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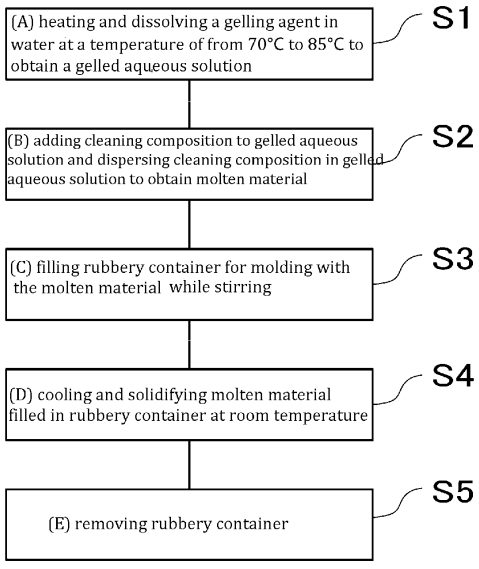
(54) METHOD FOR PRODUCING GEL DETERGENT

(57) The purpose of the present invention is to provide a high-productivity method for producing a gel detergent that reduces workload. Provided is a method for producing a gel detergent having a step for obtaining a gelled aqueous solution by dissolving in a heating manner a gelling agent in water at 70 to 85°C, a step for adding a detergent composition to the gelled aqueous solution, dispersing the result, and obtaining a molten material, a step for filling the molten material into a rubbery container for molding, a step for solidifying in a cooling manner the molten material filled in the rubbery container, and a step for removing the rubbery container.

Fig. 1



EP 3 085 762 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a method of producing a gel detergent.

BACKGROUND OF THE INVENTION

[0002] Conventionally, a detergent is categorized into solid-type, liquid-type, and gel-type in accordance with its appearance. Among them, gel-type detergent gives a unique feeling to a user, and thus has high commercial value and marketability.

[0003] A method of producing gel-type detergent has been known to include the steps of mixing ingredients such as gelling agent and detergent composition, stirring the mixture thus obtained while heating to gel-like product, and flowing the gel-like product into a mold to solidify the gel-like product.

[0004] For example, Patent Document 1 discloses a gel-type, semi-solid cleaner in which anionic surfactants, amphoteric surfactants, and naturally derived gelling agent are blended and where a template is used as a mold. However, since the gel detergent contains a large amount of moisture and the gelling agent is perishable, microorganisms such as bacteria are likely to propagate and it takes time to clean the mold for next use. Further, since various dies must be prepared for molding desired gel detergents with various sizes, production of the gel detergent becomes inefficient.

[0005] Patent Document 2 discloses a gel detergent where cleaning components and a polysaccharide are blended and which is produced using a cylindrical mold. However, Patent Document 2 is silent on the material for the cylindrical mold.

[Citation List]

[Patent Literature]

[0006]

[Patent Document 1] Japanese Patent Publication No. 2013-100305 (A)
[Patent Document 2] Japanese Patent Publication No. 2013-147455 (A)

BRIEF DESCRIPTION OF THE INVENTION

[0007] The present invention is made in view of the foregoing. By employing a rubbery composition as a mold, the mold is not needed to be cleaned, thereby providing a simplified method of producing a gel-type detergent with high productivity.

(1) One aspect of the present invention provides a method of producing a gel detergent, comprising the steps of: (A) heating and dissolving a gelling agent in water at a temperature of from 70°C to 85°C to obtain a gelled aqueous solution; (B) adding a cleaning composition to the gelled aqueous solution, and heating and dispersing the cleaning composition in the gelled aqueous solution so as to obtain a molten material; (C) filling a rubbery container for molding with the molten material; (D) cooling and solidifying the molten material filled in the rubbery container at a room temperature; and (E) removing the rubbery container.

(2) In the method according to (1), in step (C), the molten material may be filled at a filling rate of from 33g/sec to 50g/sec.

(3) In the method according to (1) or (2), the step of (F) removing a residual molten material from an opening of the rubbery container may be performed after step (C) and prior to step (D).

(4) In the method according to any of (1)-(3), the rubbery container may have a protrusion on a side opposite to an opening thereof.

(5) In the method according to any of (1)-(4), the cleaning composition may contain one or more selected from Group A and/or Group B, and the gelling agent may contain one or more selected from Group C.

(Group A) an anionic surfactant:

(A-1) carboxylate:

[0008]

[Formula 1] **R-COOM**

[0009] In the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M is Na, K or amine salt,

(A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated):

[0010]

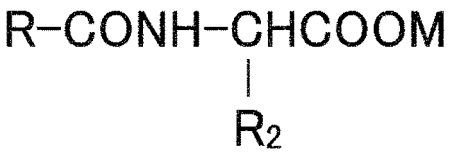
[Formula 2] **R-O(CH_2CH_2O)nR_1COOM**

[0011] In the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; R_1 is saturated alkyl group having 1 or 2 carbon atoms; and M is Na, K or amine salt,

(A-3) sodium, potassium or amine salt of N-acylamino acid:

[0012]

[Formula 5]



[0013] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; R_2 is -H, $-CH_3$, or $-CH_2CH_2COOM$; and M represents Na, K or amine salt,

(Group B) an amphoteric surfactant:

[0014]

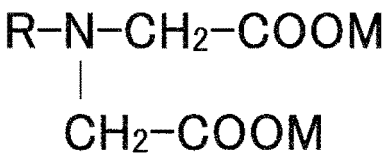
[Formula 6] **R-NH-CH_2-COOM**

[0015] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(B-2):

[0016]

[Formula 7]



[0017] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

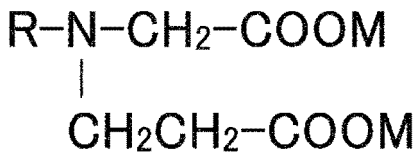
(B-3):

[0018]

[Formula 8] **R-NH-CH_2CH_2-COOM**

[0019] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt, (B-4):

[Formula 9]

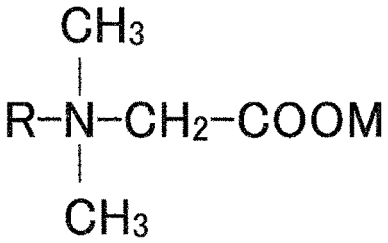


[0020] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(B-5):

[0021]

[Formula 10]

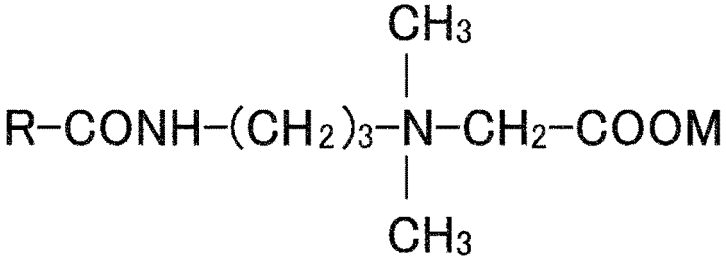


[0022] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(B-6):

[0023]

[Formula 11]

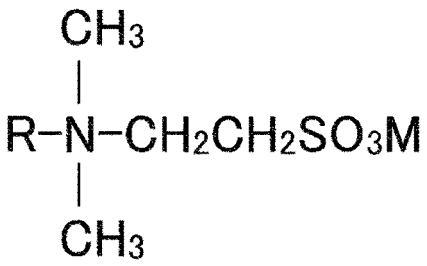


[0024] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(B-7):

[0025]

[Formula 12]

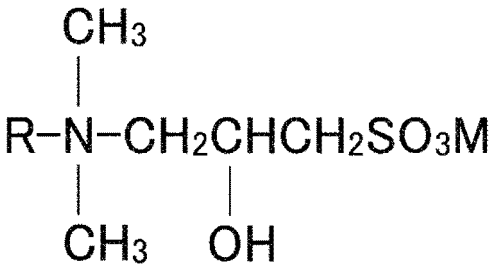


[0026] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(B-8):

[0027]

[Formula 13]



[0028] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(Group C) the gelling agent

(C-1) a water-soluble polymer derived from a plant or a seaweed: xyloglucan, guar gum, locust bean gum, agarose, carrageenan, gum arabic, sodium alginate, glucomannan, pectin

(C-2) water-soluble polymer that is produced by microbial fermentation xanthan gum, gellan gum, pullulan, curdlan, sodium hyaluronate

[0029]

(6) In the method according to (5), the (A-1) carboxylate may comprise a fatty acid potassium salt.
(7) In the method according to (5), the (A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated) may contain the following (A-2-1) or (A-2-2).

(A-2-1) polyoxyethylene alkyl ether acetate

[0030]

[Formula 3] **R-O(CH_2CH_2O)nCH_2COOM**

[0031] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

(A-2-2) polyoxyethylene alkyl ether propionate:

[0032]

[Formula 4] $\mathbf{R\text{-}OCCH_2CH_2O)nCH_2CH_2COOM}$

[0033] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

(8) In the method according to any of (1)-(7), the gel detergent may further contain one or more monohydric or polyhydric alcohol.
(9) In the method according to any of (1)-(8), step (B) may include the step of (F) adding the cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution while degassing to obtain the molten material.
(10) In the method according to (8), step (B) comprises the steps of (H) adding a fatty acid potassium salt to the gelled aqueous solution and dispersing the fatty acid potassium salt in the gelled aqueous solution while degassing to obtain an adjusted material, and (I) adding the cleaning composition other than the fatty acid potassium salt to the adjusted material and dispersing the cleaning composition other than the fatty acid potassium salt in the adjusted material while degassing to obtain the molten material.

[0034] According to the present invention, the number of steps is reduced, thereby providing a method of producing a gel detergent with high productivity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035]

Fig. 1 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a first embodiment of the present invention.
Fig. 2 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a second embodiment of the present invention.
Fig. 3 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a third embodiment of the present invention.
Fig. 4 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a fourth embodiment of the present invention.
Fig. 5 is a schematic sectional view of an exemplary tank for implementing the process in accordance with the present invention.
Fig. 6 is a schematic sectional view of an exemplary vacuum device for implementing the process in accordance with the present invention.
Fig. 7A shows the step of filling a rubbery container for molding with molten material.
Fig. 7B is an enlarged view of filling step.
FIG. 7C is a cross-sectional view of an exemplary filling apparatus for filling the rubbery container for molding with molten material for implementing the process in accordance with the present invention
Fig. 8 is a schematic diagram showing an exemplary apparatus for cooling and solidifying molten material that is filled in a rubbery container for molding for the purpose of implementing the process in accordance with the present invention
Fig. 9 shows the step of removing a rubbery container in accordance with the embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0036] A preferred embodiment of a method of producing a gel detergent in accordance with the present invention (hereinafter, referred to as an "embodiment") will be hereinafter described in detail. It should be noted that the same reference sign is imparted to the same part or element throughout the description of the embodiment(s).
[0037] In accordance with the manufacturing method of the present invention, a cleaning composition may contain one or more selected from Group A and/or Group B.

[0038] Anionic surfactants of (Group A) are (A-1) carboxylate, (A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated) or (A-3) sodium, potassium or amine salt of N-acylamino acid.

(A-1) carboxylate is preferably one represented by the following formula:

[0039]

[Formula 1] **R-COOM**

[0040] In the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

[0041] Fatty acid used in (A-1) carboxylate may be enough if it may be generally blended in the detergent, and includes, but is not limited, saturated or unsaturated, linear or branched fatty acid having alkyl group of 8 to 22 carbon atoms or natural fat. The saturated or unsaturated. linear or branched fatty acid having 8 to 22 carbon atoms may be, for example, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, eicosanoic acid, behenic acid, oleic acid, linoleic acid , linolenic acid, erucic acid, isopalmitic acid, isostearic acid, or neodecanoate. Natural fat may be, for example, coconut oil, palm oil, palm kernel oil, cottonseed oil, apricot kernel oil, avocado oil, olive oil, grape seed oil, or corn oil.

[0042] The alkali agent to be used as a salt of carboxylic acid salts may include, but is not limited to, inorganic alkali such as sodium hydroxide, potassium hydroxide, sodium carbonate, and potassium carbonate, L-arginine of basic amino acid, organic alkali such as monoethanolamine, diethanolamine, triethanolamine, and etc., polyhydric alcohol amine such as ethanolamine, aminomethyl propanol, aminoethyl propanediol, aminomethyl propanediol, or alkylamine such as diisopropanolamine, triisopropanolamine, and monoisopropanolamine. From the viewpoint of low-temperature stability, potassium hydroxide or triethanolamine is preferred, potassium hydroxide is more preferable.

[0043] Among these carboxylates, fatty acid potassium salt which is referred to as "potassium soap base" may be preferably used. The fatty acid potassium salt is one produced by a blending and cooking method of adding potassium hydroxide to natural fat and oil and heating them. The fatty acid potassium salt contains potassium laurate, potassium myristate and etc. as main components, and also contains unreacted fat and oil inevitably derived from the above method and glycerin that is created by decomposition.

(A-2) Polyoxyethylene alkyl ether carboxylates (alkyl group having 12 to 22 carbon atoms, saturated or unsaturated) may be preferably one represented by the following formula:

[0044]

[Formula 2] **R-O(CH_2CH_2O)nR_1COOM**

[0045] In the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; R_1 is saturated alkyl group having 1 or 2 carbon atoms; and M is Na, K or amine salt.

(A-2) polyoxyethylene alkyl ether carboxylate may be represented by one which is obtained by addition polymerization of 4-5 moles of ethylene oxide to lauryl alcohol and reaction of the resultant compound with monochloroacetic acid.

[0046] Among (A-2) polyoxyethylene alkyl ether carboxylates, (A-2-1) polyoxyethylene alkyl ether acetates as shown by the following formula is preferred in terms of suppressed skin irritation.

[Formula 3] **R-O(CH_2CH_2O)nCH_2COOM**

[0047] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

[0048] Furthermore, among (A-2) polyoxyethylene alkyl ether carboxylate, (A-2-2) polyoxyethylene alkyl ether propionate (alkyl group having 12-22 carbon atoms, saturated or unsaturated) is preferred in terms of stability in hard water, and desirable cleaning performance when used together with sodium laurate, and/or sodium myristate.

[Formula 4] **R-OCCH_2CH_2O)nCH_2CH_2COOM**

[0049] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

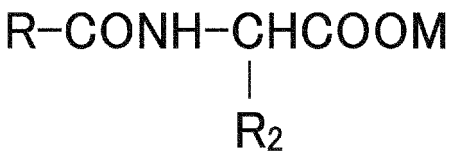
[0050] Specific examples of (A-2-2) are polyoxyethylene lauryl ether sodium acetate (n = 4, R = C_{12}, M = Na) such

as Neohitenol ECL-30S (DKS Co., Ltd.), BEAULIGHT LCA (Sanyo Chemical Industries, Ltd.), Enagicol EC-30 (Lion Co., Ltd.) and the like.

(A-3) Sodium, potassium or amine salt of N-acylamino acid is preferably one represented by the following formula:

[0051]

[Formula 5]



[0052] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; R_2 is -H, $-CH_3$, or $-CH_2CH_2COOM$; and M represents Na, K or amine salt.

(A-3) Sodium, potassium, or amine salt of N-acylamino acid is preferred in terms of mild cleaning performance and consequent low irritation to the skin.

[0053] The amphoteric surfactant of (group B) may be represented by the following formula (B-1) to (B-8):

(B-1)

[0054]

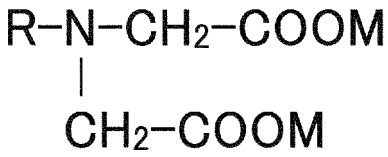
[Formula 6] **R-NH-CH_2-COOM**

[0055] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-2)

[0056]

[Formula 7]



[0057] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-3)

[0058]

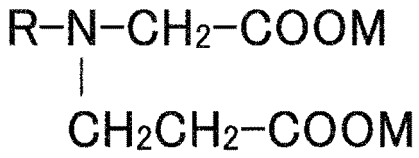
[Formula 8] **R-NH-CH_2CH_2-COOM**

[0059] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-4)

[0060]

[Formula 9]

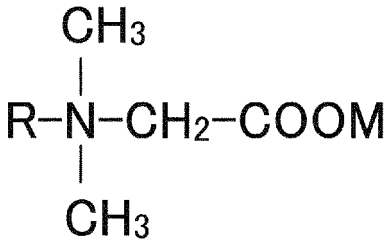


[0061] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-5)

[0062]

[Formula 10]

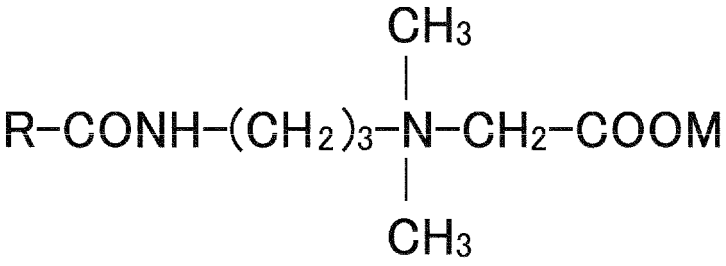


[0063] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-6)

[0064]

[Formula 11]

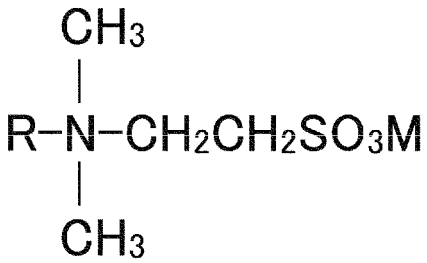


[0065] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-7)

[0066]

[Formula 12]

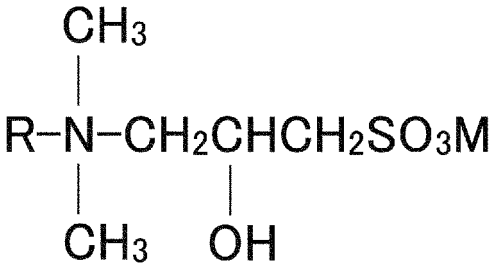


[0067] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

(B-8)

[0068]

[Formula 13]



[0069] In the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt.

[0070] Since amphoteric surfactant having a hydroxyl group has an interaction with water-soluble natural polymer, and greatly contributes to gelation, it is preferably contained in the gel detergent. In addition, in terms of low irritation to the skin, stability in hard water, and foaming power, an alkyl amide propyl betaine as represented by (B-6) is preferred. In terms of cleaning performance, foaming power, and low irritation to eye membrane, 2-alkyl-N-carboxymethyl-N-hydroxyethyl imidazolinium betaine is more preferable.

[0071] The gelling agent may contain one or more selected from (group C) as follows:

(Group C) gelling agent

(C-1) water-soluble polymer derived from plants or seaweed Xyloglucan, guar gum, locust bean gum, agarose, carrageenan, gum arabic, sodium alginate, glucomannan, pectin

(C-2) water-soluble polymer that is produced by microbial fermentation method

[0072] Xanthan gum, gellan gum, pullulan, curdlan, sodium hyaluronate.

[0073] It is preferable that the gel detergent has pH 8 to pH 11 in accordance with 1wt% aqueous solution calculation in view of low irritation to the skin. For this purpose, the gelling agent preferably has alkali resistance, salt resistance, and heat resistance. Among these, xyloglucan from tamarind seed gum, guar gum, carrageenan, and locust bean gum as the water-soluble polymer with salt resistance and heat resistance are also derived from plants, and preferred in terms of environmental protection.

[0074] The amount of gelling agent per the total weight of the gel detergent is preferably 0.1 wt% to 10 wt%, more preferably 1 wt% to 5 wt%. If the gelling agent is contained in an amount less than 1 wt% per the total weight of the gel detergent, it is difficult to be solidified into a gel. On the other hand, if the gelling agent exceeds 10 wt% per the total weight of the gel detergent, excessive solidification occurs, thereby compromising the foamability. As a result, easy foamability and cleaning power cannot be obtained in use.

[0075] 1 wt% aqueous solution of the gelling agent is preferably used in the viscosity of 5mPa·s to 9000mPa·s, more preferably 1000mPa·s to 8000mPa·s, further preferably 2000mPa·s to 6000mPa·s. If the viscosity is beyond the range of 5mPa·s to 9000mPa·s, the handling becomes worse.

[0076] The gel detergent improves foamability, foam quality, and moisture-retaining property to the skin, and has thickening property due to the interaction with the gelling agent such as water-soluble polymer. For the reasons, the gel detergent preferably contains one or more monohydric or polyhydric alcohol(s).

[0077] Examples of monohydric or polyhydric alcohol(s) include monohydric alcohols such as ethanol, propyl alcohol, and isopropyl alcohol, polyhydric alcohols such as isopentyl diol, propylene glycol, dipropylene glycol, 1,2-hexanediol, pentylene glycol, polyethylene glycol (molecular weight of 400 to 7000), polypropylene glycol (molecular weight 400), diglycerin, 1,3-butylene glycol, glycerin and inositol, or sugar or sugar alcohols such as sucrose, lactose, xylitol, maltitol, mannitol, maltose, sorbitol, fructose, glucose, trehalose, erythritol, raffinose, lactitol, sultose, isosultose, and starch syrup.

[0078] The amount of monohydric or polyhydric alcohol per the total weight of the gel detergent is preferably 2 wt% to 50 wt%, more preferably 10 wt% to 40wt%. The amount of sugar or sugar alcohol per the total weight of the gel detergent is preferably 0.5 wt% to 50 wt%, more preferably 3 wt% to 30 wt%.

[0079] FIG. 1 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a first embodiment of the present invention. The first embodiment of the present invention is performed by (A) heating and dissolving a gelling agent in water at a temperature of 70°C to 85°C to obtain a gelled aqueous solution (Step S1); (B) adding a cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution to obtain a molten material (Step S2); (C) filling the molten material in a rubbery container for molding while stirring the molten material (Step S3); and (D) cooling and solidifying the molten material filled in a rubbery container (Step S4); and (E) removing the rubbery container (Step S5).

[0080] In step S1, the gelling agent is heated and dissolved in water at a temperature of 70°C to 85°C to obtain a gelled aqueous solution. The gelled aqueous solution is obtained by heating at a temperature of 70°C to 85°C for a predetermined period (e.g., 15 minutes to 3 hours) to swell the gelling agent and by mixing and dissolving the gelling agent in water. Fig. 5 is a schematic sectional view of an exemplary tank for implementing the process in accordance with the present invention. The gelling agent and water are supplied into the tank 10 which is equipped with a heater 11 as shown in Fig. 5. The gelled aqueous solution is stirred by stirring means such as a stirring blade equipped inside the tank 10 and thus uniformly mixed. If the heating temperature is lower than 70°C, there is a risk that dissolution of the gelling agent becomes incomplete. On the other hand, if the heating temperature exceeds 85°C, there is a risk that the gelling agent is denatured.

[0081] In Step 1, if the monohydric or polyhydric alcohol is contained in the gel detergent, monohydric or polyhydric alcohol is added, and the gelling agent and water are heated and dissolved at a temperature of 70°C to 85°C to obtain the gelled aqueous solution.

[0082] In step S2, the cleaning composition is added to and dispersed in the gelled aqueous solution to obtain the molten material. The dispersing is preferably performed with heating for a predetermined period (e.g., 1 hours to 2 hours) such that the cleaning composition is uniformly dispersed in the gelled aqueous solution. The heating temperature can be properly determined depending on the melting point of the gelling agent and cleaning composition. Generally, the heating temperature is preferably equal to or above the melting point of the source material having the highest melting point, and is preferably 65°C to 85°C for the purpose of ensuring compatibility between the dissolution of the source material and the prevention of the denaturation of the gelling agent.

[0083] In order to prevent air bubbles which are created by the addition of the cleaning composition from being entrapped and improve the transparency of the gel detergent, it is preferable to degas the molten material using a vacuum device. Figure 2 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a second embodiment of the present invention. In accordance with the second embodiment, the cleaning composition is added to and dispersed in the gelled aqueous solution while degassing to obtain the molten material in Step (B). This step is referred to as "Step G (Step S2-1)". Fig. 6 is a schematic sectional view of an exemplary vacuum device for implementing the process in accordance with the present invention. In Step S2-1, the gelled aqueous solution and the cleaning composition charged in a vacuum reactor 21 are heated and stirred by actuating a jacket 24 which is provided with stirring means 22 such as a stirring blade and heating means of the vacuum device 20, and the inside of the vacuum reactor 21 becomes pressure-reduced, or vacuum by actuating a vacuum pump 23, thereby uniformly mixing the molten material and removing air bubbles. In order to remove any attachment from the inner wall of the vacuum reactor 21 and retaining material in the lower portion of the vacuum reactor 21, the stirring means 22 of the vacuum device is preferably an anchor mixer that is equipped with a scraper 25. In order to mix the molten material with high viscosity, the stirring means 22 of the vacuum device preferably has a peripheral velocity of from 5m/sec to 25/sec. Furthermore, in terms of air bubble removal efficiency, the vacuum device 20 preferably has vacuum degree of from 15Kpa (abs) to 75Kpa (abs). In a case where the step where the cleaning composition is added to and dispersed in the gelled aqueous solution to obtain the molten material, and the degassing step are simultaneously performed ion the vacuum device 20, the above steps are preferably performed for a period of 1 hour to 1.5 hours in order to prevent moisture loss in the molten material.

In a case where heating is performed, the above steps are preferably carried out in a stepwise manner.

[0084] FIG. 3 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance with a third embodiment of the present invention. In accordance with the third embodiment, a fatty acid potassium salt is added to and dispersed in the gelled aqueous solution while degassing to obtain adjusted material in Step (B) where the cleaning composition is added to and dispersed in the gelled aqueous solution to obtain the molten material. This step is referred to as "Step (H)" (Step S2-2). In accordance with the third embodiment, the cleaning composition other than the fatty acid potassium salt is added to the adjusted material in Step (B). This step is referred to as "Step (I) (Step S2-3). In a case where the fatty acid potassium salt is contained in the gel detergent, it is difficult to remove air bubbles therefrom. For the reasons, when obtaining the molten material from the gelled aqueous solution, it is preferable to perform the steps S2-2 and S2-3 and to perform degassing step twice.

[0085] The gel detergent in accordance with the embodiment of the present invention may properly contain, in addition to the gelling agent and the cleaning composition, other components, for example, preservatives (ethylparaben, butylparaben, and etc.), powders (pigments, dyes, resins, and etc.), fragrances, moisturizing agents, physiologically active ingredients, salts, solvents, pearl producing agents, neutralizing agents, pH adjusting agents, and enzymes unless the objective of the invention is not deteriorated. In view of dispersibility, it is preferable that the component(s) is blended in the molten material where the cleaning composition is sufficiently dissolved in the gelling aqueous solution. For example, if a gold leaf is contained in the gel detergent, the gold leaf dispersed in alcohol solvent is added to the molten material, and mixed and dispersed in the molten material.

[0086] In step S3, the rubbery container is filled with the molten material while stirring. Fig. 7A shows the step (C) where the rubbery container for molding is filled with the molten material, and Fig. 7B is an enlarged view of the step (C).

[0087] A plurality of notch portions 2 is formed at regular pitch in the outer periphery of the rotatable table 1 of the filling device 40. The filling device 40 is provided with an injection portion 3 and a removal portion 4. The roratable table 1 intermittently rotates with the rubbery container coupled thereto. The rubbery container 41 is coupled to the notch portion 2 which is disposed anterior to the injection portion 3. In the injection portion 3, an injector 3a descends when the rotatable table 1 is stopped, and comes in close contact with the top surface of the rubbery container 41. As such, the rubbery container 41 is filled with a certain amount of the molten material. If the injector 31 is elevated as it is, the molten material overflows from the rubbery container 41. For the reasons, due to a fastening device 3b which is mounted to the outer periphery of the rotatable table 1 the opening 41a is fastened by a fastening member 41c, and the injector 3a is then elevated. The rubbery container 41 which is filled with the molten material is rotated, and removed from the notch portion 2 at the removal portion 4.

[0088] As shown in FIG. 7B, the rubbery container 41 has an opening 41a for filling the molten material, and an expansion portion 41b that inflates or expands in a substantially spherical shape or a substantially oval spherical shape. The material for the rubbery container 41 may be material such as natural latex and synthetic latex which is generally used can be employed, without limitation. By employing the rubbery container 41 having coloring or transferable pattern on the inside thereof, coloring or pattern can be made on the outside of the gel detergent. Furthermore, while the amount of the molten material filled is not particularly limited, in a case where, for example, 100g of the molten material is filled, the rubbery container inflates or expands into a substantially spherical shape with a diameter of 5cm.

[0089] Fig. 4 is a flow chart illustrating steps for implementing a method of producing a gel detergent in accordance a fourth embodiment of the present invention. It is preferable that that the step (F) (Step S3-2) where residual molten material is removed from the opening of the rubbery container by suction is preferably performed between the step (C) and the step (D). In a case where the step S3-2 is performed, the removal portion 4 of the filling device 40 is preferably provided with, for example, a suctioning device 41 which removes the residual molten material overflowing from the rubbery container 41 from the opening 41a of the rubbery container by suction. The suctioning pump 4b of the suctioning device 4 suctions the gases inside a suctioning nozzle to recover the residual molten material and simultaneously remove the rubbery container 41 from the notch portion 2 due to the suction pressure.

[0090] Figure 7C is a cross-sectional view of an exemplary filling apparatus for filling the rubbery container for molding with molten material for implementing the process in accordance with the present invention. The filling device 40 elevates and descends the injector 3a by means of a cylindrical cam. The injector 3a is provided with a plunger 5 which is slidably mounted to a center portion of the injector 3a, and elevated or descended by an injector-actuating cam 7. The plunger 5 is elevated or descended by a plunger-actuating cam 6. When the rotatable table 1 is stopped, the injector 3a is descended by the injector-actuating cam 7 to come in contact with the top surface of the rotatable table 1. Subsequently, the plunger 5 is pushed and descended by the plunger-actuating cam 6. The tank 8 of the filling device 40 is mounted to the upper portion of the filling device 40, and is filled with the molten material for insertion or filling. When the plunger 5 is elevated, the molten material is supplied from the tank 8 of the filling device with stirring function through a pipe 9 into the injector 3a, and flows into the rubbery container 41 by descending the plunger 5. A cam shaft 47 that is coupled to each cam is actuated through a chain 43 by a motor 42, and the rotatable table 1 is rotated through a chain 44, the intermittent actuating device 45 and a chain 46 by the motor 42.

[0091] In view of filling properties, it is preferable to cool the molten material at 60°C to 65°C. If the molten material is

cooled at a temperature less than 60°C, the molten is easily solidified, and exhibits poor filling properties in the rubbery container 41. On the other hand, if the molten material is cooled at a temperature higher than 65°C, the variation in the weight of the gel detergent which is filled may occur. Furthermore, the step (C) of filling the rubbery container for molding with the molten material is preferably carried out at a filling rate (velocity) of from 33g/sec to 50g/sec. If the filling rate is less than 33/sec, the molten material is easily solidified. On the other hand, if the filling rate is greater than 50g/sec, air may be entrapped in the rubbery container 41.

[0092] In step S4, the molten material that is filled in the rubbery container 31 is solidified at a room temperature. Fig. 8 is a schematic diagram showing an exemplary apparatus for cooling and solidifying the molten material that is filled in the rubbery container 41 for molding for the purpose of implementing the process of the present invention. The molten material that is filled in the rubbery container 41 is received in a holder 51 of a storage box 50 such that the fastened opening 41 is downwardly disposed, and the storage box 50 leaves to stand at a room temperature. The molten material is cooled and solidified for a period of 1 days to 2 days until the center portion of the molten material is solidified. As a result, gel-like cleaning material is obtained.

[0093] In step S5, the rubbery container is removed. Fig. 9 shows the step (E) of removing the rubbery container in accordance with the process of the present invention. The rubbery container 41 is ruptured by an instrument 61 having a pointed tip such as a needle, thereby removing the rubbery container 41 and taking out a gel detergent 62 inside the rubbery container 41. Since the rubbery container 41 is inflated or expanded into a substantially spherical shape or a substantially oval spherical shape by the filling of the gel detergent 62, due to a small hole that is generated on the surface of the rubbery container 41 the rubbery container 41 can be easily ruptured.

[0094] As shown in Fig. 7B, the rubbery container 41 preferably has a protruding portion 41d on the side thereof opposite to the opening 41a. When the rubbery container 41 is ruptured in step S5, the ruptured rubber film is inclined to shrink at once, which may damage the outer contour or shape of the gel detergent 62. However, if the rubbery container 41 is provided with the protrusion 41d, the rubber film gently shrinks in comparison to the rubbery container 41 without the protrusion 41d. As a result, the rubbery container 41 can be ruptured without damaging the outer contour or shape of the gel detergent 62.

[Examples]

[0095] The embodiment of the present invention will be further illustrated by the following examples. However, the present invention is not limited in any way by the following examples. The percentage(s), proportion(s) and part(s) referred to in the detailed description, examples and claims are based on the weight, and represents approximate values, unless otherwise indicated. Examples 1 to 6 were prepared according to the flow chart of the process as shown in FIG. 1.

[Example 1]

[0096]

<1> purified water 67.9%
<2> glycerin 10.0%
<3> dipropylene glycol 7.0%
<4> 1,2-hexane glycol 2.5%
<5> xyloglucan (Glyloid 6C, DSP Gokyo Food & Chemical Co., Ltd.) 0.8%
<6> xanthan gum 0.2%
<7> lauric acid 5.9%
<8> myristic acid 2.2%
<9> palmitic acid 1.0%
<10> stearic acid 0.4%
<11> oleic acid 0.6%
<12> caustic soda 1.5%

Total 100.0%

Manufacturing method

[0097] Components <5> and <6> were added to and dispersed in a mixture of components <2> and <3> and the resultant mixture was added to component <1>. The mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, components <7> - <12> were mixed, molten, and stirred to obtain a homogeneous molten material (Step S2). Next, while maintaining the molten material at a temperature of 65°C to 80°C with stirring, the molten material

was filled in a rubbery container for molding (Step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container was removed with a toothpick (Step S5) to obtain a gel detergent.

[Example 2]

[0098]

<1> purified water 48.4%
<2> sorbitol 10.0%
<3> propanediol 10.0%
<4> 1,2-hexane glycol 2.5%
<5> xyloglucan (Glyloid 6C) 1.0%
<6> xanthan gum 0.5%
<7> lauric acid 5.9%
<8> myristic acid 2.2%
<9> palmitic acid 1.0%
<10> stearic acid 0.3%
<11> oleic acid 0.6%
<12> potassium hydroxide 2.60%
<13> lauric acid amide propyl hydroxy sulfobetaine solution (Softazoline LSB // Kawaken Fine Chemicals Co., Ltd.) 15.0%

Total 100.0%

Manufacturing method

[0099] Components <5> and <6> were added to and dispersed in a mixture of components <2> - <4> and the resultant mixture was added to component <1>. The mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, components <7> - <12> were mixed, heated to 75-85°C, and dissolved, and component <13> was added thereto. The mixture thus obtained was stirred to obtain a homogeneous molten material (Step S2). Next, while maintaining the molten material at a temperature of 65°C to 80°C with stirring, the molten material was filled in a rubbery container for molding (Step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container was removed with a toothpick (Step S5) to obtain a gel detergent.

[Example 3]

[0100]

<1> purified water 48.0%
<2> dipropylene glycol 7.0%
<3> 1,2-hexane glycol 2.5%
<4> xanthan gum 0.5%
<5> carrageenan 2.0%
<6> coconut oil fatty acid amide propyl betaine solution (Obazorin CAB30 / Toho Chemical Industry Co., Ltd.) 40.0%

Total 100.0%

Manufacturing method

[0101] Components <4> and <5> were added to and dispersed in components <2> and <3>, and the resultant mixture was added to a component <1>. The mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, component <6> was mixed with the resultant mixture, and the mixture thus obtained was stirred to obtain a homogeneous molten material (Step S2). Next, while maintaining the molten material at a temperature of 65°C to 80°C with stirring, the molten material was filled in a rubbery container for molding (Step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container was removed with a toothpick (Step S5) to obtain a gel detergent.

[Example 4]

[0102]

<1> purified water 58.5%
<2> dipropylene glycol 7.0%
<3> 1,2-hexane glycol 2.5%
<4> carrageenan 2.0%
<5> polyoxyethylene lauryl ether sodium acetate (Neohitenol ECL-30S/DKS Co., Ltd.) 30.0%

Total 100.0%

[0103] Components <4> and <5> were added to and dispersed in components <2> and <3>, and the resultant mixture was added to component <1>. The mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, component <6> was mixed with the resultant mixture, and the mixture thus obtained was stirred to obtain a homogeneous molten material (Step S2). Next, while maintaining the molten material at a temperature of 65°C to 75°C with stirring, the molten material was filled in a rubbery container for molding (Step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container was removed with a toothpick (Step S5) to obtain a gel detergent.

[Example 5]

[0104]

<1> purified water 59.5%
<2> 1,2-hexane glycol 2.5%
<3> xyloglucan (Glyloid 6C) 0.7%
<4> xanthan gum 0.3%
<5> potassium soap base (100%) 12.0%
<6> lauric acid amide propyl hydroxy sulfobetaine solution (Softazoline LSB / Kawaken Fine Chemicals Co., Ltd.) 15.0%
<7> glycerin 10.0%
<8> citric acid appropriate amount
<9> sodium citrate appropriate amount

Total 100.0%

Manufacturing method

[0105] Components <3> and <4> were added to and dispersed in component <2>, and the mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, components <5> and <6> were sequentially added to the resultant mixture, and the mixture thus obtained was stirred and dissolved while heating to 75-85°C. Next, components <7> - <9> were added to adjust pH to 10.0. As such, a homogeneous molten material was obtained (Step S2). Next, the molten material was filled in a rubbery container for molding while stirring (Step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container was removed with a toothpick (Step S5) to obtain a gel detergent.

[Example 6]

[0106]

<1> purified water 36.5%
<2> dipropylene glycol 10.0%
<3> 1,2-hexane glycol 2.5%
<4> xanthan gum 0.5%
<5> locust bean gum 0.5%
<6> coconut oil fatty acid amide propyl betaine solution (Obazorin CAB30 / Toho Chemical Industry Co., Ltd.) 50.0%

Total 100.0%

Manufacturing method

[0107] Components <5> and <6> were added to and dispersed in components <2> and <3>, and the resultant mixture was added to component <1>. The mixture thus obtained was heated to 85°C, stirred, and dissolved (Step S1). Next, component <6> was mixed to the resultant mixture, and the mixture thus obtained was heated to 70-85°C, and stirred to obtain a homogeneous molten material (Step S2). Next, the molten material was filled in a rubbery container for molding while stirring (step S3). The molten material filled in the rubbery container was allowed to stand at a room temperature (Step S4). The rubbery container is removed with a toothpick (Step S5) to obtain a gel detergent.

[0108] While a preferred embodiment of the present invention has been shown and described with particularity, it will be appreciated that various changes and modifications may suggest themselves to one having ordinary skill in the art upon being apprised of the present invention. It is also intended to encompass all such changes and modifications as fall within the scope and spirit of the appended claims.

[Reference Signs List]

[0109]

1	rotatable table
2	notch portion
3	injection portion
3a	injector
3b	fastening device
4	removable portion
4a	suctioning device
4b	suctioning pump
4c	suctioning nozzle
5	plunger
6	plunger-actuating cam
7	injector-actuating cam
8	tank of filling device
9	pipe
10	tank
11	heater
12	stirring means
13	gelling aqueous solution
20	vacuum apparatus
21	vacuum reactor
22	stirring means of vacuum device
23	vacuum pump
24	jacket
25	scraper
40	filling device
41	rubbery container
41a	opening
41b	expansion portion
41c	fastening member
41d	protrusion
42	motor
43, 44, and 46	chain
45	intermittent actuating device
47	cam shaft
50	storage box
51	holder
61	instrument having pointed tip
62	gel detergent

Claims

1. A method of producing a gel detergent, comprising the steps of:

(A) heating and dissolving a gelling agent in water at a temperature of from 70°C to 85°C to obtain a gelled aqueous solution;
(B) adding a cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution so as to obtain a molten material;
(C) filling a rubbery container for molding with the molten material;
(D) cooling and solidifying the molten material filled in the rubbery container at a room temperature; and
(E) removing the rubbery container.

2. The method according to claim 1, wherein in step (C), the molten material is filled at a filling rate of from 33g/sec to 50g/sec.

3. The method according to claim 1 or 2, further comprising the step of (F) removing a residual molten material from an opening of the rubbery container after step (C) and prior to step (D).

4. The method according to any of claims 1-3, wherein the rubbery container has a protrusion on a side opposite to an opening thereof.

5. The method according to any of claims 1-4, wherein the cleaning composition contains one or more selected from Group A and/or Group B, and the gelling agent contains one or more selected from Group C,

(Group A) an anionic surfactant:

(A-1) carboxylate:

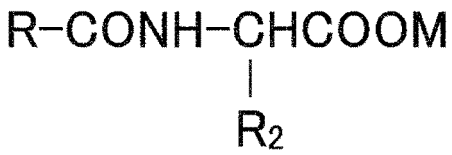
[Formula 1] **R-COOM**

in the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M is Na, K or amine salt,
(A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated):

[Formula 2] **R-O(CH_2CH_2O)nR_1COOM**

in the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; R_1 is saturated alkyl group having 1 or 2 carbon atoms; and M is Na, K or amine salt,
(A-3) sodium, potassium or amine salt of N-acylamino acid:

[Formula 5]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; R_2 is -H, $-CH_3$, or $-CH_2CH_2COOM$; and M represents Na, K or amine salt,

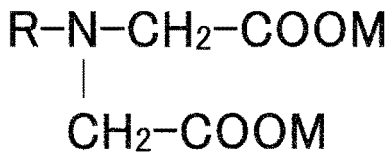
(Group B) an amphoteric surfactant:

(B-1):

[Formula 6] **R-NH-CH_2-COOM**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-2):

[Formula 7]

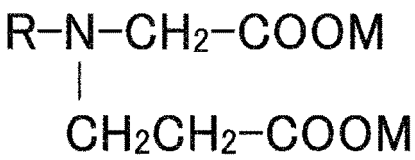


in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-3):

[Formula 8] **R-NH-CH_2CH_2-COOM**

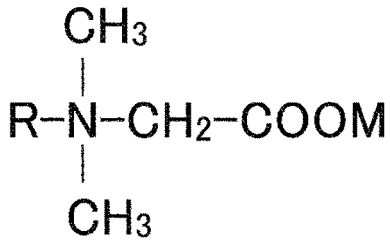
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-4):

[Formula 9]



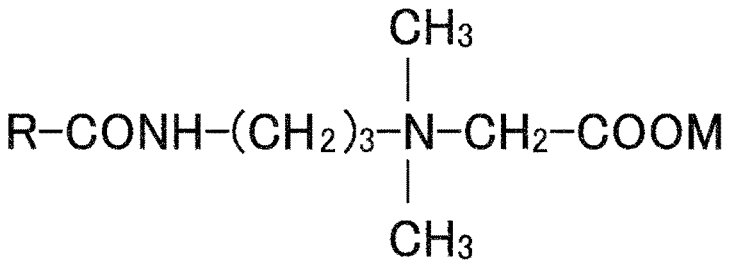
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-5):

[Formula 10]



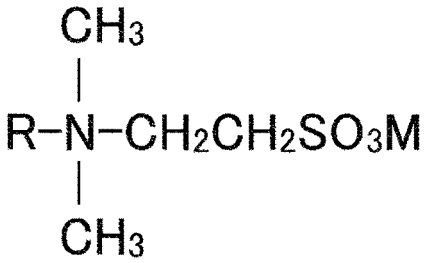
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-6):

[Formula 11]



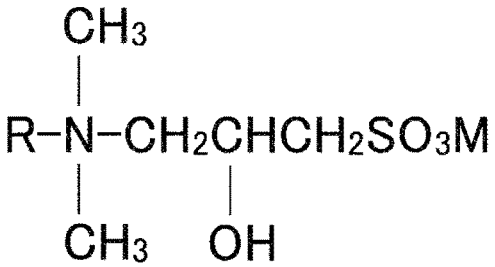
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-7):

[Formula 12]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-8):

[Formula 13]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(Group C) the gelling agent

(C-1) a water-soluble polymer derived from a plant or a seaweed:

xyloglucan, guar gum, locust bean gum, agarose, carrageenan, gum arabic, sodium alginate, glucomannan, pectin; or

(C-2) water-soluble polymer that is produced by microbial fermentation xanthan gum, gellan gum, pullulan, curdlan, sodium hyaluronate

6. The method according to claim 5, wherein the (A-1) carboxylate comprises a fatty acid potassium salt.

7. The method according to claim 5, wherein the (A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having

12-22 carbon atoms, saturated or unsaturated) comprises (A-2-1) polyoxyethylene alkyl ether acetate as represented by [Formula 3] or (A-2-2) polyoxyethylene alkyl ether propionate as represented by [Formula 4],

[Formula 3] **$R\text{-}O(CH_2CH_2O)nCH_2COOM$**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt,

[Formula 4] **$R\text{-}O(CH_2CH_2O)nCH_2CH_2COOM$**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

8. The method according to any of claims 1-7, wherein the gel detergent further comprises one or more monohydric or polyhydric alcohol.

9. The method according to any of claims 1-8, wherein step (B) comprises the step of (G) adding the cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution while degassing to obtain the molten material.

10. The method according to claim 7, wherein step (B) comprises the steps of (H) adding a fatty acid potassium salt to the gelled aqueous solution and dispersing the fatty acid potassium salt in the gelled aqueous solution while degassing to obtain an adjusted material, and (I) adding the cleaning composition other than the fatty acid potassium salt to the adjusted material and dispersing the cleaning composition other than the fatty acid potassium salt in the adjusted material while degassing to obtain the molten material.

Amended claims under Art. 19.1 PCT

1. A method of producing a gel detergent, comprising the steps of:

(A) heating and dissolving a gelling agent in water at a temperature of from 70°C to 85°C to obtain a gelled aqueous solution;
(B) adding a cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution so as to obtain a molten material;
(C) filling a rubbery container for molding with the molten material, the rubbery container having an expansion portion which is expanded by the filling of the molten material;
(D) cooling and solidifying the molten material filled in the rubbery container at a room temperature; and
(E) removing the rubbery container.

2. The method according to claim 1, wherein in step (C), the molten material is filled at a filling rate of from 33g/sec to 50g/sec.

3. The method according to claim 1 or 2, further comprising the step of (F) removing a residual molten material from an opening of the rubbery container after step (C) and prior to step (D).

4. The method according to any of claims 1-3, wherein the rubbery container has a protrusion on a side opposite to an opening thereof.

5. The method according to any of claims 1-4, wherein the cleaning composition contains one or more selected from Group A and/or Group B, and the gelling agent contains one or more selected from Group C,

(Group A) an anionic surfactant:

(A-1) carboxylate:

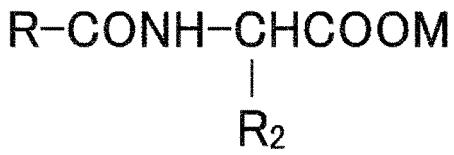
[Formula 1] **R-COOM**

in the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M is Na, K or amine salt,
(A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated):

[Formula 2] **$R\text{-}O(CH_2CH_2O)nR_1COOM$**

in the formula, R is a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; R_1 is saturated alkyl group having 1 or 2 carbon atoms; and M is Na, K or amine salt,
(A-3) sodium, potassium or amine salt of N-acylamino acid:

[Formula 5]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; R_2 is -H, $-CH_3$, or $-CH_2CH_2COOM$; and M represents Na, K or amine salt,

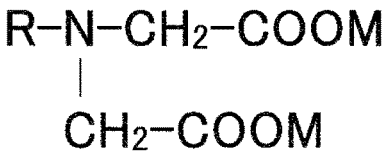
(Group B) an amphoteric surfactant:

(B-1):

[Formula 6] **$R\text{-}NH\text{-}CH_2\text{-}COOM$**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-2):

[Formula 7]

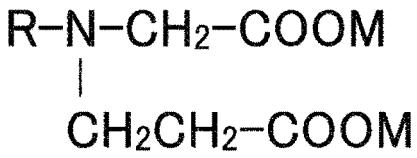


in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-3):

[Formula 8] **$R\text{-}NH\text{-}CH_2CH_2\text{-}COOM$**

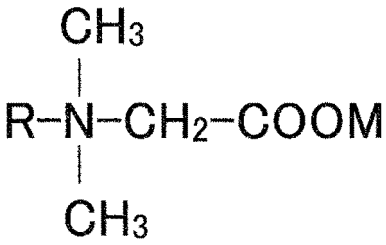
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-4):

[Formula 9]



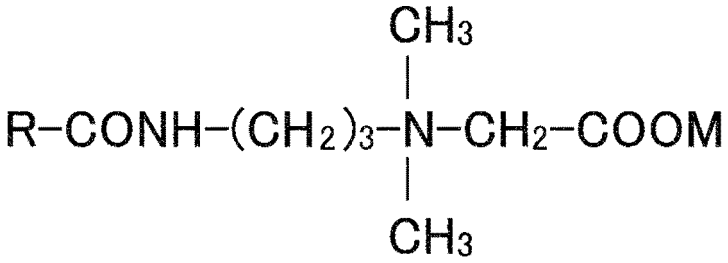
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-5):

[Formula 10]



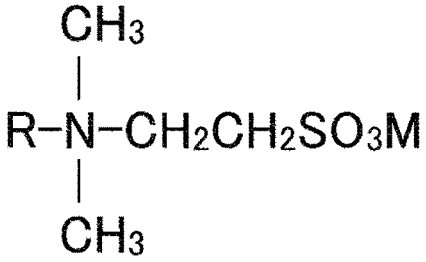
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-6):

[Formula 11]



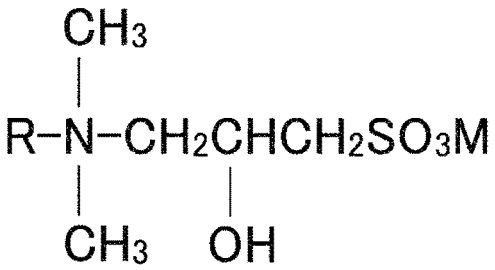
in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-7):

[Formula 12]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,
(B-8):

[Formula 13]



in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; and M represents Na, K or amine salt,

(Group C) the gelling agent

(C-1) a water-soluble polymer derived from a plant or a seaweed:

xyloglucan, guar gum, locust bean gum, agarose, carrageenan, gum arabic, sodium alginate, glucomannan, pectin; or

(C-2) water-soluble polymer that is produced by microbial fermentation xanthan gum, gellan gum, pullulan, curdlan, sodium hyaluronate

6. The method according to claim 5, wherein the (A-1) carboxylate comprises a fatty acid potassium salt.

7. The method according to claim 5, wherein the (A-2) polyoxyethylene alkyl ether carboxylate (alkyl group having 12-22 carbon atoms, saturated or unsaturated) comprises (A-2-1) polyoxyethylene alkyl ether acetate as represented by [Formula 3] or (A-2-2) polyoxyethylene alkyl ether propionate as represented by [Formula 4],

[Formula 3] **R-O(CH_2CH_2O)nCH_2COOM**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt,

[Formula 4] **R-O(CH_2CH_2O)nCH_2CH_2COOM**

in the formula, R represents a saturated or unsaturated alkyl group having 12 to 22 carbon atoms; n represents 1 to 20 on average; and M represents Na, K or amine salt.

8. The method according to any of claims 1-7, wherein the gel detergent further comprises one or more monohydric or polyhydric alcohol.

9. The method according to any of claims 1-8, wherein step (B) comprises the step of (G) adding the cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution while degassing to obtain the molten material.

10. The method according to claim 7, wherein step (B) comprises the steps of (H) adding a fatty acid potassium salt to the gelled aqueous solution and dispersing the fatty acid potassium salt in the gelled aqueous solution while degassing to obtain an adjusted material, and (I) adding the cleaning composition other than the fatty acid potassium salt to the adjusted material and dispersing the cleaning composition other than the fatty acid potassium salt in the adjusted material while degassing to obtain the molten material.

Statement under Art. 19.1 PCT

1. A method of producing a gel detergent, comprising the steps of:

(A) heating and dissolving a gelling agent in water at a temperature of from 70°C to 85°C to obtain a gelled aqueous solution;
(B) adding a cleaning composition to the gelled aqueous solution and dispersing the cleaning composition in the gelled aqueous solution so as to obtain a molten material;
(C) filling a rubbery container for molding with the molten material, the rubbery container having an expansion portion which is expanded by the filling of the molten material;
(D) cooling and solidifying the molten material filled in the rubbery container at a room temperature; and
(E) removing the rubbery container.

By the amendment of the rubbery container (i.e., the addition of the phrase "the rubbery container having an expansion portion which is expanded by the filling of the molten material"), the scope of the claim is restricted.
Cited Reference 1 discloses a safe and useful gel detergent for skin as a semi-solid cosmetic composition. Cited Reference 2 discloses a gel composition formation using a rubber elastic mold having a shape of, for example, rose. See para. 0010-0011. Furthermore, Cited Reference 3 discloses aqueous gel formation using a rubbery mold as shown in FIG. 20. See para. 0023 and 0027. However, any of Cited References 1-3 does not disclose the step of "filling a rubbery container for molding with the molten material, the rubbery container having an expansion portion which is expanded by the filling of the molten material" as recited in claim 1.
Due to the above configuration, the mold is not needed to be cleaned, thereby providing a simplified method of producing a gel-type detergent with high productivity.

Fig. 1

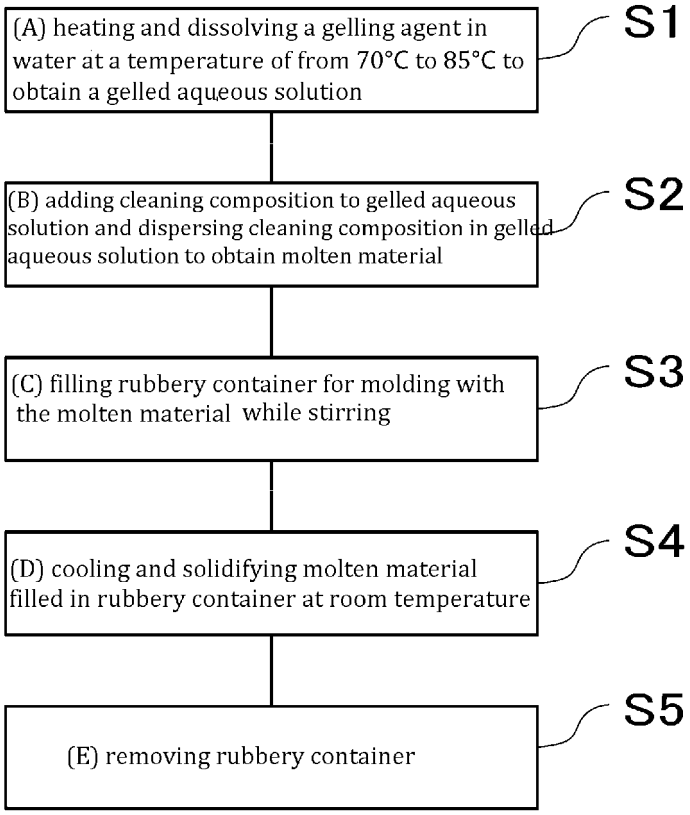

(A) heating and dissolving a gelling agent in water at a temperature of from 70°C to 85°C to obtain a gelled aqueous solution
S1
(B) adding cleaning composition to gelled aqueous solution and dispersing cleaning composition in gelled aqueous solution to obtain molten material
S2
(C) filling rubbery container for molding with the molten material while stirring
S3
(D) cooling and solidifying molten material filled in rubbery container at room temperature
S4
(E) removing rubbery container
S5

Fig. 2

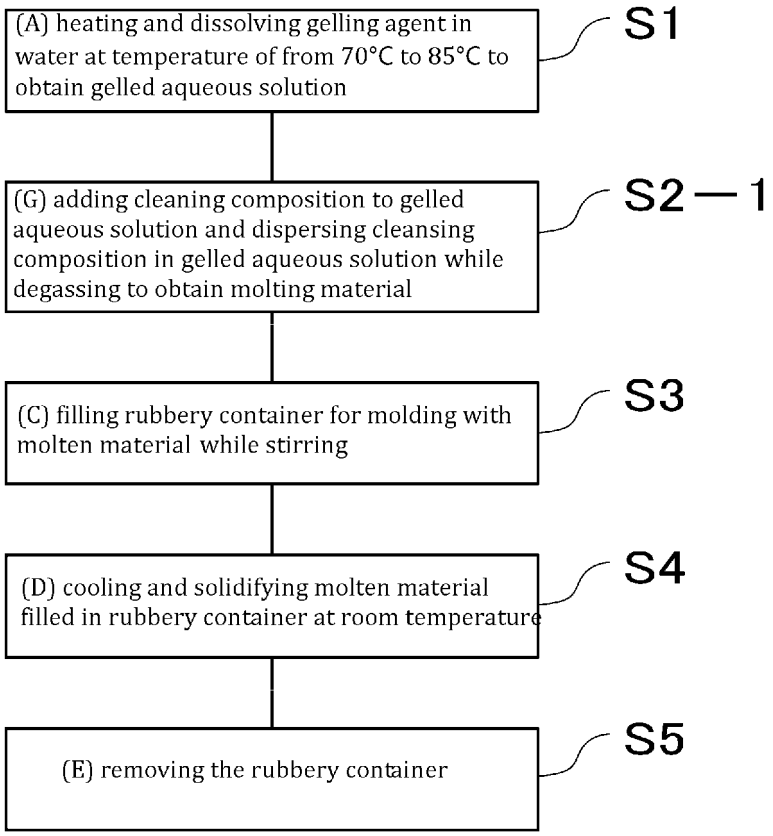

(A) heating and dissolving gelling agent in water at temperature of from 70°C to 85°C to obtain gelled aqueous solution
S1
(G) adding cleaning composition to gelled aqueous solution and dispersing cleansing composition in gelled aqueous solution while degassing to obtain molting material
S2—1
(C) filling rubbery container for molding with molten material while stirring
S3
(D) cooling and solidifying molten material filled in rubbery container at room temperature
S4
(E) removing the rubbery container
S5

Fig. 3

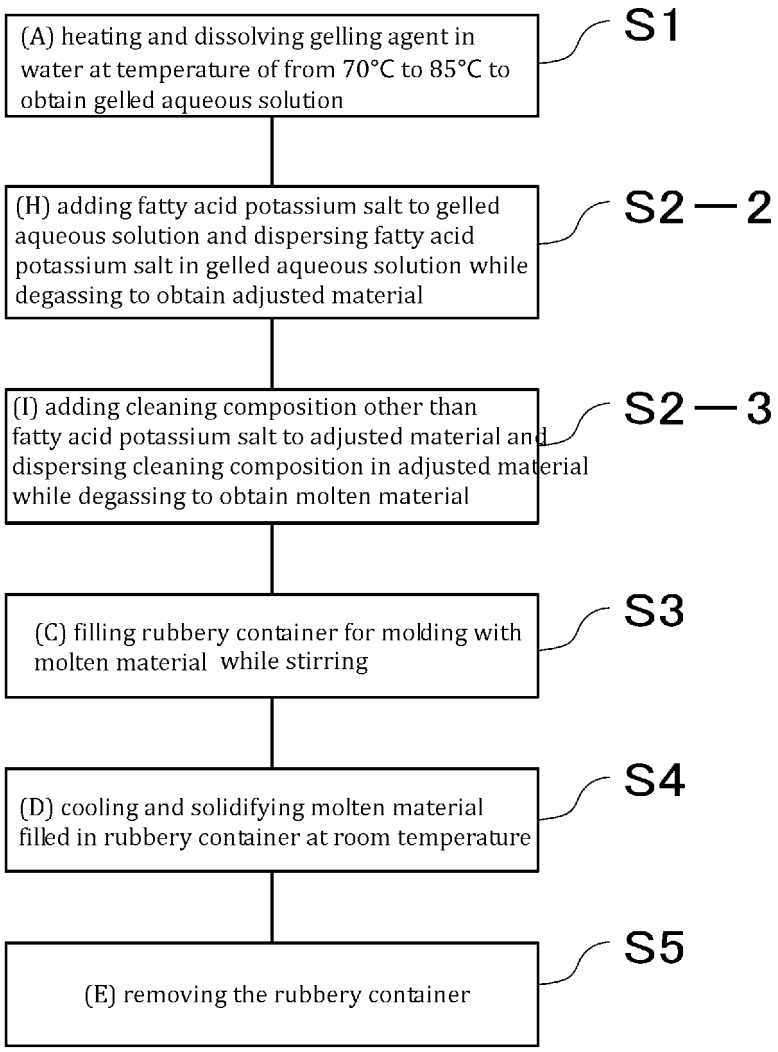

(A) heating and dissolving gelling agent in water at temperature of from 70°C to 85°C to obtain gelled aqueous solution
S1
(H) adding fatty acid potassium salt to gelled aqueous solution and dispersing fatty acid potassium salt in gelled aqueous solution while degassing to obtain adjusted material
S2—2
(I) adding cleaning composition other than fatty acid potassium salt to adjusted material and dispersing cleaning composition in adjusted material while degassing to obtain molten material
S2—3
(C) filling rubbery container for molding with molten material while stirring
S3
(D) cooling and solidifying molten material filled in rubbery container at room temperature
S4
(E) removing the rubbery container
S5

Fig. 4

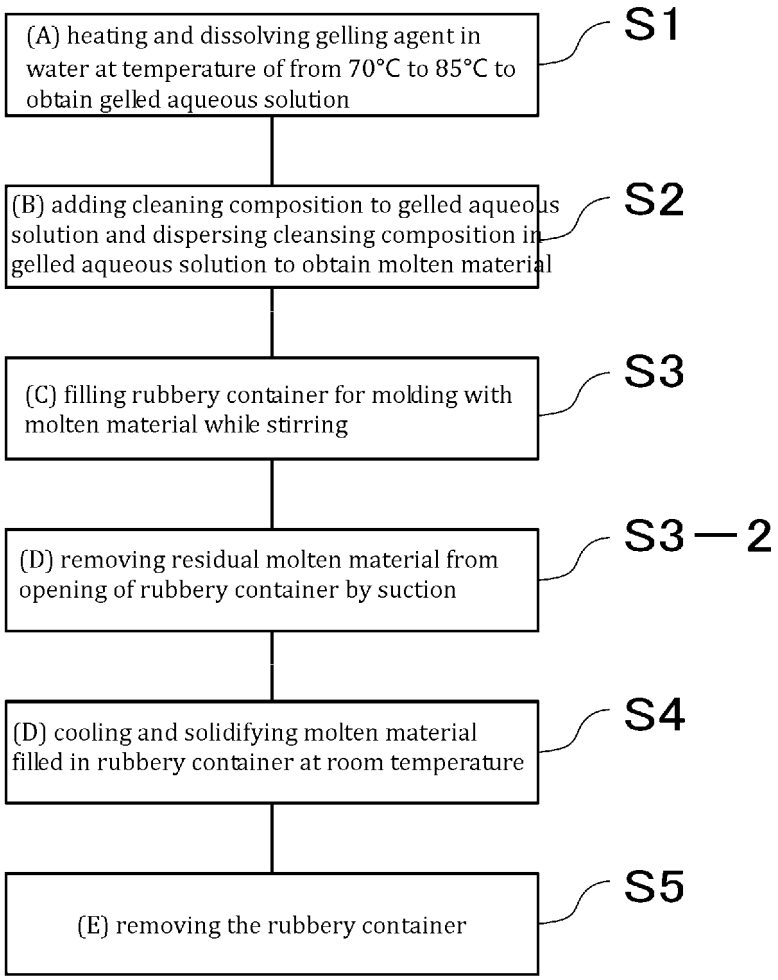

(A) heating and dissolving gelling agent in water at temperature of from 70°C to 85°C to obtain gelled aqueous solution
S1
(B) adding cleaning composition to gelled aqueous solution and dispersing cleansing composition in gelled aqueous solution to obtain molten material
S2
(C) filling rubbery container for molding with molten material while stirring
S3
(D) removing residual molten material from opening of rubbery container by suction
S3—2
(D) cooling and solidifying molten material filled in rubbery container at room temperature
S4
(E) removing the rubbery container
S5

Fig. 5

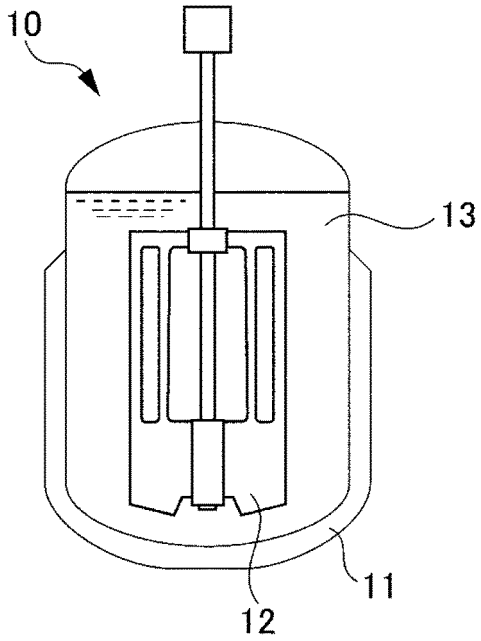


Fig. 6

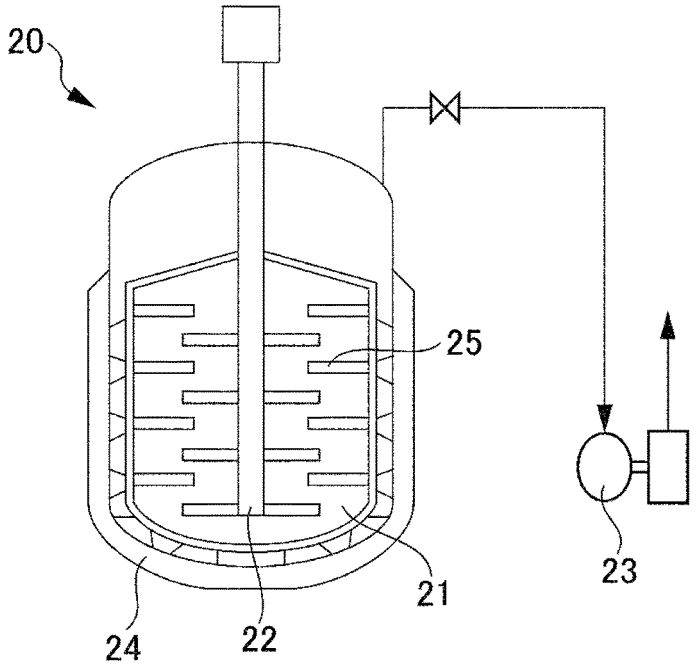


Fig. 7A

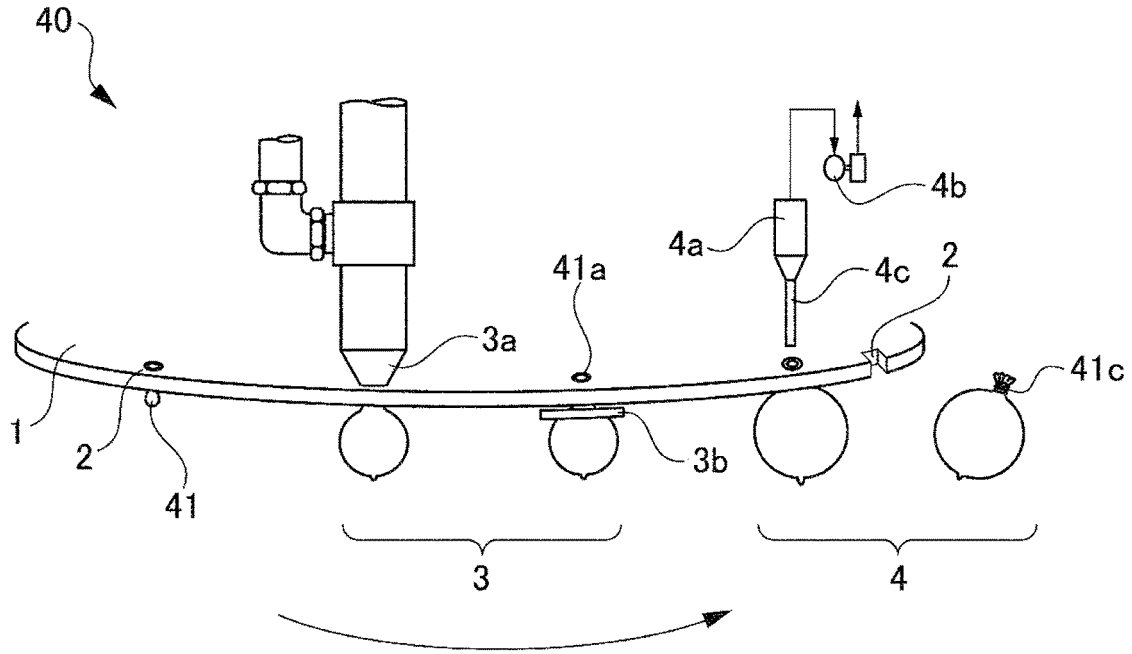


Fig. 7B

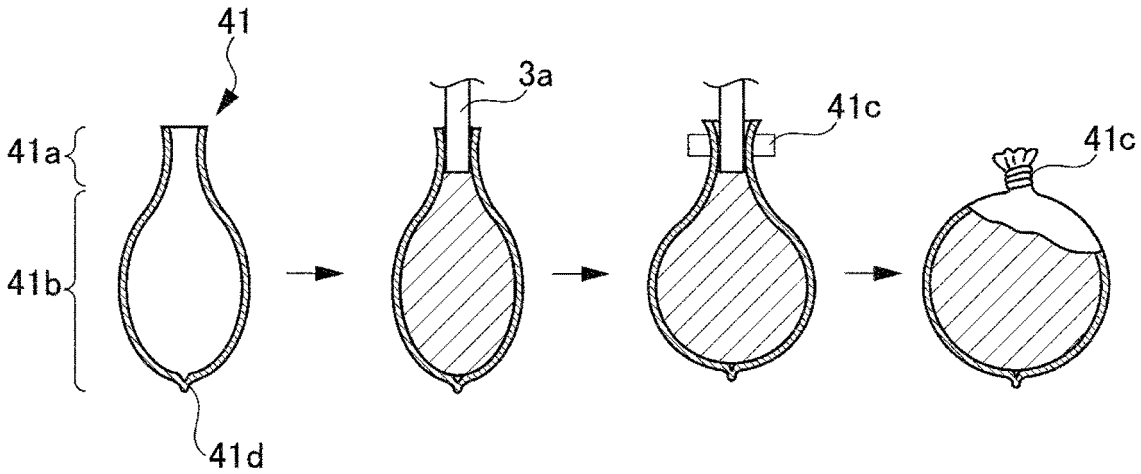


Fig. 7C

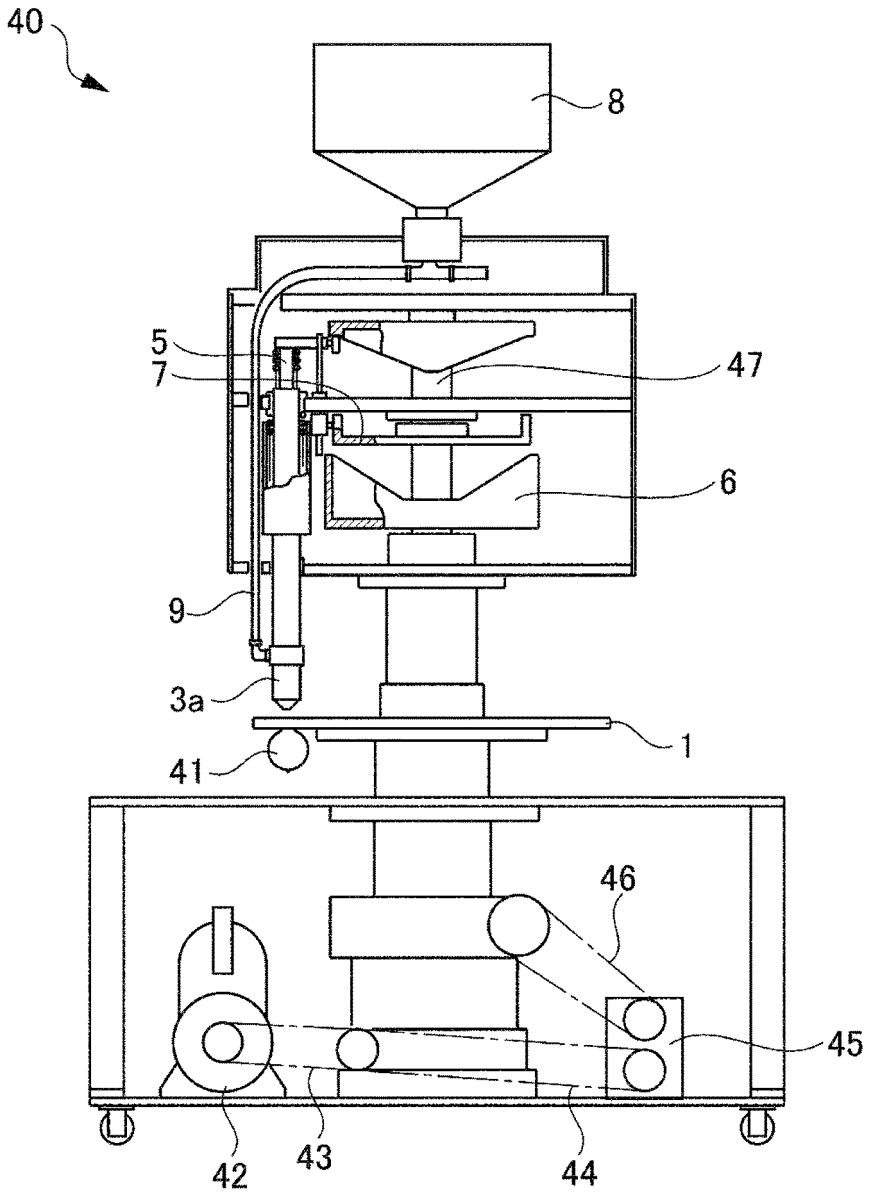


Fig. 8

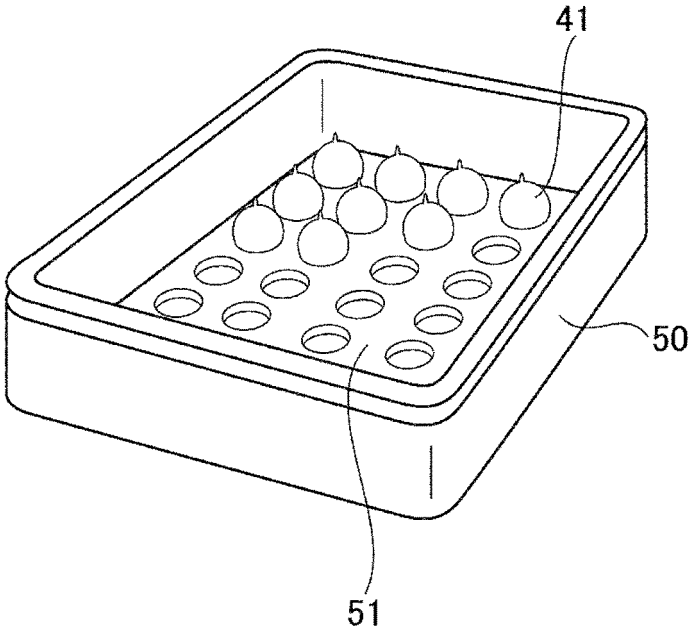
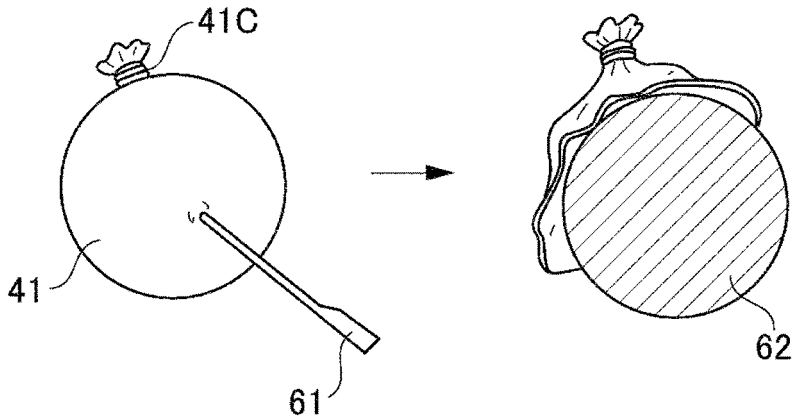


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/084366

A. CLASSIFICATION OF SUBJECT MATTER
C11D11/00(2006.01)i, *C11D1/04*(2006.01)i, *C11D1/06*(2006.01)i, *C11D1/10*(2006.01)i, *C11D1/88*(2006.01)i, *C11D1/90*(2006.01)i, *C11D1/92*(2006.01)i, *C11D3/20*(2006.01)i, *C11D3/37*(2006.01)i, *C11D3/382*(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)
C11D11/00, C11D1/04, C11D1/06, C11D1/10, C11D1/88, C11D1/90, C11D1/92, C11D3/20, C11D3/37, C11D3/382, C11D17/08

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 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2013-100305 A (Kabushiki Kaisha Neige Corporation), 23 May 2013 (23.05.2013), examples 1 to 6; claims (Family: none)	1-10
Y	JP 11-226103 A (Okamoto Industries, Inc.), 24 August 1999 (24.08.1999), examples; claims; paragraphs [0006], [0010] (Family: none)	1-10
Y	JP 2003-253246 A (Sanyo Chemical Industries, Ltd.), 10 September 2003 (10.09.2003), claims; paragraphs [0023], [0027]; examples (Family: none)	1-10

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

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 January, 2014 (27.01.14)	04 February, 2014 (04.02.14)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/084366

Continuation of A. CLASSIFICATION OF SUBJECT MATTER
(International Patent Classification (IPC))

C11D17/08(2006.01)i

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

Form PCT/ISA/210 (extra sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013100305 A **[0006]**
- JP 2013147455 A **[0006]**