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(54) **LIQUID DETERGENT COMPOSITION FOR HARD SURFACES**

(57) The present invention is a liquid detergent composition for a hard surface, containing (a) a specific sulfosuccinate or a salt thereof, (b) 0% by mass or more and less than 3% by mass of an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a), (c) an amphoteric surfactant, and water, wherein a mass ratio of (b)/[(a)+(b)+(c)] is 0.3 or less.

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Description

Field of the Invention

[0001] The present invention relates to a liquid detergent composition for a hard surface, a method for washing a hard surface, and a detergent article for a hard surface accommodated in a spray container.

Background of the Invention

[0002] Detergency against oily stains is still strongly required of dish detergents for hand washing. In particular, it is difficult to remove oily stains containing large amounts of solid fat such as beef tallow and lard from dishes having hydrophobic surfaces such as Tupperware containers and lunch boxes that are made of plastics, and strong detergency is required. Accordingly, washing methods devised to use hot water at about 40°C to 45°C, perform washing twice, or the like are usually used.

[0003] JP-A 2013-100461 discloses a liquid detergent composition for dishes for hand washing containing (a) a sulfosuccinic acid alkyl ester-type surfactant, (b) one or more selected from alkyl sulfates and polyoxyalkylene alkyl ether sulfates, and (c) a sulfobetaine-type surfactant in the predetermined contents and the predetermined proportions, and describes as achieving detergency against both liquid oil and solid fat that are oily stains adhered to dishes, cooking utensils, and the like having hydrophobic surfaces at low temperatures (10 to 35°C).

[0004] JP-A 2013-100462 discloses a liquid detergent composition for dishes for hand washing containing (a) a sulfosuccinic acid alkyl ester or a salt thereof, (b) 5 to 35% by mass of an anionic surfactant having a hydrocarbon group with 8 to 21 carbon atoms and a salt of sulfate group or a salt of sulfonate group, provided that (a) is excluded, and (c) a sulfobetaine-type surfactant, and describes that ample foaming is exhibited when washing dishes and foam is retained during washing while foam immediately disappears at the time of rinsing, and rinsing is completed with a small amount of water.

[0005] JP-A 2013-100461 and JP-A 2013-100462 describe that a liquid detergent composition for dishes for hand washing is applied to a flexible material such as sponge and foamed, and dishes are scrubbed for washing.

Summary of the Invention

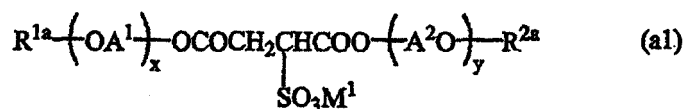
[0006] The present invention relates to a liquid detergent composition for a hard surface, which has excellent detergency and is capable of washing off oily stains containing solid fat adhered to hard surfaces of hard articles such as plastics even without scrubbing with a flexible material such as sponge, i.e., without applying a mechanical force, and a method for washing a hard surface.

[0007] The present invention relates to a liquid detergent composition for a hard surface, containing the following component (a), 0% by mass or more and less than 3% by mass of the following component (b), the following component (c), and water, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less:

<Component (a)>

a sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 1]



wherein R^{1a} and R^{2a} are each independently a hydrocarbon group having 5 or more and 18 or less carbon atoms; A¹ and A² are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M¹ is a hydrogen atom or a cation;

<Component (b)>

an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a); and

<Component (c)>

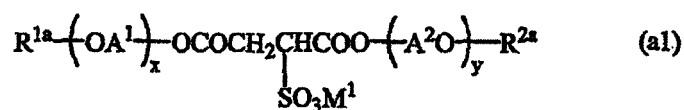
one or more amphoteric surfactants selected from sulfobetaines and carbobetaines.

[0008] One aspect of the present invention relates to a liquid detergent composition for removing oil from a hard surface, containing the following component (a), 0% by mass or more and less than 3% by mass of the following component (b), the following component (c), and water, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less. Hereinafter, when referring to the liquid detergent composition for a hard surface of the present invention, this liquid detergent composition for removing oil from a hard surface is encompassed.

<Component (a)>

A sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 2]



wherein R^{1a} and R^{2a} are each independently a hydrocarbon group having 5 or more and 18 or less carbon atoms; A^1 and A^2 are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M^1 is a hydrogen atom or a cation; <Component (b)> an anionic surfactant having a hydrocarbon group having 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a); and <Component (c)> one or more amphoteric surfactants selected from sulfobetaines and carbobetaines.

[0009] The present invention also relates to a method for washing a hard surface, including bringing the liquid detergent composition for a hard surface of the present invention into contact with a hard surface.

[0010] The present invention also relates to a method for washing a hard surface, including bringing the liquid detergent composition for a hard surface of the present invention into contact with a hard surface having adhered oily stains.

[0011] The present invention also relates to a detergent article for a hard surface accommodated in a spray container, wherein a sprayer-equipped container is filled with the liquid detergent composition for a hard surface of the present invention.

[0012] According to the present invention, it is possible to provide a liquid detergent composition for a hard surface, which has excellent detergency and is capable of washing off oily stains containing solid fat adhered to articles having hard surfaces such as plastics even without scrubbing with a flexible material such as sponge, i.e., without applying a mechanical force, a method for washing a hard surface, and a detergent article for a hard surface accommodated in a spray container.

Embodiments of the Invention

<Liquid detergent composition for hard a surface>

[0013] In the liquid detergent composition for a hard surface of the present invention, the content of the anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, which is component (b), is specified, and thereby the interaction between component (a) having two highly hydrophobic hydrocarbon groups and a highly hydrophilic sulfuric acid group and component (c) that is an amphoteric surfactant can be strengthened. It is presumed that, thereby, the surfactants contained in the liquid detergent composition for a hard surface of the present invention is likely to penetrate oily stains containing solid fat, thus the solid fat is easily removed from the hard surface and, as a result, the detergency increasing effect is obtained.

[0014] When the liquid detergent composition for a hard surface of the present invention is used in a method wherein the liquid detergent composition is directly brought into contact with a hard surface, the concentrations of the surfactants applied to the hard surface is higher than the concentrations when the liquid detergent composition is brought into contact with the hard surface by using a water-containing sponge. Therefore, the effects provided by the surfactants of the present invention are exerted more prominently.

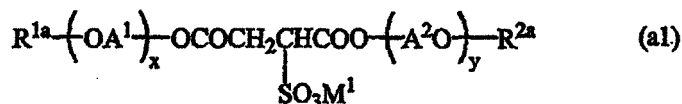
[0015] Accordingly, due to the use of the liquid detergent composition for a hard surface of the present invention,

excellent detergency can be obtained even by a washing method wherein oily stains containing solid fat adhered to hard surfaces of plastics and the like are not scrubbed with a flexible material such as sponge, i.e., a mechanical force is not applied.

<Component (a)>

[0016] Component (a) of the present invention is a sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 3]



[0017] wherein R^{1a} and R^{2a} are each a hydrocarbon group having 5 or more and 18 or less carbon atoms; A^1 and A^2 are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M^1 is a hydrogen atom or a cation.

[0018] In general formula (a1), R^{1a} and R^{2a} are each independently a hydrocarbon group having 5 or more, preferably 6 or more, and more preferably 7 or more carbon atoms, and 18 or less, preferably 16 or less, and further preferably 14 or less carbon atoms, and preferably a linear or branched alkyl group. R^{1a} and R^{2a} are more preferably each independently an alkyl group having a branched structure.

[0019] In general formula (a1), A^1 and A^2 are each independently an alkylene group having 2 or more carbon atoms, and 4 or less and preferably 3 or less carbon atoms.

[0020] In general formula (a1), x and y are each independently an average number of added moles and, from the viewpoint of detergency, 0 or more, and 6 or less, preferably 4 or less, and more preferably 2 or less, and 0 is more preferable.

[0021] From the viewpoint of detergency, $x+y$ is preferably 0 or more, and preferably 12 or less, more preferably 6 or less, further preferably 3 or less, and further preferably 0.

[0022] In general formula (a1), R^{1a} and R^{2a} are each preferably an alkyl group selected from a hexyl group, an octyl group, a nonyl group, a decyl group, a dodecyl group, a tridecyl group, a tetradecyl group, a 2-ethylhexyl group, a n -octyl group, a sec-octyl group, an isopentyl group, an isononyl group, an isodecyl group, and a cyclohexyl group, more preferably an alkyl group selected from a n -octyl group, a sec-octyl group, a decyl group, an isodecyl group, a tridecyl group, and a 2-ethylhexyl group, furthermore preferably a 2-ethylhexyl group or a tridecyl group, and furthermore preferably a 2-ethylhexyl group.

[0023] In general formula (a1), M^1 is a hydrogen atom, an inorganic cation such as sodium ion, ammonium ion, potassium ion, or magnesium ion, or an organic cation such as an acid salt of monoethanolamine, diethanolamine, triethanolamine, or morpholine, and is preferably an inorganic cation selected from sodium ion, ammonium ion, potassium ion, and magnesium ion.

[0024] The method for preparing component (a) is not particularly limited, and a compound wherein R^{1a} and R^{2a} are the same can be produced in reference to the method described in, for example, U.S. Patent. No. 2,028,091, and an asymmetrical compound wherein R^{1a} and R^{2a} are different can be produced in reference to, for example, JP-A 58-24555. In the case of using commercially available compounds, Pelex OT-P manufactured by Kao Corporation (a compound wherein both R^{1a} and R^{2a} are 2-ethylhexyl groups), Pelex TR (a compound wherein both R^{1a} and R^{2a} are tridecyl groups) manufactured also by Kao Corporation, Luensit A-BO manufactured by BASF (a compound wherein both R^{1a} and R^{2a} are 2-ethylhexyl groups), Aerol CT-1L manufactured by Toho Chemical Industry Co., Ltd. (a compound wherein both R^{1a} and R^{2a} are 2-ethylhexyl groups), Aerosol AY-100 available from Mitsui Cytec, Ltd. (a compound wherein both R^{1a} and R^{2a} are amyl groups), Aerosol A-196 (a compound wherein both R^{1a} and R^{2a} are cyclohexyl groups) available also from Mitsui Cytec, Ltd., and the like can be used. As a raw material of component (a), a material obtained by adding an alkylene oxide to an alcohol having a predetermined number of carbon atoms can be used as well.

[0025] From the viewpoint of detergency, the liquid detergent composition for a hard surface of the present invention contains component (a) in an amount of preferably 0.5% by mass or more, more preferably 0.8% by mass or more, further preferably 1% by mass or more, furthermore preferably 1.5% by mass or more, and furthermore preferably 1.7% by mass or more, and from the viewpoint of reducing the raw material cost, preferably 30% by mass or less, more

preferably 20% by mass or less, further preferably 15% by mass or less, furthermore preferably 10% by mass or less, furthermore preferably 8% by mass or less, furthermore preferably 5% by mass or less, and furthermore preferably 3% by mass or less.

[0026] In the present invention, the description (% by mass and mass ratio) concerning the mass of component (a) is based on the mass, assuming that M¹ is sodium (the ratio calculated based on the form of a sodium salt).

<Component (b)>

[0027] Component (b) of the present invention is an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a).

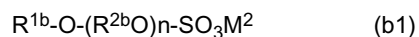
[0028] From the viewpoint of detergency, the hydrocarbon group of component (b) is preferably an alkyl group or an aryl group having 8 or more, preferably 10 or more, and more preferably 12 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms.

[0029] The anionic surfactant of component (b) is preferably one or more selected from an alkyl sulfate salt, a polyoxyalkylene alkyl ether sulfate salt, and an alkanesulfonate salt.

[0030] From the viewpoint of detergency, the anionic surfactant having a sulfate group is suitably an alkyl sulfate salt having a linear or branched alkyl group having 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms. From the viewpoint of detergency, the anionic surfactant having a sulfate group is suitably a polyoxyalkylene alkyl ether sulfate salt having a linear or branched alkyl group having 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms, and having a polyoxyalkylene group wherein the average number of moles of added oxyalkylene group having 2 or more and 3 or less carbon atoms is preferably 0.1 or more, more preferably 0.3 or more, and further preferably 0.4 or more, and preferably 6 or less, more preferably 3 or less, and further preferably 1.5 or less. From the viewpoint of detergency, the anionic surfactant having a sulfate group is suitably one or more anionic surfactants selected from an alkylbenzene sulfonate salt having an alkyl group with 6 or more and 15 or less carbon atoms, and an alkanesulfonate salt with 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms.

[0031] The salt of the anionic surfactant of component (b) is suitably an inorganic salt selected from a sodium salt, an ammonium salt, a potassium salt, a magnesium salt, or the like, or an organic ammonium salt selected from a monoethanol ammonium salt, a diethanol ammonium salt, a triethanol ammonium salt, a morpholine salt, or the like.

[0032] From the viewpoint of formulation stability and lathering property, component (b) is suitably a compound of the following general formula (b1):



wherein R^{1b} is a linear or branched alkyl group having 8 or more and 21 or less carbon atoms; R^{2b} is an ethylene group and/or a propylene group; n is an average number of added moles and is 0 or more and 6 or less; and M² is a hydrogen atom or a cation and preferably an inorganic or organic cation.

[0033] In general formula (b1), from the viewpoint of detergency, R^{1b} is a linear or branched alkyl group having 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms, and preferably a linear alkyl group. Specifically, R^{1b} is preferably an alkyl group selected from an octyl group, a decyl group, a dodecyl group, a tridecyl group, and a tetradecyl group, and more preferably a dodecyl group.

[0034] In general formula (b1), from the viewpoint of detergency, n is preferably 0.1 or more, more preferably 0.3 or more, and further preferably 0.4 or more, and preferably 6 or less, more preferably 3 or less, and further preferably 1.5 or less.

[0035] In general formula (b1), when R^{2b} is an ethylene group, from the viewpoint of detergency, n is a number of preferably 0.1 or more and more preferably 0.5 or more, and preferably 6 or less and more preferably 3 or less.

[0036] In general formula (b1), when R^{2b} is a propylene group, from the viewpoint of detergency, n is preferably 0.1 or more, more preferably 0.2 or more, and further preferably 0.4 or more, and preferably 1.5 or less, more preferably 1.0 or less, and further preferably 0.8 or less.

[0037] In general formula (b1), when R^{2b} is an ethylene group and a propylene group, n can be selected from these ranges.

[0038] In general formula (b1), M² is a hydrogen atom, an inorganic cation such as sodium ion, ammonium ion, potassium ion, or magnesium ion, or an organic cation such as monoethanol ammonium ion, diethanol ammonium ion, triethanol ammonium ion, or morpholine, and preferably an inorganic cation of sodium ion, potassium ion, ammonium ion, or magnesium ion.

[0039] The method for preparing the compound of general formula (b1) is not particularly limited, and the compound

is produced by, for example, adding a predetermined amount of ethylene oxide and/or propylene oxide to a fatty alcohol represented by R^{1b} -OH according to the purpose, then forming a sulfuric acid ester with a sulfating agent selected from sulfur trioxide (liquid or gas), sulfur trioxide-containing gas, fuming sulfuric acid, and chlorosulfonic acid, and neutralizing the sulfuric acid ester with a predetermined alkali agent. The addition reaction of ethylene oxide (hereinafter referred to as EO) and/or propylene oxide (hereinafter referred to as PO) requires a catalyst, and an alkali hydroxide such as NaOH or KOH can be used. A catalyst primarily composed of magnesium oxide as described in JP-A 8-323200 can be used. The former makes it possible to obtain polyoxyethylene alkyl ether having a relatively broad distribution of the number of moles added, and the latter makes it possible to obtain a compound having a relatively narrow distribution of the number of moles added. As disclosed in JP-A 10-158384, it is also possible to control the distribution of the number of moles added by using an alkali catalyst and a metal oxide catalyst in combination.

[0040] In the case of obtaining a compound of general formula (b1) wherein R^{1b} is an alkyl group having a branched structure suitable when n is 0, examples of the raw-material alcohol represented by R^{1b} -OH include an alcohol obtained by hydroformylating 1-alkene having 8 or more and 14 or less carbon atoms (an alkyl group in which a methyl group is branched at the β position relative to the OH group is contained in an amount of 15% by mol or more and 70% by mol or less), a Guerbet-type alcohol obtained by condensing an aldehyde having 4 or more and 8 or less carbon atoms and then reducing the condensate (an alcohol having a structure in which an alkyl group having 3 or more and 6 or less carbon atoms is branched at the β position relative to the OH group is contained in an amount of 100% by mol), 3,5,5-trimethylhexanol obtained by hydroformylating an isobutene dimer, multibranched tridecanol obtained by hydroformylating an isobutene trimer (the branching ratio is 100% by mol), and a synthetic alcohol obtained from petroleum or coal as a raw material (an alkyl group having a branching ratio of about 20% by mol or more and 100% by mol or less).

[0041] In the present invention, component (b) is preferably a compound represented by general formula (b1), wherein a linear alkyl group having preferably 8 or more and further preferably 10 or more, and preferably 18 or less, further preferably 14 or less, and further preferably 12 or less carbon atoms is contained as R^{1b} , a propylene group is contained as R^{2b} , and n is preferably 0.1 or more, further preferably 0.2 or more, and further preferably 0.4 or more, and preferably 1.5 or less, further preferably 1.0 or less, and further preferably 0.8 or less.

[0042] In the present invention, the description (% by mass and mass ratio) concerning the mass of component (b) is based on the mass, assuming that M^2 in general formula (b1) of component (b) is sodium (the ratio calculated in terms of a sodium salt).

[0043] From the viewpoint of detergency, the liquid detergent composition for a hard surface of the present invention contains component (b) in an amount of 0% by mass or more and less than 3% by mass, preferably 2.5% by mass or less, further preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, and further preferably less than 0.1% by mass. The content of component (b) in the composition may be 0% by mass.

[0044] From the viewpoint that the specific foam volume can be increased when the liquid detergent composition for a hard surface of the present invention is used in a foam form, the liquid detergent composition for a hard surface of the present invention contains component (b) in an amount of preferably 0.1% by mass or more, more preferably 0.3% by mass or more, further preferably 0.5% by mass or more, and furthermore preferably 1% by mass or more. The upper limit in this case can be selected from the above range.

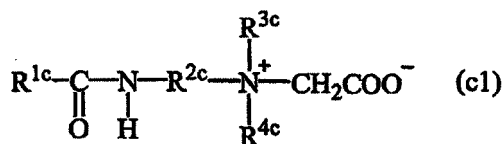
<Component (c)>

[0045] Component (c) of the present invention is one or more amphoteric surfactants selected from sulfobetaines and carbobetaines. From the viewpoint of detergency, sulfobetaine is preferable.

[0046] Examples of sulfobetaine include N-alkyl-N,N-dimethyl-N-sulfopropylammonium sulfobetaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms, N-alkyl-N,N-dimethyl-N-(2-hydroxysulfopropyl)ammonium sulfobetaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms, N-alkanoylamino-N,N-dimethyl-N-sulfopropylammonium sulfobetaine having an alkanoyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms, and N-alkanoylamino-N,N-dimethyl-N-(2-hydroxysulfopropyl)ammonium sulfobetaine having an alkanoyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms.

[0047] Examples of carbobetaine include N-alkyl-N,N-dimethyl-N-carboxymethylammonium betaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms, and a compound represented by the following general formula (c1). From the viewpoint of detergency, the compound represented by general formula (c1) is preferable.

[Formula 4]



[0048] wherein R^{1c} represents an alkyl group or an alkenyl group having 7 or more and 21 or less carbon atoms, R^{2c} represents a propylene group, and R^{3c} and R^{4c} each independently represent an alkyl group having 1 or more and 3 or less carbon atoms.

[0049] In general formula (c1), R^{1c} is an alkyl group or an alkenyl group having preferably 9 or more and more preferably 11 or more, and preferably 15 or less and more preferably 13 or less, and is preferably a nonyl group, a decyl group, an undecyl group, a dodecyl group, or a tridecyl group.

[0050] In general formula (c1), R^{3c} and R^{4c} are preferably each independently a methyl group.

[0051] Examples of the compound represented by general formula (c1) include almond amidopropyl betaine, apricot amidopropyl betaine, avocado amidopropyl betaine, babasu amidopropyl betaine, behenamidopropyl betaine, canola amidopropyl betaine, capryl/capramidopropyl betaine, cocamidopropyl betaine, coco/oleamidopropyl betaine, isostearamidopropyl betaine, lauramidopropyl betaine, milk amidopropyl betaine, mink amidopropyl betaine, myristamidopropyl betaine, oleanamidopropyl betaine, olive amidopropyl betaine, palmamidopropyl betaine, palmitamidopropyl betaine, ricinoleic acid amidopropyl betaine, sesamidopropyl betaine, soyamidopropyl betaine, stearamidopropyl betaine, beef tallow amidopropyl betaine, undecylene amidopropyl betaine, and wheat germ amidopropyl betaine. The compound represented by general formula (c1) is preferably one or more selected from lauramidopropyl betaine, myristamidopropyl betaine, oleanamidopropyl betaine, and beef tallow amidopropyl betaine. These are compounds of general formula (c1) wherein R^{3c} and R^{4c} are both methyl groups.

[0052] From the viewpoint of detergency, the liquid detergent composition for a hard surface of the present invention contains component (c) in an amount of preferably 0.1% by mass or more, more preferably 0.3% by mass or more, further preferably 0.5% by mass or more, furthermore preferably 1% by mass or more, and furthermore preferably 1.5% by mass or more, and from the viewpoint of reducing the raw material cost, preferably 30% by mass or less, more preferably 20% by mass or less, further preferably 15% by mass or less, furthermore preferably 10% by mass or less, furthermore preferably 8% by mass or less, furthermore preferably 5% by mass or less, and furthermore preferably 3% by mass or less.

[0053] In the liquid detergent composition for a hard surface of the present invention, the total content of component (a), component (b), and component (c) is, from the viewpoint of detergency, preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably more than 2% by mass, further preferably 2.5% by mass or more, further preferably 3% by mass or more, and furthermore preferably 4% by mass or more, and from the viewpoint of good dischargeability, from the viewpoint of reducing the raw material cost of the surfactants, and from the viewpoint of reducing the amount of solvent, preferably 40% by mass or less, more preferably 35% by mass or less, further preferably 30% by mass or less, further preferably 25% by mass or less, further preferably 20% by mass or less, further preferably 18% by mass or less, further preferably 15% by mass or less, and furthermore preferably 10% by mass or less. In the liquid detergent composition for a hard surface of the present invention and preferably the liquid detergent composition for a hard surface of the present invention used in a method wherein the composition is brought into contact with the hard surface and washing is made without applying a mechanical force, 0.1% by mass, 0.64% by mass, 2% by mass, and/or 20% by mass can be subtracted from the total content of component (a), component (b), and component (c).

[0054] In the liquid detergent composition for a hard surface of the present invention, the proportion of the total content of component (a), component (b), and component (c) in the entirety of the surfactants is, from the viewpoint of detergency, preferably 50% by mass or more, more preferably 60% by mass or more, further preferably 70% by mass or more, furthermore preferably 80% by mass or more, and furthermore preferably 90% by mass or more, and preferably 100% by mass or less.

[0055] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (a)/[component (a)+component (b)+component (c)], which is the mass ratio of the content of component (a) to the total content of component (a), component (b), and component (c) is, from the viewpoint of detergency, preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and from the same viewpoint, preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less. [Component

(a)+component (b)+component (c)] means the total content of component (a), component (b), and component (c) (the same also applies to the mass ratio below).

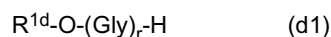
[0056] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (b)/[component (a)+component (b)+component (c)], which is the mass ratio of the content of component (b) to the total content of component (a), component (b), and component (c) is, from the viewpoint of detergency, 0.3 or less, preferably less than 0.3, preferably 0.26 or less, more preferably 0.2 or less, further preferably less than 0.2, further preferably 0.15 or less, further preferably less than 0.15, and furthermore preferably 0.1 or less. In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (b)/[component (a)+component (b)+component (c)] is, from the viewpoint of the specific foam volume that the specific foam volume can be increased when the liquid detergent composition for a hard surface of the present invention is used in a foam form, 0 or more, preferably 0.03 or more, more preferably 0.05 or more, further preferably 0.07 or more, further preferably 0.1 or more, further preferably 0.15 or more, and further preferably 0.2 or more. The mass ratio of component (b)/[component (a)+component (b)+component (c)] may be 0.

[0057] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (c)/[component (a)+component (b)+component (c)], which is the mass ratio of the content of component (c) to the total content of component (a), component (b), and component (c) is, from the viewpoint of detergency, preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and from the same viewpoint, preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

[0058] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (a)/component (c), which is the mass ratio of the content of component (a) to the content of component (c) is, from the viewpoint of detergency, preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.4 or more, further preferably 0.5 or more, and further preferably 0.6 or more, and from the viewpoint of storage stability and detergency, preferably 10 or less, more preferably 8 or less, further preferably 7 or less, further preferably 6 or less, further preferably 5 or less, further preferably 4 or less, further preferably 3 or less, and furthermore preferably 2 or less, and from the viewpoint of storage stability, further preferably 1 or less and further preferably 0.8 or less.

<Component (d) >

[0059] From the viewpoint of detergency, the liquid detergent composition for a hard surface of the present invention can contain an alkyl glyceryl ether as component (d). Examples of component (d) include alkyl monoglyceryl ethers having an alkyl group with 6 or more and 18 or less carbon atoms. Specifically, the compound of the following general formula (d1) is suitable.



wherein R^{1d} represents an alkyl group having 6 or more and 18 or less carbon atoms, Gly represents a constitutional unit derived from glycerin and preferably represents a residue obtained by removing one hydroxy group and one hydrogen atom from glycerin, and r represents a number of 1 or more and 4 or less.

[0060] In general formula (d1), examples of R^{1d} include alkyl groups having preferably 6 or more carbon atoms and more preferably 8 or more carbon atoms, and preferably 18 or less carbon atoms and more preferably 12 or less carbon atoms, and an octyl group, a 2-ethylhexyl group, a decyl group, and a dodecyl group are preferable. Preferably r is 1.

[0061] From the viewpoint of detergency, the liquid detergent composition for a hard surface of the present invention contains component (d) in an amount of preferably 0.1% by mass or more, more preferably 0.2% by mass or more, and further preferably 0.5% by mass or more, and preferably 6% by mass or less, more preferably 4% by mass or less, and further preferably 2% by mass or less.

<Component (e)>

[0062] From the viewpoint of detergency and formulation stability, the liquid detergent composition for a hard surface of the present invention preferably contains a solvent as component (e). The solvent is preferably a water-soluble organic solvent having preferably 2 or more carbon atoms and more preferably 3 or more carbon atoms and preferably 10 or less carbon atoms and more preferably 8 or less carbon atoms, and as specific examples, water-soluble organic solvents selected from ethanol, isopropyl alcohol, ethylene glycol, propylene glycol, diethylene glycol, dipropylene glycol, glycerin, isoprene glycol, propylene glycol monomethyl ether, propylene glycol monoethyl ether, 3-methyl-3-methoxybutanol, phenoxyethanol, phenylglycol, phenoxyisopropanol, butyl diglycol (diethylene glycol monobutyl ether), dibutylene diglycol, and benzyl alcohol are more preferable. In particular, one or more water-soluble organic solvents selected from butyl diglycol, ethanol, and propylene glycol are more preferable. Here, the water-soluble organic solvent refers to a

solvent having an octanol/water partition coefficient (LogPow) of 3.5 or less.

[0063] In component (e), the proportion of butyl diglycol is preferably 25% by mass or more and more preferably 50% by mass or more, and preferably 100% by mass or less.

[0064] In component (e), the proportion of ethanol is preferably 50% by mass or less, more preferably 25% by mass or less, and further preferably 10% by mass or less.

[0065] From the viewpoint of detergency and formulation stability, the liquid detergent composition for a hard surface of the present invention contains component (e) in an amount of preferably 0.5% by mass or more, more preferably 2% by mass or more, and further preferably 4% by mass or more, and preferably 30% by mass or less, more preferably 20% by mass or less, and further preferably 10% by mass or less.

[0066] When the liquid detergent composition for a hard surface of the present invention contains component (e), the mass ratio of component (e)/[component (a)+component (c)], which is the mass ratio of the content of component (e) to the total content of component (a) and component (c) is, from the viewpoint of storage stability and detergency, preferably 0.5 or more, more preferably 1 or more, further preferably 1.2 or more, and furthermore preferably 1.5 or more, and from the same viewpoint, preferably 5 or less, more preferably 4 or less, further preferably 3 or less, furthermore preferably 2.1 or less, and furthermore preferably 2 or less.

[0067] The mass ratio of component (e)/[component (a)+component (b)+component (c)], which is the mass ratio of the content of component (e) to the total content of component (a), component (b), and component (c) is, from the viewpoint of storage stability and detergency, preferably 0.5 or more, more preferably 1 or more, further preferably 1.2 or more, and furthermore preferably 1.5 or more, and from the same viewpoint, preferably 5 or less, more preferably 4 or less, further preferably 3 or less, furthermore preferably 2.1 or less, and furthermore preferably 2 or less.

<Component (f)>

[0068] From the viewpoint of formulation stability, the liquid detergent composition for a hard surface of the present invention can contain a hydrotropic agent as component (f). The hydrotropic agent is preferably toluenesulfonic acid, xylenesulfonic acid, cumenesulfonic acid, or a sodium, potassium, or magnesium salt thereof, and in particular, p-toluenesulfonic acid or a salt thereof is preferable.

[0069] From the viewpoint of formulation stability, the liquid detergent composition for a hard surface of the present invention contains component (f) in an amount of preferably 0.5% by mass or more, more preferably 1% by mass or more, and further preferably 1.5% by mass or more, and preferably 15% by mass or less, more preferably 10% by mass or less, and further preferably 5% by mass or less.

<Component (g)>

[0070] From the viewpoint of foaming property and rinsing property, the liquid detergent composition for a hard surface of the present invention may contain a fatty acid having 8 or more and 22 or less carbon atoms or a salt thereof as component (g).

[0071] From the viewpoint of foaming property, rinsing property, and detergency, component (g) of the present invention is a fatty acid having preferably 8 or more and more preferably 10 or more carbon atoms, and preferably 22 or less, more preferably 18 or less, and further preferably 14 or less carbon atoms, or a salt thereof.

[0072] Examples of component (g) include octanoic acid, decanoic acid, lauric acid, myristic acid, palmitic acid, palmitoleic acid, stearic acid, oleic acid, linolic acid, linoleic acid, and salts thereof. Moreover, mixed fatty acids such as coconut fatty acid can be used as well. Examples of fatty acid salts include inorganic salts selected from sodium salts, potassium salts, magnesium salts, and ammonium salts, and organic amine salts such as monoethanol ammonium salts, diethanol ammonium salts, and triethanol ammonium salts. Sodium salts, potassium salts, and magnesium salts are preferable, and sodium salts and potassium salts are more preferable.

[0073] Component (g) is preferably decanoic acid, lauric acid, myristic acid, palmitic acid, or a salt thereof, more preferably one or more selected from decanoic acid, lauric acid, myristic acid, or a salt thereof, and furthermore preferably one or more selected from decanoic acid, lauric acid, or a salt thereof. From the viewpoint of formulation stability, component (g) preferably contains lauric acid or a salt thereof, and the proportion of lauric acid or a salt thereof in component (g) is preferably 20% by mass or more, more preferably 50% by mass or more, and further preferably 80% by mass or more, and preferably 100% by mass or less and more preferably 100% by mass.

[0074] From the viewpoint of foaming property and rinsing property, the liquid detergent composition for a hard surface of the present invention contains component (g) in an amount of preferably 0% by mass or more, and from the viewpoint of detergency, preferably 3% by mass or less, more preferably less than 3% by mass, further preferably 2.5% by mass or less, further preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, and further preferably less than 0.1% by mass. The content of

component (g) in the composition may be 0% by mass.

[0075] In the present invention, the description (% by mass and mass ratio) concerning the mass of component (g) is calculated in terms of a fatty acid.

[0076] From the viewpoint of foaming property and rinsing property, the liquid detergent composition for a hard surface of the present invention contains component (b) and component (g) in a total amount of preferably 0% by mass or more, and from the viewpoint of detergency, preferably less than 3% by mass, more preferably 2.5% by mass or less, further preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, and further preferably less than 0.1% by mass. The total content of component (b) and component (g) in the composition may be 0% by mass.

[0077] In the liquid detergent composition for a hard surface of the present invention, the total content of component (a), component (b), component (c), and component (g) is, from the viewpoint of detergency, preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably 3% by mass or more, and furthermore preferably 4% by mass or more, and from the viewpoint of reducing the raw material cost of the surfactants and from the viewpoint of reducing the amount of solvent, preferably 40% by mass or less, more preferably 35% by mass or less, further preferably 30% by mass or less, further preferably 25% by mass or less, further preferably 20% by mass or less, further preferably 15% by mass or less, and furthermore preferably 10% by mass or less.

[0078] In the liquid detergent composition for a hard surface of the present invention, the proportion of the total content of component (a), component (b), component (c), and component (g) in the entirety of the surfactants is, from the viewpoint of detergency, preferably 50% by mass or more, more preferably 60% by mass or more, further preferably 70% by mass or more, furthermore preferably 80% by mass or more, and furthermore preferably 90% by mass or more, and preferably 100% by mass or less.

[0079] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (a)/[component (a)+component (b)+component (c)+component (g)], which is the mass ratio of the content of component (a) to the total content of component (a), component (b), component (c), and component (g) is, from the viewpoint of detergency, preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and from the same viewpoint, preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

[0080] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of [component (b)+component (g)]/[component (a)+component (b)+component (c)+component (g)], which is the mass ratio of the total content of component (b) and component (g) to the total content of component (a), component (b), component (c), and component (g) is, from the viewpoint of detergency, preferably 0.3 or less, more preferably less than 0.3, further preferably 0.26 or less, further preferably 0.2 or less, further preferably less than 0.2, further preferably 0.15 or less, further preferably less than 0.15, and furthermore preferably 0.1 or less. In the liquid detergent composition for a hard surface of the present invention, the mass ratio of [component (b)+component (g)]/[component (a)+component (b)+component (c)+component (g)] is, from the viewpoint of the specific foam volume that the specific foam volume can be increased when the liquid detergent composition for a hard surface of the present invention is used in a foam form, 0 or more, preferably 0.03 or more, more preferably 0.05 or more, further preferably 0.07 or more, further preferably 0.1 or more, further preferably 0.15 or more, and further preferably 0.2 or more. The mass ratio of [component (b)+component (g)]/[component (a)+component (b)+component (c)+component (g)] may be 0.

[0081] In the liquid detergent composition for a hard surface of the present invention, the mass ratio of component (c)/[component (a)+component (b)+component (c)+component (g)], which is the mass ratio of the content of component (c) to the total content of component (a), component (b), component (c), and component (g) is, from the viewpoint of detergency, preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and from the same viewpoint, preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

[0082] The liquid detergent composition for a hard surface of the present invention can contain components such as an antigelling agent such as polyalkylene glycol, a thickener such as polyacrylic acid, an enzyme, a perfume, a dye, a pigment, a bactericide, a preservative, and a pH adjuster.

[0083] In the liquid detergent composition for a hard surface of the present invention, the content of solids is, from the viewpoint of detergency, preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably 3% by mass or more, furthermore preferably 4% by mass or more, and from the viewpoint of reducing the raw material cost and from the viewpoint of dischargeability when a sprayer-equipped container is used, preferably 60% by mass or less, more preferably 50% by mass or less, further preferably 45% by mass or less, further preferably 40% by mass or less, further preferably 35% by mass or less, further preferably 30% by mass or less, and furthermore preferably 28% by mass or less.

[0084] Here, the solids refer to components (a) to (c) and other optional components, i.e., components other than water.

[0085] The liquid detergent composition for a hard surface of the present invention contains water. That is to say, other than components (a) to (c) and optional components, the remainder is water. The liquid detergent composition for a hard surface of the present invention contains water in an amount of preferably 30% by mass or more, more preferably 50% by mass or more, more preferably 60% by mass or more, and further preferably 70% by mass or more, and preferably 98% by mass or less, more preferably 95% by mass or less, and more preferably 90% by mass or less. Ion exchanged water, sterilized ion exchange water, or the like is preferably used as water.

[0086] From the viewpoint of mildness to the hand, the pH of the liquid detergent composition for a hard surface of the present invention at 25°C is preferably 2 or higher, more preferably 4 or higher, and more preferably 5 or higher, and preferably 10 or lower, more preferably 9 or lower, and further preferably 8 or lower.

[0087] The viscosity of the liquid detergent composition for a hard surface of the present invention at 20°C is preferably 0.5 mPa·s or higher and more preferably 1 mPa·s or higher, and preferably 50 mPa·s or lower, more preferably 20 mPa·s or lower, further preferably 10 mPa·s or lower, furthermore preferably 7 mPa·s or lower, and furthermore preferably 5 mPa·s or lower. Viscosity can be regulated by a solvent, a hydrotropic agent, or the like.

[0088] The liquid detergent composition for a hard surface of the present invention is preferably for hard surfaces of hard articles, further for hard surfaces of dishes or hard articles around the kitchen, and further for hard surfaces of dishes. Moreover, it is preferably for hand-washing hard surfaces of hard articles, further for hand-washing hard surfaces of dishes or hard articles around the kitchen, and further for hand-washing hard surfaces of dishes.

[0089] Specifically, the liquid detergent composition for a hard surface of the present invention is preferably a detergent for application to hard surfaces of hard articles, more preferably a detergent for application to hard surfaces of dishes or hard articles around the kitchen, and further preferably a detergent for application to hard surfaces of dishes.

[0090] Specifically, the liquid detergent composition for a hard surface of the present invention is preferably a detergent for spraying onto hard surfaces of hard articles, more preferably a detergent for spraying onto hard surfaces of dishes or hard articles around the kitchen, and further preferably a detergent for spraying onto hard surfaces of dishes.

[0091] Examples of hard articles include food manufacturing equipment such as pipes and components, hard articles around the kitchen, and dishes. The liquid detergent composition for a hard surface of the present invention has excellent detergency against solid fat and is therefore intended for washing hard articles, preferably dishes and hard articles around the kitchen, and more preferably dishes.

[0092] The hard articles around the kitchen are articles used in the vicinity of the kitchen, and specifically are storage places for food, dishes, and cooking utensils, such as refrigerators and cupboards; drains, kitchen counters, range hoods, sinks, and places where food is cooked, such as gas ovens and microwave ovens; and the floor, wall, and the like located therearound. In the present invention, these are referred to as "hard articles around the kitchen" for convenience.

[0093] Specific examples of dishes include so-called dishes such as plates and bowls; storage containers such as Tupperware containers and bottles; cooking utensils such as kitchen knives, cutting boards, pots, frying pans, and fish grills; and items and utensils with which food is brought into contact, such as household electric cooking appliances such as food processors, and mixers. In the present invention, these are referred to as "dishes" for convenience.

[0094] The liquid detergent composition for a hard surface of the present invention is preferably for articles selected from dishes, storage containers, cooking utensils, and household electric cooking appliances, and further it is more preferably for articles selected from plates, bowls, Tupperware containers, bottles, kitchen knives, cutting boards, pots, frying pans, fish grills, food processors, and mixers.

[0095] Examples of materials of hard surfaces, further hard surfaces of dishes and around the kitchen, and further hard surfaces of dishes that the present invention is intended for washing include plastics (including silicone resin), metal, earthenware, wood, and combinations thereof.

<Method for washing hard surface>

[0096] The method for washing a hard surface of the present invention is a method for washing a hard surface including bringing the liquid detergent composition for a hard surface of the present invention into contact with a hard surface.

[0097] That is to say, in the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface of the present invention is used. Preferable embodiments of the composition are the same as the liquid detergent composition for a hard surface of the present invention described above.

[0098] The method for washing a hard surface of the present invention can be suitably performed as a method for washing a hard surface including bringing the liquid detergent composition for a hard surface of the present invention into contact with a hard surface having adhered oily stains, and further a hard surface having adhered oily stains containing solid fat.

[0099] These methods are methods for washing a hard surface including bringing the liquid detergent composition for a hard surface of the present invention into contact with oily stains adhered to a hard surface.

[0100] In one aspect, the present invention provides a method for washing a hard surface including bringing the liquid detergent composition for removing oil from a hard surface of the present invention into contact with a hard surface having adhered oily stains.

[0101] Oily stains containing solid fat are stains containing a fat-and-oil, and this fat-and-oil takes on a solid form at ordinary temperature (for example, 20°C). Oily stains containing solid fat are typically oily stains containing solid fat, and further oily stains containing solid fat and liquid oil. The form of the oily stains containing solid fat when the liquid detergent composition for a hard surface is brought into contact may be in a state where solid fat and liquid oil are concomitantly present.

[0102] The method for washing a hard surface of the present invention can be performed with a liquid detergent composition for a hard surface, wherein the mass ratio of component (b)/[component (a)+component (b)+component (c)] as in the above liquid detergent composition for a hard surface is, from the viewpoint of the specific foam volume, preferably 0.15 or more and more preferably 0.2 or more, and 0.3 or less.

[0103] The method for washing a hard surface of the present invention can be performed with a liquid detergent composition for a hard surface, wherein the mass ratio of component (b)/[component (a)+component (b)+component (c)] as in the above liquid detergent composition for a hard surface is, from the viewpoint of detergency, preferably less than 0.2 and preferably 0 or more.

[0104] In the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface of the present invention is brought into contact with a hard surface.

[0105] A specific example is a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface without dilution, or that is to say, the liquid detergent composition for a hard surface is not diluted to be brought into contact with a hard surface. Further examples include a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains without dilution, and preferably a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains containing solid fat without dilution.

[0106] Bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains containing solid fat without dilution means not bringing the detergent composition into contact with a hard surface having adhered oily stains containing solid fat after intentionally diluting the composition with water or the like. For example, when the liquid detergent composition is brought into contact with a hard surface having droplets of water or the like, or the liquid detergent composition is brought into contact with a hard surface and then droplets of water are attached on the hard surface, it can be understood that the liquid detergent composition is brought into contact with a hard surface having adhered oily stains containing solid fat without dilution.

[0107] In the present invention, an undiluted solution of the liquid detergent composition for a hard surface is applied to the hard surface as-is, i.e., without changing the composition. For example, the liquid detergent composition for a hard surface is brought into contact with a hard surface having adhered oily stains containing solid fat without being applied to a water-containing sponge. After the liquid detergent composition for a hard surface is brought into contact with a hard surface, the composition of the liquid detergent composition for a hard surface may be changed. That is to say, after the liquid detergent composition for a hard surface is brought into contact with a hard surface, the composition of the liquid detergent composition for a hard surface may be diluted or concentrated.

[0108] The method for washing a hard surface of the present invention may include preparing a concentrated composition containing component (a), component (b), and component (c) of the present invention in advance, diluting the concentrated composition with water to prepare the liquid detergent composition for a hard surface of the present invention, and bringing the liquid detergent composition for a hard surface into contact with a hard surface. That is to say, it may be a method for washing a hard surface including diluting a concentrated composition containing component (a), component (b), and component (c) of the present invention with water to prepare the liquid detergent composition for a hard surface of the present invention, and bringing the liquid detergent composition for a hard surface into contact with a hard surface without dilution.

[0109] An example of the method for washing a hard surface of the present invention is a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface and then leaving the liquid detergent composition for a hard surface to stand without applying a mechanical force. This method is suitable for washing a site that is not reached, or a small part that is unlikely to be reached, by hand or a tool.

[0110] Leaving to stand without applying a mechanical force means that no intentional operation for washing is performed other than bringing the composition into contact. For example, allowing the contacted composition to spontaneously flow down on the surface of a hard surface, allowing vibrations that are not intended for washing to be transmitted to a hard surface, and the like can be understood as leaving to stand without applying a mechanical force.

[0111] That is to say, an example of the washing method of the present invention is a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface without using a flexible material such as sponge and leaving the liquid detergent composition for a hard surface to stand as-is without applying a mechanical force.

[0112] After being left to stand, the liquid detergent composition is usually rinsed off with water. During rinsing, a mechanical force (a physical force) may be applied by hand or the like, or rinsing may simply be performed with running water.

[0113] An example of the washing method of the present invention is a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains containing solid fat, leaving the liquid detergent composition to stand as-is without applying a mechanical force by not performing any of washing with a flexible material, washing with running water, and washing with ultrasonic waves. That is to say, an example of the washing method of the present invention is a washing method including bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains containing solid fat and leaving the liquid detergent composition to stand as-is without applying a mechanical force without using any of frictional force by a flexible material such as sponge, force of running water by, for example, shower in an automatic dishwasher, and vibrations by ultrasonic waves.

[0114] In the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface is preferably brought into contact or, further, applied or sprayed in a proportion of preferably 0.1 g or more, more preferably 0.3 g or more, and further preferably 0.4 g or more, and preferably 5 g or less, more preferably 3 g or less, and further preferably 2 g or less, per 100 cm² of the area of the target hard surface.

[0115] In the method for washing a hard surface of the present invention, from the viewpoint of increasing detergency, the liquid detergent composition for a hard surface is brought into contact with a hard surface and then left to stand without applying a mechanical force for preferably 10 seconds or longer, more preferably 20 seconds or longer, further preferably 30 seconds or longer, further preferably 40 seconds or longer, furthermore preferably 50 seconds or longer, and furthermore preferably 1 minute or longer, and from the viewpoint of shortening the washing time, preferably 60 minutes or shorter, more preferably 30 minutes or shorter, further preferably 20 minutes or shorter, more preferably 10 minutes or shorter, and furthermore preferably 5 or shorter. In this case, the time when the composition is brought into contact with a hard surface for the first time may be regarded as the start of leaving the composition to stand.

[0116] The temperature when leaving the composition to stand may be room temperature and is, for example, 10°C or higher and 30°C or lower.

[0117] In the method for washing a hard surface of the present invention, from the viewpoint of increasing detergency, the liquid detergent composition is brought into contact with a hard surface, which is the washing target, for preferably 10 seconds or longer, more preferably 20 seconds or longer, further preferably 30 seconds or longer, further preferably 40 seconds or longer, furthermore preferably 50 seconds or longer, and furthermore preferably 1 minute or longer, and from the viewpoint of shortening the washing time, preferably 60 minutes or shorter, more preferably 30 minutes or shorter, further preferably 20 minutes or shorter, furthermore preferably 10 minutes or shorter, and more preferably 5 or shorter. The temperature during contacting is room temperature, for example, 10°C or higher and 30°C or lower.

[0118] In the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface may be brought into contact with a hard surface having adhered oily stains by immersing the hard surface in the composition, and from the viewpoint of efficiently increasing detergency, a method including spraying or applying the composition to bring it into contact with a hard surface having adhered oily stains is preferable.

[0119] The method for bringing the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains is preferably spraying or applying, and a method wherein the liquid detergent composition for a hard surface is made into droplets for spraying or foamed for application is preferable. Specifically, it is preferable to bring the liquid detergent composition for a hard surface into contact with a hard surface having adhered oily stains by using a spraying means. That is to say, it is preferable to use a detergent article for a hard surface, wherein a sprayer-equipped container is filled with the liquid detergent composition for a hard surface of the present invention. The present invention provides a detergent article for a hard surface accommodated in a spray container, wherein a sprayer-equipped container is filled with the liquid detergent composition for a hard surface of the present invention. From the viewpoint of exerting the effect of the present invention, the hard surface having oily stains is preferably a hard surface having adhered oily stains containing solid fat.

[0120] Examples of the sprayer-equipped container to be filled with the liquid detergent composition for a hard surface of the present invention in the detergent article for a hard surface accommodated in a spray container of the present invention include manual-type spray apparatuses that do not use propellants, such as trigger-type spray containers and pump-type spray containers, and aerosols that use propellants. Trigger-type sprays capable of spraying or applying the contents in a droplet form or in a foam form are preferable, and trigger-type sprays provided with a mechanism for spraying the contents in a droplet form or trigger-type sprays provided with a mechanism for forming foam (a foam forming mechanism) are more preferable.

[0121] In the detergent article for a hard surface accommodated in a spray container of the present invention, in the case of using a trigger-type spray provided with a mechanism for spraying the liquid detergent composition for a hard surface of the present invention in a droplet form, the nozzle hole diameter of the spray nozzle of the spray container for accommodating the composition is in a range of preferably 0.1 mm or more and more preferably 0.3 mm or more,

and preferably 2 mm or less and more preferably 1 mm or less for the ease of spraying, for avoiding coarse sprayed droplets, for avoiding spraying in a linear manner, and for avoiding an extremely small sprayable area.

[0122] In the case of using a trigger-type spray provided with a mechanism for spraying the composition in a droplet form, the detergent article for a hard surface accommodated in a spray container of the present invention sprays preferably 0.1 mL or more and more preferably 0.3 mL or more, and preferably 5 mL or less and more preferably 2 mL or less, of the composition per operation.

[0123] In the detergent article for a hard surface accommodated in a spray container of the present invention, in the case of using a trigger-type spray provided with a foam forming mechanism, the spray suitably has a spin element and a liquid passing plate including several rod-like projections in a circular space having a diameter of 4 to 8 mm. Here, the spin element is a mechanism that imparts spin to the flow of liquid matter through the spin element and eventually discharges it from the nozzle, and JP-A 8-332422, Figure 4(b) of JP-A 8-108102, and Figure 1 of JP-A 2002-68265, and the like can be referred to for the detailed structure thereof.

[0124] In the case of using a trigger-type spray provided with a foam forming mechanism, the detergent article for a hard surface accommodated in a spray container of the present invention sprays preferably 0.5 mL or more and more preferably 1 mL or more, and preferably 30 mL or less, more preferably 15 mL or less, and further preferably 5 mL or less, of the composition per operation.

[0125] The liquid passing plate that is another member of the foam forming mechanism includes preferably 3 to 8 rod-like projections in a circular space having a diameter of 5 to 7 mm, and rod-like projections preferably in a rectangular shape having a width of 0.8 to 1.2 mm and a length of 2 to 4 mm when the plate that is passed through is viewed in a planar manner are suitable. The area occupied by the rod-like projections relative to the space excluding the rod-like projections is preferably 30% by area or more and more preferably 40% by area or more, and preferably 90% by area or less, more preferably 80% by area or less, and further preferably 70% by area or less. With such a liquid passing plate being provided, the adhesion and retention of foam on a vertical surface are favorable.

[0126] A commonly used container can be used as the container of the detergent article for a hard surface accommodated in a spray container of the present invention. For example, the container is obtained from polyethylene, polypropylene, or polyethylene terephthalate as a raw material, and can be produced by blow molding or the like. The thickness of the container may be different between the bottom surface and the side surface and is preferably 0.01 to 2 mm, and the volume of the container is preferably 100 to 1000 mL. The amount of the liquid detergent composition for a hard surface with which the container is filled is desirably 200 to 500 mL in terms of handling. In addition, filling with liquid is performed so as to leave a common-sense level of vacant space.

[0127] The method for washing a hard surface of the present invention is preferable as a method for washing hard surfaces of hard articles, further hard surfaces of dishes and hard articles around the kitchen, and further hard surfaces of dishes. Moreover, it is preferable as a method for hand-washing hard surfaces of hard articles, further a method for hand-washing hard surfaces of dishes and hard articles around the kitchen, and further a method for hand-washing hard surfaces of dishes.

[0128] The method for washing a hard surface of the present invention is intended for washing hard surfaces of hard articles, preferably hard surfaces of dishes and hard articles around the kitchen, and more preferably hard surfaces of dishes.

[0129] Examples of the hard articles, dishes, and hard articles around the kitchen include those described above.

[0130] The method for washing a hard surface of the present invention is preferably intended for hard surfaces of articles selected from dishes, storage containers, cooking utensils, and household electric cooking appliances and, further, more preferably intended for hard surfaces of articles selected from plates, bowls, Tupperware containers, bottles, kitchen knives, cutting boards, pots, frying pans, fish grills, food processors, and mixers.

[0131] Examples of materials of hard surfaces for which the method for washing a hard surface of the present invention is intended include plastics (including silicone resin), metal, earthenware, wood, and combinations thereof.

[0132] The method for washing a hard surface of the present invention can effectively wash off oily stains containing solid fat adhered to these hard surfaces.

[0133] In the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface of the present invention is directly brought into contact with a hard surface. It is sufficient that the composition is left to stand in a state of being in contact, and therefore it is not necessary to apply a mechanical force as in scrubbing with a flexible material such as sponge during washing. Accordingly, the method for washing a hard surface of the present invention can be applied also to hard articles on which it is inconvenient to perform hand washing such as pipes, components, and drains of food manufacturing equipment, refrigerators, cupboards, and the like, articles having hard surfaces on which oily stains containing solid fat covers a large area, such as storage places for food, dishes, and cooking utensils, kitchen counters, range hoods, sinks, and places where food is cooked such as gas ovens and microwave ovens, and the floor, wall, and like places therearound, articles on which it is dangerous to perform hand washing such as kitchen knives, peelers, graters, slicers, juicer blades, and food processor blades, articles on which it is inconvenient to perform hand washing such as water bottles, tumblers, kettles, and carafes, and articles on which it is difficult to

perform washing using a flexible material such as sponge, e.g., articles having portions with complex shapes. Note that scrubbing may be performed as necessary.

[0134] Further, in the method for washing a hard surface of the present invention, the liquid detergent composition for a hard surface of the present invention, preferably the composition in a foam form, is applied to a hard surface and left to stand as-is, and therefore the composition can be retained on the hard surface for a long period of time.

[0135] The method for washing a hard surface of the present invention can include a step of rinsing with water a hard surface that has been brought into contact with the liquid detergent composition for a hard surface, and preferably a step of rinsing with water a hard surface that has been brought into contact with the liquid detergent composition for a hard surface and then left to stand.

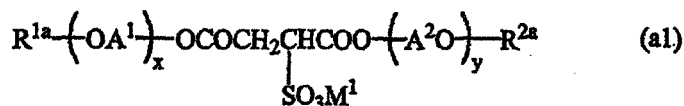
[0136] Concerning the embodiments described above, the present invention further discloses the following liquid detergent composition for a hard surface, method for washing a hard surface, detergent article for a hard surface accommodated in a spray container, and use. The matters described for the liquid detergent composition for a hard surface, method for washing a hard surface, and detergent article for a hard surface accommodated in a spray container of the present invention can be suitably applied to these embodiments mutually.

<1> A liquid detergent composition for a hard surface, containing the following component (a), 0% by mass or more and less than 3% by mass of the following component (b), the following component (c), and water, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less:

<Component (a)>

a sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 5]



wherein R^{1a} and R^{2a} are each a hydrocarbon group having 5 or more and 18 or less carbon atoms; A¹ and A² are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M¹ is a hydrogen atom or a cation;

<Component (b)>

an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a); and

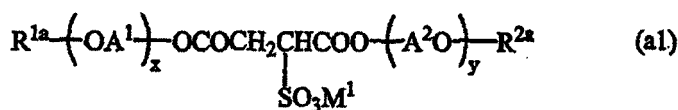
<Component (c)> one or more amphoteric surfactants selected from sulfobetaines and carboxobetaines.

<2> A liquid detergent composition for removing oil from a hard surface, containing the following component (a), 0% by mass or more and less than 3% by mass of the following component (b), the following component (c), and water, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less:

<Component (a)>

a sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 6]



wherein R^{1a} and R^{2a} are each a hydrocarbon group having 5 or more and 18 or less carbon atoms; A^1 and A^2 are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M^1 is a hydrogen atom or a cation;

<Component (b)>

an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to component (a); and

<Component (c)>

one or more amphoteric surfactants selected from sulfobetaines and carbobetaines.

<3> The liquid detergent composition for a hard surface according to <1> or <2>, wherein in general formula (a1), R^{1a} and R^{2a} are each independently a hydrocarbon group having 5 or more, preferably 6 or more, and more preferably 7 or more carbon atoms, and 18 or less, preferably 16 or less, and further preferably 14 or less carbon atoms, preferably a linear or branched alkyl group, and more preferably a branched alkyl group.

<4> The liquid detergent composition for a hard surface according to any one of <1> to <3>, wherein in general formula (a1), A^1 and A^2 are each independently an alkylene group having 2 or more carbon atoms, and 4 or less and preferably 3 or less carbon atoms.

<5> The liquid detergent composition for a hard surface according to any one of <1> to <4>, wherein in general formula (a1), x and y are each independently an average number of added moles, and 0 or more and 6 or less, preferably 4 or less, more preferably 2 or less, and furthermore preferably 0.

<6> The liquid detergent composition for a hard surface according to any one of <1> to <5>, wherein in general formula (a1), $x+y$ is preferably 0 or more and preferably 12 or less, more preferably 6 or less, further preferably 3 or less, and furthermore preferably 0.

<7> The liquid detergent composition for a hard surface according to any one of <1> to <6>, wherein in general formula (a1), R^{1a} and R^{2a} are each preferably an alkyl group selected from a hexyl group, an octyl group, a nonyl group, a decyl group, a dodecyl group, a tridecyl group, a tetradecyl group, a 2-ethylhexyl group, a *n*-octyl group, a *sec*-octyl group, an isopentyl group, an isononyl group, an isodecyl group, and a cyclohexyl group, more preferably an alkyl group selected from a *n*-octyl group, a *sec*-octyl group, a decyl group, an isodecyl group, and a 2-ethylhexyl group, further preferably a 2-ethylhexyl group or a tridecyl group, and furthermore preferably a 2-ethylhexyl group.

<8> The liquid detergent composition for a hard surface according to any one of <1> to <7>, wherein in general formula (a1), M^1 is preferably a hydrogen atom, or an inorganic cation such as sodium ion, ammonium ion, potassium ion, or magnesium ion, or an organic cation such as an acid salt of monoethanolamine, diethanolamine, triethanolamine, or morpholine, and is more preferably an inorganic cation selected from sodium ion, ammonium ion, potassium ion, and magnesium ion.

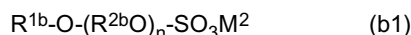
<9> The liquid detergent composition for a hard surface according to any one of <1> to <8>, containing component (a) in an amount of preferably 0.5% by mass or more, more preferably 0.8% by mass or more, further preferably 1% by mass or more, furthermore preferably 1.5% by mass or more, and furthermore preferably 1.7% by mass or more, and preferably 30% by mass or less, more preferably 20% by mass or less, further preferably 15% by mass or less, furthermore preferably 10% by mass or less, furthermore preferably 8% by mass or less, furthermore preferably 5% by mass or less, and furthermore preferably 3% by mass or less.

<10> The liquid detergent composition for a hard surface according to any one of <1> to <9>, wherein the hydrocarbon group of component (b) is an alkyl group or an aryl group having 8 or more, preferably 10 or more, and more preferably 12 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms.

<11> The liquid detergent composition for a hard surface according to any one of <1> to <10>, wherein component (b) is one or more anionic surfactants selected from an alkyl sulfate salt, a polyoxyalkylene alkyl ether sulfate salt, and an alkanesulfonate salt.

<12> The liquid detergent composition for a hard surface according to any one of <1> to <11>, wherein component (b) is one or more anionic surfactants selected from an alkyl sulfate salt having a linear or branched alkyl group with 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms, a polyoxyalkylene alkyl ether sulfate salt having a linear or branched alkyl group with 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms and a polyoxyalkylene group wherein the average number of moles of added oxyalkylene group having 2 or more and 3 or less carbon atoms is preferably 0.1 or more, more preferably 0.3 or more, and further preferably 0.4 or more, and preferably 6 or less, more preferably 3 or less, and further preferably 1.5 or less, and an alkylbenzene sulfonate salt having an alkyl group with preferably 6 or more and 15 or less carbon atoms, and an alkanesulfonate salt having 8 or more and preferably 10 or more, and 21 or less, preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms.

<13> The liquid detergent composition for a hard surface according to any one of <1> to <12>, wherein component (b) is a compound represented by the following general formula (b1):



wherein R^{1b} is a linear or branched alkyl group having 8 or more and 21 or less carbon atoms, R^{2b} is an ethylene group and/or a propylene group, n is an average number of added moles and is 0 or more and 6 or less, M^2 is a hydrogen atom or a cation and preferably an inorganic or organic cation.

<14> The liquid detergent composition for a hard surface according to <13>, wherein in general formula (b1), R^{1b} is a linear or branched alkyl group having preferably 8 or more and more preferably 10 or more, and preferably 18 or less, more preferably 14 or less, and further preferably 12 or less carbon atoms, and preferably a linear alkyl group.

<15> The liquid detergent composition for a hard surface according to <13> or <14>, wherein in general formula (b1), R^{1b} is an alkyl group selected from an octyl group, a decyl group, a dodecyl group, a tridecyl group, and a tetradecyl group, and preferably a dodecyl group.

<16> The liquid detergent composition for a hard surface according to any one of <13> to <15>, wherein in general formula (b1), n is a number of preferably 0.1 or more, more preferably 0.3 or more, and further preferably 0.4 or more, and preferably 6 or less, more preferably 3 or less, and further preferably 1.5 or less.

<17> The liquid detergent composition for a hard surface according to any one of <13> to <16>, wherein in general formula (b1), M^2 is a hydrogen atom, an inorganic cation, or an organic cation, preferably a hydrogen atom, an inorganic cation selected from sodium ion, ammonium ion, potassium ion, and magnesium ion, or an organic cation selected from monoethanol ammonium ion, diethanol ammonium ion, triethanol ammonium ion, and morpholine, and more preferably an inorganic cation selected from sodium ion, potassium ion, ammonium ion, and magnesium ion.

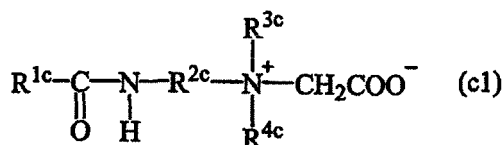
<18> The liquid detergent composition for a hard surface according to any one of <1> to <17>, containing component (b) in an amount of 0% by mass or more and less than 3% by mass, preferably 2.5% by mass or less, more preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, and further preferably less than 0.1% by mass, or containing 0% by mass.

<19> The liquid detergent composition for a hard surface according to any one of <1> to <18>, containing component (b) in an amount of preferably 0.1% by mass or more, more preferably 0.3% by mass or more, further preferably 0.5% by mass or more, and furthermore preferably 1% by mass or more.

<20> The liquid detergent composition for a hard surface according to any one of <1> to <19>, wherein the sulfobetaine is a sulfobetaine selected from N-alkyl-N,N-dimethyl-N-sulfopropylammonium sulfobetaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms; N-alkyl-N,N-dimethyl-N-(2-hydroxysulfopropyl)ammonium sulfobetaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms; N-alkanoylaminoethyl-N,N-dimethyl-N-sulfopropylammonium sulfobetaine having an alkanoyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms; and N-alkanoylaminoethyl-N,N-dimethyl-N-(2-hydroxysulfopropyl)ammonium sulfobetaine having an alkanoyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms.

<21> The liquid detergent composition for a hard surface according to any one of <1> to <20>, wherein the carboxobetaine is a carboxobetaine selected from N-alkyl-N,N-dimethyl-N-carboxymethylammonium betaine having an alkyl group with preferably 10 or more, and preferably 18 or less and more preferably 14 or less carbon atoms, and a compound represented by the following general formula (c1):

[Formula 7]



wherein R^{1c} represents an alkyl group or an alkenyl group having 7 or more and 21 or less carbon atoms, R^{2c} represents a propylene group, and R^{3c} and R^{4c} each independently represent an alkyl group having 1 or more and 3 or less carbon atoms.

<22> The liquid detergent composition for a hard surface according to <21>, wherein in general formula (c1), R^{1c}

is an alkyl group or an alkenyl group having preferably 9 or more and more preferably 11 or more, and preferably 15 or less and more preferably 13 or less, and further a nonyl group, a decyl group, an undecyl group, a dodecyl group, or a tridecyl group.

<23> The liquid detergent composition for a hard surface according to <21> or <22>, wherein in general formula (c1), R^{c3} and R^{c4} are preferably each independently a methyl group.

<24> The liquid detergent composition for a hard surface according to any one of <1> to <20>, wherein component (c) is preferably a sulfobetaine.

<25> The liquid detergent composition for a hard surface according to any one of <1> to <24>, containing component (c) in an amount of preferably 0.1% by mass or more, more preferably 0.3% by mass or more, further preferably 0.5% by mass or more, furthermore preferably 1% by mass or more, and furthermore preferably 1.5% by mass or more, and preferably 30% by mass or less, more preferably 20% by mass or less, further preferably 15% by mass or less, furthermore preferably 10% by mass or less, furthermore preferably 8% by mass or less, furthermore preferably 5% by mass or less, and furthermore preferably 3% by mass or less.

<26> The liquid detergent composition for a hard surface according to any one of <1> to <25>, wherein a total content of component (a), component (b), and component (c) is preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably more than 2% by mass, further preferably 2.5% by mass or more, further preferably 3% by mass or more, and furthermore preferably 4% by mass or more, and preferably 40% by mass or less, more preferably 35% by mass or less, further preferably 30% by mass or less, further preferably 25% by mass or less, further preferably 20% by mass or less, further preferably 18% by mass or less, further preferably 15% by mass or less, and furthermore preferably 10% by mass or less, and preferably 0.1% by mass, 0.64% by mass, 2% by mass, and/or 20% by mass can be subtracted from the total content of component (a), component (b), and component (c).

<27> The liquid detergent composition for a hard surface according to any one of <1> to <26>, wherein a proportion of a total content of component (a), component (b), and component (c) in an entirety of surfactants is preferably 50% by mass or more, more preferably 60% by mass or more, further preferably 70% by mass or more, furthermore preferably 80% by mass or more, and furthermore preferably 90% by mass or more, and preferably 100% by mass or less.

<28> The liquid detergent composition for a hard surface according to any one of <1> to <27>, wherein a mass ratio of component (a)/[component (a)+component (b)+component (c)] is preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

<29> The liquid detergent composition for a hard surface according to any one of <1> to <28>, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less, preferably less than 0.3, preferably 0.26 or less, more preferably 0.2 or less, further preferably less than 0.2, further preferably 0.15 or less, further preferably less than 0.15, and furthermore preferably 0.1 or less, or is 0.

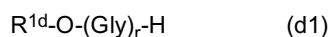
<30> The liquid detergent composition for a hard surface according to any one of <1> to <29>, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0 or more, preferably 0.03 or more, more preferably 0.05 or more, further preferably 0.07 or more, further preferably 0.1 or more, further preferably 0.15 or more, and further preferably 0.2 or more, or is 0.

<31> The liquid detergent composition for a hard surface according to any one of <1> to <30>, wherein a mass ratio of component (c)/[component (a)+component (b)+component (c)] is preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

<32> The liquid detergent composition for a hard surface according to any one of <1> to <31>, wherein a mass ratio of component (a)/component (c) is preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.4 or more, further preferably 0.5 or more, and further preferably 0.6 or more, and preferably 10 or less, more preferably 8 or less, further preferably 7 or less, further preferably 6 or less, further preferably 5 or less, further preferably 4 or less, further preferably 3 or less, furthermore preferably 2 or less, further preferably 1 or less, and further preferably 0.8 or less.

<33> The liquid detergent composition for a hard surface according to any one of <1> to <32>, containing an alkyl glyceryl ether as component (d).

<34> The liquid detergent composition for a hard surface according to <33>, wherein component (d) is preferably an alkyl monoglyceryl ether having an alkyl group with 6 or more and 18 or less carbon atoms and more preferably a compound of the following general formula (d1):



wherein R^{1d} represents an alkyl group having 6 or more and 18 or less carbon atoms, Gly represents a residue obtained by removing one hydroxy group and one hydrogen atom from glycerin, and r represents a number of 1 or more and 4 or less.

<35> The liquid detergent composition for a hard surface according to <34>, wherein in general formula (d1), R^{1d} is an alkyl group having preferably 6 or more carbon atoms and more preferably 8 or more carbon atoms, and preferably 18 or less carbon atoms and more preferably 12 or less carbon atoms.

<36> The liquid detergent composition for a hard surface according to <34> or <35>, wherein in general formula (d1), R^{1d} is preferably an alkyl group selected from an octyl group, a 2-ethylhexyl group, a decyl group, and a dodecyl group.

<37> The liquid detergent composition for a hard surface according to any one of <34> to <36>, wherein in general formula (d1), r is preferably 1.

<38> The liquid detergent composition for a hard surface according to any one of <33> to <37>, containing component (d) in an amount of preferably 0.1% by mass or more, more preferably 0.2% by mass or more, and further preferably 0.5% by mass or more, and preferably 6% by mass or less, more preferably 4% by mass or less, and further preferably 2% by mass or less.

<39> The liquid detergent composition for a hard surface according to any one of <1> to <38>, containing a solvent, preferably a water-soluble organic solvent, as component (e).

<40> The liquid detergent composition for a hard surface according to <39>, wherein component (e) is a water-soluble organic solvent having preferably 2 or more carbon atoms and more preferably 3 or more carbon atoms, and preferably 10 or less carbon atoms and more preferably 8 or less carbon atoms.

<41> The liquid detergent composition for a hard surface according to <39> or <40>, wherein component (e) is preferably one or more water-soluble organic solvents selected from ethanol, isopropyl alcohol, ethylene glycol, propylene glycol, diethylene glycol, dipropylene glycol, glycerin, isoprene glycol, propylene glycol monomethyl ether, propylene glycol monoethyl ether, 3-methyl-3-methoxybutanol, phenoxyethanol, phenylglycol, phenoxyisopropanol, butyl diglycol (diethylene glycol monobutyl ether), dibutylene diglycol, and benzyl alcohol, more preferably one or more selected from butyl diglycol, ethanol, and propylene glycol, and further preferably one or more selected from butyl diglycol, ethanol, and propylene glycol.

<42> The liquid detergent composition for a hard surface according to any one of <39> to <41>, containing component (e) in an amount of preferably 0.5% by mass or more, more preferably 2% by mass or more, and further preferably 4% by mass or more, and preferably 30% by mass or less, more preferably 20% by mass or less, and further preferably 10% by mass or less.

<43> The liquid detergent composition for a hard surface according to any one of <39> to <42>, wherein a mass ratio of component (e)/[component (a)+component (c)] is preferably 0.5 or more, more preferably 1 or more, further preferably 1.2 or more, and furthermore preferably 1.5 or more, and preferably 5 or less, more preferably 4 or less, further preferably 3 or less, furthermore preferably 2.1 or less, and furthermore preferably 2 or less.

<44> The liquid detergent composition for a hard surface according to any one of <39> to <43>, wherein a mass ratio of component (e)/[component (a)+component (b)+component (c)], which is a mass ratio of a content of component (e) to a total content of component (a), component (b), and component (c), is preferably 0.5 or more, more preferably 1 or more, further preferably 1.2 or more, and furthermore preferably 1.5 or more, and preferably 5 or less, more preferably 4 or less, further preferably 3 or less, furthermore preferably 2.1 or less, and furthermore preferably 2 or less.

<45> The liquid detergent composition for a hard surface according to any one of <1> to <44>, containing a hydrotropic agent as component (f).

<46> The liquid detergent composition for a hard surface according to <45>, wherein component (f) is preferably toluenesulfonic acid, xylenesulfonic acid, or cumenesulfonic acid, or a sodium salt, potassium salt, or magnesium salt thereof, and more preferably p-toluenesulfonic acid or a salt thereof.

<47> The liquid detergent composition for a hard surface according to <45> or <46>, containing component (f) in an amount of preferably 0.5% by mass or more, more preferably 1% by mass or more, and further preferably 1.5% by mass or more, and preferably 15% by mass or less, more preferably 10% by mass or less, and further preferably 5% by mass or less.

<48> The liquid detergent composition for a hard surface according to any one of <1> to <47>, containing a fatty acid having 8 or more and 22 or less carbon atoms or a salt thereof as component (g).

<49> The liquid detergent composition for a hard surface according to <48>, wherein component (g) is a fatty acid having 8 or more and more preferably 10 or more carbon atoms, and preferably 22 or less, more preferably 18 or less, and further preferably 14 or less carbon atoms, or a salt thereof.

<50> The liquid detergent composition for a hard surface according to <48> or <49>, wherein component (g) is one or more selected from decanoic acid, lauric acid, myristic acid, palmitic acid, or a salt thereof, more preferably one

or more selected from decanoic acid, lauric acid, myristic acid, or a salt thereof, and furthermore preferably one or more selected from decanoic acid, lauric acid, or a salt thereof.

<51> The liquid detergent composition for a hard surface according to any one of <48> to <50>, containing component (g) in an amount of preferably 0% by mass or more, and preferably 3% by mass or less, more preferably less than 3% by mass, further preferably 2.5% by mass or less, further preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, further preferably less than 0.1% by mass, or containing 0% by mass.

<52> The liquid detergent composition for a hard surface according to any one of <48> to <51>, containing component (b) and component (g) in a total amount of preferably 0% by mass or more, and preferably less than 3% by mass, more preferably 2.5% by mass or less, further preferably 2% by mass or less, further preferably 1.5% by mass or less, further preferably 1% by mass or less, further preferably less than 1% by mass, further preferably 0.5% by mass or less, further preferably less than 0.5% by mass, further preferably 0.1% by mass or less, further preferably less than 0.1% by mass, or containing 0% by mass.

<53> The liquid detergent composition for a hard surface according to any one of <48> to <52>, wherein a total content of component (a), component (b), component (c), and component (g) is preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably 3% by mass or more, and furthermore preferably 4% by mass or more, and preferably 40% by mass or less, more preferably 35% by mass or less, further preferably 30% by mass or less, further preferably 25% by mass or less, further preferably 20% by mass or less, further preferably 15% by mass or less, and furthermore preferably 10% by mass or less.

<54> The liquid detergent composition for a hard surface according to any one of <48> to <53>, wherein a proportion of a total content of component (a), component (b), component (c), and component (g) in an entirety of surfactants is preferably 50% by mass or more, more preferably 60% by mass or more, further preferably 70% by mass or more, furthermore preferably 80% by mass or more, and furthermore preferably 90% by mass or more, and preferably 100% by mass or less.

<55> The liquid detergent composition for a hard surface according to any one of <48> to <54>, wherein a mass ratio of component (a)/[component (a)+component (b)+component (c)+component (g)] is preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

<56> The liquid detergent composition for a hard surface according to any one of <48> to <55>, wherein a mass ratio of [component (b)+component (g)]/[component (a)+component (b)+component (c)+component (g)] is preferably 0.3 or less, preferably less than 0.3, preferably 0.26 or less, more preferably 0.2 or less, further preferably less than 0.2, further preferably 0.15 or less, further preferably less than 0.15, and furthermore preferably 0.1 or less, and preferably 0 or more, preferably 0.03 or more, more preferably 0.05 or more, further preferably 0.07 or more, further preferably 0.1 or more, further preferably 0.15 or more, further preferably 0.2 or more, or is 0.

<57> The liquid detergent composition for a hard surface according to any one of <48> to <56>, wherein a mass ratio of component (c)/[component (a)+component (b)+component (c)+component (g)] is preferably 0.1 or more, more preferably 0.2 or more, further preferably 0.3 or more, further preferably 0.35 or more, and further preferably 0.4 or more, and preferably 0.9 or less, more preferably 0.85 or less, further preferably 0.8 or less, further preferably 0.75 or less, further preferably 0.7 or less, and further preferably 0.65 or less.

<58> The liquid detergent composition for a hard surface according to any one of <1> to <57>, wherein a total content of solids is preferably 0.6% by mass or more, more preferably 1% by mass or more, further preferably 2% by mass or more, further preferably 3% by mass or more, furthermore preferably 4% by mass or more, and preferably 60% by mass or less, more preferably 50% by mass or less, further preferably 45% by mass or less, further preferably 40% by mass or less, further preferably 35% by mass or less, further preferably 30% by mass or less, and furthermore preferably 28% by mass or less.

<59> The liquid detergent composition for a hard surface according to any one of <1> to <58>, containing water.

<60> The liquid detergent composition for a hard surface according to any one of <1> to <59>, containing water in an amount of preferably 30% by mass or more, more preferably 50% by mass or more, more preferably 60% by mass or more, and further preferably 70% by mass or more, and preferably 98% by mass or less, more preferably 95% by mass or less, and more preferably 90% by mass or less.

<61> The liquid detergent composition for a hard surface according to any one of <1> to <60>, having a pH at 25°C of preferably 2 or higher, more preferably 4 or higher, and more preferably 5 or higher, and preferably 10 or lower, more preferably 9 or lower, and further preferably 8 or lower.

<62> The liquid detergent composition for a hard surface according to any one of <1> to <61>, having a viscosity at 20°C of preferably 0.5 mPa·s or higher and more preferably 1 mPa·s or higher, and preferably 50 mPa·s or lower, more preferably 20 mPa·s or lower, further preferably 10 mPa·s or lower, furthermore preferably 7 mPa·s or lower,

and furthermore preferably 5 mPa·s or lower.

<63> The liquid detergent composition for a hard surface according to any one of <1> to <62>, which is for a hard surface of a hard article, further for a hard surface of a hard article selected from a dish and a hard article around a kitchen, further for a hard surface of a dish, further for hand-washing a hard surface of a hard article, further for hand-washing a hard surface of a hard article selected from a dish and a hard article around a kitchen, and further for hand-washing a hard surface of a dish.

<64> The liquid detergent composition for a hard surface according to any one of <1> to <63>, which is a detergent for application to a hard surface of a hard article, preferably a detergent for application to a hard surface of a hard article selected from a dish and a hard article around a kitchen, and more preferably a detergent for application to a hard surface of a dish, or is a detergent for spraying onto a hard surface of a hard article, preferably a detergent for spraying onto a hard surface of a hard article selected from a dish and a hard article around a kitchen, and more preferably a detergent for spraying onto a hard surface of a dish.

<65> The liquid detergent composition for a hard surface according to any one of <1> to <64>, which is used by being directly brought into contact with a hard surface, preferably a hard surface of a hard article selected from a dish and a hard article around a kitchen, and more preferably a hard surface of a dish, without dilution.

<66> The liquid detergent composition for a hard surface according to any one of <1> to <65>, which is intended for washing a hard article, preferably a hard article selected from food manufacturing equipment such as pipes and components, dishes, and hard articles around a kitchen, more preferably a hard article selected from dishes and hard articles around a kitchen, and further preferably dishes; or

which is intended for washing storage places for food, dishes, and cooking utensils, such as refrigerators and cupboards, drains, kitchen counters, range hoods, sinks, and places where food is cooked such as gas ovens and microwave ovens, and floors, walls, and the like located therearound; or

which is intended for washing dishes, preferably so-called dishes such as plates and bowls, storage containers such as Tupperware containers and bottles, cooking utensils such as kitchen knives, cutting boards, pots, frying pans, and fish grills, and household electric cooking appliances such as food processors and mixers; or

which is for articles selected from dishes, storage containers, cooking utensils, and household electric cooking appliances, and further is for articles selected from plates, bowls, Tupperware containers, bottles, kitchen knives, cutting boards, pots, frying pans, fish grills, food processors, and mixers.

<67> The liquid detergent composition for a hard surface according to any one of <1> to <66>, wherein a material of a hard article is plastic, metal, earthenware, wood, and a combination thereof.

[0137] In the liquid detergent composition for a hard surface according to <1> to <67>, 0.1% by mass, 0.64% by mass, and 2% by mass can be subtracted from the total content of component (a), component (b), and component (c) .

<68> A method for washing a hard surface including bringing the liquid detergent composition for a hard surface according to any one of <1> to <67> into contact with a hard surface, preferably a hard surface having adhered oily stains, and more preferably a hard surface having adhered oily stains containing solid fat.

<69> The method for washing a hard surface according to <68>, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] in the liquid detergent composition for a hard surface according to any one of <1> to <67> is preferably 0.15 or more and more preferably 0.2 or more, and 0.3 or less.

<70> The method for washing a hard surface according to <69>, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] in the liquid detergent composition for a hard surface according to any one of <1> to <67> is preferably less than 0.2 and preferably 0 or more.

<71> The method for washing a hard surface according to any one of <68> to <70>, wherein an undiluted solution of the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface.

<72> The method for washing a hard surface according to any one of <68> to <71>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface without dilution.

<73> The method for washing a hard surface according to any one of <68> to <72>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface having adhered oily stains containing solid fat without dilution.

<74> The method for washing a hard surface according to any one of <68> to <73>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface and then left to stand without applying a mechanical force.

<75> The method for washing a hard surface according to any one of <68> to <74>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact, and preferably brought into contact by being applied or sprayed, in a proportion of preferably 0.1 g or more, more preferably 0.3 g or more,

and further preferably 0.4 g or more, and preferably 5 g or less, more preferably 3 g or less, and further preferably 2 g or less, per 100 cm² of an area of a hard surface.

<76> The method for washing a hard surface according to any one of <68> to <75>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface and then left to stand for preferably 10 seconds or longer, more preferably 20 seconds or longer, further preferably 30 seconds or longer, further preferably 40 seconds or longer, furthermore preferably 50 seconds or longer, and furthermore preferably 1 minute or longer, and preferably 60 minutes or shorter, more preferably 30 minutes or shorter, further preferably 20 minutes or shorter, and furthermore preferably 10 minutes or shorter.

<77> The method for washing a hard surface according to any one of <68> to <76>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface and then left to stand for preferably 10 seconds or longer, more preferably 20 seconds or longer, further preferably 30 seconds or longer, further preferably 40 seconds or longer, furthermore preferably 50 seconds or longer, and furthermore preferably 1 minute or longer, and preferably 60 minutes or shorter, more preferably 30 minutes or shorter, further preferably 20 minutes or shorter, furthermore preferably 10 minutes or shorter, and furthermore preferably 5 minutes or shorter without applying a mechanical force.

<78> The method for washing a hard surface according to any one of <68> to <77>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is brought into contact with a hard surface for preferably 10 seconds or longer, more preferably 20 seconds or longer, further preferably 30 seconds or longer, further preferably 40 seconds or longer, furthermore preferably 50 seconds or longer, and furthermore preferably 1 minute or longer, and preferably 60 minutes or shorter, more preferably 30 minutes or shorter, further preferably 20 minutes or shorter, furthermore preferably 10 minutes or shorter, and more preferably 5 minutes or shorter.

<79> The method for washing a hard surface according to any one of <68> to <78>, wherein by immersing a hard surface in the liquid detergent composition for a hard surface according to any one of <1> to <67>, the liquid detergent composition for a hard surface is brought into contact with the hard surface.

<80> The method for washing a hard surface according to any one of <68> to <79>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is sprayed or applied to be brought into contact with the hard surface.

<81> The method for washing a hard surface according to any one of <68> to <80>, wherein the liquid detergent composition for a hard surface according to any one of <1> to <67> is made into droplets for spraying onto or foamed for application to the hard surface.

<82> The method for washing a hard surface according to any one of <68> to <81>, wherein a detergent article for a hard surface obtained by filling a sprayer-equipped container with the liquid detergent composition for a hard surface according to any one of <1> to <67> is used to bring the liquid detergent composition for a hard surface into contact with a hard surface.

<83> The method for washing a hard surface according to any one of <68> to <82>, wherein the hard surface is a hard surface of a hard article, preferably a hard surface of a dish or a hard article around a kitchen, and more preferably a hard surface of a dish; or

the hard surface is a hard surface of food manufacturing equipment such as a pipe or a component, a dish, or a hard article around a kitchen, preferably a hard surface of a dish or a hard article around a kitchen, and more preferably a hard surface of a hard article selected from storage places for food, dishes, and cooking utensils, such as refrigerators and cupboards, drains, kitchen counters, range hoods, sinks, and places where food is cooked such as gas ovens and microwave ovens, and floors, walls, and the like located therearound; or

the hard surface is a hard surface of a dish, and preferably a hard surface of a dish selected from so-called dishes such as plates and bowls, storage containers such as Tupperware containers and bottles, cooking utensils such as kitchen knives, cutting boards, pots, frying pans, and fish grills, and household electric cooking appliances such as food processors and mixers; or

the hard surface is a hard surface of an article selected from dishes, storage containers, cooking utensils, and household electric cooking appliances, and further a hard surface of an article selected from plates, bowls, Tupperware containers, bottles, kitchen knives, cutting boards, pots, frying pans, fish grills, food processors, and mixers.

<84> The method for washing a hard surface according to any one of <68> to <83>, wherein a material of the hard article is plastic, metal, earthenware, wood, and a combination thereof.

<85> The method for washing a hard surface according to any one of <68> to <84>, wherein the liquid detergent composition for a hard surface is a liquid detergent composition for removing oil from a hard surface.

<86> A detergent article for a hard surface accommodated in a spray container, wherein a sprayer-equipped container is filled with the liquid detergent composition for a hard surface according to any one of <1> to <67>.

<87> The detergent article for a hard surface according to <86>, wherein the sprayer-equipped container is a manual-type spray apparatus that does not use a propellant or an aerosol that uses a propellant, preferably a manual-type spray apparatus that does not use a propellant selected from a trigger-type spray container and a pump-type spray

container, more preferably a trigger-type spray capable of making the contents into droplets or foam for spraying or application, and further preferably a trigger-type spray provided with a mechanism for spraying contents in a droplet form or a trigger-type spray provided with a mechanism for forming foam (a foam forming mechanism).

<88> Use of the composition according to any one of <1> to <67> as a liquid detergent for a hard surface, preferably a liquid detergent for a hard surface of a dish or a hard article around a kitchen, and more preferably a liquid detergent for a hard surface of a dish.

<89> Use of the composition according to any one of <1> to <67> as a liquid detergent for removing oil from a hard surface, preferably a liquid detergent for removing oil from a hard surface of a dish or a hard article around a kitchen, and more preferably a liquid detergent for removing oil from a hard surface of a dish.

<90> Use of the composition according to any one of <1> to <67> as a liquid detergent for a hard surface, preferably a liquid detergent for a hard surface of a dish or a hard article around a kitchen, and more preferably a liquid detergent for a hard surface of a dish used in a method including bringing the composition into contact with a hard surface without dilution and washing the hard surface without applying a mechanical force.

<91> Use of the composition according to any one of <1> to <67> in a method for washing a hard surface including bringing the composition into contact with a hard surface, preferably a hard surface having adhered oily stains, and more preferably a hard surface having adhered oily stains containing solid fat, without dilution.

Examples

[0138] The following formulation components were used to prepare liquid detergent compositions for a hard surface shown in Tables 1 and 2, and evaluations were made on the following items. The compositions of Tables 1 and 2 are liquid detergent compositions for removing oil from a hard surface. Results are shown in Tables 1 and 2. The liquid detergent compositions for a hard surface of Tables 1 and 2 were prepared by an ordinary method. That is to say, component (a) to component (g) were added to a suitable amount of ion exchanged water and dissolved at room temperature (25°C), and then sodium hydroxide and/or hydrochloric acid was added to regulate the pH (25°C) to 6. All numerical values of % by mass of the formulation components in Table 1 are based on active components. The % by mass of component (b) indicates an amount based on a sodium salt, and component (g) based on an acid-type compound. The % by mass of component (f) indicates an amount based on a compound containing water of crystallization.

<Formulation components>

Component (a)

[0139]

- Di-2-ethylhexyl sodium sulfosuccinate (trade name "Aerol CT-1L" manufactured by Toho Chemical Industry Co., Ltd), a compound having general formula (a1) wherein both R^{1a} and R^{2a} are 2-ethylhexyl groups, both x and y are 0, and M¹ is sodium
- Di-tridecyl sodium sulfosuccinate (trade name "Pelex TR", manufactured by Kao Corporation, a compound having general formula (a1) wherein both R^{1a} and R^{2a} are tridecyl groups, both x and y are 0, and M¹ is sodium

Component (b)

[0140]

- PO0.6 sodium lauryl sulfate, a compound having general formula (b1) wherein R^{1b} is an alkyl group derived from natural alcohol (mass ratio of octyl group/decyl group/dodecyl group = 5/5/90), R^{2b} is a propylene group, n is 0.6, and M² is sodium
- Sodium lauryl sulfate (trade name "Emal 0", manufactured by Kao Corporation), a compound having general formula (b1) wherein R^{1b} is a dodecyl group, n is 0, and M² is sodium
- EO2 sodium lauryl sulfate (trade name "Emal 270J", manufactured by Kao Corporation), a compound having general formula (b1) wherein R^{1b} is a dodecyl group, R^{2b} is an ethylene group, n is 2, and M² is sodium

Component (c)

[0141]

- Lauryl hydroxy sulfobetaine (trade name "Amphitol 20HD", manufactured by Kao Corporation)
- Lauramidopropyl carbobetaine (trade name "Amphitol 20AB", manufactured by Kao Corporation)
- Lauryl betaine (trade name "Amphitol 20BS", manufactured by Kao Corporation)

5 **[0142]**

Component (d): 2-Ethylhexyl glyceryl ether (trade name "Penetol GE-EH", manufactured by Kao Corporation)

Component (e): Butyl diglycol (trade name "BDG-NS", manufactured by Nippon Nyukazai Co., Ltd.)

Component (f): Paratoluenesulfonic acid monohydrate (trade name "PTS M-7000", manufactured by Meiyusangyo Co., Ltd.)

Component (g): Lauric acid (trade name "Lunac L-98", manufactured by Kao Corporation)

(1) Detergency (Solution immersion evaluation)

15 **[0143]** A mixture of beef tallow and rapeseed oil in a mass ratio of 9:1 was prepared and regarded as model stain (model stain of oily stain containing solid fat, and the same applies below). The mass of a polypropylene test piece having 30 mm (width) x 80 mm (length) x 1 mm (thickness) was measured with a 4-digit balance (x). The model stain was uniformly applied to both surfaces of the polypropylene test piece to a height of 50 mm from the lower end so as to be 0.02 to 0.03 g for both surfaces combined, and thus a soiled piece was formed. The mass of the soiled piece was measured with a 4-digit balance (y).

20 **[0144]** Then, 50 g of a liquid detergent composition for a hard surface was placed in a 50 mL container (a cylinder having an inner diameter of 35 mm x a height of 68 mm), and then one soiled piece was placed in the container so as to lean against the container and brought into contact with the composition. At this time, the soiled portion of the soiled piece was entirely immersed in the composition in the container.

25 **[0145]** After the soiled piece was left to stand for the time indicated in Table 1 while being immersed in the liquid detergent composition for a hard surface in the container, the soiled piece was removed and rinsed with running tap water for 1 minute. At this time, the conditions of running water rinsing had a tap water temperature of 25°C, a flow rate of about 4 L/min, and a diameter of the opening of the tap of about 15 mm. The soiled piece located 5 cm vertically below the opening was held at 45° relative to tap water falling onto the soiled piece, and with this angle being retained, running water was received by the unsoiled upper part of the soiled piece, and one entire surface of the washed part was rinsed with tap water flowing on the soiled piece. At this time, the front and the back were rinsed alternately every 10 seconds. After the end of rinsing, the soiled piece was dried, and then the mass was measured with a 4-digit balance (z). The detergency rate was determined by the following expression.

$$35 \quad \text{Detergency rate (\%)} = \{ (y) - (z) \} / \{ (y) - (x) \} \times 100$$

(2) Detergency (Foam immersion evaluation)

40 **[0146]** A mixture of beef tallow and rapeseed oil in a mass ratio of 9:1 was prepared and regarded as model stain. The mass of a polypropylene test piece having 30 mm (width) x 80 mm (length) x 1 mm (thickness) was measured with a 4-digit balance (x). The model stain was uniformly applied to both surfaces of the polypropylene test piece to a height of 5 cm from the lower end so as to be 0.02 to 0.03 g for both surfaces combined, and thus a soiled piece was formed. The mass of the soiled piece was measured with a 4-digit balance (y).

45 **[0147]** A trigger-type spray container (Magiclean Handy Spray, manufactured by Kao Corporation) was filled with a liquid detergent composition for a hard surface, and the composition was sprayed in a foam form 5 times inside a 50 mL container (a cylinder having an inner diameter of 35 mm x a height of 68 mm). The total amount of the composition discharged was about 5 g.

50 **[0148]** Then, one soiled piece was placed in the container so as to lean against the container so that the soiled piece was brought into contact with the foamed liquid detergent composition for a hard surface in the container. At this time, the soiled portion of the soiled piece was entirely immersed in the foamed composition in the container. After the soiled piece was left to stand for the time indicated in Table 1 while being immersed in the foam, the soiled piece was removed and rinsed with running tap water for 1 minute.

55 **[0149]** At this time, the conditions of running water rinsing had a tap water temperature of 25°C, a flow rate of about 4 L/min, and a diameter of the opening of the tap of about 15 mm. The soiled piece located 5 cm vertically below the opening was held at 45° relative to tap water falling onto the soiled piece, and with this angle being retained, running water was received by the unsoiled upper part of the soiled piece, and one entire surface of the washed part was rinsed

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with tap water flowing on the soiled piece. At this time, the front and the back were rinsed alternately every 10 seconds. After the end of rinsing, the soiled piece was dried, and then the mass was measured with a 4-digit balance (z). The detergency rate was determined by the following expression.

5

$$\text{Detergency rate (\%)} = \{ (y) - (z) \} / \{ (y) - (x) \} \times 100$$

(3) Specific foam volume

10 **[0150]** A trigger-type spray container (Magiclean Handy Spray, manufactured by Kao Corporation) was filled with a liquid detergent composition for a hard surface, and the liquid detergent composition was sprayed 10 times inside a 200 mL graduated cylinder (inner diameter 40 mm), with the container being in a broad-foam mode. The mass of the sprayed 200 mL graduated cylinder was measured using a 4-digit balance, and the difference from the mass of the graduated cylinder before being sprayed was regarded as the amount (g) of the foam applied (a). The volume (mL) of the foam in
15 the graduated cylinder was visually read (b). The specific foam volume was calculated by the following expression.

$$\text{Specific foam volume (mL/g)} = (b) / (a)$$

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[Table 1]

Evaluation	Formulation component (% by mass)	Comparative Example													Example												
		Example													Example												
		1	2	3	4	5	6	7	8	9	10	11	12	13													
Liquid detergent composition for hard surface	(a) Di-2-ethylhexyl sodium sulfosuccinate	0.79	0	0	5	1	1.5	2	2.5	3	4	4.25	3	3	3	3	3	3	3	3	3	3	3	3			
	(b) Di-tridecyl sodium sulfosuccinate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(c) FOD Sodium lauryl sulfate	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(d) Sodium lauryl sulfate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(e) EO2 Sodium lauryl sulfate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(f) Lauryl hydroxy sulfobetaine	0.21	5	0	0	4	3.5	3	2.5	2	1	0.75	2	2	2	2	2	2	2	2	2	2	2	2			
	(g) Laurandipropyl carbobetaine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(h) Lauryl betaine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(i) 2Ethylhexyl glyceryl ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(j) Butyl diglycol	0	8	8	8	8	8	8	8	8	8	8	8	7	9	10	10.5	11	11	11	11	11	11				
Formulation component (% by mass)	(k) Perarlotenesulfonic acid monohydrate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(l) Water	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance				
	(m) Total amount (% by mass)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100				
	(n) (a)+(b)+(c) (% by mass)	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5				
	(o) [(a)+(b)+(c)] (Mass ratio)	0.79	0	0	1	0.2	0.3	0.4	0.5	0.6	0.8	0.85	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6				
	(p) [(a)+(b)+(c)] (Mass ratio)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	(q) [(a)+(b)+(c)] (Mass ratio)	0.21	1	0	0	0.8	0.7	0.6	0.5	0.4	0.2	0.15	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4				
	(r) (a)/(c) (Mass ratio)	3.8	0	-	-	0.3	0.4	0.7	1.0	1.5	4.0	5.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5				
	(s) [(a)+(b)+(c)] (Mass ratio)	0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6				
	(t) [(a)+(c)] (Mass ratio)	0	1.6	-	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6				
Evaluation	pH (25°C)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6				
	Detergency (solution immersion) (%)	51	5	5	34	48	70	83	85	87	84	54	65	88	78	60	48	48	48	48	48	48	48				
	Detergency (foam immersion) (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	Standing time	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute				
Specific foam volume (mL/g)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				

[Table 2]

Liquid detergent composition for hard surface	Example										Comparative Example		Example									
	14	15	16	17	4	5	18	19	20	21	22	23	24	25	26	27	28	29				
(a) D-2-ethylhexyl sodium sulfosuccinate	2.12	2	1.85	1.75	1.5	1.25	5	15	0	3	3	2.12	2.12	2.12	2.5	2.5	8	10				
(b) D-2-ethylhexyl sodium sulfosuccinate	0	0	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0				
(c) POO.6 Sodium lauryl sulfate	0.76	1	1.3	1.5	2	2.5	0	0	0	0	0	0	0	0	0	0	0	0				
(d) Sodium lauryl sulfate	0	0	0	0	0	0	0	0	0	0	0	0.76	0	0	0	0	0	0				
(e) EO2 Sodium lauryl sulfate	0	0	0	0	0	0	0	0	0	0	0	0	0.76	0	0	0	0	0				
(f) Lauryl hydroxy sulfobetaine	2.12	2	1.85	1.75	1.5	1.25	5	15	2.5	0	0	2.12	2.12	2.12	2.5	2.5	8	10				
(g) Lauramidopropyl carboxylate	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0				
(h) Lauryl betaine	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0				
(i) 2-Ethylhexyl glyceryl ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
(j) Butyl diglycol	8	8	8	8	8	8	16	28	11	8	8	8	8	8	8	8	16	16				
(k) Perfluorooctanesulfonic acid monohydrate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
(l) Lauric acid	0	0	0	0	0	0	0	0	0	0	0	0	0	0.76	0	0	0	0				
Water	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance				
Total amount (% by mass)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100				
(a)+(b)+(c) (% by mass)	5	5	5	5	5	5	10	30	5	5	5	5	5	4.2	5	5	16	20				
(a)/(a)+(b)+(c) (Mass ratio)	0.42	0.4	0.37	0.35	0.3	0.25	0.5	0.5	0.5	0.6	0.6	0.42	0.42	0.5	0.5	0.5	0.5	0.5				
(b)/(a)+(b)+(c) (Mass ratio)	0.15	0.2	0.26	0.3	0.4	0.5	0	0	0	0	0	0.15	0.15	0	0	0	0	0				
(c)/(a)+(b)+(c) (Mass ratio)	0.42	0.4	0.37	0.35	0.3	0.25	0.5	0.5	0.5	0.4	0.4	0.42	0.42	0.5	0.4	0.4	0.4	0.4				
(a)/(c) (Mass ratio)	1	1	1	1	1	1	1	1	1	1.5	1.5	1	1	1	1.5	1.5	1.5	1.5				
(a)/(a)+(b)+(c) (Mass ratio)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2				
(b)/(a)+(c) (Mass ratio)	1.9	2.0	2.2	2.3	2.7	3.2	1.6	0.9	2.2	1.6	1.6	1.9	1.9	1.9	1.6	1.6	1	0.8				
pH (25°C)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6				
Detergency (solution immersion) (%)	63	46	40	38	12	4	84	89	90	72	86	52	58	63	78	87	90	91				
Detergency (foam immersion) (%)	-	-	40	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Standing time	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	1 minute	30 seconds	1 minute	1 minute				
Specific foam volume (mL/g)	14	14	14	14	14	14	-	-	-	-	-	14	13	11	-	-	8	7				

[0151] From comparing Example 5 of Table 1 with Examples 14 to 17 and Comparative Examples 4 to 5 of Table 2, it was verified that Example 5 having a mass ratio (b)/[(a)+(b)+(c)] of 0 has excellent detergency. On the other hand, it was verified that Examples 14 to 17 having a large mass ratio (b)/[(a)+(b)+(c)] have a large specific foam volume.

[0152] In the case where the liquid detergent composition for a hard surface of the present invention was brought into contact, it was verified from comparing Example 5 of Table 1 with Examples 18 and 19 of Table 2 that Example 5 having a total content of component (a)+component (b)+component (c) of 5% by mass is better balanced between detergency and the raw material cost of surfactants.

[0153] In the case where the liquid detergent composition for a hard surface of the present invention was brought into contact, it was verified from comparing Examples 2 to 8 of Table 1 that Example 6 having a mass ratio of component (a)/component (c) of 1.5 has better detergency.

[0154] In the case where the liquid detergent composition for a hard surface of the present invention was brought into contact, it was verified from comparing Example 6 with Examples 9 to 13 of Table 1 that Example 10 having a mass ratio of component (e)/[(a)+(c)] of 1.8 has better detergency.

[0155] Concerning Example 5, Example 6, Example 16, and Example 17, the relationship between the detergency rates in solution immersion in these examples and the relationship between the detergency rates in foam immersion of these examples show similar tendencies. Accordingly, it was found that there is a correlation between the detergency rate in solution immersion and the detergency rate in foam immersion, and it was thus verified that the value of the detergency rate in foam immersion can be estimated from the result (the detergency rate) of solution immersion in other examples as well.

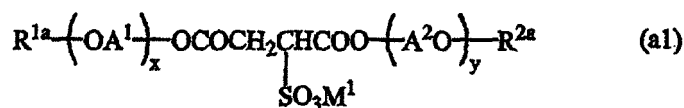
Claims

1. A liquid detergent composition for removing oil from a hard surface, comprising the following component (a), 0% by mass or more and less than 3% by mass of the following component (b), the following component (c) and water, wherein a mass ratio of component (b)/[component (a)+component (b)+component (c)] is 0.3 or less:

<Component (a)>

a sulfosuccinate or a salt thereof represented by the following general formula (a1):

[Formula 1]



wherein R^{1a} and R^{2a} are each independently a hydrocarbon group having 5 or more and 18 or less carbon atoms; A^1 and A^2 are each independently an alkylene group having 2 or more and 4 or less carbon atoms; x and y are each independently an average number of added moles, and 0 or more and 6 or less; and M^1 is a hydrogen atom or a cation;

<Component (b)>

an anionic surfactant having a hydrocarbon group with 8 or more and 21 or less carbon atoms and a sulfate group or a sulfonate group, excluding compounds belonging to the component (a); and

<Component (c)>

one or more amphoteric surfactants selected from sulfobetaines and carbobetaines.

2. The liquid detergent composition for removing oil from a hard surface according to claim 1, containing 0.5% by mass or more and 30% by mass or less of the component (a) .
3. The liquid detergent composition for removing oil from a hard surface according to claim 1 or 2, containing 0.1% by mass or more and 30% by mass or less of the component (c).
4. The liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 3, wherein a total content of the component (a), the component (b), and the component (c) is 0.6% by mass or more and 40% by mass or less.
5. The liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 4, containing 0% by mass or more and 3% by mass or less of a fatty acid having 8 or more and 22 or less carbon atoms or a salt thereof.
6. The liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 5, wherein a mass ratio of component (a)/component (c) is 0.1 or more and 10 or less.
7. The liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 6, further

comprising a solvent (e).

- 5 8. The liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 7, which is used in a method wherein the composition is brought into contact with the hard surface and washing is made without applying a mechanical force.
9. A method for washing a hard surface, wherein the liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 8 is brought into contact with a hard surface having adhered oily stains.
- 10 10. The method for washing a hard surface according to claim 9, wherein the liquid detergent composition for removing oil from a hard surface is brought into contact with the hard surface without dilution.
11. The method for washing a hard surface according to claim 9 or 10, wherein the liquid detergent composition for removing oil from a hard surface is brought into contact with the hard surface and then left to stand without applying a mechanical force.
12. The method for washing a hard surface according to any one of claims 9 to 11, wherein the liquid detergent composition for removing oil from a hard surface is brought into contact with the hard surface and then left to stand for 10 seconds or longer.
13. The method for washing a hard surface according to any one of claims 9 to 12, wherein the liquid detergent composition for removing oil from a hard surface is sprayed or applied to be brought into contact with the hard surface.
14. The method for washing a hard surface according to claim 13, wherein the liquid detergent composition for removing oil from a hard surface is made into droplets for spraying onto the hard surface or foamed for application to the hard surface.
15. The method for washing a hard surface according to any one of claims 9 to 14, wherein the oily stains are oily stains containing solid fat.
16. A detergent article for a hard surface accommodated in a spray container, wherein a sprayer-equipped container is filled with the liquid detergent composition for removing oil from a hard surface according to any one of claims 1 to 8.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/087877

A. CLASSIFICATION OF SUBJECT MATTER

C11D17/08(2006.01)i, B08B3/08(2006.01)i, C11D1/04(2006.01)i, C11D1/14(2006.01)i, C11D1/28(2006.01)i, C11D1/90(2006.01)i, C11D1/92(2006.01)i, C11D3/43(2006.01)i, C11D17/04(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C11D17/08, B08B3/08, C11D1/04, C11D1/14, C11D1/28, C11D1/90, C11D1/92, C11D3/43, C11D17/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CAPLUS/REGISTRY (STN)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 09-137194 A (Kao Corp.), 27 May 1997 (27.05.1997), claims; paragraphs [0002], [0003], [0009], [0014], [0018]; examples (Family: none)	1-16
X	JP 2012-172032 A (Kao Corp.), 10 September 2012 (10.09.2012), claims; paragraphs [0014] to [0024], [0045]; examples (Family: none)	1-16
X	CN 103695202 A (NANTONG JINGXIN OPTICAL GLASS CO., LTD.), 02 April 2014 (02.04.2014), claims; paragraph [0007]; examples (Family: none)	1-16

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/087877

5	C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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15	A	JP 2015-199941 A (Kao Corp.), 12 November 2015 (12.11.2015), claims (Family: none)	8, 11
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25			
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REFERENCES CITED IN THE DESCRIPTION

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