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2,870,091

DETERGENT COMPOSITION

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This invention relates to novel and unique liquid detergent compositions, and more particularly, to improved compositions containing organic and inorganic detergents in aqueous solution.

As is well known, the ever increasing need for improved liquid detergent compositions has resulted in the expenditure of a substantial amount of research time and attention. The particularly complicated physical and chemical phenomena here involved have, however, added a great deal of confusion to the art and have given rise to a great plurality of conflicting theories and concepts. The complexity of the overall problem is readily appreciated when one considers the fact that the phenomena here involved include suspension, interfacial tension, micellar structure, dispersion, emulsion, and the like.

Detergent compositions containing both organic and inorganic active ingredients have been known for some time, as is indicated in United States Patent No. 2,486,922, issued November 1, 1949, to Bruce Strain and assigned to the Procter & Gamble Company, showing compositions comprising tripolyphosphates, alkalis and a water-soluble anionic sulfated or sulfonated detergent. Although detergents of this type can be, and are currently being, packaged and sold in dry particulate form, certain features of this type of packaging leave something to be desired; and there has developed a very great demand on the part of home users as well as industrial users for suitable synthetic detergent compositions in liquid form. Those skilled in the art, however, recognize fully that a rather substantial number of critical considerations are involved in the formulation of a suitable liquid detergent composition, one of the most important of which being the problem of keeping all the active ingredients in solution. In the case of the so-called water-soluble anionic sulfated and sulfonated detergents, it is usually necessary to include an alcohol in the solvent system (with water) in order to have any appreciable concentration of such detergents in liquid solution. The presence of the alcohol, however, tends to depress drastically the solubility of inorganic "builders" or deterative ingredients such as sodium tripolyphosphate and the various alkalis used in inorganic detergent compositions.

In a liquid system wherein the water-soluble anionic sulfated and/or sulfonated detergents are eliminated or used in only very small concentrations, somewhat larger concentrations of the inorganic builders may be permitted. For example, an aqueous solution of about 7% diethanolamide of a higher fatty acid such as lauric acid can retain up to about 4% of sodium tripolyphosphate in solution. Minor amounts of perhaps up to

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½% of sodium dodecyl benzene sulfonate may also be permitted. The amide derivative is an organic ingredient which correlates foaming and deterative efficiency and contributes materially with respect to each function.

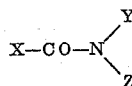
The instant invention is based upon the discovery that, if all or a substantial proportion of the just mentioned amide is replaced by a corresponding amide of a C₆-C₉ fatty acid, such as pelargonic acid, in the above mentioned aqueous solution, as much as 12½ tripolyphosphate can be retained in the solution, thereby providing a highly useful and competitive liquid detergent composition.

It is, therefore, an important object of the instant invention to provide an improved liquid detergent composition.

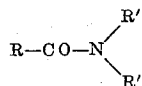
It is a further object of the instant invention to provide an improved liquid detergent formulation having superior deterative, emulsifying and foam stabilizing properties, which comprises inorganic detergents, a higher fatty acid amide detergent and foam stabilizer, and a specific lower fatty acid amide derivative which functions to permit high concentrations of the first two ingredients to be present in aqueous solution.

Other objects, features and advantages of the invention will become apparent to those skilled in the art from the following detailed description of preferred embodiments thereof.

One aspect of the instant invention consists in a liquid detergent composition consisting essentially of (a) lower fatty acid alkylolamide having the formula



wherein X—CO— is a fatty acyl radical of 6 to 9 carbon atoms and Y and Z are H or hydroxyalkyl groups of 2 to 3 carbon atoms each; (b) higher fatty acid alkylolamide having the formula



wherein R—CO— is a fatty acyl radical of 10 to 14 carbon atoms and R' and R'' are H or hydroxyalkyl groups of up to 5 carbon atoms each; and (c) alkali metal tripolyphosphate; the concentrations of the ingredients being:

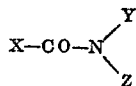
- 1-10 weight percent of (a)
- 3-20 weight percent of (b)
- 4-12 weight percent of (c)
- Remainder water

As will be explained hereinafter, other aspects of the instant invention include the incorporation of (d) an alkali in an amount sufficient to give a solution of the mixture, in ordinary concentrations for laundering, a pH of 8.8 to 10.7 and sufficient alkalinity to be compatible with the existence of the tripolyphosphate wholly as a non-acid metal normal alkali metal tripolyphosphate, and/or (e) water-soluble detergent salt of a higher alkyl benzene sulfonate, in small amounts to the above identified aqueous liquid detergent composition.

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INGREDIENT (a)

An essential ingredient in the instant composition is (a) lower fatty acid alkylolamide having the formula:

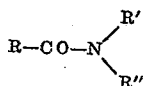


wherein X—CO— is a fatty acyl radical of 6 to 9 carbon atoms, Y is H or a hydroxyalkyl group of 2 to 3 carbon atoms and Z is a hydroxyalkyl group of 2 to 3 carbon atoms. The alkylolamides which may be used in the practice of the instant invention contain an X—CO— lower fatty acyl radical of 6-9 carbon atoms, which may be derived from C₆ (e. g. caproic), C₇ (e. g. heptic), C₈ (e. g. caprylic), and/or C₉ (e. g. pelargonic) fatty acids. Most preferably the amide is a derivative of pelargonic acid. The hydroxyalkyl or alkylol groups Y and Z may be the same or different, each containing 2 to 3 carbon atoms and these groups may be hydroxyethyl, 2-hydroxypropyl, 3-hydroxypropyl, and/or 2,3-dihydroxypropyl groups. Most preferably, both Y and Z are 2-hydroxyethyl. Examples of the alkylolamides (a-1) include N,N bis (2-hydroxyethyl) caprylamide, N,N bis (2-hydroxyethyl) pelargonamide, N,N bis (2,3-dihydroxypropyl) pelargonamide, N,N bis (3-hydroxypropyl) caprylamide, N,N bis (2-hydroxypropyl) caproamide, N-hydroxyethyl caprylamide and N-(2-hydroxypropyl) pelargonamide, and the like. Preferably the diethanolamide compounds are used and the most preferred compound is the diethanolamide of pelargonic acid or N,N bis (2-hydroxyethyl) pelargonamide. Since the compound (a-1) is an alkylolamide, it will be appreciated that both Y and Z cannot be H and one of these groups (and preferably both) must be a hydroxyalkyl group as above indicated.

These alkylolamides may be prepared in any suitable manner and numerous processes for their production are well known in the art. Specific processes are described in connection with ingredient (b) and it will be noted that these processes can be applied to the instant alkylolamides. The preferred process involves the condensation of an alkylolamine with the fatty acid or acid halide. The amide is produced by condensation of the suitable lower fatty acids (or their equivalent) with a molecular equivalent or in excess of alkylolamine, the molar ratio being from about 1:1 to about 1:10 but preferably up to about 1:5 and usually from about 1:2 to about 1:3, at about 100° C. to about 200° C. (and preferably about 120-180° C.), and achieving a reaction mixture equilibrium comprising an effective amount of the alkylolamide. The final product will contain the amide with an excess of the amine (preferably in excess of ½-1½ mols of the amine) and this product is preferred because it appears to give better results than the substantially pure amide, in the absence of an excess of the amine.

INGREDIENT (b)

The second ingredient, ingredient (b), which may be used in the practice of the invention is a higher fatty acid amide derivative, namely, an alkylolamide having the formula

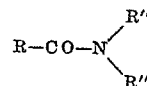


wherein R—CO— is a fatty acyl radical of 10 to 14 carbon atoms and R' is H or a hydroxyalkyl group of up to 5 carbon atoms and R'' is a hydroxyalkyl group of up to 5 carbon atoms. Since the compound is an alkylolamide, only one of R' or R'' can be hydrogen and the other must be a hydroxyalkyl group.

Among the alkylolamides, the dialkylolamides which may be used in the practice of the instant invention have been described in detail in said U. S. Patent No. 75

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2,607,740, and these compounds are characterized by their weakly polar nature and may be represented by the following formula



wherein R—CO— represents a fatty acyl radical of 10-14 carbon atoms, and R'' and R'' may be the same or different, each being a lower hydroxyalkyl group of preferably up to about 5 and, more particularly, from about 2 to about 5 carbon atoms. The hydroxyalkyl groups may be mono- or polyhydroxy alkyl. Examples of suitable additives are N,N bis (2-hydroxyethyl) lauramide, N,N bis (2-hydroxyethyl) myristamide, N,N bis (2-hydroxyethyl) capramide, N,N bis (2,3-dihydroxypropyl) lauramide, N,N bis (3-hydroxypropyl) myristamide, N,N bis (3-hydroxypropyl) lauramide, N,N bis (3-hydroxypropyl) capramide, N,N bis (2-hydroxypropyl) myristamide, N,N bis (4-hydroxybutyl) lauramide, etc. Because of the excellent results obtained it is preferred to use the diethanolamide compounds and the additives possessing a fatty acyl radical of 12-14 carbon atoms.

These dialkylolamides may be prepared in any suitable manner and numerous processes for their production are well known in the art. A convenient and economical mode of synthesis involves the condensation of the higher fatty acylating compounds (e. g. lauric acid, lauric acid halide, etc.) with a suitable amino compound to produce a reaction product having the desired amide structure.

The higher fatty acylating substances may be derived from pure, impure or commercial grades of capric, lauric or myristic acids and the like. More particularly, these acids may be produced from fatty oils, fats, greases, and other natural sources or be of synthetic origin as derived from the oxidation of hydrocarbons. According to its origin and the degree and manner of purification, capric, lauric and myristic acids may be commonly admixed or associated with other fatty acids or higher and lower molecular weight. It is within the scope of the invention that the capryl, lauroyl and myristoyl compounds may be associated with other fatty substances and the like provided the character and amount of such other materials are not sufficient to substantially neutralize or materially affect the enhancing power of the additives in the relationship set forth. Thus, there may be suitably employed for the preparation of the dialkylolamide additives the commercially pure capric, lauric and myristic acids having a concentration of such acids of about 90% and above. A typical composition of commercially pure lauric acid may be 90% lauric acid, 9% myristic acid, 1% unsaturated acids, trace capric acid. Another suitable fatty acid mixture is "topped" coconut oil fatty acids produced by the removal of a low-boiling fraction, e. g. 10-15%, from coconut oil fatty acids.

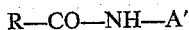
Among the dialkylolamines suitable for condensation are diethanolamine, N,N bis (2,3-dihydroxypropyl) amine, dipropanolamine, N,N bis (2-hydroxypropyl) amine, dibutanolamine, etc. It is to be understood that the dialkylolamines may be utilized in pure, impure, or commercial form.

According to the circumstances of manufacture of the dialkylolamide, it may be chemically and/or physically associated with other materials such as soap, free alkylolamine, piperazine type derivatives, etc. The presence of varying amount of such materials and the like in admixture with dialkylolamide is contemplated within the scope of the present invention, provided the same are not significant enough to materially neutralize or substantially adversely affect the desired improvements to be accomplished with the combination of the anionic detergent and the dialkylolamide additive.

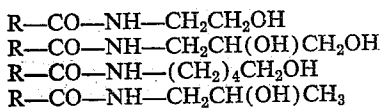
It is a particular feature of this invention that the

reaction product of the higher fatty acylating substance and the dialkylolamine comprising the desired dialkylolamide and other derivatives as produced under certain conditions may be utilized with marked success as additives in the novel compositions of the present invention. More particularly, the product is to be produced by the condensation of the suitable higher fatty acids or their equivalent with an equivalent or an excess of dialkylolamine, the molar ratio being from about 1:1 to about 1:10 but preferably up to about 1:5 and usually from about 1:2 to about 1:3, and from about 100° C. to about 200° C., and preferably from about 120° C. to 180° C., and achieving a reaction mixture equilibrium comprising an effective amount of the dialkylolamide. With the fatty acids, an excess of dialkylolamine will usually be used, preferably up to about 3:1. Using fatty acids or anhydrides illustratively as reactants, as the water is distilled off or otherwise removed during the reaction, the acid number falls indicating formation of amides. The reaction is to be continued until the desired amount of water has been removed, e. g. not substantially in excess of 15% acid or soap and preferably up to about 10% as determined by the acid value resulting from titration of the reaction mixture with potassium hydroxide. With the use of methyl esters and the like as reactants, the amount of alcohol liberated is an index of completion of the reaction. In the case of the acid chlorides and the like as reactants, formation of chloride ion or its equivalent may be determined also. This condensation reaction between the higher fatty acids and the alkylolamines or their equivalents is highly complex and produces a variety of products in addition to the desired dialkylolamide. Accordingly, it is necessary to achieve an equilibrium of the reaction mixture containing an effective proportion of the dialkylolamide. This equilibrium may be achieved usually by permitting the reaction mixture to cool relatively slowly or maintaining the reaction mixture at slightly elevated temperatures for a sufficient period of time. The optimum equilibrium of the reaction mixture however achieved may be determined by routine tests such as hereinafter set forth wherein the novel liquid detergent compositions are subjected to practical washing operations. A typical suitable reaction mixture cited for illustrative purposes and resulting from the condensation of commercially distilled lauric acid in 90% purity and commercial diethanolamine contains the following components on a solids basis: diethanolamide about 65%, diethanolamine soap about 10%, free amine, diethanolpiperazine and minor amounts of possibly other substances totaling 25%. The reaction product may contain usually minor amounts of water also, e. g. about 5%.

The dialkylolamides which may be used in the practice of the instant invention have just been described in detail. The compounds of the monoalkylolamide class which we may use in connection with the instant invention have been substantially described in United States Patent No. 2,382,737, issued August 28, 1945, to Albert S. Richardson, and assigned to the Procter & Gamble Company. In general, these compounds may have the formula:



wherein R—CO— is a fatty acyl radical of about 10–14 carbon atoms, and A' is a hydroxyalkyl radical of up to about 5 carbon atoms and having 1 to 2 hydroxy groups with none of the carbon atoms having more than one hydroxy group attached thereto. Examples include:



wherein R is decyl, lauryl, myristyl and keryl, and mixtures of such compounds. Any of the alkylol groups

disclosed in connection with the dialkylolamide may, of course, be used; and it is also apparent that those dihydroxy groups (such as the 2,3 - dihydroxy propyl group) may, of course, be present in the dialkylolamide hereinbefore disclosed. The method of preparing the monoalkylolamides are disclosed in detail in said U. S. Patent No. 2,382,737 and need not be discussed in further detail herein.

INGREDIENT (c)

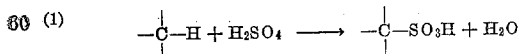
One of the inorganic builders which may be used in the practice of the instant invention is ingredient (c), which is an alkali metal triphosphosphate. The alkali metal triphosphates include, primarily, the three lower members of this group, namely, lithium, sodium and potassium triphosphates. These ingredients are described in detail in United States Patent No. 2,486,921, issued to David R. Byerly on November 1, 1949, and assigned to Procter & Gamble Company, and also in the aforementioned United States Patent No. 2,486,922, issued to Bruce Strain on November 1, 1949, and assigned to Procter & Gamble Company. As is pointed out in these patent disclosures, the sodium triphosphate has a tendency to decompose to some extent during some methods of treating this material, particularly, spray drying which is not used in the practice of the instant invention, and the triphosphates referred to herein may contain some decomposition products.

INGREDIENT (d)

Still another material which may be incorporated in the composition of the invention is an alkali of the type described in detail in the aforementioned United States Patent No. 2,486,922, issued to Bruce Strain on November 1, 1949. The alkali (d) may be any material which will alkalize the composition so as to impart thereto a pH value consistent with the existence of the triphosphate therein (as non-acid, normal alkali metal triphosphate) of about 8.8 to about 10.7 in ordinary concentrations used for laundering (such as a 0.6% solution). The alkalis which may be used as ingredient (d) include sodium hydroxide, potassium hydroxide, sodium silicate, tetrasodium pyrophosphate (which, incidentally, is one of the thermal decomposition products of triphosphate), trisodium orthophosphate and the alkali metal carbonate such as sodium carbonate. Tetrasodium pyrophosphate is preferred.

INGREDIENT (e)

As has been mentioned, still another ingredient may be employed in rather small quantities in the instant composition. This ingredient, ingredient (e), is an anionic sulfonated detergent, which may be referred to as a higher alkyl benzene sulfonate salt. Under vigorous anhydrous conditions, a C—SO₃H group is formed, for example, in the reaction represented by Equation 1 below:



and the resulting product is sulfonated. Certain alkylbenzenes (providing a reactive nuclearily substituted hydrogen instead of an OH group) are used for sulfonation.

As is also pointed out in U. S. Patent No. 2,607,740, another classification or group of detergents is the group of aliphatic detergents. Included therein are the aliphatic sulfated or sulfonated agents, such as the aliphatic acyl-containing compounds wherein the acyl radical has about 8 to about 22 carbon atoms, and more particularly, the aliphatic carboxylic ester type, containing at least about 10 and preferably about 12 to about 6 carbon atoms to the molecule. Among the aliphatic detergent compounds, it is preferred to use the sulfated

aliphatic compounds having about 12 to about 22 carbon atoms. As suitable examples of aliphatic detergents may be found the sulfuric acid esters of polyhydric alcohols incompletely esterified with higher fatty acids, e. g. coconut oil monoglyceride mono-sulfate, tallow diglyceride mono-sulfate; the long chain pure or mixed higher alkyl sulfates, e. g. lauryl sulfate, cetyl sulfate, higher fatty alcohol sulfates derived from reduced coconut oil fatty acids; the hydroxy sulfonated higher fatty acid ester, e. g. higher fatty acid esters of 2,3-dihydroxy propane sulfonic acid; the higher fatty acid esters of low molecular weight alkylol sulfonic acids, e. g. oleic acid ester of isethionic acid; the higher fatty acid ethanolamide sulfates; the higher fatty acid amides of amino alkyl sulfonic acids, e. g. lauric amide of taurine, and the like. The instant invention does not preclude the use of smaller amounts of such other sulfated or sulfonated detergents; but the advantages of the invention are obtained mainly by the use of the alkyl benzene sulfonates as the sole or at least predominant detergent of ingredient (e).

These aromatic sulfonate detergents are also known in the art. They are mononuclear rather than polynuclear in structure (the polynuclear compounds having appreciably different deterative properties). More particularly, the aromatic nucleus may be derived from benzene, toluene, xylene, phenol, cresols, etc. The alkyl substituent on the aromatic nucleus may vary widely, as long as the desired detergent power of the active ingredient is preserved. While the number of sulfonic acid groups present on the benzene nucleus may vary it is usual to have one such group present in order to preserve as much as possible a balance between the hydrophilic and hydrophobic portions of the molecule.

More specific examples of suitable alkyl benzene sulfonate detergents are the higher alkyl benzene sulfonates. The higher alkyl substituent on the benzene nucleus may be branched or straight-chain in structure; it comprises moreover such groups as decyl, dodecyl, keryl, penta-decyl, hexadecyl, mixed long-chain alkyls derived from long-chain fatty materials, cracked paraffin wax olefins, polymers of lower mono-olefins, etc. Preferred examples of this class are the higher alkyl mononuclear aryl sulfonates wherein the alkyl group is about 8 to about 22, and preferably about 12 to 18 carbon atoms. More particularly, it is preferred to use the higher alkyl benzene sulfonates wherein the higher alkyl group is about 12 to 16 carbon atoms. For example, propylene may be polymerized to the tetramer and condensed with benzene in the presence of a Friedel-Crafts catalyst to yield essentially the dodecyl benzene derivative which is suitable for sulfonation to the desired sulfonate compounds.

The above mentioned anionic detergents are used in the instant invention in the form of their water-soluble salts, which salts include the amine, ammonium, alkali metal and alkaline earth metal salts. Such salts include the lower three alkali metals (lithium, sodium and potassium, which are the only commercially significant alkali metal salts), the ammonium salts, the magnesium salts (which are the preferred alkaline earth metal salts), the amine salts and the alkylol amine salts. Although in certain instances, the alkylol amine salts have been found to be particularly preferable (e. g., the monoethanolamine, diethanolamine, triethanolamine salts and mixtures thereof have been found to be particularly useful however, I have also found that the alkali metal salts, particularly the alkali metal alkyl benzene sulfonates are advantageous in many respects including economic aspects and are preferred for use in the instant invention.

A basic feature of the instant invention resides in the combination of inorganic detergent materials with an organic foaming and deterative efficiency ingredient in reasonably high concentrations in aqueous solution. Additional organic detergents, such as ingredient (e), can be added but the bulk of the deterative efficiency of the

composition comes from the inorganic ingredients (c) and/or (d), the preferred group of such inorganic ingredients being inorganic detergents that are alkali metal salts of phosphorous-oxy acids, such as the sodium polyphosphates, trisodium orthophosphate, tetrasodium pyrophosphate, and the like.

A typical formulation is as follows:

Composition I

2 parts—I(a)—pelargonic diethanolamide
5 parts—I(b)—lauroyl diethanolamide
12 parts—I(c)—sodium tripolyphosphate
81 parts—water

If ingredient I(a) of Composition I is omitted and 7 parts of ingredient I(b) are used instead of 5 parts, it will be found that only about 4 parts of the sodium tripolyphosphate can be retained in solution and the remainder of the sodium tripolyphosphate precipitates out. The incorporation of the pelargonic diethanolamide in the composition (as a substitute for a portion of the lauroyl diethanolamide component) thus effectively triples the ability of the composition to retain sodium tripolyphosphate in solution. This is of tremendous advantage in the formation of a liquid detergent composition, as can be readily appreciated.

In a liquid detergent composition preferred for use by the housewife, for example, it has been found that the preferred proportions of ingredient (a) are in the range of about 1 to about 5 weight percent and the preferred proportions of ingredient (b) are in the range of about 10 weight percent to about 17 weight percent, with the total weight percent of ingredient (a) plus ingredient (b) being preferably about 6% to about 20%. In such a composition, the amount of inorganic builder, i. e., ingredients (c) plus (d) is preferably within the range of about 6 weight percent to about 11 weight percent, in order to have the best correlation between foaming and deterative efficiency.

As will be appreciated, adjustments can be made between ingredients (a) and (b) and also between ingredients (c) and (d). Either ingredient (c) or ingredient (d) may be used alone in the composition as the inorganic builder; and ingredient (a) may be used alone in the composition as the sole organic foaming and deterative efficiency ingredient. Because of the "coupling" effect of ingredient (a) in making ingredients (b) and (c) or (d) compatible in an aqueous solution, greater amounts of the amides (a) and (b) may be incorporated in aqueous solution with greater amounts of the inorganic builders (c) and (d) than were heretofore possible. For example, the amount of ingredient (a) may vary from a minimum effective amount of about 1 weight percent to as much as about 10 weight percent; and the proportion of ingredient (b) may vary from a minimum of about 3 weight percent to a maximum of about 20 weight percent, if ingredient (b) is to be incorporated in the composition for the purpose of imparting a superior deterative efficiency to the amide component. Ingredient (b) has better detergent properties than ingredient (a) and for this reason it is preferable to employ ingredients (a) and (b) together in the proportions herein indicated. The proportion of the inorganic builder, ingredients (c) and/or (d), may vary from a minimum effective amount of about 4 weight percent to a maximum of about 12 weight percent. It will be appreciated that a certain amount of manipulation of the proportions of ingredients (a) and (b) may be necessary in instances involving the use of greater concentrations of the inorganic builders (i. e. concentrations of perhaps 8 to 12 weight percent, and in such cases the amount of ingredient (a) will have to be appreciable and the amount of ingredient (b) should usually be in the lower region of the range, such as about 3 weight percent to about 6 weight percent.

Other formulations which also give the superior results of the invention include:

Composition II

2 parts—II(a): Pelargonic diethanolamide
7 parts—II(b): Coconut fatty acid diethanolamide
5 parts—II(c): Sodium tripolyphosphate
6 parts—II(d): Sodium orthophosphate
0.5 part—II(e): Sodium dodecyl benzene sulfonate
79.5 parts—water

Composition III

2 parts—III(a): Pelargonic diethanolamide
9 parts—III(b): Coconut fatty acid diethanolamide
5 parts—III(c): Sodium tripolyphosphate
6 parts—III(d): Sodium orthophosphate
0.5 part—III(e): Sodium dodecyl benzene sulfonate
77.5 parts—water
Resulting pH is 10

Composition IV

2 parts—IV(a): Pelargonic diethanolamide
13 parts—IV(b): Coconut fatty acids diethanolamide
5 parts—IV(c): Sodium tripolyphosphate.
6 parts—IV(d): Sodium orthophosphate
0.5 part—IV(e): Sodium dodecyl benzene sulfonate
73.5 parts—water

Composition V

2 parts—V(a): N,N bis (2-hydroxyethyl) pelargonamide
17 parts—V(b): Coconut fatty acid diethanolamide
5 parts—V(c): Sodium tripolyphosphate
6 parts—V(d): Sodium orthophosphate
0.5 part—V(e): Sodium dodecyl benzene sulfonate
69.5 parts—water

Composition VI

6 parts—VI(a): N,N bis (2-hydroxypropyl) caprylamide
4 parts—VI(b): Monoethanol myristamide
5 parts—VI(c): Sodium tripolyphosphate
84 parts—water

Composition VII

2 parts—VII(a): N-(2-hydroxypropyl) pelargonamide
5 parts—VII(b): Lauroyl diethanolamide
8 parts—VII(c): Sodium tripolyphosphate
2 parts—VII(d): Potassium carbonate
83 parts—water.

Composition VIII

2 parts—VIII(a): Pelargonic diethanolamide
7 parts—VIII(b): Lauroyl diethanolamide
12 parts—VIII(d): Sodium silicate (anhydrous)
78 parts—water

Composition IX

5 parts—IX(a): Pelargonic diethanolamide
5 parts—IX(b): Lauroyl diethanolamide
5 parts—IX(c): Sodium tripolyphosphate
2 parts—IX(d): Sodium silicate
83 parts—water

As will be appreciated, the particular advantage of the instant invention resides in the fact that this combination of ingredients permits the use of a liquid concentrated detergent rather than requiring the use of a dry particulated detergent composition. Accordingly, tests were made of certain compositions herein to compare the same with a standard commercially available composition in dry powder form. The test employed is a standard detergent test known as the "cotton soil test cloth" test. In this test, a standardized artificially soiled cotton fabric (produced by Test Fabrics, New York city) is employed. The light reflectance of the soiled cotton fabric is tested and the fabric is then washed under cer-

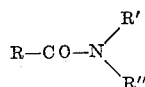
tain standard conditions and again tested to determine the difference in light reflectance which in turn gives a figure representing the deterative effect of the material. The higher the figure the greater the deterative effect.

- 5 Tests were conducted using a Tergetometer (which is a standard device) to wash predetermined amounts of the cotton fabric using a temperature of 120° F., a concentration of 0.25% for the detergent and using water having 50 p. p. m. hard water. The standard commercially available dry powder product give a result of 19.1. In contrast, Composition II herein described gives a test result of 21.2. Composition III herein described gives a test result of 21.7; Composition IV herein described gives a test result of 23.8; Composition V herein described gives a test result of 25.3; etc. It will thus be seen that the compositions of the instant invention give better deterative efficiency with increased amounts of the coconut fatty acid diethanolamide, but only small amounts of ingredient (a) are required to permit the formulation of compositions containing large amounts of the coconut fatty acid diethanolamides and the inorganic builders. It will also be noted that the instant compositions actually give results that are superior to a commercially available dry powder and the instant compositions have the additional advantage of being a liquid.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

- 30 1. A liquid detergent composition capable of retaining relatively large amounts of inorganic detergent materials in stable aqueous solution consisting essentially of (a) diethanolamide of pelargonic acid; (b) higher fatty acid alkylolamide having the formula:



- wherein R—CO— is a fatty acyl radical of 10 to 14 carbon atoms, R' is H or a hydroxyalkyl group of up to 5 carbon atoms and R'' is a hydroxyalkyl group of up to 5 carbon atoms; (c) alkali metal tripolyphosphate; and (d) an alkali in an amount sufficient to give a solution of the mixture, in ordinary concentrations for laundering, a pH of 8.8 to 10.7 and sufficient alkalinity to be compatible with the existence of the tripolyphosphate wholly as a non-acid normal alkali metal tripolyphosphate; the concentrations of the ingredients being:

- 50 1-10 weight percent of (a)
3-20 weight percent of (b)
4-12 weight percent of (c) plus (d)
Remainder water

with the weight ratio of (c):(d) being 1:20 to 20:1.

- 55 2. A liquid detergent composition capable of retaining relatively large amounts of inorganic detergent materials in stable aqueous solution consisting essentially of (a) lower fatty acid alkylolamide having the formula



- wherein X—CO— is a fatty acyl radical of 6 to 9 carbon atoms, Y is H or a hydroxyalkyl group of 2 to 3 carbon atoms and Z is a hydroxyalkyl group of 2 to 3 carbon atoms; (b) higher fatty acid alkylolamide having the formula



- wherein R—CO— is a fatty acyl radical of 10 to 14 carbon atoms, R' is H or a hydroxyalkyl group of up to 5 carbon atoms and R'' is a hydroxyalkyl group of

up to 5 carbon atoms; (c) alkali metal tripolyphosphate; (d) an alkali in an amount sufficient to give a solution of the mixture, in ordinary concentrations for laundering, a pH of 8.8 to 10.7 and sufficient alkalinity to be compatible with the existence of the tripolyphosphate wholly as a non-acid normal alkali metal tripolyphosphate; and (e) water-soluble detergent salt of a higher alkyl benzene sulfonate; the concentrations of the ingredients being:

- 1-10 weight percent of (a)
- 3-20 weight percent of (b)
- 4-12 weight percent of (c) plus (d)

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$\frac{1}{2}$ -2 weight percent of (e)
Remainder water

with the weight ratio of (c):(d) being 1:20 to 20:1.

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