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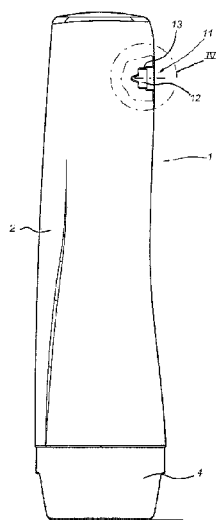
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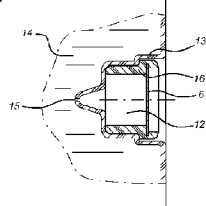
(54) **Title:** CONTAINER HOLDING A FLUID PRODUCT THAT CONTAINS ONE OR MORE GAS-GENERATING COMPONENTS

Fig. 3



(57) **Abstract:** The present invention relates to a packaged product in the form of a container (1) holding a highly viscous fluid product that contains one or more components that can give rise to gas formation and pressure built-up within the container, the container comprising: • a squeezable container body (2) with an interior space containing the highly viscous fluid product; • an outlet (7) through which the fluid product can exit the container body; and • a venting system (11) on the container body through which a gas can exit the container body, wherein the venting system comprises: a venting chamber (12) separate from the interior space (14) of the container body; one or more openings (15) connecting the interior space of the container body to the venting chamber to allow gas to flow from the container body to the venting chamber, said one or more openings being sized such that the one or more openings are too small to allow the highly viscous fluid product to enter the one or more openings; and a gas-permeable membrane (6) through which gas can exit the venting chamber to an outside of the container body; said container comprising a first end (4) with the outlet (3) and a second end, wherein the container is shaped to rest on the first end. The packaged product according to the invention offers the advantage that gas that is generated within the container can exit the container via the venting system when the container is closed.

Fig. 5





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CONTAINER HOLDING A FLUID PRODUCT THAT CONTAINS ONE OR MORE GAS-GENERATING COMPONENTS

TECHNICAL FIELD OF THE INVENTION

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The present invention relates to a packaged product in the form of a container holding a fluid product that contains one or more components that can give rise to gas formation and pressure built-up. An example of such a packaged product is a container holding a liquid detergent composition that contains a bleaching agent.

10

The container of the present invention comprises a venting system that is impermeable to the fluid product but through which gas can exit the container in case of pressure built-up.

15 BACKGROUND OF THE INVENTION

Pressure built-up within containers containing a fluid product can result from the formation of gas, e.g. as a result of decomposition of a component and/or due to chemical reactions between two or more different components.

20

Packaged products, especially products packaged in sealed containers, are usually formulated in such a way that gas formation during distribution and storage is minimized. Nonetheless, in products that contain gas generating components formation of gas cannot always completely be avoided. The resulting pressure built-up can lead to deformation of the package. In addition, it can give rise to an explosive release of gas and/or product when the pressurized container is opened. This is why containers holding a gas generating product have been provided with venting systems to ensure that pressure built-up within the container is minimized.

25

30 WO 96/24534 describes a package containing a liquid product, said package comprising a venting means, said venting means allowing passage of gases between the interior and the exterior of said package when the pressure inside said package differs from the ambient pressure, said venting means being permeable to gases, but impermeable to said product, characterized in that said package further comprises a protecting means which inhibits
35 splashing of said product onto said venting means, and said protecting means allows the passage of gases to said venting means.

DE 9217614 U1 describes a closure for a packaging container with a gas-permeable film/membrane and a protection element with one or more small openings that should minimize fouling of the film/membrane with liquid product.

5

The venting systems described in the aforementioned prior art publications make use of gas-permeable membranes. These gas-permeable membranes work well as long as they are not fouled with liquid product. This is why these publications disclose containers in which the venting system is located above product level close to the container outlet, and wherein these

10 containers have been designed to keep the liquid product away from the gas-permeable membrane. However, fouling of the gas-permeable membrane is likely to occur with these containers when the openings that give access to the space adjacent the gas-permeable membrane are in direct contact with liquid product for some time, e.g. when the bottle has fallen over or when it is transported or stored in upside down or horizontal position.

15

SUMMARY OF THE INVENTION

The inventors have developed a packaged product in the form of a container holding a fluid

20 product that contains one or more components that can give rise to gas formation and pressure built-up, said container comprising a venting system that includes (i) a venting chamber separate from the interior space of the container; (ii) one or more openings connecting the interior space of the container body to the venting chamber; and (iii) a gas-permeable membrane. Each of the rheology of the fluid product and the design of the

25 container, including the venting system, have been optimized by the inventors to prevent fouling of the gas-permeable membrane by the fluid product even if the openings of the venting chamber are fully covered by the fluid product during a prolonged period of time.

The inventors have discovered that if the fluid product has a high viscosity and if the openings

30 connecting the interior space of the container are sufficiently small, gas can still exit the container through these openings and the gas-permeable membrane, whilst at the same time the viscous fluid product is unable to enter the venting chamber and is thus prevented from fouling the gas-permeable membrane.

35 The fluid product contained in the container of the present invention is highly viscous. As a result, unlike liquid products or ordinary viscosity, the fluid product of the present invention

tends to flow rather slowly. In order to ensure that the fluid product can be readily dispensed from the container at all times, the container has been shaped to rest on the end of the container that comprises the outlet through which the fluid product can be dispensed.

The rheological behavior of the fluid product of the present invention can be described as

5 thixotropic. The term "thixotropic" means that the product is viscous under quiescent conditions and become less viscous when shaken, agitated, or otherwise stressed. In thixotropic compositions, this so called "shear thinning effect" is reversible, i.e. the composition will return to a more viscous state once it is no longer subjected to shear stress. This thixotropic behavior of the fluid product can be demonstrated by measuring the storage
10 modulus (G') and the loss modulus (G'') of the product as a function of angular frequency (ω) on a rheometer in oscillatory mode. Both G' and G'' of the fluid product increase as a function of angular frequency (ω), be it that G'' increases at a faster rate than G' . At very low angular frequency (ω) G'' of the fluid product is lower than G' , but at an ω in the range of 0.05-50 rad/s G'' surpasses G' .

15 Thus, the present invention provides a packaged product in the form of a container holding a highly viscous fluid product that contains one or more components that can give rise to gas formation and pressure built-up within the container, the container comprising:

- a squeezable container body with an interior space containing the highly viscous fluid
20 product having a storage modulus at 20°C ($G'(\omega)$) and a loss modulus at 20°C ($G''(\omega)$), both moduli measured as a function of angular frequency (ω) on a rheometer in oscillatory mode operating at a strain of 0.1%, wherein:
 $G''(\omega) > G'(\omega)$ at angular frequencies (ω) in the range of 50 to 100 rad/s, and
 $G''(\omega) < G'(\omega)$ at angular frequencies (ω) in the range of 0.01 to 0.05 rad/s;
- 25 • an outlet through which the fluid product can exit the container body; and
- a venting system on the container body through which a gas can exit the container body, wherein the venting system comprises:
 - a venting chamber separate from the interior space of the container body;
 - one or more openings connecting the interior space of the container body to the
30 venting chamber to allow gas to flow from the container body to the venting chamber, said one or more openings being sized such that the one or more openings are too small to allow the highly viscous fluid product to enter the one or more openings; and
 - a gas-permeable membrane through which gas can exit the venting chamber to an
35 outside of the container body;

said container comprising a first end with the outlet and a second end, wherein the container is shaped to rest on the first end.

The packaged product according to the invention offers the advantage that gas that is generated within the container can exit the container via the venting system when the container is closed. The benefits of the present invention are very evident in case the highly viscous fluid product is a detergent composition containing bleaching agent.

10 DRAWINGS

Figure 1 shows a view in perspective of the container of the present invention

Figure 2 shows a side view of the open container

Figure 3 shows a side view of the container with a cross-cut view at the position of the venting system

15 Figure 4 shows an up-scaled view of the cross-cut detail of Figure 3.

Figure 5 shows the same cross-cut detail as Figure 4, including the gas-permeable membrane

20 DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a packaged product in the form of a container holding a highly viscous fluid product that contains one or more components that can give rise to gas formation and pressure built-up within the container, the container comprising:

- 25 • a squeezable container body with an interior space containing the highly viscous fluid product, said highly viscous fluid product having a storage modulus at 20°C ($G'(\omega)$) and a loss modulus at 20°C ($G''(\omega)$), both moduli measured as a function of angular frequency (ω) on a rheometer in oscillatory mode operating at a strain of 0.1%, wherein:
 - 30 $G''(\omega) > G'(\omega)$ at angular frequencies (ω) in the range of 50 to 100 rad/s, and $G''(\omega) < G'(\omega)$ at angular frequencies (ω) in the range of 0.01 to 0.05 rad/s;
- an outlet through which the fluid product can exit the container body; and
- a venting system on the container body through which a gas can exit the container body, wherein the venting system comprises:

- a venting chamber separate from the interior space of the container body;
- one or more openings connecting the interior space of the container body to the venting chamber to allow gas to flow from the container body to the venting chamber, said one or more openings being sized such that the one or more openings are too small to allow the highly viscous fluid product to enter the one or more openings; and
- a gas-permeable membrane through which gas can exit the venting chamber to an outside of the container body;

said container comprising a first end with the outlet and a second end, wherein the container is shaped to rest on the first end.

Both the storage modulus (G') and the loss modulus (G'') of the fluid product are determined at 20°C using Anton Paar® MCR 302 rheometer, using plate-plate geometry, spindle PP50/S (sandblasted) and a gap size of 3mm. The program settings applied are as follows:

- A Strain γ is chosen in the Linear Visco-elastic range of the product (LVER is determined by an Amplitude Sweep). The strain is kept constant on 0.1%.
- An increasing ramp log of angular frequency ω is set on the sample from low to high frequency, starting at 0.01 rad/s. The end ω is 100 rad/s unless the sample is very stiff.
- The setting in which the measuring points are gathered is the 'no time settings'. In this modus the apparatus waits for a steady state situation before it takes his measuring point.
- Every decade six measuring points are taken.

Using oscillatory rheology, it is possible to quantify both the viscous-like and the elastic-like properties of a material at different time scales. The basic principle of an oscillatory rheometer is to induce a sinusoidal shear deformation in the sample and measure the resultant stress response; the time scale probed is determined by the frequency of oscillation, ω , of the shear deformation. A sample is placed between two plates. While the top plate remains stationary, a motor rotates the bottom plate, thereby imposing a time dependent strain $\gamma(t) = \gamma \cdot \sin(\omega t)$ on the sample. Simultaneously, the time dependent stress $\sigma(t)$ is quantified by measuring the torque that the sample imposes on the top plate.

Measuring this time dependent stress response at a single frequency immediately reveals key differences between materials. If the material is an ideal elastic solid, then the sample stress is proportional to the strain deformation, and the proportionality constant is the shear modulus of the material. The stress is always exactly in phase with the applied sinusoidal strain deformation.

In contrast, if the material is a purely viscous fluid, the stress in the sample is proportional to the rate of strain deformation, where the proportionality constant is the viscosity of the fluid. The applied strain and the measured stress are out of phase, with a phase angle $\delta = \pi/2$.

- 5 Viscoelastic materials show a response that contains both in-phase and out-of-phase contributions. These contributions reveal the extents of solid-like and liquid-like behavior. As a consequence, the total stress response shows a phase shift δ with respect to the applied strain deformation that lies between that of solids and liquids, $0 < \delta < \pi/2$. The viscoelastic behaviour of the system at ω is characterised by the storage modulus, $G'(\omega)$, and the loss
- 10 modulus, $G''(\omega)$, which respectively characterise the solid-like and fluid-like contributions to the measured stress response. For a sinusoidal strain deformation $\gamma(t) = \gamma_0 \sin(\omega t)$, the stress response of a viscoelastic material is given by $\sigma(t) = G'(\omega) \gamma_0 \sin(\omega t) + G''(\omega) \gamma_0 \cos(\omega t)$.

- The special rheological properties of the fluid product of the present invention become evident
- 15 when measuring $G'(\omega)$ and $G''(\omega)$ as a function of the frequency of oscillation, ω . Whether the product behaves more solid-like or more liquid-like depends on the time scale at which it is deformed. At the lowest accessible frequencies the fluid product of the present invention has a loss modulus that is lower than the storage modulus, indicating solid-like behavior, while at the highest frequencies accessed the loss modulus dominates the response, indicating
- 20 viscous-like behavior.

Container

- The squeezable container body is preferably made of a thermoplastic material selected from the group of polypropylene, polystyrene, polyethylene and combinations thereof. Most
- 25 preferably, the container body is made of polypropylene.

According to another preferred embodiment, the container body has been produced by blow moulding, preferably extrusion blow moulding.

- 30 The interior space of the container body preferably has a volume in the range of 0.2-2 liter, more preferably in the range of 0.25-1.4 liter and most preferably in the range of 0.3-1.1 liter.

- The outlet through which the product can be dispensed from the container body typically has a diameter in the range of 5-20 mm, more preferably in the range of 8-15 mm. Here the term
- 35 "outlet" refers to the actual dispensing opening through which the fluid product can be dispensed from the container.

According to another preferred embodiment, the container body is translucent, allowing consumers to visually determine how much product is present in the container.

The present container is shaped to rest on the first end that contains the container outlet. This
5 may be achieved by providing the first end of the container with a flat upper edge.

Preferably, the venting chamber that is part of the venting system is partially formed by the container body and partially formed by the gas permeable membrane. This may be achieved by employing a container body with a hollow protuberance into the interior of the container
10 body, wherein the hollow protuberance is connected to the interior of the container body by the one or more openings and wherein the gas-permeable membrane together with the inside walls of the hollow protuberance defines the venting chamber.

The venting chamber typically has a volume in the range of 0.1-2 ml, more preferably in the
15 range of 0.15-1 ml and most preferably in the range of 0.2-0.8 ml.

The interior space of the container body is connected to the interior of the venting chamber by one or more openings. Preferably, the number of openings is in the range of 1 to 3, more preferably in the range of 1 to 2. Most preferably, the interior space of the container body is connected with the venting chamber by only 1 opening.

20

The one or more openings preferably have an average diameter in the range of 10-800 μm , more preferably in the range of 30-750 μm , even more preferably in the range of 100-700 μm and most preferably in the range of 200-650 μm ,

25 The one or more openings preferably have an aspect ratio in the range of 0.2-5, more preferably an aspect ratio of 0.3-3.3 and most preferably an aspect ratio of 0.5-2. Here the aspect ratio refers to the ratio of the longest diameter to the shortest diameter of the opening. Thus, a perfectly circular opening has an aspect ratio of 1.

30 According to a preferred embodiment the gas-permeable membrane comprises at least 50 wt.%, more preferably at least 80 wt.% of one or more polymers selected from polytetrafluoroethylene (PTFE), polypropylene (PP) and polyethylene (PE). More preferably, the gas-permeable membrane comprises at least 50 wt.%, even more preferably at least 80 wt.% PTFE, especially ePTFE.

35

The gas-permeable membrane typically has a surface area in the range of 0.2-2 cm², preferably in the range of 0.3-1.5 cm² and most preferably in the range of 0.4-1.3 cm².

Preferably, the gas-permeable membrane comprises a gas-permeable membrane housing
5 which secures the gas-permeable membrane with respect to the venting chamber and/or the container body.

According to a preferred embodiment the venting system is located on the container body at a location distal to the outlet.

10 The container of the present invention preferably comprises a cap that is connected to the outlet. The cap typically comprises a collar, a cap and a hinge that connects said cap to said collar. Preferably, the cap is a flip top cap.

15 According to a particularly preferred embodiment, the container comprises a shroud connected to the container body and surrounding the cap, the shroud shaped and positioned to support the container in an upright position. Preferably, the shroud has considerable cross dimensions which allow a stable position to be obtained on flat surfaces.

20 According to a further advantageous embodiment the shroud is at least partially transparent. The at least partially transparent shroud allows a consumer to observe the amount of highly viscous fluid product that is discharged from the container through the outlet. Thus, the consumer is enabled to carefully dose the desired amount of product.

25 The shroud preferably includes a first cut out portion to accommodate the cap in an open position. Even more preferably, the shroud further comprises a second cut out portion to accommodate opening of the cap.

Highly viscous fluid product

30 The rheological properties of the fluid product are critically important for ensuring that the fluid product does not enter the venting chamber but can be squeezed out of the container relatively easily.

35 Typically, the fluid product has a storage modulus (G') and a loss modulus (G'') that meet at least one of the following conditions:

$G''(\omega) > G'(\omega)$ at angular frequencies (ω) in the range of 30 to 100 rad/s, more preferably in the range of 10 to 100 rad/s;

$G''(\omega) < G'(\omega)$ at angular frequencies (ω) in the range of 0.01 to 0.2 rad/s, more preferably in the range of 0.01 to 0.5 rad/s.

5

The fluid product of the present invention typically has a storage modulus (G') at 0.2 rad/s in the range of 1 to 100 Pa, more preferably in the range of 8 to 30 Pa, most preferably in the range of 10 to 20 Pa.

- 10 The loss modulus (G'') of the fluid product at 0.2 rad/s preferably is in the range of 1 to 100 Pa, more preferably in the range of 3 to 60 Pa, most preferably in the range of 8 to 30 Pa.

The highly viscous fluid product that is present in the container preferably is a detergent composition, more preferably a machine dishwash detergent composition.

15

According to a particularly preferred embodiment, the one or more components that can give rise to gas formation include a bleaching agent. Even more preferably, the fluid product comprises at least 0.1 wt.%, preferably at least 1 wt.%, even more preferably 2-20 wt.% of a gas forming bleaching agent, e.g. a chlorine-, or bromine-releasing bleaching agent or a

20 peroxygen compound. The peroxygen compounds are preferably selected from peroxides, organic peracids, salts of organic peracids and combinations thereof.

Examples of peroxides include acids and corresponding salts of monopersulphate, perborate monohydrate, perborate tetrahydrate, and percarbonate. Organic peracids that can be used

25 include alkyl peroxy acids and aryl peroxyacids such as peroxybenzoic acid and ring-substituted peroxybenzoic acids (e.g. peroxy- α -naphthoic acid), aliphatic and substituted aliphatic monoperoxy acids (e.g. peroxy lauric acid and peroxy stearic acid), and phthaloyl amido peroxy caproic acid (PAP).

- 30 Typical diperoxy acids that can be used include alkyl diperoxy acids and aryldiperoxy acids, such as 1,12-di-peroxy-dodecanedioic acid (DPDA), 1,9-diperoxyazelaic acid, diperoxybrassylic acid, diperoxysebacic acid and diperoxy-isophthalic acid, and 2-decyldiperoxybutane-1,4-dioic acid.

- 35 Preferably, the highly viscous fluid product comprise a bleaching agent selected from peroxides (including peroxide salts such as sodium percarbonate), organic peracids, salts of

organic peracids and combinations thereof. More preferably, the bleaching agent is a peroxide. Most preferably, the bleaching agent is a percarbonate.

The fluid product of the present invention preferably contains bleaching agent in the form of
5 particles. More preferably, the fluid product contains 0.3-15 wt.% of particles of bleaching agent.

According to a preferred embodiment, particles of bleaching agent are coated particles comprising one or more core particles that contain the bleaching agent, which one or more
10 core particles are enclosed by a water-soluble coating. The water-soluble coating advantageously comprises a coating agent selected from alkali sulphate, alkali carbonate or alkali chloride and combinations thereof.

The highly viscous fluid product preferably contains at least 8 wt.%, more preferably 10-50
15 wt.% and most preferably 12-30 wt.% of aminocarboxylate chelant. The term "aminocarboxylate chelant" refers to compounds containing one or more nitrogen atoms connected through carbon atoms to one or more carboxyl groups, which form strong complexes with metal ions by donation of electron pairs from the nitrogen and oxygen atoms to the metal ion to form multiple chelate rings.

20 Preferably the aminocarboxylate chelant is selected from glutamic acid N,N-diacetic acid (GLDA), methylglycinediacetic acid (MGDA), iminodisuccinic acid (IDS), ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), hydroxyethyliminodiacetic acid (HEIDA), Nitrilotriacetic acid (NTA), aspartic acid
25 diethoxysuccinic acid (AES), aspartic acid-N, -diacetic acid (ASDA), hydroxyethylenediaminetetraacetic acid (HEDTA), hydroxyethylethylenediaminetriacetic acid (HEEDTA), iminodifumaric (IDF), iminoditartaric acid (IDT), iminodimaleic acid (IDMAL), iminodimalic acid (IDM), ethylenediaminedifumaric acid (EDDF), ethylenediaminedimalic acid (EDDM), ethylenediamineditartaric acid (EDDT), ethylenediaminedisuccinic acid (EDDS),
30 ethylenediaminedimaleic acid and (EDDMAL), dipicolinic acid, their salts, and combinations thereof.

More preferably, the aminocarboxylate chelant is selected from GLDA, MGDA, IDS, HEIDA, EDDS and NTA. In an even more preferred embodiment, the aminocarboxylate chelant is
35 selected from GLDA, MGDA, IDS and combinations thereof. Most preferably, the aminocarboxylate chelant is GLDA.

The highly viscous fluid product of the present invention typically contains 5-40 wt.% of water. More preferably, the product contains 8-30 wt.%, most preferably 10-22 wt.% water.

- 5 According to a particularly preferred embodiment, the fluid product contains aminocarboxylate chelant and water in a weight ratio that lies within the range of 2:3 to 5:1, more preferably of 5:6 to 3:1.

The fluid product of the present invention preferably contains 10-75 wt.% glycerol, More
10 preferably, the product contains 25-72 wt.% glycerol, most preferably 32-70 wt.% glycerol.

In accordance with a particularly advantageous embodiment, the fluid product contains water and a structuring biopolymer. The inventors have found that the use of biopolymer that is capable of structuring water (e.g. through gelation) makes it possible to prepare a fluid
15 product with excellent rheological properties that make it possible to fill the container with freshly prepared product without contaminating the venting chamber. In this respect it is noted that the processing of the fluid product before filling inevitably causes shear thinning of the product, thereby increasing the risk that product will be able to enter the venting chamber of the container.

20 Preferably, the fluid product contains at least 0.1% of structuring biopolymer by weight of water. Even more preferably, the product contains 0.2-3%, most preferably 0.3-2% of structuring biopolymer by weight of water. Examples of structuring biopolymers that can be employed include xanthan gum, locust bean gum, guar gum, gum Arabic, gellan gum,
25 carrageenan, carboxymethyl cellulose, microcrystalline cellulose, microfibrinous cellulose and combinations thereof. More preferably, the structuring biopolymer is selected from xanthan gum, guar gum, carboxymethyl cellulose, microfibrinous cellulose and combinations thereof. Most preferably, the structuring biopolymer is xanthan gum. According to another preferred embodiment, the fluid product contains 0.1-4 wt.%, more preferably 0.2-3 wt.% and most
30 preferably 0.3-1.5 wt.% of citrate. Here the term "citrate" encompasses both citric acid and salts of citric acid and the wt.% is to be calculated as citric acid equivalents.

Figure 1 shows a packaged product according to the invention. The container **1** comprises a container body **2** that is made of a flexible, transparent polypropylene. The outlet of the
35 container **1** is closed off by a cap **3**, which is surrounded by a transparent shroud **4** that is attached to the container body **2** and supports the container in the upright position. The

shroud includes a first cut out portion **5** to accommodate the cap **3** in an open position. The sidewall of the container body **2** comprises a gas-permeable membrane **6** that is positioned close to the second end of the container.

5 Figure 2 shows a side view of the open container **1**. The container **1** comprises a container body **2** with an outlet that can be closed off by cap **3**. The cap **3** is in open position, showing the cap opening **7**. The cap **3** is surrounded by a transparent shroud **4** that is attached to the container body **2**. The shroud includes a first cut out portion **5** that accommodates the cap lid **8** which is kept in open position by the hinge **9**. The second cut out portion **10** of the shroud **4**
10 accommodates the opening of the cap **3**.

Figure 3 shows a side view of the packaged product **1** with a cross-cut view at the position of the venting system (without membrane). The container **1** rests on the shroud **4** and the container body **2** comprises a venting system **11**. The venting system **11** comprises a venting
15 chamber **12** that is partially defined by a part **13** of the sidewall of the container body **2**.

Figure 4 shows an up-scaled view of the cross-cut detail of Figure 3. The venting system **11** comprises a venting chamber **12** that is defined by a part **13** of the sidewall of the container body. The interior of the venting chamber **12** is connected to the interior **14** of the container
20 body through an opening **15**.

Figure 5 shows the same cross-cut detail as Figure 4. The venting system **11** comprises a venting chamber **12** that is defined by a part **13** of the sidewall of the container body and the gas-permeable membrane **6**. The gas-permeable membrane **6** is mounted in a frame **16** that
25 is sealed to the sidewall of the container body. The interior of the venting chamber **12** is connected to the interior **14** of the container body through an opening **15**. The highly viscous liquid that is present in the interior of the container body **14** cannot enter the venting chamber **12** through the opening **15**.

30 The invention is further illustrated by the following non-limiting examples.

EXAMPLES

Example 1

35

A highly viscous fluid machine dishwashing product was prepared on the basis of the recipe that is shown in Table 1.

Table 1

Ingredients	Wt.%
Glycerol	60.56
Citric Acid (50%)	2.5
Dissolvine™ GL 47-S ¹	10.79
Dissolvine™ PD-S 2 ²	14.84
Demi water	9.31
Xanthan Gum	0.39
Lutensol™ AT80 (nonionic surfactant)	1.22

1 Contains appr. 48 wt.% GLDA and 45 wt.% water

5 2 Contains appr. 85 wt.% GLDA and 9 wt.% water

The product was prepared as follows: a liquid premix is made by mixing glycerol and xanthan gum to a homogeneous suspension, then demi water is added under constant stirring. After that Dissolvine™ GL 47-S and citric acid are dosed at ambient temperature; next remaining

10 Dissolvine™ PD-S is mixed in and dissolved in the remaining free water. Finally the nonionic surfactant is added to the mix under stirring. All ingredients were mixed under vacuum to minimize formation of air bubbles.

The rheological properties of the thixotropic fluid product, measured 10 hours from

15 production, are summarized in Table 2.

Table 2

ω (in rad/s)	G' (in Pa)	G'' (in Pa)
0.05	16.5	4.6
0.1	19	5.5
0.5	25	9
1	30	12.6
3.2	37	23.5
10	51	48.2
32	72	108
100	57	255

The fluid product was filled into a container as depicted in Figures 1-4. A specification of the container is provided in Table 3.

20

Table 3

Material of container body	Transparent polypropylene
Interior volume of the container body	544 ml (brimful)
Diameter of the circular outlet	1.1 cm

Cap	Flip top cap
Material of shroud	Polypropylene copolymer
Material of gas-permeable membrane	ePTFE (in polypropylene housing)
Diameter of gas-permeable membrane	9.9 mm
Diameter opening in venting chamber	500 μ m

CLAIMS

1. A packaged product in the form of a container holding a highly viscous fluid product that contains one or more components that can give rise to gas formation and pressure built-up within the container, the container comprising:
 - a squeezable container body with an interior space containing the highly viscous fluid product, said highly viscous fluid product having a storage modulus at 20°C (G') and a loss modulus at 20°C (G''), both moduli measured as a function of angular frequency (ω) on a rheometer in oscillatory mode operating at a strain of 0.1%, wherein:
 $G''(\omega) > G'(\omega)$ at angular frequencies (ω) in the range of 50 to 100 rad/s, and
 $G''(\omega) < G'(\omega)$ at angular frequencies (ω) in the range of 0.01 to 0.05 rad/s;
 - an outlet through which the fluid product can exit the container body; and
 - a venting system on the container body through which a gas can exit the container body, wherein the venting system comprises:
 - a venting chamber separate from the interior space of the container body;
 - one or more openings connecting the interior space of the container body to the venting chamber to allow gas to flow from the container body to the venting chamber, said one or more openings being sized such that the one or more openings are too small to allow the highly viscous fluid product to enter the one or more openings; and
 - a gas-permeable membrane through which gas can exit the venting chamber to an outside of the container body;said container comprising a first end with the outlet and a second end, wherein the container is shaped to rest on the first end.
2. The packaged product according to claim 1, wherein the highly viscous fluid product is a detergent composition, preferably a machine dishwasher detergent composition.
3. The packaged product according to claim 1 or 2, wherein the one or more components that can give rise to gas formation and pressure built-up include a bleaching agent.
4. The packaged product according to claim 2, wherein the fluid product contains at least 0.1 wt.% of a gas forming bleaching agent.

5. The packaged product according to any one of the preceding claims, wherein one or more openings have an average diameter in the range of 10-800 μm , preferably of 30-750 μm , more preferably of 100-700 μm and most preferably of 300-650 μm .
6. The packaged product according to any one of the preceding claims, wherein the fluid product contains at least 8 wt.% of aminocarboxylate chelant.
7. The packaged product according to any one of the preceding claims, wherein the fluid product contains 5-40 wt.% of water.
8. The packaged product according to claim 6 and 7, wherein the fluid product contains aminocarboxylate chelant and water in a weight ratio that lies within the range of 2:3 to 5:1.
9. The packaged product according to any one of the preceding claims, wherein the fluid product contains 10-75 wt.% glycerol.
10. The packaged product according to any one of the preceding claims, wherein the highly viscous fluid product has a storage modulus (G') at 0.2 rad/s and 20°C in the range of 1 to 100 Pa.
11. The packaged product according to any one of the preceding claims, wherein the highly viscous fluid product has a loss modulus (G'') at 0.2 rad/s and 20°C in the range of 1 to 100 Pa.
12. The packaged product according to any one of the preceding claims, wherein the container body comprises a hollow protuberance into the interior of the container body, wherein the interior of the hollow protuberance is connected to the interior of the container body by the one or more openings and wherein the gas-permeable membrane together with the inside walls of the hollow protuberance defines the venting chamber.
13. The packaged product according to any of the preceding claims, and further comprising a cap that is connected to the outlet.

14. The packaged product according to claim 13, and further comprising a shroud connected to the container body and surrounding the cap, the shroud shaped and positioned to support the container in an upright position.
15. The packaged product according to any one of the preceding claims, wherein the gas-permeable membrane comprises at least 50 wt.% of one or more polymers selected from polytetrafluoroethylene (PTFE), polypropylene (PP) and polyethylene (PE).

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Fig. 1

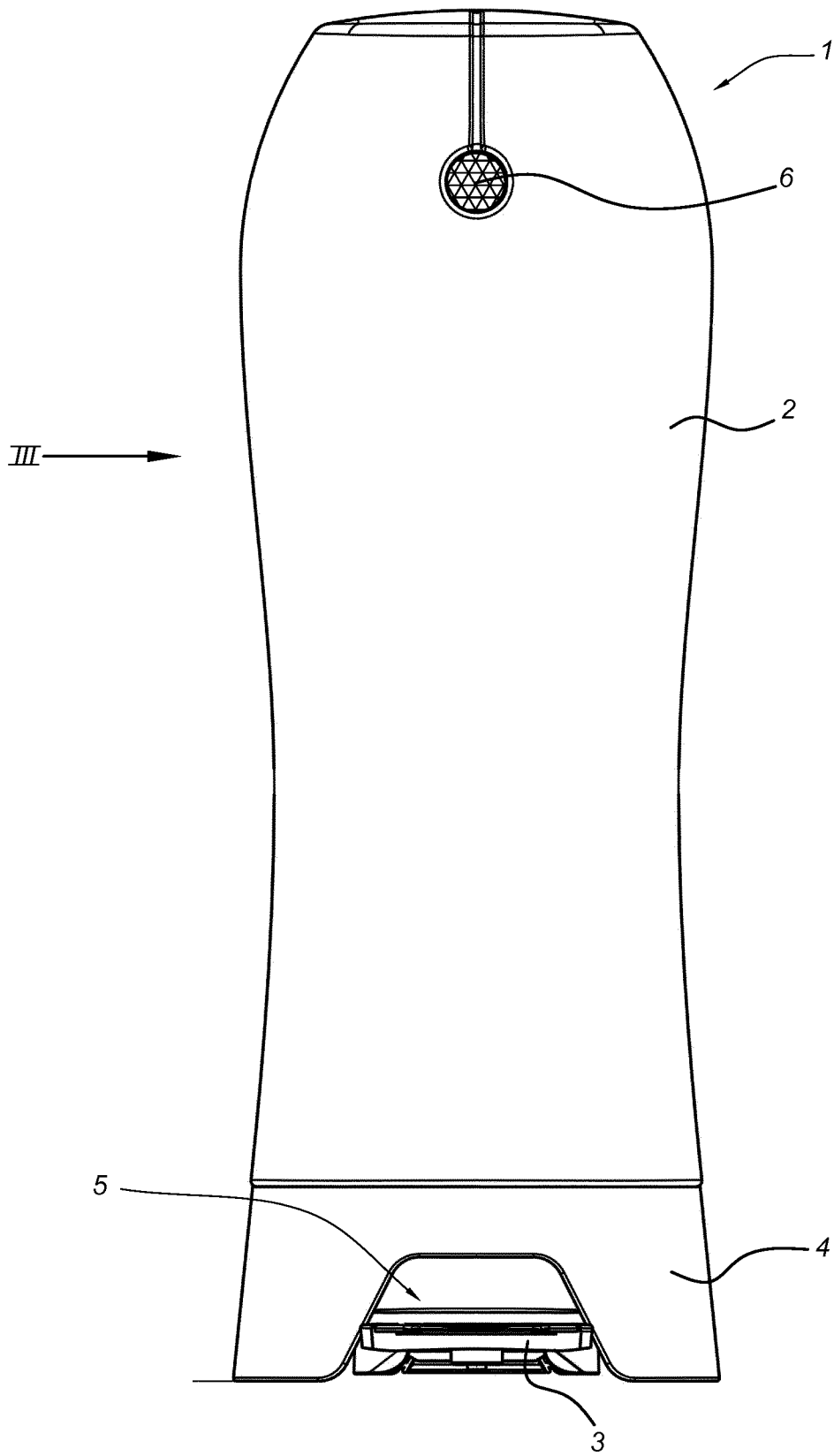


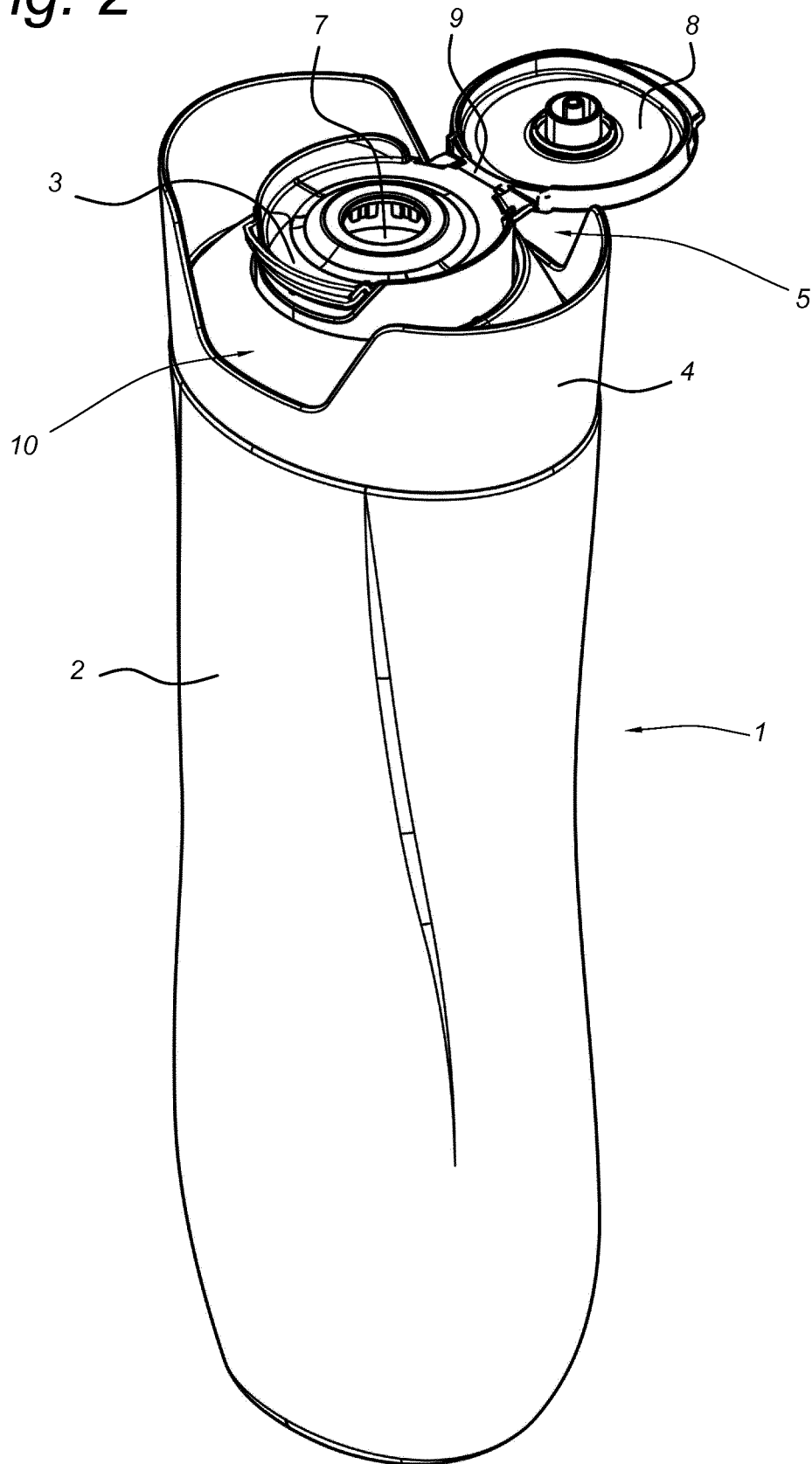
Fig. 2

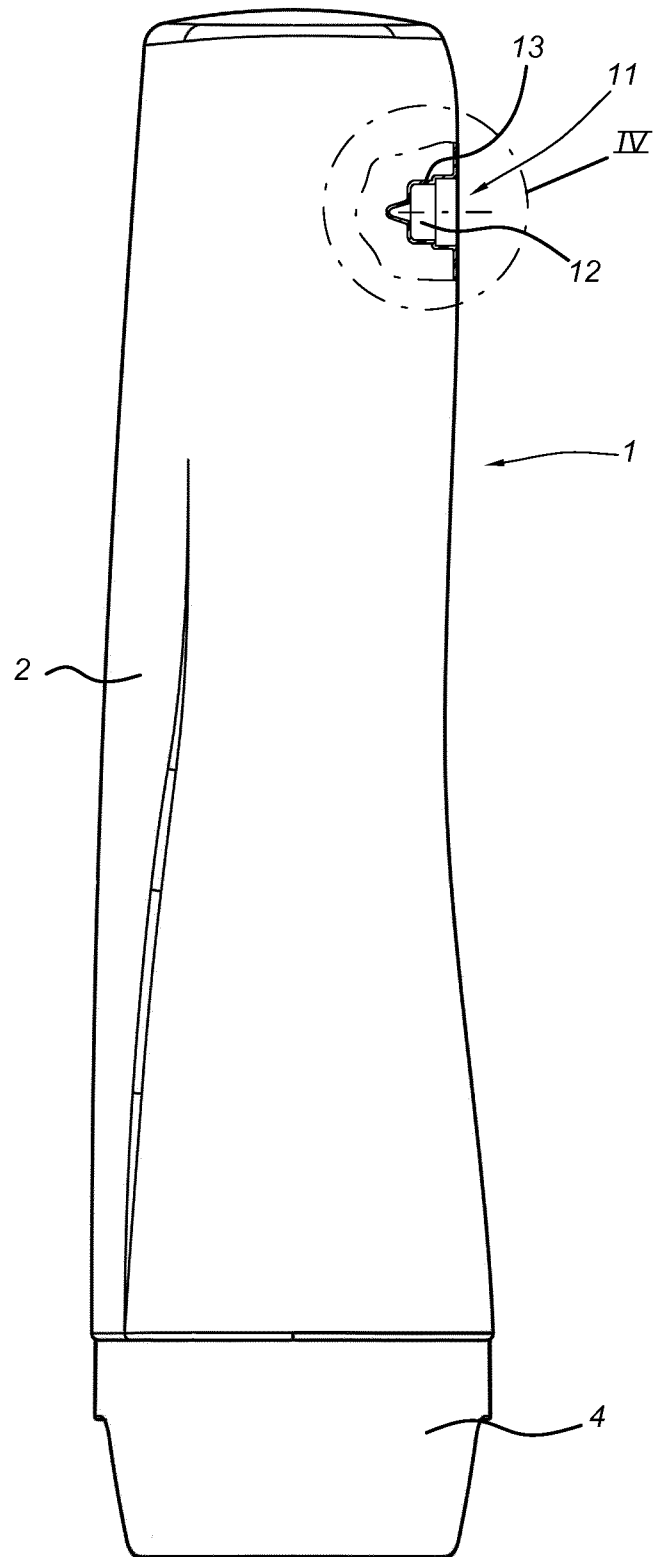
Fig. 3

Fig. 4

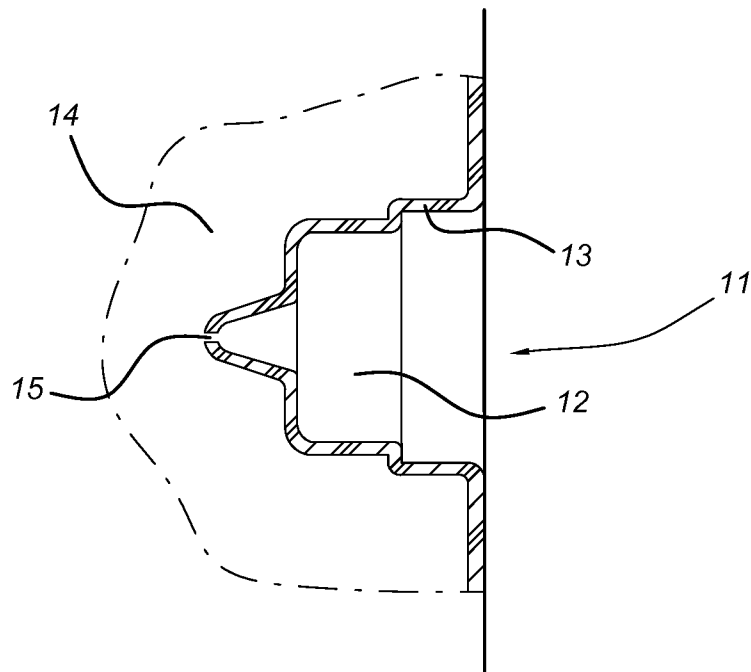
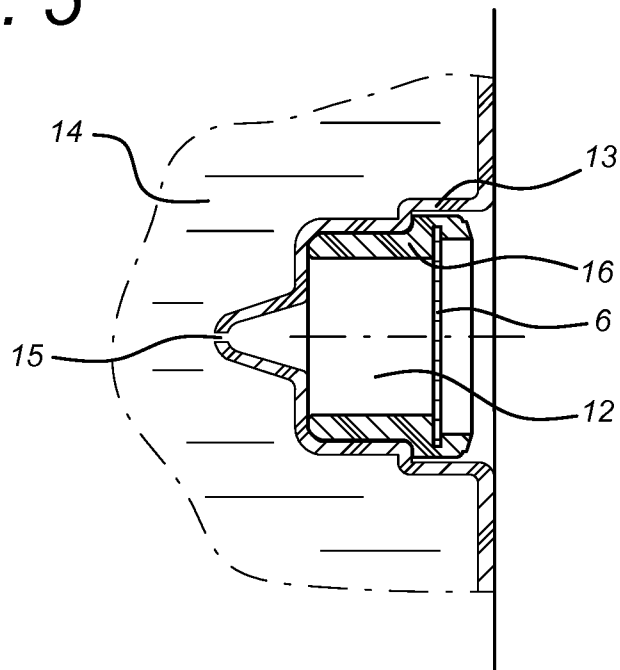


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/054716

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D77/22 B65D1/32
ADD.

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)
B65D B05B

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 1 944 241 A1 (SCHLIEMANN ERIC [DE]) 16 July 2008 (2008-07-16) the whole document	1-15
A	US 2008/314933 A1 (LEONOFF CHRISTOPHER [US]) 25 December 2008 (2008-12-25) the whole document	1-15
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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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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Information on patent family members

International application No

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