to provide a liquid detergent composition in which the phosphate components may easily be replaced by non-phosphate components in order to avoid the eutrophication phenomenon in waters.

Another object is to provide a liquid detergent composition having a degree of biodegradability higher than 90% within 24 hours.

Another object is to provide a liquid detergent composition, which is not toxic for surface water fauna under standardized test conditions.

A further object is to provide a liquid detergent composition which will reduce to a minimum the wear action under standardized test condition washing cycles.

Another object is to provide a liquid detergent composition which will attain, in addition to the above specified objects, also all other objects recited in my above specified copending and parent applications.

I have found that the following liquid detergent composition hereinafter indicated as incomplete LDC—"A" attains the above objects, when integrated with selected salts of the kind specified hereinafter. The formulation of this incomplete LDC is as follows:

	Percent by weight
Potassium soap of fatty acids derived from olive oil	13.25
Potassium soap of fatty acids derived from coconut oil	13.25
Water	43.30
Ethyl alcohol	6.83
Ethylene glycol	5.56
Nonyl phenol oxyethylated with 9 moles of ethylene oxide	3.18
Tetrapotassium salt of ethylene diamine tetraacetic acid	3.87

	Percent by weight
Optical bleach (Photine) -----	0.25
Defoaming agent:	
Nonyl phenol oxyethylated with 1.5 moles of	
ethylene oxide -----	0.50
+ tributyl phosphate -----	0.50
Citronella oil -----	0.10

I have found that the viscosity of this LDC-"A" is remarkably influenced, in a surprising manner, by the presence or absence of potassium tetraborate and/or sodium tripolyphosphate.

Expectably, when only potassium tetraborate or only sodium tripolyphosphate were singularly added to the above LDC the viscosity of it increased remarkably.

In fact, from the prior art (e.g. Soap Manufacture, vol. I, by J. Davidsohn et al., 1953, p. 461) it is known that liquid detergent compositions including fatty acid soaps in a hydroalcoholic solvent are thickened when inorganic salts are added thereto.

It was therefore surprising that, when both potassium tetraborate and sodium polyphosphate are added to the above LDC, the increase in viscosity unexpectedly diminished, even in cases where the total amount of these salts was greater than the singularly added salt.

On the basis of the tests and experiments carried out it seems to me reasonable to believe that this surprising behavior of the viscosity is due to a synergetic action not only between the two mentioned salts involved, but between all other main components of the LDC-"A." In fact, the tests carried out and partly reported also in my above said copending application, showed the existence of a remarkably stable equilibrium between the components of the LDC-"A" including the above mentioned salts, and a resistance to separation of the components even at near to 0° C. temperatures.

I have also found that the following inorganic salts alone or in admixture with one another and/or with tetraborate sodium tripolyphosphate display a similar synergetic action with the components of the above incomplete LDC-"A" or a similar composition and with potassium tetraborate present in it: sodium carbonate, potassium carbonate, tetrapotassium pyrophosphate 3H₂O, tetrasodiumpyrophosphate 10H₂O, trisodiumphosphate 12H₂O, tripotassiumphosphate, sodium bicarbonate, potassium bicarbonate, sodium metasilicate 5H₂O.

I have found further that a similar synergetic action is obtained when using the following organic salts alone, combined with one another or with one or more of the above organic salts: sodium nitriltriacetate, potassium-nitriltriacetate.

EXAMPLES 1-8

These examples illustrate the variation of viscosity in Engler degrees, of compositions in which various percentages of potassium tetraborate and sodium tripolyphosphate are added to the incomplete LDC-"A" specified in the summary of the invention.

Examples	Percent					
	Potassium tetraborate	Sodium tripolyphosphate	E.° at 10° C.	E.° at 23° C.	E.° at 12° C.	E.° at 24° C.
1-----	0	0	16.34	11.04		
2-----	0	1.5	18.36	11.97		
3-----	0	3	19.42	12.81		
4-----	0	6.31	24.71	14.79		
5-----	3.10	0		23.23	14.47	
6-----	3.10	1.50		23.01	13.50	
7-----	3.10	3.00		22.01	13.22	
8-----	3.10	6.31		19.36	11.91	

From the above examples it appears that when only sodium tripolyphosphate or only potassium tetraborate are added, increasing amounts of these salts singularly used, cause the viscosity with respect to that of the incomplete LDC-"A," to increase at a higher rate than

when these salts are used together, which is a surprising behaviour.

For example the viscosity of 23.23° E. of Example 5 surprisingly diminishes to 19.63° E. of Example 8 when, in addition to 3.10% by weight of potassium tetraborate 6.31 weight percent of sodium tripolyphosphate are used, i.e. even if the total amount of these salts is far greater than in Example 5. In fact, one would normally expect the viscosity to increase under these conditions, but exactly the opposite occurs in this invention.

This surprising effect may be construed as a showing of a synergetic action not only between the two salts involved but also between these salts and the other components of the composition.

The following examples show that a similar effect may be obtained when, in addition to potassium tetraborate other inorganic or also determined organic salts are added to this or a similar composition.

EXAMPLES 9-23

These examples illustrate the viscosity in Engler degrees at 17.5° C. of compositions in which the indicated percentages of potassium tetraborate and one or more of other inorganic and organic salts are added to an incomplete LDC-"B." The incomplete LDC-"B" is equal to incomplete LDC-"A" except for the defoaming agent mixture in which the ratio between nonyl phenol oxyethylated with 1.5 moles of ethylene oxide and tributyl phosphate is 1:3 instead of 1:1, the total amount of defoaming mixture remaining substantially the same.

Examples	Potassium tetraborate, weight percent	Other salts		E.° at 17.5° C.
		Kind	Weight percent	
9-----	0	0-----		18.84
10-----	3.1	0-----		25.12
11-----	3.1	Sodium tripolyphosphate-----	6.31	19.20
12-----	3.1	Sodium carbonate-----	6.31	16
13-----	3.1	Potassium carbonate-----	6.31	12.12
14-----	3.1	Tetrapotassium pyrophosphate 3 H ₂ O-----	6.31	16.30
15-----	3.1	Tetrasodium pyrophosphate 10 H ₂ O-----	6.31	19.10
16-----	3.1	Trisodium phosphate 12 H ₂ O-----	6.31	22.84
17-----	3.1	Tripotassium phosphate-----	6.31	15.30
18-----	3.1	Sodium bicarbonate-----	6.31	18.00
19-----	3.1	Potassium bicarbonate-----	6.31	16.04
20-----	3.1	Sodium nitriltriacetate-----	6.31	18.00
21-----	3.1	Potassium nitriltriacetate-----	6.31	17.00
22-----	3.1	Sodium metasilicate 5 H ₂ O-----		18.00
23-----	3.1	{ Sodium metasilicate 5 H ₂ O----- plus { Sodium tripolyphosphate... }	{ 3.15 3.15 }	17.00

I have also found that when one or more of the salts of Examples 9-23 are added to LDC-"B" so that the total amount of the mixture of these salts is about 6.31 weight percent with respect to the total composition similar results in viscosity are obtained.

I have also found that, when as emulsifying agent an alkylphenol oxyethylated with 5-6 moles of ethylene oxide and oleic alcohol oxyethylated with 5-6 moles of ethylene are used, similar satisfactory results are obtained.

It seems to me reasonable to believe that also the liquid detergent compositions described in the 53 examples of my above said copending application would behave in a similar manner when salts of the above described kind are added therein.

The compositions of Examples 8 and 11 were subjected to the 18 tests described in my above said copending application and similar results have been obtained.

In addition to the above tests the composition of Example 8 has been subjected to the following toxicological analysis:

Toxicological Analysis

This analysis has been carried out according to conventional methodology using goldfish exemplars (*Carassius auratus* L.) in groups of 6 exemplars for each dilution of

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the composition to be examined. The following environmental conditions were maintained during the entire duration of the tests: temperature: 15° C.; saturation percentage of oxygen, water hardness: 270 mg./l. CaCO₃; pH 7.3.

From the table which follows it appears clear that only concentrations exceeding 110 mg./l. cause death among the fish exemplars. This shows a very low toxicity of the tested composition as compared to other known detergents.

Concentration (g./l.)	Observation at—			
	6 hours	24 hours	48 hours	72 hours
1	6 dead			
0.5	do			
0.25	5 dead	1 dead		
0.20	6 alive	6 dead		
0.15	do	4 dead	2 alive	2 alive.
0.14	do	2 dead	4 alive	4 alive.
0.13	do	6 alive	6 alive	6 alive.
0.12	do	2 dead	4 alive	4 alive.
0.11	do	6 alive	6 alive	6 alive.
0.10	do	do	do	Do.
0.05	do	do	do	Do.
0.01	do	do	do	Do.

From the above description and from the disclosure of my above specified compending application it appears that the described liquid detergent compositions attain all the objects set out in the summary of the invention.

It appears further that the potassium tetraborate is present in the composition in the amount of about 30% by weight with respect to the total amount of the inorganic salts.

It appears further that, in cooperation with the other mentioned inorganic salts, and with sodium and potassium nitrilotriacetate, potassium tetraborate has a buffering action on pH and a fluidifying action on the liquid composition.

It appears further that the total amount of inorganic salts contained in the composition in admixture with potassium tetraborate is about 33% by weight with respect to the potassium salt.

It appears further that the concentration of the inorganic salts in the existing water is of about 20% by weight.

It appears further that the concentration of inorganic salts in admixing with sodium and potassium nitrilotriacetate, in the existing water is of about 20%.

It appears further that the ratio between potassium borate and the inorganic salts is about 1:2.

It appears further that the ratio between potassium borate and sodium and potassium nitrilotriacetate is about 1:2.

It appears further that the ratio between the potassium borate and the mixtures of inorganic salts and sodium and potassium nitrilotriacetate is about 1:2.

It appears further that the potassium soap component of the composition is constituted of 50% by weight of potassium soap of fatty acids derived from olive and 50% by weight of potassium soap of fatty acids derived from coconut oil.

It appears further that all the components of the liquid detergent composition of this invention display a synergistic action among each other.

What is claimed is:

1. A liquid detergent composition consisting essentially of:

- from 25% to 35% by weight of the composition of potassium soap of fatty acid comprising, by weight, from zero up to 3% saturated fatty acid (C₁₈-C₂₂), from zero up to 10% saturated fatty acid (C₁₆), from

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zero up to 30% unsaturated linoleic acid (C₁₈), from zero up to 50% unsaturated ricinoleic acid (C₁₈), from 20% to 100% unsaturated oleic acid (C₁₈), from zero up to 10% unsaturated myristic acid (C₁₄), from zero up to 30% unsaturated lauric acid (C₁₂) and from zero up to 5% of colophony,

- from 28% to 55% by weight of the composition of a solvent consisting of water and a hydrotropic substance selected from the group consisting of lower saturated monohydric alcohol having from 1 to 4 carbon atoms, potassium para-toluenesulphonate and mixtures thereof, the ratio by weight of hydrotropic substance to water being from 1:30 to 3:1,

- from 1 to 15% by weight of the composition, of a fluidifying agent selected from the group consisting of glycerol, ethylene glycol, polyethylene glycol having a molecular weight (M.W.) from 200 to 600 and mixtures thereof,

- from 1% to 25% by weight of the composition, of an organic dispersing agent selected from the group consisting of alkali metal sulphoricinate, octyl and nonyl phenol ester oxyethylated with from 7 to 12 moles of ethylene oxide, polyethylene glycol mono-oleate having a M.W. from 200 to 600, higher fatty alcohols having from 12 to 18 carbon atoms and oxyethylated with from 16 to 25 moles of ethylene oxide, sulphated higher fatty alcohols,

- from 1% to 25% by weight of the composition, of an organic sequestering agent selected from the group consisting of salts of ethylene diamine tetracetic acid, potassium gluconate and mixtures thereof,

- from 1 to 10% by weight of the composition, of an emulsifying agent selected from the group consisting of monoethanolamine, diethanolamine, triethanolamine alkyl phenols and oleic alcohols both oxyethylated with 5-6 moles of ethylene oxide and mixtures thereof,

- from 1% to 7% by weight of the composition, of potassium tetraborate,

- from 3% to 30% by weight of the composition, of inorganic salt selected from the group consisting of potassium carbonate, sodium carbonate, potassium dibasic phosphate, sodium dibasic phosphate, potassium tribasic phosphate, sodium tribasic phosphate, potassium tetrabasic pyrophosphate, sodium tetrabasic pyrophosphate, potassium tripolyphosphate, sodium tripolyphosphate and mixtures thereof.

2. A liquid detergent composition consisting essentially of:

13.25% potassium soap of fatty acids derived from olive oil;

13.25% potassium soap of fatty acids derived from coconut oil;

43.30% of water, 6.83% of ethyl alcohol, 5.56% of ethylene glycol, 3.18% of nonyl phenol oxyethylated with 9 moles of ethylene oxide;

3.87% tetrapotassium salt of ethylene diamine tetracetic acid, 0.25% optical bleach, 0.25% of nonyl phenol oxyethylated with 1.5 moles of ethylene oxide, 0.75% of tributyl phosphate, 0.1% of citronella oil, 3.10% potassium tetraborate, 6.31% of sodium tripolyphosphate, all percentages being by weight.

3. A composition according to claim 2, wherein at least a part of sodium tripolyphosphate is replaced by at least one inorganic salt selected from the group consisting of sodium carbonate, potassium carbonate, tetrapotassium pyrophosphate.3H₂O, tetrasodium pyrophosphate 10H₂O, trisodium phosphate and mixtures thereof.

4. A composition according to claim 2, wherein at least a part of sodium tripolyphosphate is replaced by at least one inorganic salt selected from the group consisting of tripotassium phosphate, sodium bicarbonate, potassium

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bicarbonate, sodium metasilicate.5H₂O and mixtures thereof.

5. A composition according to claim 2, wherein at least a part of sodium tripolyphosphate is replaced by at least one organic salt selected from the group consisting of potassium nitrile triacetate, sodium nitrile triacetate and mixtures thereof.

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