DESCRIPTION

TITLE OF THE INVENTION: HARD SURFACE LIQUID CLEANER COMPOSITION

TECHNICAL FIELD

[0001] The present invention relates to a cleaning agent composition for hard surfaces.

BACKGROUND ART

[0002] Generally, as cleaning agents for hard surfaces, in order to remove different stains on subjects to be treated in bathrooms, kitchens, floors and the like, compositions suitable for each of the stains to be treated have been used. For example, as the kitchen cleaning agents usable in areas around the kitchen such as stove ranges, ovens, walls or floors of areas around the stove ranges, and exhaust fans, cleaning agents containing a surfactant, a solvent, an alkalizing agent or the like have been used, in order to remove grease stains deteriorated by an action of heat, sunlight, oxygen in the air or the like. In addition, as bathroom cleaning agents usable in bathrooms including areas such as bathtubs, and walls or floors of bathrooms, cleaning agents containing a surfactant, a solvent, a metal sequestering agent or the like have been used, in order to remove stains originated from metal soaps, particularly calcium salts of fatty acids.

[0003] Among these cleaning agents, the cleaning agents usable in kitchen are applied to a part of hard surfaces of the walls of areas around the stove

ranges, kitchen counters or the like. After the cleaning agents are applied to the hard surfaces, the agents serve to remove stains from greases, dusts and the like, while at the same time the agents are spread over a wide range using tools such as towels and sponges, and at the same time. The grease smokes generated by daily cooking works deposit to the hard surfaces of the walls of areas around the stove ranges, kitchen counters, or the like, and many of these stains exist in the state that would not hardly undergo any deteriorations due to oxidation or heat if only for a period of a week or so. In order to remove the cooking grease stains as mentioned above, it is necessary to utilize solubilizing strength or emulsifying property of surfactants, dissolving strength or swelling strength of solvents, and the like. A solvent a monoalkyl(4 to 8 carbon atoms) ether of dialkylene(2 to 4 carbon atoms) glycol, especially a monoalkyl ether of dipropylene glycol, of which alkyl group has 4 to 8 carbon atoms, has excellent removability of cooking grease stains having a low degree of deterioration mentioned above, and a cleaning agent blended with this solvent has been desired. Since the above solvent does not dissolve in water alone, a two-layer separation system would be undesirably formed in the absence of a surfactant, thereby making it awfully inconvenient in use of the above solvent.

[0004] Patent Document 1 discloses a cleaning agent composition for hard surfaces which shows excellent cleaning power against stubborn deteriorated grease stains, containing dipropylene glycol monobutyl ether as a glycolic solvent. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of

deterioration.

[0005] Patent Document 2 discloses a liquid cleaning agent composition for air conditioner fins, containing a glycolic solvent dipropylene glycol monobutyl ether, and a surfactant. However, the patent document does not suggest on the cleaning effects and working facilitation against grease stains in the kitchen.

[0006] Patent Document 3 discloses a cleaning agent for hard surfaces, comprising two or more layers containing dipropylene glycol monobutyl ether as a lipophilic substance. The compositions described in Examples of Patent Document 3 are all in the state that two layers are separated, thereby necessitating mixing of the contents of the vessels before every cleaning and temporary transformation of the mixture to an emulsified state.

[0007] The compositions shown in Examples of Patent Document 3 include a procedure of mixing immediately before use, thereby making the work complicated, so that a method in which a single-layered liquid can be conveniently used with a squeezable vessel or a sprayable vessel is preferred. A method in a combined use with a surfactant may be also considered; however, if a surfactant is used in a large amount, not only a cleaning effect inherently owned by the above solvent is lost, but also the time would be necessary for the work of cleanly wiping off the cleaning agent so that the agent does not remain after use, thereby making it unfavorable for the consumer. In view of the above, homogenously dissolving the above solvent with a surfactant in as a small amount as possible is desired. However, when a surfactant is used in a small amount,

even if the surfactant could have been homogeneously dissolved at room temperature, the layer undesirably becomes turbid or is separated at high temperatures during storage. If the composition is used without sufficient mixing in the state still having turbidity or separation, the blending components cannot be kept at a given level to a final stage, thereby undesirably causing the lowering of the performances.

[0008] Patent Document 4 discloses an aqueous cleaning composition which is suitable for removing stains encountered in bathrooms, containing dipropylene glycol monobutyl ether as a lipophilic substance. However, the dipropylene glycol monobutyl ether is blended as a hydrotropic agent for increasing a viscosity of the composition, so that Patent Document 4 does not suggest at all on a cleaning effect of a lipophilic substance.

[0009] Patent Document 5 discloses a cleaning agent composition for hard surfaces, containing a nonionic surfactant, dipropylene glycol monobutyl ether as a hydrophobic solvent, and an anionic surfactant. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of deterioration.

[0010] Patent Document 6 discloses a phase-stable liquid wiper refreshening composition, containing a solvent such as butoxypropoxypropanol. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of deterioration.

PRIOR ART REFERENCES

PATENT PUBLICATIONS

[0011] Patent Publication 1: Japanese Patent Laid-Open No. 2008-45108

Patent Publication 2: Japanese Patent Laid-Open No. 2000-290699

Patent Publication 3: Japanese Unexamined Patent Publication No. 2003-506561

Patent Publication 4: Japanese Unexamined Patent Publication No. 2001-524592

Patent Publication 5: WO 93/04151

Patent Publication 6: Japanese Unexamined Patent Publication No. Hei-11-511800

SUMMARY OF THE INVENTION

MEANS TO SOLVE THE PROBLEMS

[0012] As a result of intensive studies, the present inventor has found that in a composition containing, as essential components, a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1) [a component (a)], an amine oxide [a component (b)], and one or more surfactants selected from the group consisting of anionic surfactants excluding soaps and amphoteric surfactants [a component (c)], wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.01/1 to 1/1, and wherein 60 to 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol, of which alkyl group has 4 to 8 carbon atoms [a component (a-1)], the composition forms a homogenous liquid phase without turbidity or separation, and has excellent cleaning power against grease stains and storage stability, and the

composition exhibits excellent cleaning ability especially against cooking grease stains having a low degree of deterioration. The present invention has been perfected thereby.

[0013] $R^{1a}(OR^{2a})_lOH$ (a1)

In the formula, R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is a number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms.

[0014] The present invention relates to the provision of a compound capable of forming a homogenous liquid composition with a surfactant in as a small amount as possible, in a cleaning agent composition for hard surfaces having excellent cleaning power against cooking grease stains, the cleaning agent composition being blended with a monoalkyl ether of a polyalkylene glycol of which alkylene group has 2 to 4 carbon atoms and of which alkyl group has 4 to 8 carbon atoms.

[0015] Further, the present invention relates to the provision of a liquid cleaning agent composition for hard surfaces, having excellent cleaning ability against cooking grease stains, being capable of forming a homogenous liquid phase free from turbidity or separation, and having excellent storage stability at high temperatures and low temperatures.

[0016] Further, the present invention relates to the provision of a liquid cleaning agent composition for hard surfaces which exhibits excellent cleaning ability especially against cooking grease stains having a low degree of deterioration.

[0017] The liquid cleaning agent composition for hard surfaces of the present invention exhibits some effects of not only having high cleaning

power against cooking grease stains but also having excellent storage stability at high temperatures and at low temperatures, as being present in the form of a homogeneous liquid phase free from turbidity or separation. The liquid cleaning agent composition for hard surfaces of the present invention can be applied to various kinds of hard surfaces, and the composition is especially suitable for hard surfaces in the kitchen areas, so that the composition is suitable as a kitchen liquid cleaning agent composition. Since the liquid cleaning agent composition for hard surfaces of the present invention exhibits excellent cleaning ability against grease stains having a low degree of deterioration, the composition can be preferably applied to hard surfaces in the kitchen areas where the grease stains as mentioned above exist in large amounts. Here, the state that a composition "is present in the form of a homogeneous liquid phase" as used herein refers to a state of the composition in which turbidity or separation cannot be visually confirmed after stirring a composition and allowing it to stand at room temperature (for example, 25°C) for 1 hour.

MODES FOR CARRYING OUT THE INVENTION

[0018] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (a), a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1), from the viewpoint of cleaning power. The content of the component (a) is from 1 to 15% by mass, and preferably from 2 to 10% by mass, of the composition of the present invention, from the viewpoint of cleaning power against grease stains and storage stability, and especially from the viewpoint of

cleaning power against a low-deterioration oil. The content is preferably 1% by mass or more, and more preferably 2% by mass or more, from the viewpoint of cleaning power against grease stains, and the content is preferably 15% by mass or less, and more preferably 10% by mass or less, from the viewpoint of storage stability. R^{1a} in the formula (a1) includes a butyl group, an isobutyl group, a hexyl group, a 2-ethylhexyl group, and the like, preferably a butyl group or a hexyl group, and more preferably a butyl group, from the viewpoint of cleaning power against grease stains and storage stability. R^{2a} in the formula (a1) is preferably an ethylene group, a propylene group, or a butylene group, more preferably an ethylene group or a propylene group, and even more preferably a propylene group, from the viewpoint of cleaning power against grease stains and storage stability. Further, l is from 1 to 4, more preferably the number of from 2 to 3, and even more preferably the number of 2, from the viewpoint of cleaning power against grease stains and storage stability.

[0019] $R^{1a}(OR^{2a})_lOH$ (a1)

In the formula, R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms.

[0020] Further, the component (a) is preferably (a-1) a monoalkyl ether of dipropylene glycol of which alkyl group has 4 to 8 carbon atoms, from the viewpoint of cleaning power against grease stains and storage stability, and especially from the viewpoint of cleaning power against a low-deterioration oil, more preferably dipropylene glycol monobutyl ether, dipropylene glycol monoisobutyl ether, dipropylene glycol monohexyl

ether, or dipropylene glycol mono(2-ethylhexyl) ether, even more preferably dipropylene glycol monobutyl ether, dipropylene glycol monoisobutyl ether, or dipropylene glycol monohexyl ether, still even more preferably dipropylene glycol monobutyl ether or dipropylene glycol monohexyl ether, and especially preferably dipropylene glycol monobutyl ether. The component (a) may be a single compound or a mixture of plural compounds, and the component (a-1) is contained in an amount of from 60 to 100% by mass, preferably from 80 to 100% by mass, more preferably from 90 to 100% by mass, and even more preferably 100% by mass, of the component (a), from the viewpoint of cleaning power against grease stains.

[0021] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (b), an amine oxide, from the viewpoint of high-temperature storage stability, low-temperature storage stability, and cleaning power against low-deterioration oil, and especially from the viewpoint of cleaning power against low-deterioration oil. The content of the component (b) is preferably from 0.05 to 15% by mass, more preferably from 0.06 to 5% by mass, even more preferably from 0.08 to 4% by mass, and still even more preferably from 0.1 to 3.5% by mass, of the composition of the present invention. The content is preferably 0.05% by mass or more, more preferably 0.06% by mass or more, even more preferably 0.08% by mass or more, and still even more preferably 0.1% by mass or more, from the viewpoint of storage stability, and the content is preferably 15% by mass or less, more preferably 5% by mass or less, even more preferably 4% by mass or less, and still even more

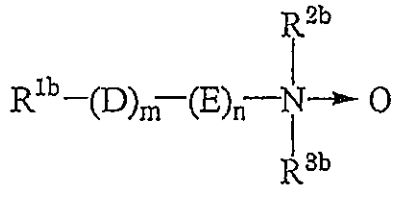
preferably 3.5% by mass or less, from the viewpoint of residuality of the component on an object to be cleaned.

[0022] A mass ratio of the component (a) to a total amount of the component (b) and a component (c) described later, i.e. (a) / ((b) + (c)), of preferably from 1/1 to 15/1, more preferably from 1.2/1 to 14/1, and even more preferably from 1.5/1 to 13/1. The mass ratio is preferably 1/1 or more, more preferably 1.2/1 or more, and even more preferably 1.5/1 or more, from the viewpoint of cleaning power against grease stains. The mass ratio is preferably 15/1 or less, more preferably 14/1 or less, and even more preferably 13/1 or less, from the viewpoint of high-temperature storage stability.

[0023] The component (b) includes, for example, as the followings.

[0024] The component includes an alkyl- or alkenylamine oxide, preferably having a hydrocarbon group, and more preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, from the viewpoint of cleaning power against grease stains. A more preferred amine oxide includes an alkyl- or alkenylamine oxide represented by the following general formula (b1):

[0025]



(b1)

[0026] wherein R^{1b} is preferably a hydrocarbon group, and more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2b}

and R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, m and n are m=0 and n=0, or m=1 and n=1.

[0027] In the above general formula (b1), R^{1b} is preferably a hydrocarbon group, and more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, from the viewpoint of cleaning power against grease stains. An alkyl group having 10 to 16 carbon atoms is preferred, an alkyl group having 12 to 14 carbon atoms is more preferred, and an alkyl group having 12 carbon atoms is even more preferred. Each of R^{2b} and R^{3b} is an alkyl group having 1 to 3 carbon atoms, and more preferably a methyl group having 1 carbon atom.

[0028] Preferred examples of the alkyl- or alkenylamine oxide represented by the general formula (b1) include an alkyldimethylamine oxide in which R^{1b} is an alkyl group having 8 to 18 carbon atoms, from the viewpoint of cleaning power against grease stains. Specific examples thereof include, for example, caprylyldimethylamine oxide, capryldimethylamine oxide, lauryldimethylamine oxide, myristyldimethylamine oxide, and the like. Further, lauric acid amide propyldimethylamine oxide, myristic acid amide propyldimethylamine oxide, palmitic acid amide propyldimethylamine oxide, and the like are included in the preferred examples.

[0029] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (c), one or more surfactants selected from anionic surfactants excluding soaps and amphoteric surfactants, from the viewpoint of high-temperature storage stability.

[0030] The anionic surfactants excluding soaps include an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate. The anionic surfactants may be a single compound or a mixture of plural compounds.

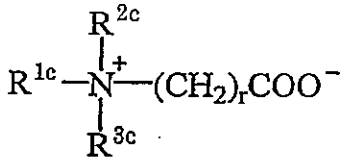
[0031] The alkyl or alkenyl carbon chain length in the above anionic surfactant is preferably from 8 to 18, and more preferably from 10 to 14.

[0032] The number of moles of EO added in the polyoxyethylene alkyl ether sulfate, the polyoxyethylene alkyl(or alkenyl) ether carbonate, or the polyoxyethylene amide alkyl(or alkenyl) ether carbonate is preferably from 1 to 10 on average, from the viewpoint of cleaning power against grease stains.

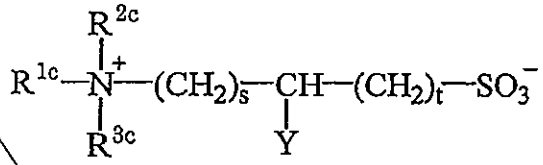
[0033] The counterion of the above anionic surfactant is suitably sodium, potassium, magnesium, calcium, an alkanolamine, or ammonium, and the counterion is preferably sodium, potassium, or an alkanolamine, from the viewpoint of cleaning power against grease stains.

[0034] The amphoteric surfactants are not particularly limited, and in the present invention, the amphoteric surfactants include one or more members selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4). The amphoteric surfactants may be a single compound or a mixture of plural compounds.

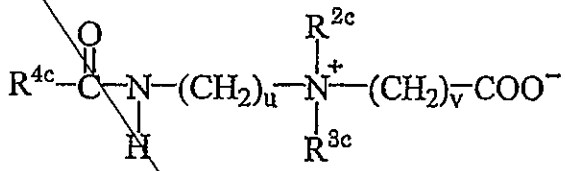
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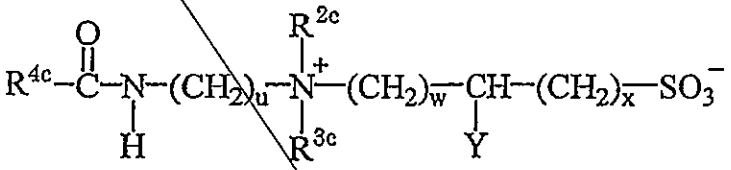
(c1)



(c2)



(c3)



(c4)

[0036] wherein R^{1c} is a hydrocarbon group, and preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group, and preferably a linear or branched alkyl group or alkenyl group, having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[0037] In the general formula (c1), R^{1c} is preferably an alkyl group having 8 to 18 carbon atoms, and more preferably an alkyl group having 10 to 16

carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, and r is preferably 1, for the same reason as above.

[0038] In the general formula (c2), R^{1c} is preferably an alkyl group having 8 to 18 carbon atoms, and more preferably an alkyl group having 10 to 16 carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, s is preferably 1, and t is preferably 1, for the same reason as above.

[0039] In the general formulas (c3) and (c4), R^{4c} is preferably an alkyl group having 9 to 15 carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, u is preferably 2 or 3, v is preferably 1, w is preferably 1, and x is preferably 1, for the same reason as above.

[0040] Specific examples of the betaine represented by the general formula (c1), (c2), (c3) or (c4) include fatty acid amide propyl-N,N-dimethylacetic acid betaines, fatty acid amide propyl-N,N-dimethyl-2-hydroxypropylsulfobetaines, fatty acid amide propyl-N,N-dimethyl-propylsulfobetaines, alkyl-N,N-dimethyl-2-hydroxypropylsulfobetaines, and the like. Among them, lauric acid amide propyl-N,N-dimethylacetic acid betaine, myristic acid amide propyl-N,N-dimethylacetic acid betaine, cocamidopropyl-N,N-dimethylacetic acid betaine, lauryl-N,N-dimethyl-2-hydroxypropylsulfobetaine, lauric acid amide propyl-N,N-dimethyl-2-hydroxypropylbetaine, and the like are preferred, from the viewpoint of cleaning power against grease stains and foaming strength.

[0041] The content of the component (c) is from 0.01 to 15% by mass, preferably within the range of from 0.05 to 1% by mass, more preferably within the range of from 0.1 to 0.7% by mass, and especially preferably within the range of from 0.1 to 0.5 % by mass, of the liquid cleaning agent composition for hard surfaces of the present invention. The content is 0.01% by mass or more, preferably 0.05% by mass or more, and more preferably 0.1% by mass or more, from the viewpoint of storage stability, and the content is 15% by mass or less, preferably 1% by mass or less, more preferably 0.7% by mass or less, and especially preferably 0.5% by mass or less, from the viewpoint of cleaning ability. When the anionic surfactant excluding soaps is used as the component (c), the content thereof is more preferably from 0.02 to 0.6% by mass, and even more preferably from 0.1 to 0.5% by mass. When the amphoteric surfactant is used as the component (c), the content thereof is more preferably from 0.1 to 0.6% by mass, and even more preferably from 0.3 to 0.5% by mass.

[0042] The component (c) is a component which is necessary for allowing the composition of the present invention to form a stable homogeneous liquid phase under storage conditions. Further, a mass ratio of the component (c) to a total amount of the component (b) and the component (c), i.e. (c) / ((b) + (c)), is from 0.01/1 to 1/1, preferably from 0.04/1 to 0.6/1, more preferably from 0.07/1 to 0.5/1, more preferably from 0.079/1 to 0.5/1, and especially preferably from 0.2/1 to 0.35/1, from the viewpoint of cleaning performance and storage stability.

[0043] Although the causes why high-temperature stability and low-temperature stability, and especially high-temperature storage stability of

the composition are improved by blending the component (c) are not elucidated, the mechanisms which are possibly considered will be explained hereinbelow.

[0044] A dipolar force, a main interaction between a hydrophilic group of the component (b) and water, is reduced with a temperature increase. Accordingly, with the temperature increase, the component (b) has a tendency of causing phase separation with water. In that case, the component (b) would not be able to solubilize the component (a) as a surfactant.

[0045] Meanwhile, oxygen of the amine oxide moiety of the component (b) is electron-attractive, so that it is considered that nitrogen atom located adjacent to the oxygen in a hydrophilic group of the component (b) is slightly positively charged. Therefore, it is considered that there is a weak electric interaction between the component (b) and the component (c) having an anionic moiety. For this reason, if the composition is blended with the component (c), the component (b) would be less likely to cause phase separation with water, so that it is considered that the component (b) is capable of functioning as a surfactant, whereby the separation of the component (a) and the component (b) from water, which can be caused during the temperature increase can be suppressed.

[0046] Supposing the above mechanisms, it is deduced that an effect of a strongly anionic component is even higher as the component (c). The matter that the anionic surfactant is acknowledged to have a tendency of exhibiting the effect with a smaller amount than the amphoteric surfactant suggests a possibility that the above stabilization mechanisms take place.

Accordingly, the component (c) is more preferably an anionic surfactant excluding soaps.

[0047] In addition, as one of the properties of the component (c), the presence of a hydrophobic group having an enough length to be capable of forming mixed micelles is considered to be important. This hypothesis is deduced from the matter that an anionic compound having a hydrophobic group only containing an alkyl group having 6 or less carbon atoms or an aryl group having 10 or less carbon atoms, including, for example, acids such as citric acid, propionic acid, benzoic acid, and p-toluenesulfonic acid, and salts thereof, has a tendency of a weaker effect as the component (c) in the present invention.

[0048] It is preferable that the liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (d), an alkanolamine and/or an alkali hydroxide, from the viewpoint of further improving cleaning performance. The alkanolamine includes monoethanolamine, diethanolamine, and triethanolamine, and the alkanolamine is more preferably monoethanolamine, from the viewpoint of cleaning power against grease stains. The alkali hydroxide as used herein refers to a hydroxide of an alkali metal or alkaline earth metal. The alkali hydroxide includes sodium hydroxide, potassium hydroxide and the like.

[0049] The content of the component (d) is preferably from 0.01 to 20% by mass, more preferably from 0.05 to 15% by mass, more preferably from 1.5 to 15% by mass, even more preferably from 2 to 10% by mass, still even more preferably from 3 to 7% by mass, and still even more preferably

from 3 to 5% by mass, of the liquid cleaning agent composition for hard surfaces of the present invention, in order to give sufficient cleaning power to the grease stains. The component (d) may be a single compound or a mixture of plural compounds.

[0050] The liquid cleaning agent composition for hard surfaces of the present invention can contain, as a component (e), a builder component, from the viewpoint of further improving cleaning performance. As the builder component, one or more members listed hereinbelow can be used.

[0051] (1) An alkali metal salt or alkanolamine salt of an aminopolyacetic acid, the aminopolyacetic acid including nitrilotriacetic acid, iminodiacetic acid, ethylenediaminetetraacetic acid, hydroxyethylethylenediaminetriacetic acid, diethylenetriaminepentaacetic acid, glycol ether diaminetetraacetic acid, hydroxyethyliminodiacetic acid, triethylenetetraminehexaacetic acid, djenkolic acid, or the like.

[0052] (2) An alkali metal salt or alkanolamine salt of an organic acid, the organic acid including diglycolic acid, oxydisuccinic acid, carboxymethyloxysuccinic acid, carboxymethylsuccinic acid, carboxymethyltartaric acid, citric acid, lactic acid, tartaric acid, oxalic acid, malic acid, gluconic acid or the like.

[0053] Among them, citric acid, malic acid, ethylenediaminetetraacetic acid, hydroxyethylethylenediaminetriacetic acid, or a salt thereof is preferred. The form of the salt is preferably a sodium salt, a potassium salt, an ammonium salt, or an alkanolamine salt.

[0054] The content of the component (e) is preferably from 0.01 to 5% by mass, more preferably from 0.1 to 3% by mass, and even more preferably

from 0.2 to 1% by mass, of the composition, from the viewpoint of cleaning power against grease stains.

[0055] The liquid cleaning agent composition for hard surfaces of the present invention can be blended with, in addition to the above components, other components within the range that would not impair the objects or effects of the present invention. Other components include, for example, surfactants such as polyoxyethylene alkyl ethers and alkyl (poly)glycosides; solvents such as ethanol, propanol, glycerol, ethylene glycol, propylene glycol, propylene glycol monomethyl ether, an alkyl monoglyceryl ether of which alkyl group has 3 to 8 carbon atoms, and a polyoxyethylene phenyl ether or benzyl ether, of which EO has the number of moles added of from 1 to 5 on average; antioxidants such as BHT; bactericidal and mildewproof agents; and anti-corrosive agents. Here, the liquid cleaning agent composition for hard surfaces of the present invention can be blended, as an optional component, with a polyacrylic acid and a salt thereof, a copolymer formed between an olefin and maleic anhydride, and others such as a dispersant, including a carboxylate polymer or a sulfonate polymer described in the paragraphs 0035 to 0038 of Japanese Patent Laid-Open No. Hei-7-292398.

[0056] The polyoxyethylene alkyl ethers include those listed in the following (1) or (2):

(1) A polyoxyethylene alkyl ether or alkenyl ether, of which alkyl group or alkenyl group has the number of carbon atoms of from 10 to 18, and preferably from 10 to 16, on average, from the viewpoint of cleaning power against grease stains, and of which ethylene oxide

(hereinafter simply referred to as EO) has the number of moles added of from 1 to 30 mol on average, and preferably from 6 to 20 on average. Preferred examples of the above (1) include a polyoxyethylene alkyl ether of which alkyl group has 8 to 18 carbon atoms.

[0057] (2) A polyoxyethylene alkylphenyl ether, of which alkyl group has the number of carbon atoms of from 6 to 12 on average, from the viewpoint of cleaning power against grease stains, and of which EO has the number of moles added of from 1 to 25 mol on average.

[0058] As the alkyl (poly)glycoside, an alkyl (poly)glycoside represented by the following general formula (b2) is a preferred example, from the viewpoint of cleaning power against grease stains.

[0059] $R^{4b}(OR^{5b})_xG_y$ (b2)

wherein R^{4b} is a hydrocarbon group, and preferably a linear or branched alkyl group, alkenyl group or alkylphenyl group, having a total number of carbon atoms of from 8 to 18, R^{5b} is an alkylene group having 2 to 4 carbon atoms, G is a residue originated from a reducing sugar having 5 to 6 carbon atoms, x is from 0 to 5, and y is from 1 to 5.

[0060] In the liquid cleaning agent composition for hard surfaces of the present invention, water is blended together with each of the components mentioned above. The amount of water blended is an amount so that a total amount is adjusted to 100% by mass. In other words, the balance of the composition is water. The amount of water is preferably from 70 to 98% by mass, more preferably from 75 to 96% by mass, and even more preferably from 80 to 94% by mass, of the composition, from the viewpoint of cleaning power against grease stains and high-temperature

stability. In addition, the liquid cleaning agent composition for hard surfaces of the present invention has a pH at 25°C of from 6 to 14, and preferably from 7.5 to 14, from the viewpoint of cleaning power against grease stains and ensuring of safety during use. The composition has a pH of 6 or more, preferably a pH of 8 or more, more preferably a pH of 8.5 or more, more preferably a pH of 9 or more, and even more preferably a pH of 10 or more, in order to obtain a high cleaning power. On the other hand, the composition has a pH of 14 or less, preferably a pH of 13 or less, more preferably 12 or less, and especially preferably a pH of 11.5 or less, from the viewpoint of ensuring safety during use. In other words, the liquid cleaning agent composition for hard surfaces of the present invention has a pH at 25°C of preferably from 7.5 to 14, more preferably from 8 to 13, more preferably from 9 to 12, and even more preferably from 10 to 11.5. The pH is measured with a pH meter D-52S and a pH electrode 6367-10D both manufactured by HORIBA, Ltd.

[0061] The liquid cleaning agent composition for hard surfaces of the present invention can be produced by mixing each of the components in proper amounts.

[0062] The present invention relates to a liquid cleaning agent composition in which hard surfaces are subject to be cleaned. Here, the term "hard surfaces" means those surfaces having given shapes, irrespective of being two-dimensional or three-dimensional, and the degree of hardness is not limited so long as the surfaces can be subjected to a cleaning treatment. The hard surfaces include fixed objects such as floors, staircases, and walls made of plastics, rubbers, metals, tiles, bricks, concrete, cement, glass,

wood, and the like, as well as generally any surfaces humans contact, such as various instruments, appliances, tools, furniture, and dishware made of those listed, more preferably including those made of plastics, metals, glass, and the like.

[0063] Accordingly, the liquid cleaning agent composition for hard surfaces of the present invention can be applied as kitchen cleaning agents, bathroom cleaning agents, floor cleaning agents, dishware cleaning agents, cleaning agents for fully automatic washing machine wash tubs, small article cleaning agents for kitchens and toilets, and the like, and more preferably can be applied as kitchen cleaning agents.

[0064] The embodiments of the present invention will be exemplified hereinbelow:

[1] a liquid cleaning agent composition for hard surfaces, containing:

(a) a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1):

$$R^{1a}(OR^{2a})_lOH \qquad (a1)$$

wherein R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, preferably the number of 2 to 3, and more preferably the number of 2, and R^{2a} is an alkylene group having 2 to 4 carbon atoms, and preferably a propylene group,

the monoalkyl ether of a polyalkylene glycol being in an amount of from 1 to 15% by mass, and preferably from 2 to 10% by mass;

(b) an amine oxide;

(c) one or more surfactants selected from the group consisting

of anionic surfactants excluding soaps and amphoteric surfactants in an amount of from 0.01 to 15% by mass, preferably from 0.1 to 0.7% by mass, and more preferably from 0.1 to 0.5% by mass; and

water,

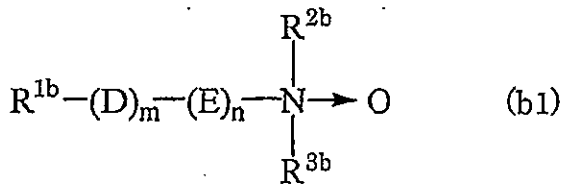
wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.01/1 to 1/1, and wherein 60 to 100% by mass, preferably from 80 to 100% by mass, more preferably from 90 to 100% by mass, and more preferably 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol (a-1) of which alkyl group has 4 to 8 carbon atoms,

wherein its pH at 25°C is from 6 to 14.

[2] The composition according to the above [1], wherein a mass ratio of the component (a) / (the component (b) + the component (c)) is from 1/1 to 15/1, preferably from 1.2/1 to 14/1, and more preferably from 1.5/1 to 13/1.

[3] The composition according to the above [1] or [2], wherein the component (b) is an alkylamine or alkenylamine oxide represented by the following general formula (b1):

[0065]



(b1)

[0066] wherein R^{1b} is preferably a hydrocarbon group, more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2b} and

R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, and m and n are m=0 and n=0, or m=1 and n=1.

[4] The composition according to any one of the above [1] to [3], wherein the component (b) is an alkyldimethylamine oxide, of which alkyl group has 8 to 18 carbon atoms.

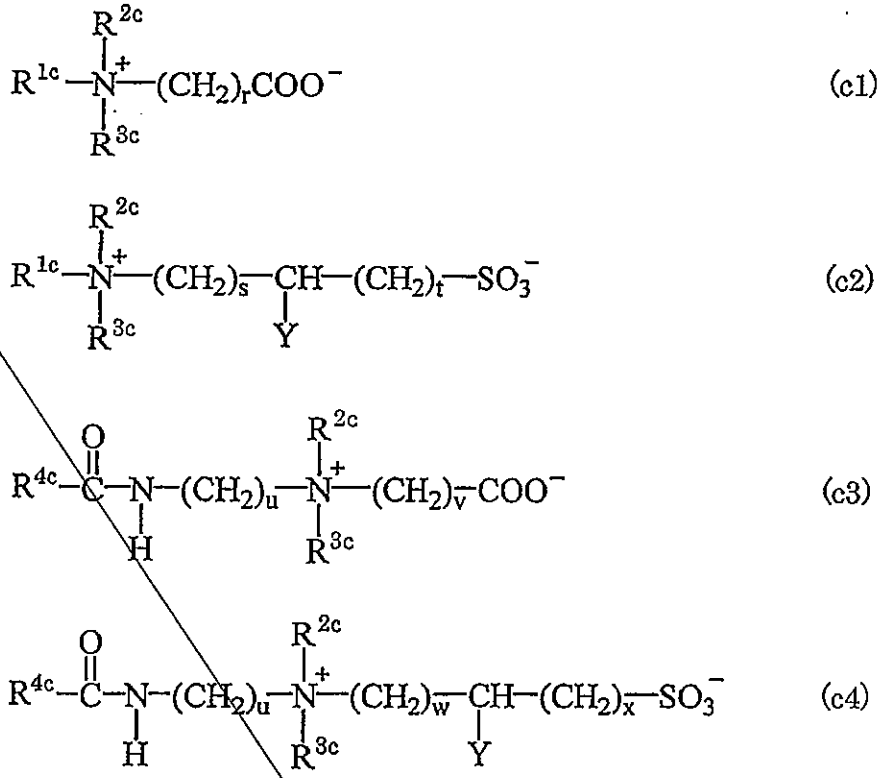
[5] The composition according to any one of the above [1] to [4], wherein the component (b) is contained in an amount of from 0.05 to 15% by mass, preferably from 0.06 to 5% by mass, more preferably from 0.08 to 4% by mass, and more preferably from 0.1 to 3.5% by mass.

[6] The composition according to any one of the above [1] to [5], wherein the component (c) is an anionic surfactant excluding soaps.

[7] The composition according to any one of the above [1] to [6], wherein the component (c) is an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate.

[8] The composition according to any one of the above [1] to [7], wherein the component (c) is one or more amphoteric surfactants selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4):

[0067]



(c1)

(c2)

(c3)

(c4)

[0068] wherein R^{1c} is a hydrocarbon group, preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group, preferably a linear or branched alkyl group or alkenyl group, having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[9] The composition according to any one of the above [1] to

[8], wherein the composition contains, as a component (d), an alkanolamine, and preferably monoethanolamine, and/or an alkali hydroxide in an amount of from 0.01 to 20% by mass, preferably from 0.05 to 15% by mass, more preferably from 1.5 to 15% by mass, more preferably from 2 to 10% by mass, more preferably from 3 to 7% by mass, and more preferably from 3 to 5% by mass.

[10] The composition according to any one of the above [1] to [9], wherein the component (a-1) is dipropylene glycol monobutyl ether.

[11] The composition according to any one of the above [1] to [10], wherein the component (a) consists of a component (a-1).

[12] The composition according to any one of the above [1] to [11], wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.04/1 to 0.6/1, preferably from 0.07/1 to 0.5/1, more preferably from 0.079/1 to 0.5/1, and more preferably from 0.2/1 to 0.35/1.

[13] The composition according to any one of the above [1] to [12], wherein water is contained in an amount of from 70 to 98% by mass, preferably from 75 to 96% by mass, and more preferably from 80 to 94% by mass.

[14] The composition according to any one of the above [1] to [13], wherein the composition has a pH at 25°C of from 7.5 to 14, preferably from 8 to 13, more preferably from 9 to 12, and more preferably from 10 to 11.5.

[15] The composition according to any one of the above [1] to [14], wherein the composition is present in the form of a homogeneous

liquid phase.

[16] The composition according to any one of the above [1] to [15], wherein the composition has a pH at 25°C of from 8 to 13.

[17] The composition according to any one of the above [1] to [16], wherein the composition is applicable as a kitchen cleaning agent.

[18] A cleaning method including applying the composition as defined in any one of the above [1] to [17] to a hard surface on which grease stains are present to clean the hard surface.

EXAMPLES

[0069] Examples 1 to 14, and Comparative Examples 1 to 16

The following examples further describe and demonstrate embodiments of the present invention. The examples are given solely for the purposes of illustration and are not to be construed as limitations of the present invention. Each of the liquid cleaning agent composition for hard surfaces of Examples and Comparative Examples was obtained using each of the components listed in the following tables. The numerical values of the amount of each component in the tables are expressed as % by mass, and the balance was deionized water. The values for the mass ratios in the tables are listed abbreviating the denominator, i.e. abbreviating /1.

[0070] Each of the prepared compositions of Examples and Comparative Examples 1 to 4, 6 and 8 to 16 was present in the form of a homogeneous liquid phase without turbidity or separation. On the other hand, each of the compositions of Comparative Examples 5 and 7 could not be made into a homogeneous liquid composition, so that the evaluation could not be

carried out. Accordingly, the evaluations for Comparative Examples 5 and were listed as F.

[0071] The pH of the composition (at 25°C) was adjusted with a 6 N-aqueous sodium hydroxide solution or a 6 N-hydrochloric acid, as occasion demands. Each test for the cleaning performances and the storage stability was conducted in accordance with the following methods, using each of the liquid cleaning agent compositions for hard surfaces. The results are shown in the following tables.

[0072] (Cleaning Performance I)

A cleaning effect against deteriorated soybean oil stains was evaluated using a composition stock solution.

A 1 g sample was applied to the following stainless steel plate previously coated with deteriorated soybean oil stains so as to be in a circular form having a diameter of about 35 mm. After allowing the sample to contact the stainless steel plate at room temperature for 5 minutes, the plate was subjected to rinsing procedure with deionized water. A sample to which the above cleaning procedure was conducted, and the following stainless steel plate (reference) not subjected to the cleaning procedure was photographed with a digital camera. The areas of stain removal parts of the circular part of the sample after rinsing were numerically expressed. In other words, supposing that a case where the stains of the circular part were completely removed was 100 and a case where the stains were not removed at all was 0, the values were converted according to a cleaning ratio corresponding to the area (digitized to the 5% cut).

[0073] [Method for Preparing Deteriorated Soybean Oil Stains]

A commercially available soybean oil (a product of Wako Pure Chemical Industries, Ltd. being used, the product purchased within 3 months was used) was added in an amount of 40 mL to a 50 mL stainless steel beaker, and the beaker was heated at 180°C for 1 hour in a state that the top part was allowed to be in the open air, and then air-cooled naturally to room temperature (25°± 5°C). An oil orange SS was added in an amount of 1 parts by mass, based on 99 parts by mass of this heat-treated oil, and the components were thoroughly mixed at room temperature. The model stains were applied as evenly as possible so as to be in an amount of 1.4 to 1.6 mg per one square centimeter, and allowed to stand at room temperature for one week. The stains were used in the evaluation of cleaning.

[0074] (Cleaning Performance II)

A commercially available soybean oil (a product of Wako Pure Chemical Industries, Ltd. being used, the product purchased within 3 months was used) was added in an amount of 40 mL to a 50 mL stainless steel beaker, and the beaker was heat-treated at 180°C for 50 hours (using an electric thermostat) in a state that the top part was allowed to be in the open air, and then air-cooled naturally to room temperature. An oil orange SS was added in an amount of 1 parts by mass, based on 99 parts by mass of this heat-treated oil, and the components were thoroughly mixed at room temperature (25°± 5°C). The model stains were applied as evenly as possible so as to be in an amount of 1.4 to 1.6 mg per one square centimeter, and the stains were immediately used in evaluation, in the

same manner as that mentioned above.

[0075] [Method of Digitizing Stain Removal Areas]

The images photographed with the digital camera were subjected to a graying treatment using an image processing software (Win ROOF Ver. 3.30 (MITANI Corporation)). The areas of the stain removal parts were digitized by subjecting processed images to binarization, and counting the stain removal parts. As the threshold value used in the binarization of each of the images, a value in which stained parts of the reference in the images are all not counted was used.

[0076] (Storage Stability)

With respect to the liquid cleaning agent compositions listed in the following tables, changes in external appearances during storage at 5°C and at 50°C were examined. The confirmation of the external appearance was made every week. A 50 mL-volume vessel (Maruemu Corporation, Screw Bottle No. 7) was charged with 40 g of a composition, to conduct a storage test, which was evaluated in accordance with the following criteria:

[0077] 4: No turbidity and/or separation being generated at a point of 4 weeks after storage.

3: Turbidity and/or separation being generated at a point of 3 weeks after storage.

2: Turbidity and/or separation being generated at a point of 2 weeks after storage.

1: Turbidity and/or separation being generated at a point of 1 week after storage.

[0078] [Table 1]

Table 1

Examples		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Component (a)	Component (a-1) a-1-1	2.50	2.50	2.50	-	3.50	3.50	2.50	2.50	7.00	10.0	2.50	2.50	2.50	2.50
	Component (a-1) a-1-2	-	-	-	2.00	-	-	-	-	-	-	-	-	-	-
a-1/a		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Component (b)	b-3	1.00	1.00	1.00	1.20	1.50	-	2.00	0.10	3.50	-	-	-	1.00	1.00
	b-3'	-	-	-	-	-	-	-	-	-	-	1.00	1.00	-	-
	b-4	-	-	-	-	-	1.50	-	-	-	3.50	-	-	-	-
Component (c)	c-1	0.300	-	-	0.500	0.500	0.500	0.500	0.100	0.500	0.300	0.300	0.300	0.300	0.300
	c-2	-	0.300	-	-	-	-	-	-	-	-	-	-	-	-
	c-3	-	-	0.300	-	-	-	-	-	-	-	-	-	-	-
Component (d)	Monoethanol-amine	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.05	-
Numerical Conditions	a/(b+c)	1.9	1.9	1.9	1.2	1.8	1.8	1.0	13	1.8	2.6	1.9	1.9	1.9	1.9
	c/(b+c)	0.23	0.23	0.23	0.29	0.25	0.25	0.20	0.50	0.13	0.079	0.23	0.23	0.23	0.23
pH		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	8.5	7.5
Cleaning Performance I		95	90	90	90	90	90	90	95	90	95	90	90	90	90
High-Temperature Storage Stability (at 50°C)		4	4	4	4	4	4	4	4	4	4	4	4	4	4
Low-Temperature Storage Stability (at 5°C)		4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cleaning Performance II		95	95	95	90	95	90	95	90	95	90	90	90	95	95

[0079]

[Table 2]

Table 2

Comparative Examples			1	2	3	4	5	6	7	8
Component (a)	Component (a-1)	a-1-1	-	-	-	-	-	3.50	25.0	3.50
	a-2		-	3.50	-	-	-	3.50	-	-
Non-Component (a)	DPG		-	-	3.50	-	-	-	-	-
	PG		-	-	-	3.50	-	-	-	-
	Dodecane		-	-	-	-	3.50	-	-	-
a-1/a			-	-	-	-	-	0.50	1.00	1.00
Component (b) or Non-Component (b)	b-1		-	-	-	-	-	-	-	1.50
	b-2		-	1.50	-	-	-	1.50	-	-
	b-3		1.50	-	1.50	1.50	1.50	-	-	-
	b-4		-	-	-	-	-	-	3.50	-
Component (c)	c-1		0.500	0.500	0.500	0.500	0.500	0.500	0.300	-
Component (d)	Monoethanolamine		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Numerical Conditions	a/(b+c)		0	1.8	1.8	1.8	1.8	3.5	6.6	2.3
	c/(b+c)		0.25	0.25	0.25	0.25	0.25	0.25	0.0789	0
pH			11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Cleaning Performance I			20	50	30	25	F	65	F	90
High-Temperature Storage Stability (at 50°C)			4	4	4	4	F	4	F	1
Low-Temperature Storage Stability (at 5°C)			4	4	4	4	F	4	F	4

[0080]

[Table 3]

Table 3

Comparative Examples			9	10	11	12	13	14	15	16
Component (a)	Component (a-1)	a-1-1	2.50	2.50	2.50	3.00	3.50	3.50	3.50	3.50
		a-1-2	-	-	-	-	-	-	-	-
	a-2		-	-	-	-	-	-	-	-
	a-1/a		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.636
Component (b) or Non-Component (b)	b-1		1.00	1.00	1.00	-	1.50	-	-	-
	b-2		-	-	-	1.00	-	1.50	-	1.50
	b-3		-	-	-	-	-	-	-	-
	b-5		-	-	-	-	-	-	1.50	-
Component (c)	c-1		0.500	-	-	0.500	0.500	0.500	0.500	0.500
	c-2		-	0.500	-	-	-	-	-	-
	c-3		-	-	0.500	-	-	-	-	-
Component (d)	Monoethanolamine		5.00	5.00	5.00	-	5.00	5.00	5.00	5.00
Numerical Conditions	a/(b+c)		1.7	1.7	1.7	2.0	1.8	1.8	1.8	1.8
	c/(b+c)		0.33	0.33	0.33	0.33	0.25	0.25	0.25	0.25
pH			11.5	11.5	11.5	7.0	11.5	11.5	11.5	11.5
Cleaning Performance I			90	90	90	80	90	85	85	90
High-Temperature Storage Stability (at 50°C)			4	4	4	4	4	4	4	4
Low-Temperature Storage Stability (at 5°C)			4	4	4	4	4	4	4	4
Cleaning Performance II			75	75	75	90	80	80	75	80

[0081] From the results summarized in the tables mentioned above, the followings could be seen.

[0082] It could be seen that the products of the present invention are excellent in cleaning performances, and high-temperature and low-temperature storage stability.

From Comparative Examples 1 and 3 to 5, when the component (a) was not contained, cleaning power against grease stains was insufficient. From Comparative Example 7, when the component (a) was contained in excess, a homogeneous liquid composition could not be formed. From Comparative Examples 2 and 6, when the component (a-1) is contained too little in the component (a), cleaning power was not sufficient. From Example 14 and Comparative Example 12, when a pH of a composition is 7.5 or more, it can be seen that a tendency that cleaning performance is higher is found. Further from Comparative Examples 9 to 11 and 13 to 16, when the polyoxyethylene alkyl ether or the alkyl (poly)glycoside was used in place of the component (b), it could be seen that its cleaning performance against low-deterioration oil is worsened.

[0083] When Comparative Example 13 and Comparative Example 8 were compared, it could be seen that when the component (c) was not contained, it could be seen that high-temperature storage stability was not sufficient.

[0084] The component (a) and the non-(a) component in each of the tables are as follows.

a-1-1: dipropylene glycol monobutyl ether

a-1-2: dipropylene glycol monohexyl ether

a-2: diethylene glycol monobutyl ether

DPG: dipropylene glycol

PG: propylene glycol

[0085] The component (b) and the non-(b) component in each of the tables are as follows.

b-1: polyoxyethylene(average number of moles of EO added=8) lauryl ether

b-2: polyoxyethylene(average number of moles of EO added=7) secondary alkyl (mixture of 12 to 14 carbon atoms) ether

b-3: lauryldimethylamine oxide

b-3': capryldimethylamine oxide

b-3": stearyldimethylamine oxide

b-4: lauric acid amide propyldimethylamine oxide

b-5: alkyl(mixture of 10 to 14 carbon atoms) glycoside (average degree of condensation of glycoside=1.3)

[0086] The component (c) in each of the tables are as follows.

c-1: sodium linear alkyl(mixture of 10 to 14 carbon atoms)benzenesulfonate

c-2: lauric acid amide propyl-N,N-dimetjylacetic acid betaine

c-3: lauryl-N,N-dimethyl-2-hydroxypropylsulfobetaine

INDUSTRIAL APPLICABILITY

[0087] The liquid cleaning agent composition for hard surfaces of the present invention can be applied to various kinds of hard surfaces, and the composition is more suitable for hard surfaces in the kitchen area, so that the composition is suitable as a kitchen liquid cleaning agent composition.

CLAIMS

[Claim 1] A liquid cleaning agent composition for hard surfaces, comprising:

(a) a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1):

$$R^{1a}(OR^{2a})_lOH \qquad (a1)$$

wherein R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms, the monoalkyl ether of a polyalkylene glycol being in an amount of from 1 to 15% by mass;

(b) an amine oxide;

(c) one or more surfactants selected from the group consisting of anionic surfactants excluding soaps and amphoteric surfactants in an amount of from 0.01 to 15% by mass; and

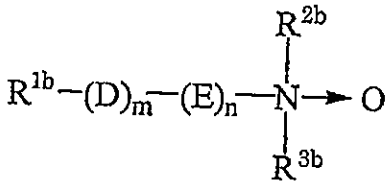
water,

wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.04/1 to 0.6/1, and wherein 60 to 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol (a-1) of which alkyl group has 4 to 8 carbon atoms,

wherein its pH at 25°C is 9 or more and 14 or less.

[Claim 2] The composition according to claim 1, wherein a mass ratio of the component (a) / (the component (b) + the component (c)) is from 1/1 to 15/1.

[Claim 3] The composition according to claim 1 or 2, wherein the component (b) is an alkylamine or alkenylamine oxide represented by the following general formula (b1):



(b1)

wherein R^{1b} is a hydrocarbon group having 8 to 18 carbon atoms, each of R^{2b} and R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, and m and n are m=0 and n=0, or m=1 and n=1.

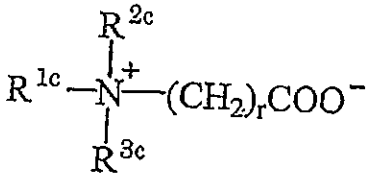
[Claim 4] The composition according to any one of claims 1 to 3, wherein the component (b) is an alkyldimethylamine oxide, of which alkyl group has 8 to 18 carbon atoms.

[Claim 5] The composition according to any one of claims 1 to 4, wherein the component (b) is contained in an amount of from 0.05 to 15% by mass.

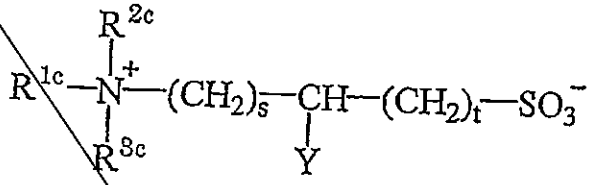
[Claim 6] The composition according to any one of claims 1 to 5, wherein the component (c) is an anionic surfactant excluding soaps.

[Claim 7] The composition according to any one of claims 1 to 6, wherein the component (c) is an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate.

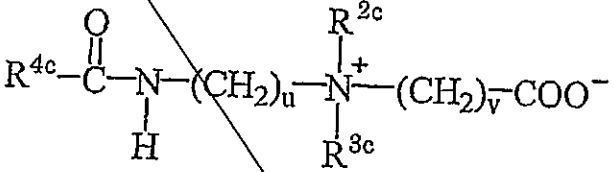
[Claim 8] The composition according to any one of claims 1 to 7, wherein the component (c) is one or more amphoteric surfactants selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4):



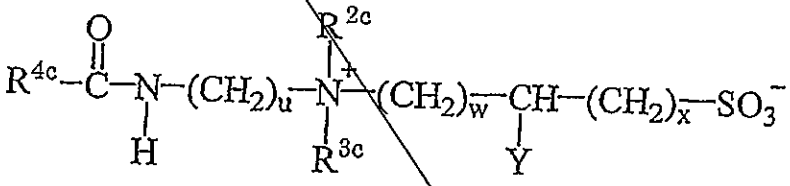
(c1)



(c2)



(c3)



(c4)

wherein R^{1c} is a hydrocarbon group having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[Claim 9] The composition according to any one of claims 1 to 8, wherein the component (c) is contained in an amount of from 0.1 to 0.5% by mass.

[Claim 10] The composition according to any one of claims 1 to 9, wherein the composition comprises, as a component (d), an alkanolamine and/or an alkali hydroxide in an amount of from 0.01 to 20% by mass.

[Claim 11] The composition according to any one of claims 1 to 10, wherein the component (a-1) is dipropylene glycol monobutyl ether.

[Claim 12] The composition according to any one of claims 1 to 11, wherein the component (a) consists of a component (a-1).

[Claim 13] The composition according to any one of claims 1 to 12, wherein water is contained in an amount of from 70 to 98% by mass.

[Claim 14] The composition according to any one of claims 1 to 13, wherein the composition is present in the form of a homogeneous liquid phase.

[Claim 15] The composition according to any one of claims 1 to 14, the composition further comprises a component (e) a builder component in an amount of from 0.01 to 5 % by mass.

[Claim 16] The composition according to any one of claims 1 to 15, wherein the composition is applicable as a kitchen cleaning agent.

[Claim 17] A cleaning method comprising applying the composition as defined in any one of claims 1 to 16 to a hard surface on which grease stains are present to clean the hard surface.

DESCRIPTION

TITLE OF THE INVENTION: HARD SURFACE LIQUID CLEANER COMPOSITION

TECHNICAL FIELD

[0001] The present invention relates to a cleaning agent composition for hard surfaces.

BACKGROUND ART

[0002] Generally, as cleaning agents for hard surfaces, in order to remove different stains on subjects to be treated in bathrooms, kitchens, floors, compositions suitable for each of the stains to be treated have been used. For example, as the kitchen cleaning agents usable in areas around the kitchen such as stove ranges, ovens, walls or floors of areas around the stove ranges, and exhaust fans, cleaning agents containing a surfactant, a solvent, an alkalizing agent or the like have been used, in order to remove grease stains deteriorated by an action of heat, sunlight, oxygen in the air or the like. In addition, as bathroom cleaning agents usable in bathrooms including areas such as bathtubs, and walls or floors of bathrooms, cleaning agents containing a surfactant, a solvent, a metal sequestering agent or the like have been used, in order to remove stains originated from metal soaps, particularly calcium salts of fatty acids.

[0003] Among these cleaning agents, the cleaning agents usable in kitchen are applied to a part of hard surfaces of the walls of areas around the stove

ranges, kitchen counters or the like. After the cleaning agents are applied to the hard surfaces, the agents serve to remove stains from greases, dusts, while at the same time the agents are spread over a wide range using tools such as towels and sponges, and at the same time. The grease smokes generated by daily cooking works deposit to the hard surfaces of the walls of areas around the stove ranges, kitchen counters, or the like, and many of these stains exist in the state that would not hardly undergo any deteriorations due to oxidation or heat if only for a period of a week or so. In order to remove the cooking grease stains as mentioned above, it is necessary to utilize solubilizing strength or emulsifying property of surfactants, dissolving strength or swelling strength of solvents.

A solvent a monoalkyl(4 to 8 carbon atoms) ether of dialkylene(2 to 4 carbon atoms) glycol, especially a monoalkyl ether of dipropylene glycol, of which alkyl group has 4 to 8 carbon atoms, has excellent removability of cooking grease stains having a low degree of deterioration mentioned above, and a cleaning agent blended with this solvent has been desired. Since the above solvent does not dissolve in water alone, a two-layer separation system would be undesirably formed in the absence of a surfactant, thereby making it awfully inconvenient in use of the above solvent.

[0004] Patent Document 1 discloses a cleaning agent composition for hard surfaces which shows excellent cleaning power against stubborn deteriorated grease stains, containing dipropylene glycol monobutyl ether as a glycolic solvent. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of

deterioration.

[0005] Patent Document 2 discloses a liquid cleaning agent composition for air conditioner fins, containing a glycolic solvent dipropylene glycol monobutyl ether, and a surfactant. However, the patent document does not suggest on the cleaning effects and working facilitation against grease stains in the kitchen.

[0006] Patent Document 3 discloses a cleaning agent for hard surfaces, comprising two or more layers containing dipropylene glycol monobutyl ether as a lipophilic substance. The compositions described in Examples of Patent Document 3 are all in the state that two layers are separated, thereby necessitating mixing of the contents of the vessels before every cleaning and temporary transformation of the mixture to an emulsified state.

[0007] The compositions shown in Examples of Patent Document 3 include a procedure of mixing immediately before use, thereby making the work complicated, so that a method in which a single-layered liquid can be conveniently used with a squeezable vessel or a sprayable vessel is preferred. A method in a combined use with a surfactant may be also considered; however, if a surfactant is used in a large amount, not only a cleaning effect inherently owned by the above solvent is lost, but also the time would be necessary for the work of cleanly wiping off the cleaning agent so that the agent does not remain after use, thereby making it unfavorable for the consumer. In view of the above, homogenously dissolving the above solvent with a surfactant in as a small amount as possible is desired. However, when a surfactant is used in a small amount,

even if the surfactant could have been homogeneously dissolved at room temperature, the layer undesirably becomes turbid or is separated at high temperatures during storage. If the composition is used without sufficient mixing in the state still having turbidity or separation, the blending components cannot be kept at a given level to a final stage, thereby undesirably causing the lowering of the performances.

[0008] Patent Document 4 discloses an aqueous cleaning composition which is suitable for removing stains encountered in bathrooms, containing dipropylene glycol monobutyl ether as a lipophilic substance. However, the dipropylene glycol monobutyl ether is blended as a hydrotropic agent for increasing a viscosity of the composition, so that Patent Document 4 does not suggest at all on a cleaning effect of a lipophilic substance.

[0009] Patent Document 5 discloses a cleaning agent composition for hard surfaces, containing a nonionic surfactant, dipropylene glycol monobutyl ether as a hydrophobic solvent, and an anionic surfactant. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of deterioration.

[0010] Patent Document 6 discloses a phase-stable liquid wiper refreshening composition, containing a solvent such as butoxypropoxypropanol. However, the patent document does not suggest at all on the removability of cooking grease stains having a low degree of deterioration.

PRIOR ART REFERENCES

PATENT PUBLICATIONS

[0011] Patent Publication 1: Japanese Patent Laid-Open No. 2008-45108

Patent Publication 2: Japanese Patent Laid-Open No. 2000-290699

Patent Publication 3: Japanese Unexamined Patent Publication No. 2003-506561

Patent Publication 4: Japanese Unexamined Patent Publication No. 2001-524592

Patent Publication 5: WO 93/04151

Patent Publication 6: Japanese Unexamined Patent Publication No. Hei-11-511800

SUMMARY OF THE INVENTION

MEANS TO SOLVE THE PROBLEMS

[0012] As a result of intensive studies, the present inventor has found that in a composition containing, as essential components, a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1) [a component (a)], an amine oxide [a component (b)], and one or more surfactants selected from the group consisting of anionic surfactants excluding soaps and amphoteric surfactants [a component (c)], wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.01/1 to 1/1, and wherein 60 to 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol, of which alkyl group has 4 to 8 carbon atoms [a component (a-1)], the composition forms a homogenous liquid phase without turbidity or separation, and has excellent cleaning power against grease stains and storage stability, and the

composition exhibits excellent cleaning ability especially against cooking grease stains having a low degree of deterioration. The present invention has been perfected thereby.

[0013] $R^{1a}(OR^{2a})_lOH$ (a1)

In the formula, R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is a number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms.

[0014] The present invention relates to the provision of a compound capable of forming a homogenous liquid composition with a surfactant in as a small amount as possible, in a cleaning agent composition for hard surfaces having excellent cleaning power against cooking grease stains, the cleaning agent composition being blended with a monoalkyl ether of a polyalkylene glycol of which alkylene group has 2 to 4 carbon atoms and of which alkyl group has 4 to 8 carbon atoms.

[0015] Further, the present invention relates to the provision of a liquid cleaning agent composition for hard surfaces, having excellent cleaning ability against cooking grease stains, being capable of forming a homogenous liquid phase free from turbidity or separation, and having excellent storage stability at high temperatures and low temperatures.

[0016] Further, the present invention relates to the provision of a liquid cleaning agent composition for hard surfaces which exhibits excellent cleaning ability especially against cooking grease stains having a low degree of deterioration.

[0017] The liquid cleaning agent composition for hard surfaces of the present invention exhibits some effects of not only having high cleaning

power against cooking grease stains but also having excellent storage stability at high temperatures and at low temperatures, as being present in the form of a homogeneous liquid phase free from turbidity or separation. The liquid cleaning agent composition for hard surfaces of the present invention can be applied to various kinds of hard surfaces, and the composition is especially suitable for hard surfaces in the kitchen areas, so that the composition is suitable as a kitchen liquid cleaning agent composition. Since the liquid cleaning agent composition for hard surfaces of the present invention exhibits excellent cleaning ability against grease stains having a low degree of deterioration, the composition can be preferably applied to hard surfaces in the kitchen areas where the grease stains as mentioned above exist in large amounts. Here, the state that a composition "is present in the form of a homogeneous liquid phase" as used herein refers to a state of the composition in which turbidity or separation cannot be visually confirmed after stirring a composition and allowing it to stand at room temperature (for example, 25°C) for 1 hour.

MODES FOR CARRYING OUT THE INVENTION

[0018] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (a), a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1), from the viewpoint of cleaning power. The content of the component (a) is from 1 to 15% by mass, and preferably from 2 to 10% by mass, of the composition of the present invention, from the viewpoint of cleaning power against grease stains and storage stability, and especially from the viewpoint of

cleaning power against a low-deterioration oil. The content is preferably 1% by mass or more, and more preferably 2% by mass or more, from the viewpoint of cleaning power against grease stains, and the content is preferably 15% by mass or less, and more preferably 10% by mass or less, from the viewpoint of storage stability. R^{1a} in the formula (a1) includes a butyl group, an isobutyl group, a hexyl group, a 2-ethylhexyl group, preferably a butyl group or a hexyl group, and more preferably a butyl group, from the viewpoint of cleaning power against grease stains and storage stability. R^{2a} in the formula (a1) is preferably an ethylene group, a propylene group, or a butylene group, more preferably an ethylene group or a propylene group, and even more preferably a propylene group, from the viewpoint of cleaning power against grease stains and storage stability. Further, l is from 1 to 4, more preferably the number of from 2 to 3, and even more preferably the number of 2, from the viewpoint of cleaning power against grease stains and storage stability.

[0019] $R^{1a}(OR^{2a})_lOH$ (a1)

In the formula, R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms.

[0020] Further, the component (a) is preferably (a-1) a monoalkyl ether of dipropylene glycol of which alkyl group has 4 to 8 carbon atoms, from the viewpoint of cleaning power against grease stains and storage stability, and especially from the viewpoint of cleaning power against a low-deterioration oil, more preferably dipropylene glycol monobutyl ether, dipropylene glycol monoisobutyl ether, dipropylene glycol monohexyl

ether, or dipropylene glycol mono(2-ethylhexyl) ether, even more preferably dipropylene glycol monobutyl ether, dipropylene glycol monoisobutyl ether, or dipropylene glycol monohexyl ether, still even more preferably dipropylene glycol monobutyl ether or dipropylene glycol monohexyl ether, and especially preferably dipropylene glycol monobutyl ether. The component (a) may be a single compound or a mixture of plural compounds, and the component (a-1) is contained in an amount of from 60 to 100% by mass, preferably from 80 to 100% by mass, more preferably from 90 to 100% by mass, and even more preferably 100% by mass, of the component (a), from the viewpoint of cleaning power against grease stains.

[0021] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (b), an amine oxide, from the viewpoint of high-temperature storage stability, low-temperature storage stability, and cleaning power against low-deterioration oil, and especially from the viewpoint of cleaning power against low-deterioration oil. The content of the component (b) is preferably from 0.05 to 15% by mass, more preferably from 0.06 to 5% by mass, even more preferably from 0.08 to 4% by mass, and still even more preferably from 0.1 to 3.5% by mass, of the composition of the present invention. The content is preferably 0.05% by mass or more, more preferably 0.06% by mass or more, even more preferably 0.08% by mass or more, and still even more preferably 0.1% by mass or more, from the viewpoint of storage stability, and the content is preferably 15% by mass or less, more preferably 5% by mass or less, even more preferably 4% by mass or less, and still even more

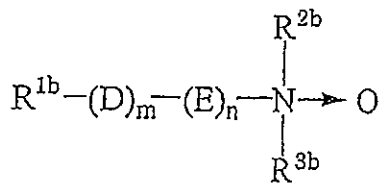
preferably 3.5% by mass or less, from the viewpoint of residuality of the component on an object to be cleaned.

[0022] A mass ratio of the component (a) to a total amount of the component (b) and a component (c) described later, i.e. (a) / ((b) + (c)), of preferably from 1/1 to 15/1, more preferably from 1.2/1 to 14/1, and even more preferably from 1.5/1 to 13/1. The mass ratio is preferably 1/1 or more, more preferably 1.2/1 or more, and even more preferably 1.5/1 or more, from the viewpoint of cleaning power against grease stains. The mass ratio is preferably 15/1 or less, more preferably 14/1 or less, and even more preferably 13/1 or less, from the viewpoint of high-temperature storage stability.

[0023] The component (b) includes, for example, as the followings.

[0024] The component includes an amine oxide, preferably having a hydrocarbon group, and more preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, from the viewpoint of cleaning power against grease stains. A more preferred amine oxide is represented by the following general formula (b1):

[0025]



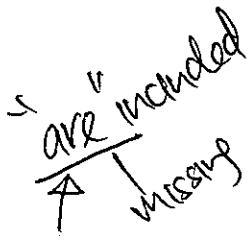
(b1)

[0026] wherein R^{1b} is preferably a hydrocarbon group, and more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2b}

and R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, m and n are m=0 and n=0, or m=1 and n=1.

[0027] In the above general formula (b1), R^{1b} is preferably a hydrocarbon group, and more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, from the viewpoint of cleaning power against grease stains. An alkyl group having 10 to 16 carbon atoms is preferred, an alkyl group having 12 to 14 carbon atoms is more preferred, and an alkyl group having 12 carbon atoms is even more preferred. Each of R^{2b} and R^{3b} is an alkyl group having 1 to 3 carbon atoms, and more preferably a methyl group having 1 carbon atom.

[0028] Preferred examples of the amine oxide represented by the general formula (b1) include an alkyldimethylamine oxide in which R^{1b} is an alkyl group having 8 to 18 carbon atoms, from the viewpoint of ase stains. Specific examples thereof include, thylamine oxide, capryldimethylamine oxide, , myristyldimethylamine oxide. propyldimethylamine oxide, myristic acid amide e, palmitic acid amide propyldimethylamine oxide, are included in the preferred examples.



[0029] The liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (c), one or more surfactants selected from anionic surfactants excluding soaps and amphoteric surfactants, from the viewpoint of high-temperature storage stability.

[0030] The anionic surfactants excluding soaps include an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate. The anionic surfactants may be a single compound or a mixture of plural compounds.

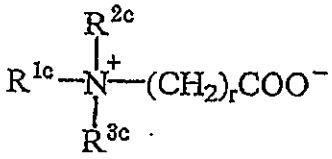
[0031] The alkyl or alkenyl carbon chain length in the above anionic surfactant is preferably from 8 to 18, and more preferably from 10 to 14.

[0032] The number of moles of EO added in the polyoxyethylene alkyl ether sulfate, the polyoxyethylene alkyl(or alkenyl) ether carbonate, or the polyoxyethylene amide alkyl(or alkenyl) ether carbonate is preferably from 1 to 10 on average, from the viewpoint of cleaning power against grease stains.

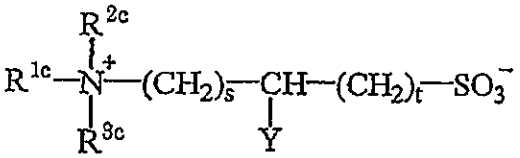
[0033] The counterion of the above anionic surfactant is suitably sodium, potassium, magnesium, calcium, an alkanolamine, or ammonium, and the counterion is preferably sodium, potassium, or an alkanolamine, from the viewpoint of cleaning power against grease stains.

[0034] The amphoteric surfactants are not particularly limited, and in the present invention, the amphoteric surfactants include one or more members selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4). The amphoteric surfactants may be a single compound or a mixture of plural compounds.

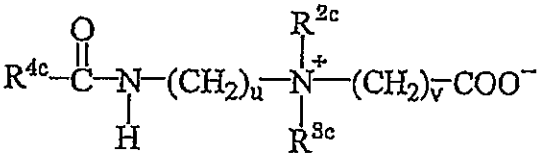
[0035]



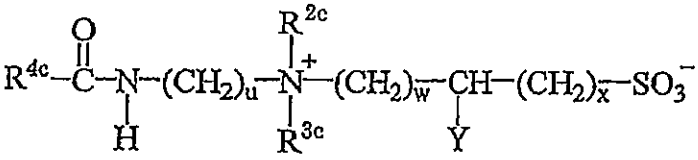
(c1)



(c2)



(c3)



(c4)

[0036] wherein R^{1c} is a hydrocarbon group, and preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group, and preferably a linear or branched alkyl group or alkenyl group, having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[0037] In the general formula (c1), R^{1c} is preferably an alkyl group having 8 to 18 carbon atoms, and more preferably an alkyl group having 10 to 16

carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, and r is preferably 1, for the same reason as above.

[0038] In the general formula (c2), R^{1c} is preferably an alkyl group having 8 to 18 carbon atoms, and more preferably an alkyl group having 10 to 16 carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, s is preferably 1, and t is preferably 1, for the same reason as above.

[0039] In the general formulas (c3) and (c4), R^{4c} is preferably an alkyl group having 9 to 15 carbon atoms, from the viewpoint of cleaning power against grease stains. Each of R^{2c} and R^{3c} is preferably a methyl group, an ethyl group, or a hydroxyethyl group, u is preferably 2 or 3, v is preferably 1, w is preferably 1, and x is preferably 1, for the same reason as above.

[0040] Specific examples of the betaine represented by the general formula (c1), (c2), (c3) or (c4) include fatty acid amide propyl-N,N-dimethylacetic acid betaines, fatty acid amide propyl-N,N-dimethyl-2-hydroxypropylsulfobetaines, fatty acid amide propyl-N,N-dimethyl-propylsulfobetaines, alkyl-N,N-dimethyl-2-hydroxypropylsulfobetaines.

Among them, lauric acid amide propyl-N,N-dimethylacetic acid betaine, myristic acid amide propyl-N,N-dimethylacetic acid betaine, cocamidopropyl-N,N-dimethylacetic acid betaine, lauryl-N,N-dimethyl-2-hydroxypropylsulfobetaine, lauric acid amide propyl-N,N-dimethyl-2-hydroxypropylbetaine, are preferred, from the viewpoint of cleaning power against grease stains and foaming strength.

[0041] The content of the component (c) is from 0.01 to 15% by mass, preferably within the range of from 0.05 to 1% by mass, more preferably within the range of from 0.1 to 0.7% by mass, and especially preferably within the range of from 0.1 to 0.5 % by mass, of the liquid cleaning agent composition for hard surfaces of the present invention. The content is 0.01% by mass or more, preferably 0.05% by mass or more, and more preferably 0.1% by mass or more, from the viewpoint of storage stability, and the content is 15% by mass or less, preferably 1% by mass or less, more preferably 0.7% by mass or less, and especially preferably 0.5% by mass or less, from the viewpoint of cleaning ability. When the anionic surfactant excluding soaps is used as the component (c), the content thereof is more preferably from 0.02 to 0.6% by mass, and even more preferably from 0.1 to 0.5% by mass. When the amphoteric surfactant is used as the component (c), the content thereof is more preferably from 0.1 to 0.6% by mass, and even more preferably from 0.3 to 0.5% by mass.

[0042] The component (c) is a component which is necessary for allowing the composition of the present invention to form a stable homogeneous liquid phase under storage conditions. Further, a mass ratio of the component (c) to a total amount of the component (b) and the component (c), i.e. (c) / ((b) + (c)), is from 0.01/1 to 1/1, preferably from 0.04/1 to 0.6/1, more preferably from 0.07/1 to 0.5/1, more preferably from 0.079/1 to 0.5/1, and especially preferably from 0.2/1 to 0.35/1, from the viewpoint of cleaning performance and storage stability.

[0043] Although the causes why high-temperature stability and low-temperature stability, and especially high-temperature storage stability of

the composition are improved by blending the component (c) are not elucidated, the mechanisms which are possibly considered will be explained hereinbelow.

[0044] A dipolar force, a main interaction between a hydrophilic group of the component (b) and water, is reduced with a temperature increase. Accordingly, with the temperature increase, the component (b) has a tendency of causing phase separation with water. In that case, the component (b) would not be able to solubilize the component (a) as a surfactant.

[0045] Meanwhile, oxygen of the amine oxide moiety of the component (b) is electron-attractive, so that it is considered that nitrogen atom located adjacent to the oxygen in a hydrophilic group of the component (b) is slightly positively charged. Therefore, it is considered that there is a weak electric interaction between the component (b) and the component (c) having an anionic moiety. For this reason, if the composition is blended with the component (c), the component (b) would be less likely to cause phase separation with water, so that it is considered that the component (b) is capable of functioning as a surfactant, whereby the separation of the component (a) and the component (b) from water, which can be caused during the temperature increase can be suppressed.

[0046] Supposing the above mechanisms, it is deduced that an effect of a strongly anionic component is even higher as the component (c). The matter that the anionic surfactant is acknowledged to have a tendency of exhibiting the effect with a smaller amount than the amphoteric surfactant suggests a possibility that the above stabilization mechanisms take place.

Accordingly, the component (c) is more preferably an anionic surfactant excluding soaps.

[0047] In addition, as one of the properties of the component (c), the presence of a hydrophobic group having an enough length to be capable of forming mixed micelles is considered to be important. This hypothesis is deduced from the matter that an anionic compound having a hydrophobic group only containing an alkyl group having 6 or less carbon atoms or an aryl group having 10 or less carbon atoms, including, for example, acids such as citric acid, propionic acid, benzoic acid, and p-toluenesulfonic acid, and salts thereof, has a tendency of a weaker effect as the component (c) in the present invention.

[0048] It is preferable that the liquid cleaning agent composition for hard surfaces of the present invention contains, as a component (d), an alkanolamine and/or an alkali hydroxide, from the viewpoint of further improving cleaning performance. The alkanolamine includes monoethanolamine, diethanolamine, and triethanolamine, and the alkanolamine is more preferably monoethanolamine, from the viewpoint of cleaning power against grease stains. The alkali hydroxide as used herein refers to a hydroxide of an alkali metal or alkaline earth metal. The alkali hydroxide includes sodium hydroxide, potassium hydroxide.

[0049] The content of the component (d) is preferably from 0.01 to 20% by mass, more preferably from 0.05 to 15% by mass, more preferably from 1.5 to 15% by mass, even more preferably from 2 to 10% by mass, still even more preferably from 3 to 7% by mass, and still even more preferably

from 3 to 5% by mass, of the liquid cleaning agent composition for hard surfaces of the present invention, in order to give sufficient cleaning power to the grease stains. The component (d) may be a single compound or a mixture of plural compounds.

[0050] The liquid cleaning agent composition for hard surfaces of the present invention can contain, as a component (e), a builder component, from the viewpoint of further improving cleaning performance. As the builder component, one or more members listed hereinbelow can be used.

[0051] (1) An alkali metal salt or alkanolamine salt of an aminopolyacetic acid, the aminopolyacetic acid including nitrilotriacetic acid, iminodiacetic acid, ethylenediaminetetraacetic acid, hydroxyethylethylenediaminetriacetic acid, diethylenetriaminepentaacetic acid, glycol ether diaminetetraacetic acid, hydroxyethyliminodiacetic acid, triethylenetetraminehexaacetic acid, djenkolic acid, or the like.

[0052] (2) An alkali metal salt or alkanolamine salt of an organic acid, the organic acid including diglycolic acid, oxydisuccinic acid, carboxymethyloxysuccinic acid, carboxymethylsuccinic acid, carboxymethyltartaric acid, citric acid, lactic acid, tartaric acid, oxalic acid, malic acid, gluconic acid or the like.

[0053] Among them, citric acid, malic acid, ethylenediaminetetraacetic acid, hydroxyethylethylenediaminetriacetic acid, or a salt thereof is preferred. The form of the salt is preferably a sodium salt, a potassium salt, an ammonium salt, or an alkanolamine salt.

[0054] The content of the component (e) is preferably from 0.01 to 5% by mass, more preferably from 0.1 to 3% by mass, and even more preferably

from 0.2 to 1% by mass, of the composition, from the viewpoint of cleaning power against grease stains.

[0055] The liquid cleaning agent composition for hard surfaces of the present invention can be blended with, in addition to the above components, other components within the range that would not impair the objects or effects of the present invention. Other components include, for example, surfactants such as polyoxyethylene alkyl ethers and alkyl (poly)glycosides; solvents such as ethanol, propanol, glycerol, ethylene glycol, propylene glycol, propylene glycol monomethyl ether, an alkyl monoglyceryl ether of which alkyl group has 3 to 8 carbon atoms, and a polyoxyethylene phenyl ether or benzyl ether, of which EO has the number of moles added of from 1 to 5 on average; antioxidants such as BHT; bactericidal and mildewproof agents; and anti-corrosive agents. Here, the liquid cleaning agent composition for hard surfaces of the present invention can be blended, as an optional component, with a polyacrylic acid and a salt thereof, or a copolymer formed between an olefin and maleic anhydride.

[0056] The polyoxyethylene alkyl ethers include those listed in the following (1) or (2):

(1) A polyoxyethylene alkyl ether or alkenyl ether, of which alkyl group or alkenyl group has the number of carbon atoms of from 10 to 18, and preferably from 10 to 16, on average, from the viewpoint of cleaning power against grease stains, and of which ethylene oxide

(hereinafter simply referred to as EO) has the number of moles added of from 1 to 30 mol on average, and preferably from 6 to 20 on average. Preferred examples of the above (1) include a polyoxyethylene alkyl ether of which alkyl group has 8 to 18 carbon atoms.

[0057] (2) A polyoxyethylene alkylphenyl ether, of which alkyl group has the number of carbon atoms of from 6 to 12 on average, from the viewpoint of cleaning power against grease stains, and of which EO has the number of moles added of from 1 to 25 mol on average.

[0058] As the alkyl (poly)glycoside, an alkyl (poly)glycoside represented by the following general formula (b2) is a preferred example, from the viewpoint of cleaning power against grease stains.

[0059] $R^{4b}(OR^{5b})_xG_y$ (b2)

wherein R^{4b} is a hydrocarbon group, and preferably a linear or branched alkyl group, alkenyl group or alkylphenyl group, having a total number of carbon atoms of from 8 to 18, R^{5b} is an alkylene group having 2 to 4 carbon atoms, G is a residue originated from a reducing sugar having 5 to 6 carbon atoms, x is from 0 to 5, and y is from 1 to 5.

[0060] In the liquid cleaning agent composition for hard surfaces of the present invention, water is blended together with each of the components mentioned above. The amount of water blended is an amount so that a total amount is adjusted to 100% by mass. In other words, the balance of the composition is water. The amount of water is preferably from 70 to 98% by mass, more preferably from 75 to 96% by mass, and even more preferably from 80 to 94% by mass, of the composition, from the viewpoint of cleaning power against grease stains and high-temperature

stability. In addition, the liquid cleaning agent composition for hard surfaces of the present invention has a pH at 25°C of from 6 to 14, and preferably from 7.5 to 14, from the viewpoint of cleaning power against grease stains and ensuring of safety during use. The composition has a pH of 6 or more, preferably a pH of 8 or more, more preferably a pH of 8.5 or more, more preferably a pH of 9 or more, and even more preferably a pH of 10 or more, in order to obtain a high cleaning power. On the other hand, the composition has a pH of 14 or less, preferably a pH of 13 or less, more preferably 12 or less, and especially preferably a pH of 11.5 or less, from the viewpoint of ensuring safety during use. In other words, the liquid cleaning agent composition for hard surfaces of the present invention has a pH at 25°C of preferably from 7.5 to 14, more preferably from 8 to 13, more preferably from 9 to 12, and even more preferably from 10 to 11.5. The pH is measured with a pH meter D-52S and a pH electrode 6367-10D both manufactured by HORIBA, Ltd.

[0061] The liquid cleaning agent composition for hard surfaces of the present invention can be produced by mixing each of the components in proper amounts.

[0062] The present invention relates to a liquid cleaning agent composition in which hard surfaces are subject to be cleaned. Here, the term "hard surfaces" means those surfaces having given shapes, irrespective of being two-dimensional or three-dimensional, and the degree of hardness is not limited so long as the surfaces can be subjected to a cleaning treatment. The hard surfaces include fixed objects such as floors, staircases, and walls made of plastics, rubbers, metals, tiles, bricks, concrete, cement, glass,

wood, as well as generally any surfaces humans contact, such as various instruments, appliances, tools, furniture, and dishware made of those listed, more preferably including those made of plastics, metals, glass,

[0063] Accordingly, the liquid cleaning agent composition for hard surfaces of the present invention can be applied as kitchen cleaning agents, bathroom cleaning agents, floor cleaning agents, dishware cleaning agents, cleaning agents for fully automatic washing machine wash tubs, small article cleaning agents for kitchens and toilets, and more preferably can be applied as kitchen cleaning agents.

[0064] The embodiments of the present invention will be exemplified hereinbelow:

[1] a liquid cleaning agent composition for hard surfaces, containing:

(a) a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1):

$$R^{1a}(OR^{2a})_lOH \qquad (a1)$$

wherein R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, preferably the number of 2 to 3, and more preferably the number of 2, and R^{2a} is an alkylene group having 2 to 4 carbon atoms, and preferably a propylene group,

the monoalkyl ether of a polyalkylene glycol being in an amount of from 1 to 15% by mass, and preferably from 2 to 10% by mass;

(b) an amine oxide;

(c) one or more surfactants selected from the group consisting

of anionic surfactants excluding soaps and amphoteric surfactants in an amount of from 0.01 to 15% by mass, preferably from 0.1 to 0.7% by mass, and more preferably from 0.1 to 0.5% by mass; and

water,

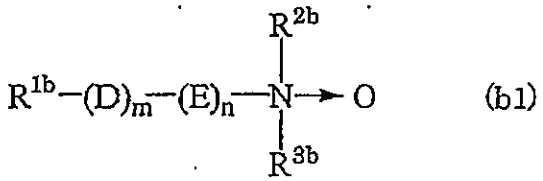
wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.01/1 to 1/1, and wherein 60 to 100% by mass, preferably from 80 to 100% by mass, more preferably from 90 to 100% by mass, and more preferably 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol (a-1) of which alkyl group has 4 to 8 carbon atoms,

wherein its pH at 25°C is from 6 to 14.

[2] The composition according to the above [1], wherein a mass ratio of the component (a) / (the component (b) + the component (c)) is from 1/1 to 15/1, preferably from 1.2/1 to 14/1, and more preferably from 1.5/1 to 13/1.

[3] The composition according to the above [1] or [2], wherein the component (b) is an alkylamine or alkenylamine oxide represented by the following general formula (b1):

[0065]



(b1)

[0066] wherein R^{1b} is preferably a hydrocarbon group, more preferably an alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2b} and

R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, and m and n are m=0 and n=0, or m=1 and n=1.

[4] The composition according to any one of the above [1] to [3], wherein the component (b) is an alkyldimethylamine oxide, of which alkyl group has 8 to 18 carbon atoms.

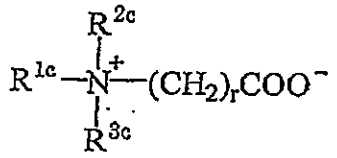
[5] The composition according to any one of the above [1] to [4], wherein the component (b) is contained in an amount of from 0.05 to 15% by mass, preferably from 0.06 to 5% by mass, more preferably from 0.08 to 4% by mass, and more preferably from 0.1 to 3.5% by mass.

[6] The composition according to any one of the above [1] to [5], wherein the component (c) is an anionic surfactant excluding soaps.

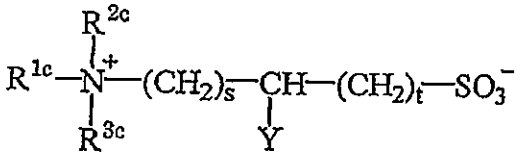
[7] The composition according to any one of the above [1] to [6], wherein the component (c) is an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate.

[8] The composition according to any one of the above [1] to [7], wherein the component (c) is one or more amphoteric surfactants selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4):

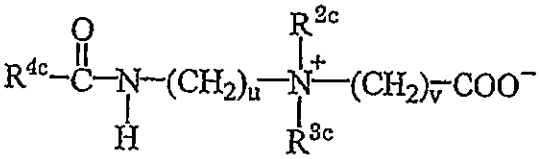
[0067]



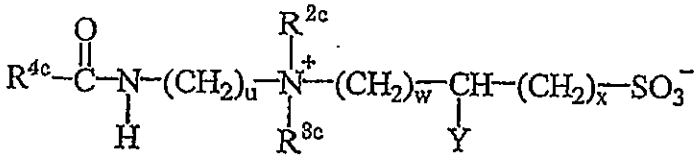
(c1)



(c2)



(c3)



(c4)

[0068] wherein R^{1c} is a hydrocarbon group, preferably a linear or branched alkyl group or alkenyl group, having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group, preferably a linear or branched alkyl group or alkenyl group, having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[9] The composition according to any one of the above [1] to

[8], wherein the composition contains, as a component (d), an alkanolamine, and preferably monoethanolamine, and/or an alkali hydroxide in an amount of from 0.01 to 20% by mass, preferably from 0.05 to 15% by mass, more preferably from 1.5 to 15% by mass, more preferably from 2 to 10% by mass, more preferably from 3 to 7% by mass, and more preferably from 3 to 5% by mass.

[10] The composition according to any one of the above [1] to [9], wherein the component (a-1) is dipropylene glycol monobutyl ether.

[11] The composition according to any one of the above [1] to [10], wherein the component (a) consists of a component (a-1).

[12] The composition according to any one of the above [1] to [11], wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.04/1 to 0.6/1, preferably from 0.07/1 to 0.5/1, more preferably from 0.079/1 to 0.5/1, and more preferably from 0.2/1 to 0.35/1.

[13] The composition according to any one of the above [1] to [12], wherein water is contained in an amount of from 70 to 98% by mass, preferably from 75 to 96% by mass, and more preferably from 80 to 94% by mass.

[14] The composition according to any one of the above [1] to [13], wherein the composition has a pH at 25°C of from 7.5 to 14, preferably from 8 to 13, more preferably from 9 to 12, and more preferably from 10 to 11.5.

[15] The composition according to any one of the above [1] to [14], wherein the composition is present in the form of a homogeneous

liquid phase.

[16] The composition according to any one of the above [1] to [15], wherein the composition has a pH at 25°C of from 8 to 13.

[17] The composition according to any one of the above [1] to [16], wherein the composition is applicable as a kitchen cleaning agent.

[18] A cleaning method including applying the composition as defined in any one of the above [1] to [17] to a hard surface on which grease stains are present to clean the hard surface.

EXAMPLES

[0069] Examples 1 to 14, and Comparative Examples 1 to 16

The following examples further describe and demonstrate embodiments of the present invention. The examples are given solely for the purposes of illustration and are not to be construed as limitations of the present invention. Each of the liquid cleaning agent composition for hard surfaces of Examples and Comparative Examples was obtained using each of the components listed in the following tables. The numerical values of the amount of each component in the tables are expressed as % by mass, and the balance was deionized water. The values for the mass ratios in the tables are listed abbreviating the denominator, i.e. abbreviating /1.

[0070] Each of the prepared compositions of Examples and Comparative Examples 1 to 4, 6 and 8 to 16 was present in the form of a homogeneous liquid phase without turbidity or separation. On the other hand, each of the compositions of Comparative Examples 5 and 7 could not be made into a homogeneous liquid composition, so that the evaluation could not be

carried out. Accordingly, the evaluations for Comparative Examples 5 and were listed as F.

[0071] The pH of the composition (at 25°C) was adjusted with a 6 N-aqueous sodium hydroxide solution or a 6 N-hydrochloric acid, as occasion demands. Each test for the cleaning performances and the storage stability was conducted in accordance with the following methods, using each of the liquid cleaning agent compositions for hard surfaces. The results are shown in the following tables.

[0072] (Cleaning Performance I)

A cleaning effect against deteriorated soybean oil stains was evaluated using a composition stock solution.

A 1 g sample was applied to the following stainless steel plate previously coated with deteriorated soybean oil stains so as to be in a circular form having a diameter of about 35 mm. After allowing the sample to contact the stainless steel plate at room temperature for 5 minutes, the plate was subjected to rinsing procedure with deionized water. A sample to which the above cleaning procedure was conducted, and the following stainless steel plate (reference) not subjected to the cleaning procedure was photographed with a digital camera. The areas of stain removal parts of the circular part of the sample after rinsing were numerically expressed. In other words, supposing that a case where the stains of the circular part were completely removed was 100 and a case where the stains were not removed at all was 0, the values were converted according to a cleaning ratio corresponding to the area (digitized to the 5% cut).

[0073] [Method for Preparing Deteriorated Soybean Oil Stains]

A commercially available soybean oil (a product of Wako Pure Chemical Industries, Ltd. being used, the product purchased within 3 months was used) was added in an amount of 40 mL to a 50 mL stainless steel beaker, and the beaker was heated at 180°C for 1 hour in a state that the top part was allowed to be in the open air, and then air-cooled naturally to room temperature (25°± 5°C). An oil orange SS was added in an amount of 1 parts by mass, based on 99 parts by mass of this heat-treated oil, and the components were thoroughly mixed at room temperature. The model stains were applied as evenly as possible so as to be in an amount of 1.4 to 1.6 mg per one square centimeter, and allowed to stand at room temperature for one week. The stains were used in the evaluation of cleaning.

[0074] (Cleaning Performance II)

A commercially available soybean oil (a product of Wako Pure Chemical Industries, Ltd. being used, the product purchased within 3 months was used) was added in an amount of 40 mL to a 50 mL stainless steel beaker, and the beaker was heat-treated at 180°C for 50 hours (using an electric thermostat) in a state that the top part was allowed to be in the open air, and then air-cooled naturally to room temperature. An oil orange SS was added in an amount of 1 parts by mass, based on 99 parts by mass of this heat-treated oil, and the components were thoroughly mixed at room temperature (25°± 5°C). The model stains were applied as evenly as possible so as to be in an amount of 1.4 to 1.6 mg per one square centimeter, and the stains were immediately used in evaluation, in the

same manner as that mentioned above.

[0075] [Method of Digitizing Stain Removal Areas]

The images photographed with the digital camera were subjected to a graying treatment using an image processing software (Win ROOF Ver. 3.30 (MITANI Corporation)). The areas of the stain removal parts were digitized by subjecting processed images to binarization, and counting the stain removal parts. As the threshold value used in the binarization of each of the images, a value in which stained parts of the reference in the images are all not counted was used.

[0076] (Storage Stability)

With respect to the liquid cleaning agent compositions listed in the following tables, changes in external appearances during storage at 5°C and at 50°C were examined. The confirmation of the external appearance was made every week. A 50 mL-volume vessel (Maruemu Corporation, Screw Bottle No. 7) was charged with 40 g of a composition, to conduct a storage test, which was evaluated in accordance with the following criteria:

[0077] 4: No turbidity and/or separation being generated at a point of 4 weeks after storage.

3: Turbidity and/or separation being generated at a point of 3 weeks after storage.

2: Turbidity and/or separation being generated at a point of 2 weeks after storage.

1: Turbidity and/or separation being generated at a point of 1 week after storage.

[0078] [Table 1]

Table 1

Examples		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Component (a)	Component (a-1) a-1-1	2.50	2.50	2.50	-	3.50	3.50	2.50	2.50	7.00	10.0	2.50	2.50	2.50	2.50
	a-1-2	-	-	-	2.00	-	-	-	-	-	-	-	-	-	-
a-1/a		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Component (b)	b-3	1.00	1.00	1.00	1.20	1.50	-	2.00	0.10	3.50	-	-	-	1.00	1.00
	b-3'	-	-	-	-	-	-	-	-	-	-	1.00	1.00	-	-
	b-4	-	-	-	-	-	1.50	-	-	-	3.50	-	-	-	-
Component (c)	c-1	0.300	-	-	0.500	0.500	0.500	0.500	0.100	0.500	0.300	0.300	0.300	0.300	0.300
	c-2	-	0.300	-	-	-	-	-	-	-	-	-	-	-	-
	c-3	-	-	0.300	-	-	-	-	-	-	-	-	-	-	-
Component (d)	Monoethanol-amine	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.05	-
Numerical Conditions	a/(b+c)	1.9	1.9	1.9	1.2	1.8	1.8	1.0	13	1.8	2.6	1.9	1.9	1.9	1.9
	c/(b+c)	0.23	0.23	0.23	0.29	0.25	0.25	0.20	0.50	0.13	0.079	0.23	0.23	0.23	0.23
pH		11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	8.5	7.5
Cleaning Performance I		95	90	90	90	90	90	90	95	90	95	90	90	90	90
High-Temperature Storage Stability (at 50°C)		4	4	4	4	4	4	4	4	4	4	4	4	4	4
Low-Temperature Storage Stability (at 5°C)		4	4	4	4	4	4	4	4	4	4	4	4	4	4
Cleaning Performance II		95	95	95	90	95	90	95	90	95	90	90	90	95	95

[0079] [Table 2]

Table 2

Comparative Examples			1	2	3	4	5	6	7	8
Component (a)	Component (a-1)	a-1-1	-	-	-	-	-	3.50	25.0	3.50
	a-2		-	3.50	-	-	-	3.50	-	-
Non-Component (a)	DPG		-	-	3.50	-	-	-	-	-
	PG		-	-	-	3.50	-	-	-	-
	Dodecane		-	-	-	-	3.50	-	-	-
a-1/a			-	-	-	-	-	0.50	1.00	1.00
Component (b) or Non-Component (b)	b-1		-	-	-	-	-	-	-	1.50
	b-2		-	1.50	-	-	-	1.50	-	-
	b-3		1.50	-	1.50	1.50	1.50	-	-	-
	b-4		-	-	-	-	-	-	3.50	-
Component (c)	c-1		0.500	0.500	0.500	0.500	0.500	0.500	0.300	-
Component (d)	Monoethanolamine		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Numerical Conditions	a/(b+c)		0	1.8	1.8	1.8	1.8	3.5	6.6	2.3
	c/(b+c)		0.25	0.25	0.25	0.25	0.25	0.25	0.0789	0
pH			11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Cleaning Performance I			20	50	30	25	F	65	F	90
High-Temperature Storage Stability (at 50°C)			4	4	4	4	F	4	F	1
Low-Temperature Storage Stability (at 5°C)			4	4	4	4	F	4	F	4

[0080]

[Table 3]

Table 3

Comparative Examples			9	10	11	12	13	14	15	16
Component (a)	Component (a-1)	a-1-1	2.50	2.50	2.50	3.00	3.50	3.50	3.50	3.50
		a-1-2	-	-	-	-	-	-	-	-
	a-1/a	a-2	-	-	-	-	-	-	-	2.00
			1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.636
Component (b) or Non-Component (b)	b-1		1.00	1.00	1.00	-	1.50	-	-	-
	b-2		-	-	-	-	-	1.50	-	1.50
	b-3		-	-	-	1.00	-	-	-	-
	b-5		-	-	-	-	-	-	1.50	-
Component (c)	c-1		0.500	-	-	0.500	0.500	0.500	0.500	0.500
	c-2		-	0.500	-	-	-	-	-	-
	c-3		-	-	0.500	-	-	-	-	-
Component (d)	Monoethanolamine		5.00	5.00	5.00	-	5.00	5.00	5.00	5.00
Numerical Conditions	a/(b+c)		1.7	1.7	1.7	2.0	1.8	1.8	1.8	1.8
	c/(b+c)		0.33	0.33	0.33	0.33	0.25	0.25	0.25	0.25
pH			11.5	11.5	11.5	7.0	11.5	11.5	11.5	11.5
Cleaning Performance I			90	90	90	80	90	85	85	90
High-Temperature Storage Stability (at 50°C)			4	4	4	4	4	4	4	4
Low-Temperature Storage Stability (at 5°C)			4	4	4	4	4	4	4	4
Cleaning Performance II			75	75	75	90	80	80	75	80

[0081] From the results summarized in the tables mentioned above, the followings could be seen.

[0082] It could be seen that the products of the present invention are excellent in cleaning performances, and high-temperature and low-temperature storage stability.

From Comparative Examples 1 and 3 to 5, when the component (a) was not contained, cleaning power against grease stains was insufficient. From Comparative Example 7, when the component (a) was contained in excess, a homogeneous liquid composition could not be formed. From Comparative Examples 2 and 6, when the component (a-1) is contained too little in the component (a), cleaning power was not sufficient. From Example 14 and Comparative Example 12, when a pH of a composition is 7.5 or more, it can be seen that a tendency that cleaning performance is higher is found. Further from Comparative Examples 9 to 11 and 13 to 16, when the polyoxyethylene alkyl ether or the alkyl (poly)glycoside was used in place of the component (b), it could be seen that its cleaning performance against low-deterioration oil is worsened.

[0083] When Comparative Example 13 and Comparative Example 8 were compared, it could be seen that when the component (c) was not contained, it could be seen that high-temperature storage stability was not sufficient.

[0084] The component (a) and the non-(a) component in each of the tables are as follows.

a-1-1: dipropylene glycol monobutyl ether

a-1-2: dipropylene glycol monohexyl ether

a-2: diethylene glycol monobutyl ether

DPG: dipropylene glycol

PG: propylene glycol

[0085] The component (b) and the non-(b) component in each of the tables are as follows.

b-1: polyoxyethylene(average number of moles of EO added=8) lauryl ether

b-2: polyoxyethylene(average number of moles of EO added=7) secondary alkyl (mixture of 12 to 14 carbon atoms) ether

b-3: lauryldimethylamine oxide

b-3': capryldimethylamine oxide

b-3": stearyldimethylamine oxide

b-4: lauric acid amide propyldimethylamine oxide

b-5: alkyl(mixture of 10 to 14 carbon atoms) glycoside (average degree of condensation of glycoside=1.3)

[0086] The component (c) in each of the tables are as follows.

c-1: sodium linear alkyl(mixture of 10 to 14 carbon atoms)benzenesulfonate

c-2: lauric acid amide propyl-N,N-dimetjylacetic acid betaine

c-3: lauryl-N,N-dimethyl-2-hydroxypropylsulfobetaine

INDUSTRIAL APPLICABILITY

[0087] The liquid cleaning agent composition for hard surfaces of the present invention can be applied to various kinds of hard surfaces, and the composition is more suitable for hard surfaces in the kitchen area, so that the composition is suitable as a kitchen liquid cleaning agent composition.

CLAIMS

[Claim 1] A liquid cleaning agent composition for hard surfaces, comprising:

(a) a monoalkyl ether of a polyalkylene glycol represented by the following formula (a1):

$$R^{1a}(OR^{2a})_lOH \qquad (a1)$$

wherein R^{1a} is an alkyl group having 4 to 8 carbon atoms, l is the number of from 1 to 4, and R^{2a} is an alkylene group having 2 to 4 carbon atoms, the monoalkyl ether of a polyalkylene glycol being in an amount of from 1 to 15% by mass;

(b) an amine oxide;

(c) one or more surfactants selected from the group consisting of anionic surfactants excluding soaps and amphoteric surfactants in an amount of from 0.01 to 15% by mass; and

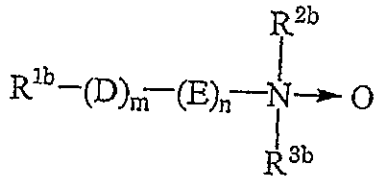
water,

wherein a mass ratio of the component (c) / (the component (b) + the component (c)) is from 0.04/1 to 0.6/1, and wherein 60 to 100% by mass of the component (a) is a monoalkyl ether of dipropylene glycol (a-1) of which alkyl group has 4 to 8 carbon atoms,

wherein its pH at 25°C is 10 or more and 14 or less.

[Claim 2] The composition according to claim 1, wherein a mass ratio of the component (a) / (the component (b) + the component (c)) is from 1/1 to 15/1.

[Claim 3] The composition according to claim 1 or 2, wherein the component (b) is represented by the following general formula (b1):



(b1)

wherein R^{1b} is a hydrocarbon group having 8 to 18 carbon atoms, each of R^{2b} and R^{3b}, which may be identical or different, is an alkyl group having 1 to 3 carbon atoms, D is an -NHC(=O)- group or a -C(=O)NH- group, E is an alkylene group having 1 to 5 carbon atoms, and m and n are m=0 and n=0, or m=1 and n=1.

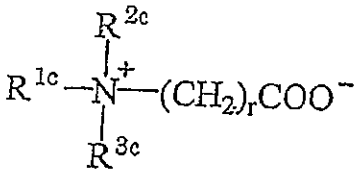
[Claim 4] The composition according to any one of claims 1 to 3, wherein the component (b) is an alkyldimethylamine oxide, of which alkyl group has 8 to 18 carbon atoms.

[Claim 5] The composition according to any one of claims 1 to 4, wherein the component (b) is contained in an amount of from 0.05 to 15% by mass.

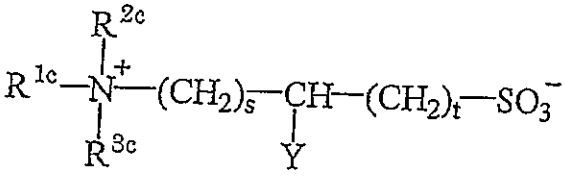
[Claim 6] The composition according to any one of claims 1 to 5, wherein the component (c) is an anionic surfactant excluding soaps.

[Claim 7] The composition according to any one of claims 1 to 6, wherein the component (c) is an alkylbenzenesulfonate, an alkanesulfonate, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α-olefinsulfonate, a methyl ester salt of an α-sulfofatty acid, a polyoxyethylene alkyl(or alkenyl) ether carbonate, or a polyoxyethylene amide alkyl(or alkenyl) ether carbonate.

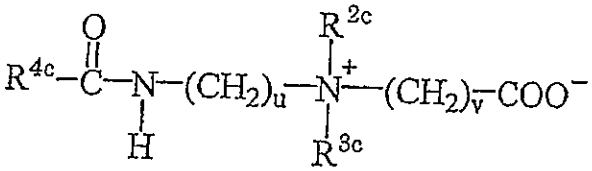
[Claim 8] The composition according to any one of claims 1 to 7, wherein the component (c) is one or more amphoteric surfactants selected from betaines represented by the following general formulas (c1), (c2), (c3) and (c4):



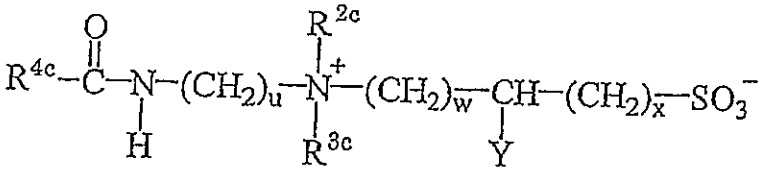
(c1)



(c2)



(c3)



(c4)

wherein R^{1c} is a hydrocarbon group having 8 to 18 carbon atoms, each of R^{2c} and R^{3c} is an identical or different alkyl group having 1 to 5 carbon atoms which may be substituted with a hydroxyl group, R^{4c} is a hydrocarbon group having 7 to 17 carbon atoms, Y is a hydrogen atom or a hydroxyl group, each of r, s, and t is the number of from 1 to 3, u is the number of from 1 to 5, v is the number of 1 or more, and w and x are the numbers satisfying $0 \leq w + x \leq 4$.

[Claim 9] The composition according to any one of claims 1 to 8, wherein the component (c) is contained in an amount of from 0.1 to 0.5% by mass.

[Claim 10] The composition according to any one of claims 1 to 9, wherein the composition comprises, as a component (d), an alkanolamine and/or an alkali hydroxide in an amount of from 0.01 to 20% by mass.

[Claim 11] The composition according to any one of claims 1 to 10, wherein the component (a-1) is dipropylene glycol monobutyl ether.

[Claim 12] The composition according to any one of claims 1 to 11, wherein the component (a) consists of a component (a-1).

[Claim 13] The composition according to any one of claims 1 to 12, wherein water is contained in an amount of from 70 to 98% by mass.

[Claim 14] The composition according to any one of claims 1 to 13, wherein the composition is present in the form of a homogeneous liquid phase.

[Claim 15] The composition according to any one of claims 1 to 14, the composition further comprises a component (e) a builder component in an amount of from 0.01 to 5 % by mass.

[Claim 16] The composition according to any one of claims 1 to 15, wherein the composition is applicable as a kitchen cleaning agent.

[Claim 17] A cleaning method comprising applying the composition as defined in any one of claims 1 to 16 to a hard surface on which grease stains are present to clean the hard surface.