

[54] LIQUID CLEANSING COMPOSITION AND METHOD OF PRODUCING

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[57] ABSTRACT

A relatively stable, liquid cleansing composition containing (a) an alkylbenzene sulfonic acid detergent surfactant, (b) an alkaline builder or a builder which is a mineral acid or inorganic salt thereof, (c) a normally liquid organic solvent, and (d) water. The molar ratio of builder material to the detergent surfactant is from 0.01:1 to 3:1, the weight ratio of solvent to detergent surfactant is within the range of 1:1 to 5:1 and water may be present in the composition in amounts from about 4 to 80 weight percent.

22 Claims, No Drawings

LIQUID CLEANSING COMPOSITION AND METHOD OF PRODUCING

BACKGROUND OF THE INVENTION

The present invention relates to a new and useful liquid cleansing composition, and to a method for producing such composition.

Three component liquid systems consisting of organic solvent, certain alkylbenzene sulfonic acid detergent surfactants and varying amounts of water offer possibilities for a wide range of effective cleansing products. However use of such three component liquid systems has heretofore been limited because of typically undesirable storage characteristics and/or undesirable viscosity characteristics. For example such systems frequently form undesirable gels or suffer from liquid phase separation problems or have hard to manage high viscosity characteristics at temperatures below about 60°F. In addition to other storage problems, such three component liquid systems are quite corrosive to some metals and adversely affect the condition of mild steel or tinplate steel normally used in the industry for storage vessels. This is due somewhat to the acid nature of the detergent surfactants.

It is thus the object of the present invention to provide a new and useful liquid cleansing composition containing certain alkylbenzene sulfonic acid type detergents, water and an organic solvent which has desirable storage characteristics. It is another object of the present invention to provide such a cleansing composition which is less corrosive than those known in the prior art. It is a further object of the present invention to provide a cleansing composition containing such ingredients which have improved cleansing properties. It is another object of the present invention to provide a method for producing such a cleansing composition. Additional objects will become apparent from the following description of the present invention.

SUMMARY OF THE INVENTION

These and other objects are accomplished by the present invention which in one of its aspects is a cleansing composition comprising (a) an anionic detergent surfactant which is an alkylamine salt or an alkylolamine salt of an alkylbenzene sulfonic acid (b) a normally liquid organic solvent (c) water and (d) a builder material which is an alkaline builder, a mineral acid builder or an inorganic, neutral or acidic, mineral acid salt builder, wherein in said composition the molar ratio of said builder material to said detergent surfactant is within the range of 0.01:1 to 3:1, wherein the weight ratio of said solvent to said detergent surfactant is within the range of 1:1 to 5:1, and wherein said water is present in amounts of from about 4.0 to 80 weight percent. In another of its aspects the present invention is a method of producing the foregoing described cleansing composition, which method comprises the sequential steps of (1) firstly mixing together said organic solvent and said detergent surfactant, (2) secondly adding to and blending with the thus formed mixture of solvent and detergent surfactant a concentrated solution of said builder material dissolved in a portion of said water and (3) finally adding to and blending the remaining portion of said water with the mixture resulting from steps (1) and (2) above.

DETAILED DESCRIPTION OF THE INVENTION

As can be seen from the foregoing summary, the present invention resides in the addition of a builder material in specific amounts to the three component systems of the prior art. That an alkaline builder material or mineral acid (or salt thereof) builder can be successfully incorporated into a balanced one phase liquid system of water, organic solvent, and alkylbenzene sulfonic acid type detergent is indeed surprising since addition of electrolytes generally effects phase separation in such liquid systems.

The detergent surfactants that may be used in the present invention are those alkylamine or alkylolamine salts of alkylbenzene sulfonic acids. These anionic detergent surfactants are well known in the industry. For best results the alkyl portion of the alkylbenzene sulfonic acid or salt contains at least 3 carbon atoms, for example 8 to 16 carbon atoms, however it is preferred that such alkyl portion contains from 11 to 13 carbon atoms with 12 carbon atoms being most preferable. In other words the salts of dodecylbenzene sulfonic acid are most preferable as detergent surfactants for use in the present invention. As between the alkylamine salts and the alkylolamine salts the alkylamine salts are preferred, with the monoalkylamine salts being most preferable. By "monoalkylamine" is meant those primary amines having a single alkyl group such as methyl amine, ethyl amine, isopropyl amine, n-propyl amine, n-butyl amine, isobutyl amine, and n-hexyl amine. The salts of monoalkylamines of 1 to 6 carbon atoms are preferred. The most preferred salt of an alkylbenzene sulfonic acid for use as the detergent surfactant in the present invention is the monoisopropyl amine salt. Alkylolamine salts include those salts of amines having at least one hydroxyalkyl group. Of the alkylolamine salts those of monoalkylolamines are most preferable, the term monoalkylolamine being used to refer to a primary amine having a single hydroxyalkyl, (sometimes referred to as alkylol or alkanol) group substituent. Specific alkylolamines include monoethanol amine, diethanolamine and monoisopropanolamine. The salts of alkylolamines containing 1 to 6 carbon atoms are preferred.

The normally liquid organic solvents useful in the present invention include both polar and non-polar solvents although the non-polar hydrocarbon solvents are preferred. By the term "normally liquid" is meant liquid at 65°F and atmospheric pressure. Of the polar solvents the most useful are those free of halogen atoms, especially those halogen-free polar solvents selected from the group consisting of glycol ethers and cyclic ketones. The preferred glycol ethers, are those of 2-12 carbon atoms of the formula $R_1-O-R-OH$ wherein R_1 is an alkyl or hydroxyalkyl group and where R is an alkylene group, such as 2-methoxy ethanol, diethylene glycol, 2-butoxy ethanol, and 5-ethoxy-1-pentanol. The cyclic ketones may be either carbocyclic or heterocyclic such as N-methyl-2-pyrrolidone and cyclohexanone. The non-polar hydrocarbon solvents useful in the present invention are preferably those normally liquid, substantially aliphatic hydrocarbon solvents having boiling ranges within the range of 250° to 800°F, preferably in the range of 300° to 550°F although the aromatic hydrocarbons may also be used. The most readily available are those derived from petroleum fractions such as kerosene, naphtha, mineral spirits, (Stoddard

solvent), no. 2 diesel fuel and the like. Kerosene and no. 2 diesel fuel are generally the preferred solvents as compositions containing such do the least harm to painted surfaces. When the storage characteristics of a cleansing composition prepared using a petroleum-derived non-polar solvent are of concern, it has been unexpectedly discovered that the neutralization number of the non-polar solvent is quite material. As is well known in crude petroleum there are a great many organic compounds present in very small amounts which can be neutralized with strong alkalis such as sodium hydroxide or potassium hydroxide and these are sometimes called saponifiable materials. A great many of these saponifiable materials are naphthenic acids consisting primarily of mono or dicyclic monocarboxylic acids such as methylcyclohexane monocarboxylic acid. Although not all of the saponifiable materials, and not even all of the naphthenic acids, have been identified several of them can and usually do distill over in refined petroleum cuts boiling from 250° to 850°F, particularly kerosene. Due to modern refining methods many types of the saponifiable materials are eliminated by other than distillation however the naphthenic acids usually remain in the final products in amounts of from 10 to 200 p.p.m. depending on the source of crude, refining method, etc. The most convenient method for measuring the presence of naphthenic acids and other saponifiables is as a neutralization equivalent against potassium hydroxide such as by ASTM-D974-64 test method. This latter method gives a "neutralization number" which is actually the milligrams of potassium hydroxide required to neutralize the saponifiables in one gram of non-polar solvent. As pointed out above the neutralization number of a petroleum-derived non-polar solvent is quite material in that it has been discovered that the neutralization number should be above 0.01 but not exceeding 0.04 when the water content of the cleansing composition is above 65% while the neutralization number should be 0.01 or below when the water content of the cleansing composition is 65% or below. For example if a cleansing composition containing 30% of water were prepared with a kerosene solvent having a neutralization number of 0.015 then the cleansing composition would most likely separate into two phases after only a short period of time, while if a kerosene with a neutralization number of 0.008 had been used the cleansing composition would have remained homogenous for a long period of time—even in excess of 1 year in many cases. Conversely if one were to prepare a cleansing composition containing 75% water with a kerosene solvent having a neutralization number of 0.008 then such would most likely separate into two phases after about 3 hours, while if a kerosene of 0.015 neutralization number had been used then the cleansing composition would have remained stable for a much longer period of time.

The builders useful in the present invention may vary widely and are well known in the industry with the alkaline builders being preferred. Both inorganic builders as well as the organic chelating agent builders may be utilized. Included among the types of alkaline builders which may be utilized in the present invention are those selected from the group consisting of the invention are those selected from the group consisting of the inorganic alkali metal or ammonium phosphates, silicates, carbonates or borates, ammonium hydroxide, the alkali metal hydroxides, the alkaline salts of nitrilotriacetic

acid, the alkaline salts of the unsubstituted or hydroxyl-substituted carboxylic acids, the alkylolamines, and the alkylolpolyamines having one or more of the amino hydrogens thereof substituted with hydroxyalkyl groups and/or carboxyalkyl groups or the alkali salts thereof and/or with carboxyl groups or the salts thereof. Mixtures of the foregoing may also be used. By the term "alkali metal" as used herein and in the claims is meant lithium, sodium, potassium, rubidium and cesium.

The inorganic alkali metal or ammonium phosphates that may be used include the orthophosphates as well as the condensed or complex phosphates. Specific orthophosphates include monosodium phosphate, monoammonium phosphates, disodium phosphate, and trisodium phosphate. Condensed or complex phosphates that may be used are tetrasodium pyrophosphate, tetrapotassium pyrophosphate, disodium acid pyrophosphate, sodium hexametaphosphate, sodium tetraphosphate, and pentasodium tripolyphosphate.

The inorganic alkali metal or ammonium silicate builders that may be used include sodium metasilicate, sodium silicate, potassium silicate, sodium sequisilicate, and sodium orthosilicate.

Inorganic alkali metal or ammonium borate builders useful in the present invention include sodium metaborate, sodium tetraborate (including the anhydrous, pentahydrate and the decahydrate), potassium tetraborate, potassium pentaborate, and sodium perborate.

Useful inorganic alkali metal or ammonium carbonate builders include anhydrous sodium carbonate, sodium sesquicarbonate, and sodium bicarbonate. The useful alkali metal hydroxides include sodium hydroxide, potassium hydroxide and lithium hydroxide with sodium hydroxide the most preferable among the hydroxides.

The builders comprising alkaline salts of nitrilotriacetic acid include the sodium salt of nitriloacetic acid as well as the potassium salt thereof. The unsubstituted and hydroxyl substituted carboxylic acids, the salts of which may be used, include glycolic acid, citric acid, formic acid, acetic acid, butyric acid, oxalic acid, malonic acid, succinic acid, diglycolic acid, glutaric acid, tartaric acid and gluconic acid. For example, sodium gluconate and disodium oxydiacetate are specific utilizable salts.

Alkylolamines useful in the present invention include primary, secondary and tertiary amines wherein at least one amino-hydrogen is substituted with an hydroxyalkyl group. These are generally of the formula $NR_1R_2R_3$ wherein R_1 is a hydroxy alkyl group and R_2 and R_3 may be either hydrogen, alkyl, or hydroxyalkyl. Most preferably the alkylolamines used have from 1 to 10 carbon atoms. Specific alkylolamines includes monoethanolamine, diethanolamine, triethanolamine, monoisopropanolamine, triisopropanolamine, morpholine, 2-amino-2-methyl-1-propanol, diethyl-aminoethanol, and diglycolamine. Also useful are the alkaline builders which are alkylolpolyamines having one or more of the amino hydrogens substituted with an hydroxy alkyl group and/or a carboxyalkyl group or alkali metal salt thereof and/or a carboxyl group or alkali metal salt thereof. This class of builders preferably contains from 6 to 25 carbon atoms. Examples include ethylenediamine tetraacetic acid and its tetrasodium salt, diethylenetriamine pentaacetic acid, and N-hydroxyethylenediamine triacetic acid, N-betahydroxypropyl

ethylenediamine, and the trisodium salt of N,N,N'-tris(2-hydroxypropyl)-N'-1,2,3-tricarboxyisopropylethylenediamine. Although the alkaline builders are preferred in the present invention the builders which are mineral acids or the neutral and acidic inorganic salts thereof may also be used. Specific examples include orthophosphoric acid, sulfuric acid, hydrochloric acid, sodium sulfate, magnesium sulfate, and sodium chloride.

It has been found that the cleansing compositions of the present invention are best accomplished by blending the ingredients in a particular sequence in order to avoid flocculation, gelling or lumping. Namely, it is preferred to form the cleansing compositions by first blending together in a suitable blending vessel all of the solvent and all of the detergent surfactant to be used. Either the solvent can be added to the detergent surfactant or vice-versa; or the solvent and surfactant may be added simultaneously. Next in the sequence of steps is the addition to the solvent-surfactant mixture of a concentrated aqueous solution of the builder material. Such concentrated aqueous solution is formed by dissolving all of the builder material to be utilized in a minimum amount of the water which is to be present in the finished cleansing composition. Most preferably the amount of water utilized in forming the concentrated aqueous builder solution is only that amount required to completely dissolve the builder at the temperatures involved, however satisfactory results are obtained with concentrated aqueous solutions wherein the water is present in amount of from 1.0 to 2.0 times the amount required for complete dissolution at the temperatures involved. In this respect, the temperatures to be maintained in all phases of the blending of components so as to form the cleansing composition should be at least 45°F and generally not above 135°F, although preferably the temperatures are within the range of 65°F to 120°F.

After blending the concentrated aqueous solution of builder material with the mixture of solvent and detergent surfactant, the final step involves the mere addition and blending of the remaining portion of water to be used in the cleansing composition which was not used in forming the concentrated aqueous solution of builder material. Undesirable results occur when the foregoing mixing sequence is not followed. For example if water alone is added to the mixture of synthetic detergent and solvent without the builder present, considerable gelling or thickening is encountered soon after introduction of the water begins which requires a great amount of agitation over undesirably long length of time to "thin out." If all the water and solvent are first mixed and the detergent surfactant then added, a thick, unmanageable suspension results. A similar thick, unmanageable suspension also results if all the builder material dissolved in all the water is first placed in the blending tank and then either the solvent or the synthetic detergent, or a mixture of the latter, is then added. Further, suitable results are not obtained by first mixing the detergent surfactant and the builder (regardless of whether the builder is a solid or a liquid) since these two usually will not uniformly mix, and further addition of the solvent and/or the water results in flocculation, gelling or lumping. It has also been unexpectedly found that where alkali metal or ammonium carbonates are to be utilized as builders, then the preferred blending procedure gives products with longer

storage stability. The foregoing preferred blending procedure is especially applicable when using non-polar solvents as they present the most problems of gel formation although it is also preferred for polar solvents as well.

The best use for the cleansing compositions of the present invention is in application where they are used to loosen soil, dirt and grease from hard surfaces and then wash away with water. The cleansing compositions generally fall into three classes — light duty general maintenance cleaners, medium duty degreasers and heavy duty degreasers — with the main difference in the three classes being in the amount of water present. Generally speaking the light duty cleaners have present from about 65 to 80 weight percent water, the medium duty degreasers from about 40 to 65 weight percent water and the heavy duty degreasers from about 4 to 40 weight percent water. Of course other factors than water concentration are to be considered in selecting a cleansing composition for a particular job since the choice of a builder and solvent also affects cleansing characteristics. The light duty general maintenance cleaners can be used to remove thin films of grease, pigment stains, general dirt, waxes, and/or metallic oxides. The medium duty degreasers are generally used to remove grease deposits which range up to about 0.10 inches in thickness with the heavy duty degreasers being used for thicker deposits which are usually harder crusted.

In preparing a cleansing composition of the present invention, the molar ratio of builder material to detergent surfactant must be maintained within critical ranges. Generally such molar ratio will be within the range of 0.01:1 to 3:1 however the preferred ratio for any particular cleansing composition will vary according to the nature of the solvent, surfactant and builder being used. When a non-polar solvent and an alkaline builder are being used the molar ratio of builder to surfactant is preferably 0.01:1 to 1:1, especially 0.04:1 to 0.55:1. When a non-polar solvent and a mineral acid or a neutral or acidic mineral acid salt builder is utilized, the molar ratio of builder to surfactant is preferably within the range of 0.01:1 to 1:1, especially 0.04:1 to 0.70:1. When utilizing a polar solvent and an alkaline builder such molar ratio is preferably within the range of 0.01:1 to 1.5:1, especially 0.04:1 to 0.90:1. When utilizing a polar solvent and a mineral acid or a neutral or acidic salt builder, the molar ratio of builder to surfactant is preferably within the range of 0.01:1 to 3.0:1, especially 0.04:1 to 2.7:1.

The following examples serve to illustrate but not to limit the present invention. All ratios, parts and percentages are by weight unless otherwise specified.

Several cleansing compositions were prepared in accordance with the present invention and the composition of each is hereafter set forth. The water utilized in each cleansing composition was soft water containing less than one grain hardness per gallon, and the detergent surfactant utilized in each composition was the monoisopropylamine salt of dodecylbenzenesulfonic acid.

COMPOSITION A

An excellent medium duty cleaner composition found to be useful in cleansing is as follows:

Soft water	62.5%
Detergent surfactant	9.0
Kerosene, neut. no. 0.009	27.0
Potassium tetraborate.4H ₂ O	1.5

The molar ratio of builder to surfactant in this composition is 0.209:1. This composition was prepared by placing 2700 pounds of the kerosene in a 1500 gallon stainless steel mixing tank fitted with a mechanical propeller type stirrer and then slowly adding 900 pounds of the surfactant thereto with mechanical stirring. After addition of the surfactant was complete, a concentrated solution of the potassium tetraborate was formed by dissolving 150 pounds of such in about 1000 pounds of water and then such concentrated solution slowly added to the mixing tank with stirring. As the final step, 5,250 pounds of water was added fairly fast with stirring. The temperature in all the mixing steps was maintained at about 77°F. This composition could be stored in mild steel containers.

COMPOSITION B

An excellent heavy duty cleansing composition was prepared utilizing the following ingredients:

Soft water	25.00%
Detergent surfactant	18.00
Trisodium phosphate.12H ₂ O	3.00
Kerosene, neut. no. 0.009	54.00

This composition is suitable for storage in mild steel. The molar ratio of builder to surfactant is 0.168:1.

COMPOSITION C

Another excellent heavy-duty cleansing composition was prepared from the following ingredients:

Soft water	16.31%
Detergent surfactant	20.60
Sodium metasilicate.5H ₂ O	1.29
Kerosene, neut. no. 0.009	61.80

The molar ratio of builder to surfactant was 0.113:1. This composition may be stored in mild steel.

COMPOSITION D

A medium duty cleansing composition was prepared from the following ingredients:

Soft water	50.50%
Detergent surfactant	12.10
Sodium carbonate	1.10
Kerosene, neut. no. 0.009	36.30

The molar ratio of builder to surfactant was 0.329:1. This composition may be stored in mild steel.

COMPOSITION E

A light duty cleansing composition was prepared from the following ingredients:

Soft water	75.00%
Detergent surfactant	6.00
NTA, trisodium salt.H ₂ O	1.00
Kerosene, neut. no. 0.015	18.00

The molar ratio of builder to surfactant was 0.233:1. NTA is the abbreviation for nitrilotriacetic acid. This

composition may be stored in mild steel. In the above composition the trilitium salt or a mixed alkali metal salt of NTA could be used.

COMPOSITION F

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	5.10%
Detergent surfactant	23.40
Sodium hydroxide	1.30
Kerosene, neut. no. 0.009	70.20

The molar ratio of builder to surfactant was 0.533:1. This composition may be stored in mild steel.

COMPOSITION G

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	10.33%
Detergent surfactant	21.96
Ammonium hydroxide	1.83
Kerosene, neut. no. 0.009	65.88

The molar ratio of builder to surfactant was 0.912:1. The composition could be stored in mild steel.

COMPOSITION H

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	41.78%
Detergent surfactant	14.20
Sodium gluconate	1.42
Kerosene, neut. no. 0.009	42.60

The molar ratio of builder to surfactant was 0.176:1. Storage of this composition in other than a mild-steel container is recommended.

COMPOSITION I

A light duty cleansing composition was prepared from the following ingredients:

Soft water	70.33%
Detergent surfactant	7.30
Sodium acetate.3H ₂ O	0.47
Kerosene, neut. no. 0.015	21.90

The molar ratio of builder to surfactant was 0.182:1. Storage of this composition in other than a mild steel container is recommended.

COMPOSITION J

A light duty cleansing composition was prepared from the following ingredient:

Soft water	75.10%
Detergent surfactant	6.10
Dilithium oxydiacetate	0.50
Kerosene, neut. no. 0.009	18.30

The molar ratio of builder to surfactant was 0.215:1. Storage of this composition in mild steel is not recommended.

COMPOSITION K

A medium duty cleansing composition was prepared from the following ingredients:

Soft water	48.15%
Detergent surfactant	12.75
Disodium oxydiacetate	0.85
Kerosene, neut. no. 0.015	38.25

The molar ratio of builder to surfactant was 0.144:1. Storage of this composition in mild steel is not recommended.

COMPOSITION L

A light duty cleansing composition was prepared from the following ingredients:

Soft water	71.94%
Detergent surfactant	6.90
Triethanol amine	0.46
Kerosene, neut. no. 0.015	20.70

The molar ratio of builder to surfactant was 0.171:1. This composition may be stored in mild steel containers.

COMPOSITION M

A light duty cleansing composition was prepared from the following ingredients:

Soft water	75.06%
Detergent surfactant	6.02
Ethylenediamine tetraacetic acid, tetrasodium salt	0.86
Kerosene, neut. no. 0.015	18.06

The molar ratio of builder to surfactant was 0.144:1. Storage of this composition may be in mild steel containers.

COMPOSITION N

A light duty cleansing composition was prepared from the following ingredients:

Soft water	66.88%
Detergent surfactant	8.16
Disodium succinate. 6H ₂ O	0.48
Kerosene, neut. no. 0.015	24.48

The molar ratio of builder to surfactant was 0.0836:1. Storage of this composition in mild steel is not recommended.

COMPOSITION O

A light duty cleansing composition was prepared from the following ingredients:

Soft water	75.00%
Detergent surfactant	6.00
Sulfuric acid builder	1.00
Kerosene, neut. no. 0.015	18.00

The molar ratio of builder to surfactant was 0.652:1. Storage of this composition in mild steel is not recommended.

COMPOSITION P

A light duty cleansing composition was prepared from the following ingredients:

Soft water	74.00%
Detergent surfactant	6.00
NTA, trisodium salt.H ₂ O	2.00
2-Butoxy ethanol	18.00

The molar ratio of builder to surfactant was 0.465:1. This composition may be stored in mild steel.

COMPOSITION Q

A light duty cleansing composition was prepared from the following ingredients:

Soft water	74.22%
Detergent surfactant	5.95
NTA, trisodium salt.H ₂ O	1.98
N-methyl-2-pyrrolidone	17.85

The molar ratio of builder to surfactant was 0.464:1. This composition may be stored in mild steel.

COMPOSITION R

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	30.27%
Detergent surfactant	16.87
Trisodium phosphate. 12H ₂ O	2.25
140°F flash naphtha, neut. no. 0.007	50.61

The molar ratio of builder to surfactant was 0.135:1. The flash naphtha was predominately aliphatic. Storage of this composition may be in mild steel.

COMPOSITION S

A light duty cleansing composition was prepared from the following ingredients:

Soft water	72.46%
Detergent surfactant	6.80
NTA, trisodium salt.H ₂ O	0.34
Mineral spirits, neut. no. 0.012	20.40

The molar ratio of builder to surfactant was 0.0697:1. The mineral spirits utilized were petroleum refined, substantially aliphatic hydrocarbons. Storage of this composition may be in mild steel.

COMPOSITION T

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	8.60%
Detergent surfactant	24.23
Triethanolamine	2.60
Heavy aromatic naphtha, neut. no. 0.020	64.57

The molar ratio of builder to surfactant was 0.276:1. This composition may be stored in mild steel containers.

COMPOSITION U

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	35.42%
Detergent surfactant	15.80
Trisodium salt of N,N,N'-tris betahydroxypropyl-N'-1,2,3 tri- carboxy isopropyl-ethylenediamine	1.38
Kerosene, neut. no. 0.009	47.40

The molar ratio of builder to surfactant was 0.0706:1. This composition has excellent rinseability characteristics. Storage in mild steel is however not recommended.

COMPOSITION V

A light duty cleansing composition was prepared from the following ingredients:

Soft water	75.00%
Detergent surfactant	6.00
Sodium citrate.2H ₂ O	1.00
Kerosene, neut. no. 0.015	18.00

The molar ratio of builder to surfactant was 0.217:1. Storage of this composition in mild steel is not recommended.

COMPOSITION W

A light duty cleansing composition was prepared from the following ingredients:

Soft water	74.92%
Detergent surfactant	6.08
Sodium sulfate	0.76
Kerosene, neut. no. 0.015	18.24

The molar ratio of builder to surfactant was 0.338:1. Storage of this composition in mild steel is not recommended.

COMPOSITION X

A heavy duty cleansing composition was prepared from the following ingredients:

Soft water	37.15%
Detergent surfactant	15.60
Magnesium sulfate.7H ₂ O	0.45
Kerosene, neut. no. 0.009	46.80

The molar ratio of builder to surfactant was 0.0449:1. Storage of this composition in mild steel is not recommended.

In order to illustrate the cleansing properties of the compositions of the present invention several runs were made in each of which a flat test panel coated with white enamel paint was placed in a horizontal position in a basin and then a test grease evenly applied to the upper surface of the test panel. Different panels were utilized for each run although they were identical to each other. After the test grease was applied it was allowed to dry for 24 hours and then an amount of cleansing composition was placed in the basin so as to be a uniform depth over the panels. The soiled test panels were allowed to soak in the cleansing composition until it appeared that the grease deposits had been dissolved and fluxed, and the time required for such

noted. The test panels were then flushed with sufficient constant pressure tap water (eleven grains hardness per gallon) to emulsify and rinse away the test grease and cleansing composition as completely as practicable, and the amount of flush water so required as well as the condition of the test panel was noted. All tests were carried out inside a building in open air at about 75°F, 75% relative humidity and no wind velocity.

EXAMPLE 1

The cleansing characteristics of Composition B above as well as a control composition was tested according to the foregoing procedure. The control composition was practically identical to Composition B except that the builder was left out. The test grease utilized was a clean SAE-90 gear lubricant and such was applied in a thickness of 0.15 inch or a total of 20 pounds per panel. Using 26 pounds of cleansing composition in each run about 20 minutes was required of both Composition B and the control composition to flux the test grease, however only 195 pounds of flush water was needed for Composition B while 290 pounds of flush water was required for the control. Also the pressure of the flush water required for the control was 30 p.s.i.g. as opposed to 20 p.s.i.g. for Composition B. In both runs it appeared that 100% of the test grease had been removed from the panels and that there was no soil redeposition. In neither run did there appear to be any paint stripping.

EXAMPLE 2

The cleansing characteristics of Composition E above as well as a control composition was tested according to the foregoing procedure. The control composition was practically identical to Composition E except that the builder was deleted. The test grease utilized was about 11% SAE-90 gear lubricant, 81% scrapings from inside an automobile engine crankcase and 8% dirty oil removed from an automobile engine crankcase. The test grease was applied to the panels and a thickness of 0.03 inch or a total weight of 0.001 pound per panel. Utilizing about 4.5 pounds of cleaner in each run, Composition E required about 60 minutes fluxing time while the control required about 75 minutes. Composition E required 50 pounds of flush water at 20 p.s.i.g. while the control required 125 pounds at 30 p.s.i.g. It appeared that Composition E removed 100% of the test grease with a no soil redeposition taking place, while the control composition removed slightly less than all of the test grease and some soil redeposition occurred as several film spots were noted. No paint stripping was observed in either run.

EXAMPLE 3

The cleansing characteristics of Composition P above as well as a control composition was tested according to the foregoing procedure. The control composition was practically identical to Composition P except that the builder was deleted. The test grease utilized was about 28% SAE-90 gear lubricant, 5% dirty axle grease, 11% printer's ink, and 56% clay. The test grease was applied to the panels and a thickness of 0.005 inch or a total weight of 0.75 pound per panel. Utilizing about 10.5 pounds of cleaner in each run, Composition P required only about 45 minutes fluxing time while the control required about 75 minutes. Composition P required 65 pounds of flush water at 15

p.s.i.g. while the control required 95 pounds at 20 p.s.i.g. It appeared that both Composition P and the control removed 100% of the test grease and no soil re-deposition was observed in either run. There was some slight blistering of paint in both of the runs.

In order to test the storage stability of various cleansing compositions and their corrosion of mild steel, several cleansing compositions were placed in a DOT-17E-20/18 gauge mild steel drums and the drums stoppered. The cleansing compositions were stored in the drums for 1 year with the temperature varying between about 60°F and 90°F during that time. The cleansing compositions were frequently observed during the year. It was observed that cleansing Composition B was very slightly turbid after 1 year but otherwise clean and useable. The drum lining was essentially uncorroded there being only about two or three tiny rust spots along one of the seams. On the contrary the control composition analogous to Composition B (see Example 1 above) was moderately turbid after two months storage with some evidence of very fine rust particles in suspension. At 3.5 months the control composition was very turbid and rusty appearing and the drum lining was extensively etched and pitted with several large flakes of rusted steel on the bottom of the drum. At the end of 1 year the control composition analogous to Composition B had corroded four pin-hole leaks in the drum where the bottom joined the sides.

The storage and corrosion characteristics of Composition E and its un-built control were also observed for 1 year with results very similar to that of Composition B and its un-built control. That is Composition E was stable at the end of one year with very little corrosion observed while the un-built control analogous to Composition E showed strong corrosion after 3 months. Furthermore the un-built control analogous to Composition E separated into two liquid phases after about 4 months.

In order to illustrate the materiality of the neutralization number of non-polar solvent utilized in forming a cleansing composition, two cleansing compositions were prepared containing 75.00% soft water, 6.10% of the monoisopropylamine salt of dodecylbenzene sulfonic acid, 0.60% monoammonium phosphate, and 18.30% kerosene. However in one of the compositions the kerosene had a neutralization number of 0.009 while in the other the kerosene had a neutralization number of 0.013. The cleansing composition utilizing the kerosene having a neutralization number of 0.009 separated into two liquid phases after about 3 hours time at 60°F to 90°F while the composition utilizing the kerosene with the neutralization number of 0.013 remained homogeneous for at least one year at 60°F to 105°F. Similar tests have shown that where the water is present in the cleansing composition in amounts of less than 65% that the neutralization number of the kerosene should be 0.01 or below in order to prevent phase separation. It is pointed out that the amount of saponifiable materials in a non-polar solvent has an effect both when using acidic builders, neutral builders and alkaline builders however by far the greatest advantage is obtained when alkaline builders are being utilized.

The compositions herein described find their main use as cleansing compositions, but are also useful as oil spill dispersants to be poured upon oil slicks on water. They are also suitable wetting agents which may be

added to strong acid or alkali solutions used in descaling or derusting operations as well as in oil and gas well operations to dissolve formations or loosen sludge.

What is claimed is:

- 5 1. A one phase cleansing composition comprising (a) an anionic detergent surfactant which is an alkylamine salt or an alkylolamine salt of an alkylbenzene sulfonic acid, (b) a normally liquid organic solvent, (c) water and (d) an alkaline builder material or a builder material which is a mineral acid or a neutral or acidic inorganic salt thereof, wherein in said composition the molar ratio of said builder material to said detergent surfactant is within the range of 0.01:1 to 3:1, wherein the weight ratio of said solvent to said detergent surfactant is within the range of 1:1 to 5:1, wherein said water is present in amounts of from about 4.0 to 80 weight per cent, and wherein the alkyl portion of said alkylbenzene sulfonic acid contains substantially from 11 to 13 carbon atoms.
- 10 2. The cleansing composition of claim 1 wherein said builder material is an alkaline builder material, wherein said solvent is a non-polar normally liquid hydrocarbon solvent, and wherein the ratio of said alkaline builder material to said detergent surfactant is within the range of 0.01:1 to 1:1.
- 15 3. The cleansing composition of claim 2 wherein said detergent surfactant is a salt of a monoalkylamine containing 1 to 6 carbon atoms.
- 20 4. The cleansing composition of claim 2 wherein said solvent is a petroleum derived, substantially aliphatic hydrocarbon solvent having a boiling range of about 300°F to 550°F and having a neutralization number of 0.01 or below, and wherein said water is present in amounts of 65 weight per cent or below.
- 25 5. The cleansing composition of claim 4 wherein said alkaline builder material is selected from the group consisting of (i) the inorganic alkali metal or ammonium phosphates, (ii) the inorganic alkali metal or ammonium silicates, (iii) the inorganic alkali metal or ammonium carbonates, (iv) the inorganic alkali metal or ammonium borates, (v) ammonium hydroxide, (vi) the alkali metal hydroxides, (vii) the alkaline salts of nitrotriacetic acid, (viii) the alkaline salts of the unsubstituted or hydroxy substituted carboxylic acids, (ix) the alkylolamines, (x) the alkylenepolyamines having the one or more of the hydrogens thereof substituted with hydroxyalkyl groups and/or with carboxyl-substituted alkyl groups or the alkali salts thereof and/or with carboxyl groups or the alkali salts thereof, and (xi) mixtures thereof.
- 30 6. The cleansing composition of claim 5 wherein the molar ratio of said builder material to said detergent surfactant is within the range of 0.04:1 to 0.55:1.
- 35 7. The cleansing compositions of claim 2 wherein said solvent is a petroleum derived, substantially aliphatic hydrocarbon solvent having a boiling range of about 300°F to 550°F and having a neutralization number above 0.01 and below 0.04, and wherein said water is present in amounts above 65 weight per cent.
- 40 8. The cleansing composition of claim 7 wherein said alkaline builder material is selected from the group consisting of (i) the inorganic alkali metal or ammonium phosphates, (ii) the inorganic alkali metal or ammonium silicates, (iii) the inorganic alkali metal or ammonium carbonates, (iv) the inorganic alkali metal or ammonium borates, (v) ammonium hydroxide, (vi) the alkali metal hydroxides, (vii) the alkaline salts of ni-
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triloltriacetic acid, (viii) the alkaline salts of the unsubstituted or hydroxy substituted carboxylic acids, (ix) the alkylolamines, (x) the alkylenepolyamines having the one or more of the hydrogens thereof substituted with hydroxyalkyl groups and/or with carboxyl-

substituted alkyl groups or the alkali salts thereof and/or with carboxyl groups or the alkali salts thereof, and (xi) mixtures thereof.

9. The cleansing composition of claim 8 wherein the molar ratio of said builder material to said detergent surfactant is within the range of 0.04:1 to 0.55:1.

10. The cleansing composition of claim 6 wherein said detergent surfactant is a salt of a monoalkylamine containing 1 to 6 carbon atoms.

11. The cleansing composition of claim 9 wherein said detergent surfactant is a salt of monoalkylamine containing 1 to 6 carbon atoms.

12. The cleansing composition of claim 1 wherein said builder material is an alkaline builder material selected from the group consisting of (i) the inorganic alkali metal or ammonium phosphates, (ii) the inorganic alkali metal or ammonium silicates, (iii) the inorganic alkali metal or ammonium carbonates, (iv) the inorganic alkali metal or ammonium borates, (v) ammonium hydroxide, (vi) the alkali metal hydroxides, (vii) the alkaline salts of nitrilotriacetic acid, (viii) the alkaline salts of the unsubstituted or hydroxy substituted carboxylic acids, (ix) the alkylolamines, (x) the alkylenepolyamines having the one or more of the hydrogens thereof substituted with hydroxyalkyl groups and/or with carboxyl-substituted alkyl groups or the alkali salts thereof and/or with carboxyl groups or the alkali salts thereof, and (xi) mixtures thereof.

13. The cleansing composition of claim 12 wherein said solvent is a polar solvent, and wherein the ratio of said alkaline builder material to said detergent surfactant is within the range of 0.01:1 to 1.5:1.

14. The cleansing composition of claim 13 wherein said polar solvent is free of halogen atoms and is selected from the group consisting of glycol ethers and cyclic ketones.

15. The cleansing composition of claim 1 wherein said builder is a builder material which is a mineral acid or a neutral or acidic inorganic salt thereof.

16. The cleansing composition of claim 15 wherein said solvent is a non-polar, petroleum derived, substantially aliphatic hydrocarbon solvent having a boiling range of about 250°F to 800°F and having a neutralization number of 0.01 or below, wherein said water is present in amounts of 65 weight per cent or below, and

wherein the molar ratio of said builder to detergent surfactant is within the range of 0.04:1 to 0.70:1.

17. The cleansing composition of claim 15 wherein said solvent is a non-polar petroleum derived, substantially aliphatic hydrocarbon solvent having a boiling range of about 250°F to 800°F and having a neutralization number of within the range of above 0.01 and below 0.04, wherein said water is present in amounts of above 65 weight per cent, and wherein the molar ratio of said builder to said detergent surfactant is within the range of 0.04:1 to 0.70:1.

18. The cleansing composition of claim 15 wherein said solvent is a polar solvent and wherein the molar ratio of said builder to said detergent surfactant is within the range of 0.04:1 to 2.7:1.

19. The cleansing composition of claim 18 wherein said polar solvent is free of halogen atoms and is selected from the group consisting of glycol ethers and cyclic ketones, and wherein said detergent surfactant is a salt of a monoalkylamine having 1 to 6 carbon atoms.

20. The cleansing composition of claim 18 wherein said builder is a mineral acid builder.

21. A method of producing a one phase cleansing composition containing (a) an anionic detergent surfactant which is an alkylamine salt or an alkylolamine salt of an alkylbenzene sulfonic acid, (b) a normally liquid organic solvent, (c) water and (d) an alkaline builder material or a builder material which is a mineral acid or a neutral or acidic inorganic salt thereof, wherein in said composition the molar ratio of said builder material to said detergent surfactant is within the range of 0.01:1 to 3:1, wherein the weight ratio of said solvent to said detergent surfactant is within the range of 1:1 to 5:1, wherein said water is present in amounts of from about 4.0 to 80 weight per cent, and wherein the alkyl portion of said alkylbenzene sulfonic acid contains substantially from 11 to 13 carbon atoms, which method comprises the sequential steps of (1) firstly mixing together said organic solvent and said detergent surfactant, (2) secondly adding to and blending with the thus formed mixture of solvent and detergent surfactant a concentrated solution of said builder material dissolved in a portion of said water and (3) finally adding to and blending the remaining portion of said water with the mixture resulting from steps (1) and (2) above.

22. The method of claim 21 wherein said builder material is an alkaline builder material and said solvent is a non-polar solvent.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,887,497
DATED : June 3, 1975
INVENTOR(S) : George B. Ulvild

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Cover page, in the title, after the word "PRODUCING" add---SAME---; Column 1, Line 2, in the title, after the word "PRODUCING" add---SAME---

Column 2, Line 53, delete "thos" and insert therefor---those---; Column 4, Line 28, delete "potssium" and insert therefor---potassium---; Column 4, Line 30, delete "corbonate" and insert therefor---carbonate---; Column 13, Line 37, delete "ligquid" and insert therefor---liquid---; and Column 14, Line 54, delete "compositions" and insert therefor---composition---

Signed and Sealed this
twenty-fifth Day of May 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks