



(51) International Patent Classification:

A23G 9/28 (2006.01) B67D 1/00 (2006.01)

B67D 7/02 (2010.01) B67D 1/04 (2006.01)

B65D 83/00 (2006.01) B65D 85/78 (2006.01)

(21) International Application Number:

PCT/EP2017/061804

(22) International Filing Date:

17 May 2017 (17.05.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

16172413.3 01 June 2016 (01.06.2016) EP

(71) Applicant (for AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only): UNILEVER PLC [GB/GB]; Unilever House, 100 Victoria Embankment, London Greater London EC4Y 0DY (GB).

(71) Applicant (for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG,

US, VC, ZA, ZM, ZW): UNILEVER N.V. [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) Applicant (for US only): CONOPCO, INC., D/B/A UNILEVER [US/US]; 800 Sylvan Avenue AG West, S. Wing, Englewood Cliffs, New Jersey 07632 (US).

(72) Inventor: ACUNZO, Vincenzo; Corso Umberto I, 193 – 80058 Torre Annunziata (IT).

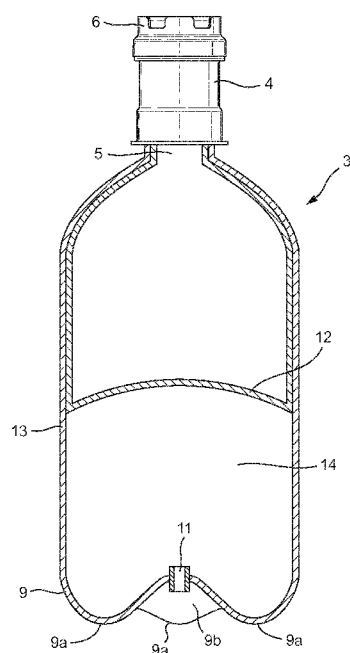
(74) Agent: KEENAN, Robert, Daniel; Unilever PLC, Unilever Patent Group, Colworth House, Sharnbrook, Bedford Bedfordshire MK44 1LQ (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

(54) Title: CONTAINER FOR FROZEN CONFECTIONS

Fig. 2



(57) Abstract: Disclosed is a container (3) suitable for containing a frozen confection. The container (3) comprises a product outlet (5) through which the frozen confection can be dispensed; a receptacle (13) comprising a body extending from the product outlet (5) to a base (9) wherein the base is shaped with 3 or 4 petaloid feet (9a); a flexible bag (12) for containing the frozen confection and located inside the receptacle (13); and a propellant inlet (11) through which pressurized gas can be introduced to a region (14) inside the receptacle (13) and outside of the bag (12) to urge the frozen confection towards the product outlet (5).

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*

Container for Frozen Confections

Technical field

This invention relates to a container from which frozen confections, such as soft ice cream can be dispensed. The invention also relates to a method and apparatus for
5 dispensing frozen confections from the container.

Background

Soft ice cream is normally dispensed at the point of sale from a soft serve ice cream machine, i.e. a semi-continuous, pressurised scraped surface heat exchanger in which
10 a pre-packaged mix is frozen and aerated. It is typically dispensed at temperatures of -4 to -8 °C, for example into a cone, and is then immediately consumed. It is liked by many consumers because of its texture, which is softer than that of ice cream served by scooping from a container kept in a freezer cabinet at around -18 °C. Soft serve ice cream machines have a number of disadvantages: they are large and expensive, require
15 training to operate, consume considerable energy, do not deliver consistent product quality if used over a period of time and are inconvenient for the operator to dismantle and clean. Each machine can also only offer one type of product (e.g. flavour/ice cream/sorbet etc) at a time – separate freezer barrels are required for different products.

20

In recent years, systems for dispensing frozen confections such as soft ice cream have been developed in which pre-packaged ice cream is delivered from a container by a dispensing device. In particular systems which employ bag-in-bottle type containers have been developed.

25

WO 2013/124193 A discloses a method for dispensing a frozen confection comprising: providing a refrigerated, insulated chamber, which houses at least one container, containing a frozen confection at a temperature of -12 °C or below; wherein the at least one container has an outlet which is closed by a self-closing valve; wherein the container
30 comprises flexible bag containing the frozen confection located inside a bottle; pressurising gas in the region inside the bottle and outside the flexible bag thereby applying pressure to the frozen confection so that the valve opens and the frozen

confection is forced out of the container through the outlet; releasing the pressure so that the valve closes.

The present inventors have now found that the high pressures needed to dispense frozen confections from such bag-in-bottle containers produces stresses that can lead to permanent deformation of the bottle that can give rise to inconsistencies in dispensing. After careful investigation, the present inventors surprisingly found that by providing a specific shape to the base of the bottle, these problems can be effectively ameliorated.

10 Brief description of the invention

Accordingly, in a first aspect, the present invention provides a container suitable for containing a frozen confection, the container comprising:

- a product outlet through which the frozen confection can be dispensed;
- a receptacle comprising a body extending from the product outlet to a base
15 wherein the base is shaped with 3 or 4 petaloid feet;
- a flexible bag for containing the frozen confection and located inside the receptacle; and
- a propellant inlet through which pressurized gas can be introduced to a region
inside the receptacle and outside of the bag to urge the frozen confection towards
20 the product outlet.

The present inventors have found that limiting the number of petaloid feet to 3 or 4 reduces the stresses created in the base when the container is pressurised compared with containers having a higher number of feet. Most preferred is a container with 4
25 petaloid feet as this allows for very good stability when the container is free-standing on the petaloid feet in storage as well as resistance of the container to stress and deformation when pressurized in use.

A further cause of stress can be encountered where the propellant inlet is located in the
30 base of the receptacle and thus the present invention can be particularly advantageous for such an arrangement. More preferably the propellant inlet is located in the centre of the base. Typically the petaloid feet extend radially outwards from a central recessed

area of the base. In such an arrangement the central recessed area preferably comprises the propellant inlet.

Where the body of the receptacle is elongate, for example cylindrical rather than spherical, the body can be relatively resistant to deformation under pressure. In turn this may mean extra concentration of stress in the base. Thus the present invention is especially advantageous where the body is elongate. For ease of manufacture and/or use the body is typically a hollow cylinder.

- 10 In a further aspect, the invention provides a method for dispensing a frozen confection, the method comprising:
- a) providing a dispensing apparatus comprising a chamber and a pressurized gas outlet;
 - b) providing a container according to any embodiment of the first aspect;
 - 15 c) locating the container inside the chamber;
 - d) placing the pressurized gas outlet and the propellant inlet into fluid communication; and
 - e) introducing pressurized gas from the pressurized gas outlet through the propellant inlet to a region inside the receptacle and outside of the bag to
 - 20 urge the frozen confection through the product outlet.

The pressurized gas outlet is preferably shaped to receive the petaloid base of the container to allow for easy location of the container.

- 25 In a still further aspect, the present invention provides an apparatus for dispensing a frozen confection, the apparatus comprising:
- a chamber for containing at least one of the containers according to any embodiment of the first aspect; and
 - at least one pressurized gas outlet shaped to receive the petaloid base of the
 - 30 container.

Preferably the chamber is refrigerated and insulated. For example the device may comprise a refrigeration system which cools air which is circulated around the container

in the chamber. Preferably the interior of the chamber is maintained at a temperature below -12 °C, more preferably at a temperature from -15 to -22 °C.

5 Because of the high viscosity of frozen confections, very high pressures are needed for dispensing. Typically the pressurized gas is introduced to the region inside the receptacle and outside of the bag at a pressure of at least 0.5 bar, more preferably at a pressure of from 0.8 to 5 bar and most preferably from 1 to 3 bar. References herein to pressure are to gauge pressure, i.e., pressure above atmospheric pressure.

10 Permanent deformation of the receptacle can be accelerated by repeated changes of pressure (and therefore stress). Thus the present invention is particularly advantageous wherein multiple portions of frozen confection are dispensed from the container and the pressure of the pressurized gas is released between dispensing each portion.

15 Additionally or alternatively the pressure may be varied during dispensing as described, for example, in WO 2013/124193, the disclosure of which is hereby incorporated by reference in its entirety.

20 The product outlet is preferably closed by a self-closing valve such as a slit valve made from a resilient material. Preferably the valve closes when the pressure of the pressurized gas is released.

25 Preferably the frozen confection is a frozen aerated confection, most preferably ice cream.

In a yet further aspect, the present invention provides a pressurized gas outlet shaped to receive the petaloid base of the container of any embodiment of the first aspect.

30 The outlet preferably comprises recesses for receiving the petaloid feet. Additionally or alternatively the outlet comprises a projecting region for being received by a central region surrounding the propellant inlet of the base.

Detailed description

The present invention will now be described with reference to the figures, wherein:

Figure 1 shows an apparatus according to the invention.

5 Figure 2 shows a side view, partly in section, of a container of the invention which is self-standing on 4 petaloid feet.

Figure 3 shows a plan view of the base of the container of Fig. 2.

Figure 4 shows a plan view of the base of another container of the invention having three petaloid feet.

10

Figure 1 shows an apparatus according to the invention. The apparatus **1** comprises a dispenser having an insulated chamber **2**, which houses one or more containers **3** of a frozen confection such as ice cream. In the embodiment shown in Figure 1 there are two such containers. A refrigeration system **8** cools the chamber and its contents to a
15 temperature of -12 °C or below. The refrigeration system is typically a conventional system, having a compressor, cooling coils and a fan for circulating the cooled air. The refrigeration system is designed to allow cold air to flow around the container in the insulated chamber, in order to keep the ice cream at the correct temperature (e.g. -18 °C). The apparatus also comprises a compressed air supply (not shown in Figure 1)
20 which supplies pressurized air to each container via a gas outlet **10** which is in gas-tight engagement with the propellant inlet **11** in the base **9** of the respective container.

The insulated chamber **2** is a chamber having insulated walls which preferably comprise a heat insulating material having a thermal conductivity in the range of 0.5 to 50
25 mWm⁻¹K⁻¹. The insulated walls may be constructed from an insulating material encased between sheets of a material such as fibreglass, metal or plastic. The insulating material can be, for example, a closed cell foam structure such as expanded polystyrene; foam rubber, such as elastomeric nitrile rubber insulation (which has a thermal conductivity of around 30 mW m⁻¹K⁻¹); rigid foams, such as polyurethane; a fibrous material, such as
30 fibreglass; a vacuum sealed within a double walled container; or vacuum insulated panels, which are typically made of an open cell foam or granular structure which is enveloped and hermetically sealed into a gas-impervious film under very low pressure. These panels have a thermal conductivity of around 5 to 10 mW m⁻¹ K⁻¹. Different

insulating materials can be used to construct different parts of the container. The walls are usually 5 – 50 mm thick, typically about 25 to 50 mm.

5 The containers **3** are “bag in bottle” containers, where the frozen confection is located in a flexible bag inside a more rigid receptacle (the bottle). WO 07 / 039158 describes an example of this type of container. Details of a first container according to an embodiment of the present invention can be seen in Figures 2 and 3.

10 The container **3** comprises a bottle **13** having a substantially hollow cylindrical body extending from a product outlet **5** at the top end to a petaloid-shaped base **9**. The propellant inlet **11** is in the centre of the base **9**. Within the bottle **13** is a flexible bag **12** which in a filled state contains the frozen confection.

15 The base **9** of the bottle **13** is formed from four petaloid feet **9a** which extend radially outwards from a central recessed area **9b** surrounding the propellant inlet **11**. Valleys **9c** also extend radially outward from the central region **9b** with each valley **9c** separating adjacent pairs of petaloid feet **9a**.

20 An alternative embodiment is shown in Figure 4, which is identical to the embodiment shown in Figures 2 and 3 except that the base is formed into three petaloid feet **9a**.

When stored (for example in a freezer cabinet), the containers shown in Figures 1 to 4 can conveniently stand on the petaloid feet in a self-supporting manner.

25 In use the containers are loaded into the apparatus in an inverted configuration as shown in Figure 1. The gas outlet **10** is preferably shaped with recesses for receiving the petaloid feet **9a** and a projecting region for being received by the central region **9b** surrounding the propellant inlet **11**. This allows for efficient mating of the gas outlet **10** with the container base **9** such that good sealing can be achieved between the gas outlet
30 **10** and propellant inlet **11**.

The pressure is applied to the frozen confection by increasing the pressure of the gas in the region **14** outside the bag **12** but inside the bottle **13**. In this way pressure is applied

over a large surface area of the bag which contains the frozen confection, so that the force on the frozen confection is substantially directed towards the outlet of the bag, which communicates with the outlet of the bottle **5**. This has the effect that gagging of the bag in the outlet is avoided so very little frozen confection is wasted by becoming trapped as the bag empties. Moreover the air pressure can be increased gently and with a high degree of control so as to obtain a good flow, in comparison to applying pressure to ice cream in a cartridge by means of a piston. Since air is compressible it acts as a cushion. This provides very good control over the dispensing rate, compared for example to a system wherein pressure is applied to the frozen confection by means of a piston.

10 The external source of compressed air which supplies the pressure in the embodiment illustrated in Figure 1 may comprise a pump and / or buffer tank. When the pressure is released after dispensing a portion of ice cream, the bag is able to expand back into the free space inside the bottle. The pressure may be decreased in a controlled manner or simply released quickly.

15 A nozzle **4** is attached to each container. The inner end of the nozzle is connected to the outlet **5** of the container **3** and in use is located inside the insulated chamber **2**. The outer end **6** of the nozzle is located outside the insulated chamber. A cap **7** can move between a closed position, wherein the outer end of the nozzle is enclosed between the cap and the outside of the chamber, and an open position which allows external access to the outer end of the nozzle. In Figure 1 the cap is shown in the closed position, thus enclosing a region around the outer end of the nozzle. The cap **7** is designed to minimise heat ingress into this region. Preferably the inside of the cap comprises a layer of insulating material and has a gasket (e.g. made from silicone) which seals the cap against the outside of the chamber when the cap is in the closed position and therefore prevents air flow into the enclosed region around the end of the nozzle, thus keeping it cold.

Preferably a self-closing valve is formed in the outer end **6** of the nozzle from a slit valve, i.e. a piece of resilient material (such as silicone rubber) which has two or more slits which cross each other. The resilient nature of the material has the result that a threshold pressure is required to open the slits, allowing the frozen confection to flow out. Once the pressure is returned to ambient, the valve closes itself in a self-sealing manner. Thus the valve forms a ventricle which opens under the pressure of the frozen confection

pushing against it when pressure is exerted by the gas inside the bottle on the frozen confection inside the flexible bag. Similarly, the valve closes and cuts the stream of frozen confection when the pressure is released. In the present invention, the slit valve (when used) is preferably 2 to 4 cm in diameter.

5

Preferably the valve and surrounding area is kept at a temperature of below -13 °C. Whilst, for microbiological reasons it would be expected that the valve should be kept at a temperature of no higher than -6 °C, we have further found that by keeping the frozen confection in the container adjacent to the valve at a lower temperature than would have
10 been thought necessary, then the combination of the solid-like nature of the ice cream and the self-closing valve prevents drips of ice cream from leaking. Thus the self-closing valve is sufficient in itself both to regulate the flow of ice cream during dispensing, and also to close the container and thus prevent any leaks between dispensing operations.

15 The required temperature can be achieved for example by having the cap **7** which covers the valve and the end of the container between dispensing operations. Preferably cold air from the chamber which houses the container is circulated around the valve in the space enclosed by the cap.

20 The means for applying pressure to the frozen confection preferably allows the operator to vary the applied pressure (for example the pressure applied is determined by the extent to which an operating lever is pulled by the operator as with a "beer tap"). This gives good control over the rate of dispensing of the frozen confection, which results in products that have an attractive appearance.

25

During dispensing the pressure inside the bottle is relatively high (e.g. about 2 bar). This has the effect of putting stress on the bottle. The stress is evenly distributed about the cylindrical body of the bottle but at the base **9** is concentrated in certain areas, such as the central region **9b** and the valleys **9c**, which undergo significant strain and therefore
30 expansion. This is especially the case where the container is disposable and/or recyclable and so made from lightweight plastics material. Areas around orifices, such as the orifice needed to form the propellant inlet **11** in the base **9** may also be regions of stress concentration. The present inventors have found that by limiting the number of

petaloid feet to three or four, such stresses can be minimized and/or better resisted whilst maintaining the convenience of allowing the containers to be free-standing and/or to be manufactured by high through-put processes such as blow-moulding.

- 5 All numbers in this description indicating amounts of material, time periods, length scales, conditions of reaction, physical properties of materials and/or use may optionally be understood as modified by the word “about”.

- 10 It should be noted that in specifying any range of values, any particular upper value can be associated with any particular lower value.

- For the avoidance of doubt, the word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of”. In other words, the listed steps or options need not be exhaustive.

- 15 The disclosure of the invention as found herein is to be considered to cover all embodiments as found in the claims as being multiply dependent upon each other irrespective of the fact that claims may be found without multiple dependency or redundancy.

- 20 Where a feature is disclosed with respect to a particular aspect of the invention (for example a method of the invention), such disclosure is also to be considered to apply to any other aspect of the invention (for example an apparatus of the invention) *mutatis mutandis*.

Claims

1. A container suitable for containing a frozen confection, the container comprising:
 - a product outlet through which the frozen confection can be dispensed;
 - a receptacle comprising a body extending from the product outlet to a base wherein the base is shaped with 3 or 4 petaloid feet;
 - a flexible bag for containing the frozen confection and located inside the receptacle; and
 - a propellant inlet through which pressurized gas can be introduced to a region inside the receptacle and outside of the bag to urge the frozen confection towards the product outlet.
2. The container as claimed in claim 1, wherein the base has 4 petaloid feet.
3. The container as claimed in claim 1 or claim 2, wherein the propellant inlet is located in the base of the receptacle.
4. The container as claimed in claim 3, wherein the propellant inlet is located in the centre of the base.
5. The container as claimed in any one of the preceding claims, wherein the product outlet is closed by a self-closing valve.
6. The container as claimed in any one of the preceding claims, wherein the flexible bag contains a frozen aerated confection.
7. The container as claimed in claim 6, wherein the frozen aerated confection is ice cream.
8. The container as claimed in any one of the preceding claims wherein the container is self-standing on the petaloid feet.
9. A method for dispensing a frozen confection, the method comprising:
 - a) providing a dispensing apparatus comprising a chamber and a pressurized gas outlet;

- b) providing a container as claimed in any one of the preceding claims;
 - c) locating the container inside the chamber;
 - d) placing the pressurized gas outlet and the propellant inlet into fluid communication; and
 - e) introducing pressurized gas from the pressurized gas outlet through the propellant inlet to a region inside the receptacle and outside of the bag to urge the frozen confection through the product outlet.
10. The method as claimed in claim 9, wherein the pressurized gas outlet is shaped to receive the petaloid base.
11. The method as claimed in claim 9 or claim 10, wherein the chamber is refrigerated and insulated to maintain the interior of the chamber at a temperature of -12 °C or below.
12. An apparatus for dispensing a frozen confection, the apparatus comprising:
- a chamber for containing at least one of the containers as claimed in any one of claims 1 to 8; and
 - at least one pressurized gas outlet shaped to receive the petaloid base of the container.
13. The apparatus as claimed in claim 12, wherein the chamber is refrigerated and insulated to maintain the interior of the chamber at a temperature of -12 °C or below.

Fig. 1

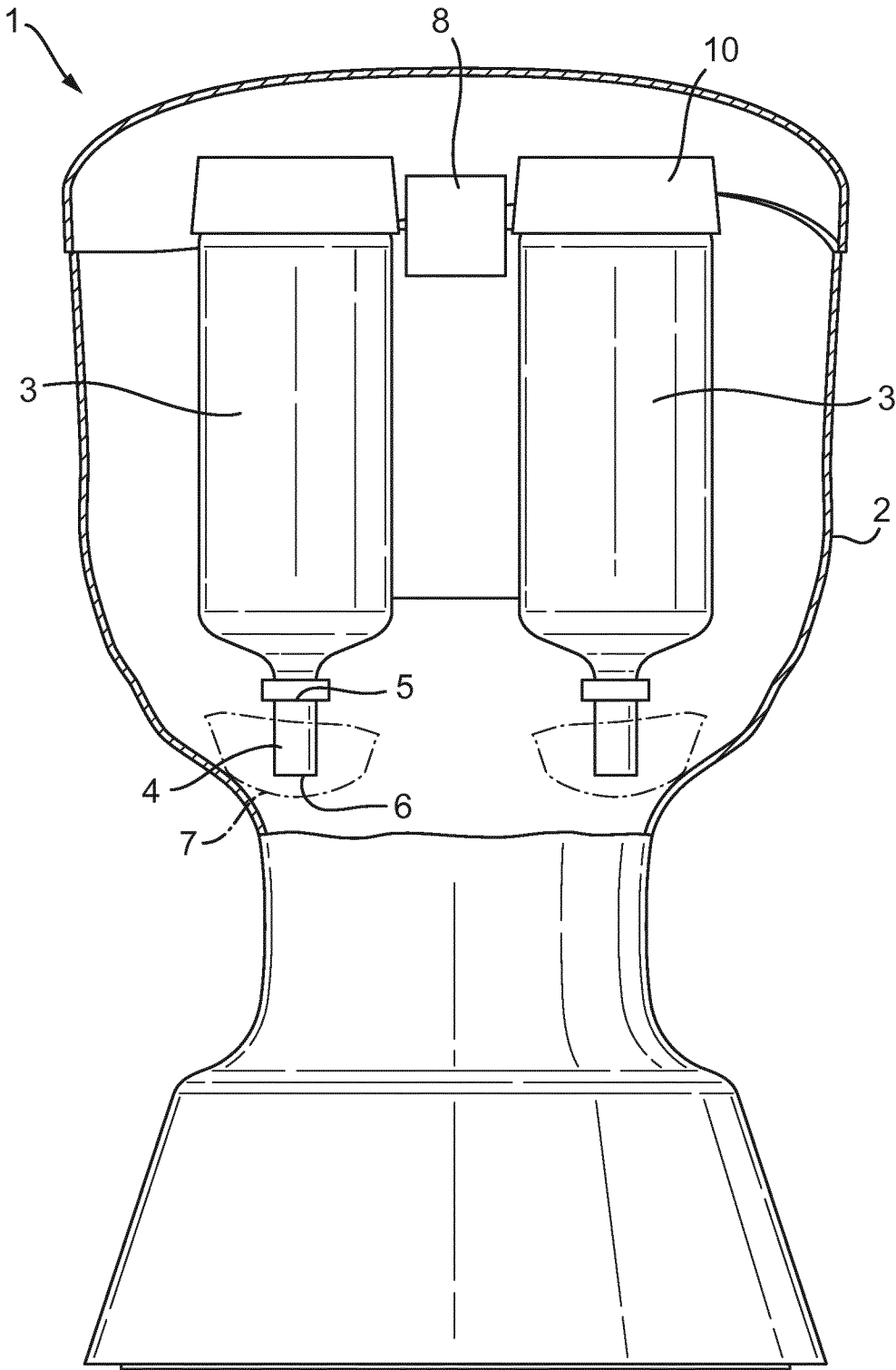


Fig. 2

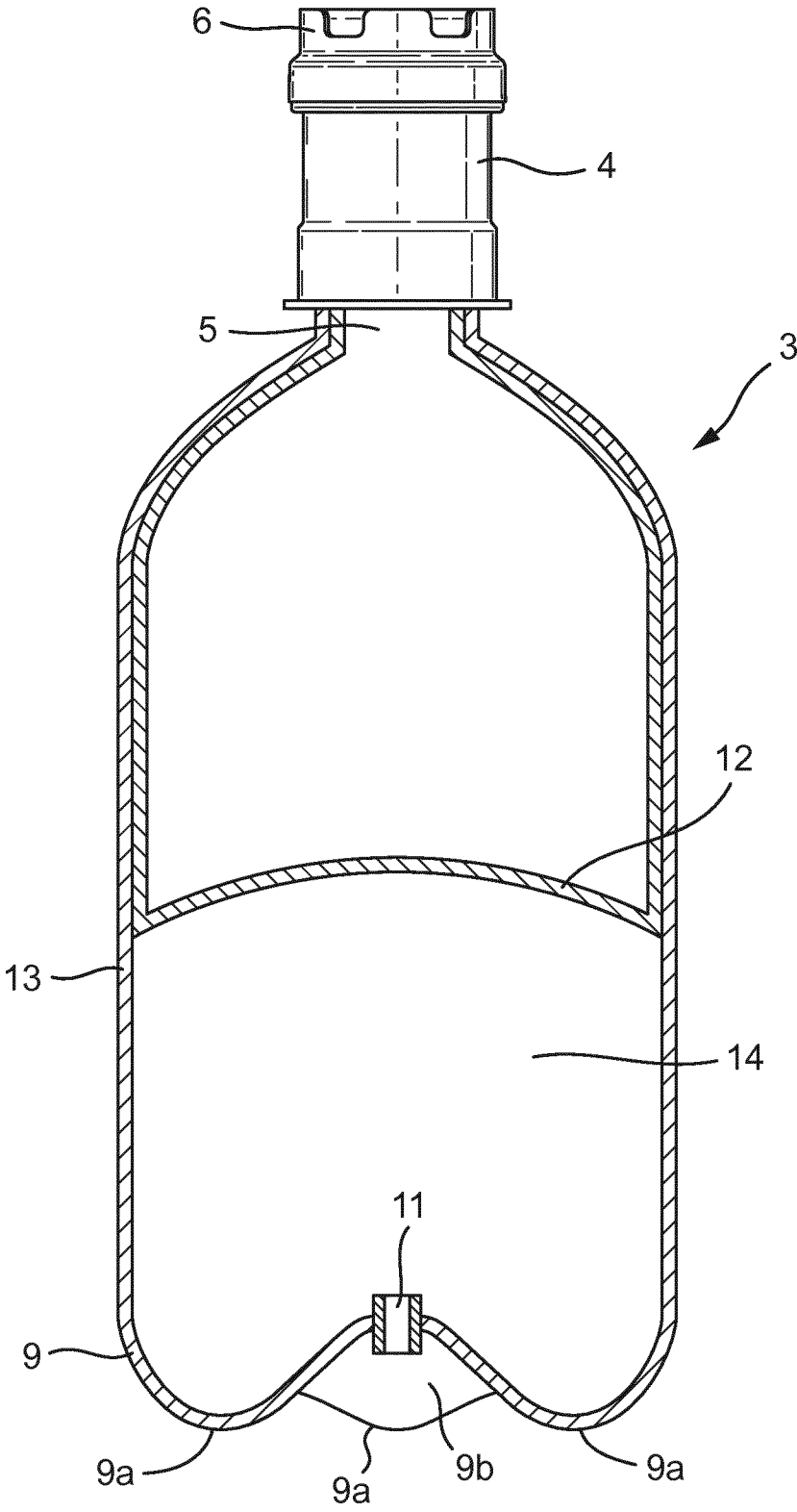


Fig. 3

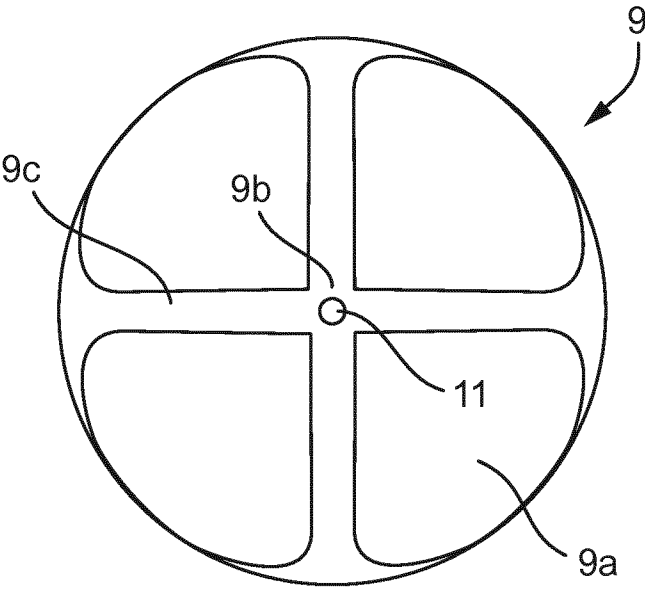
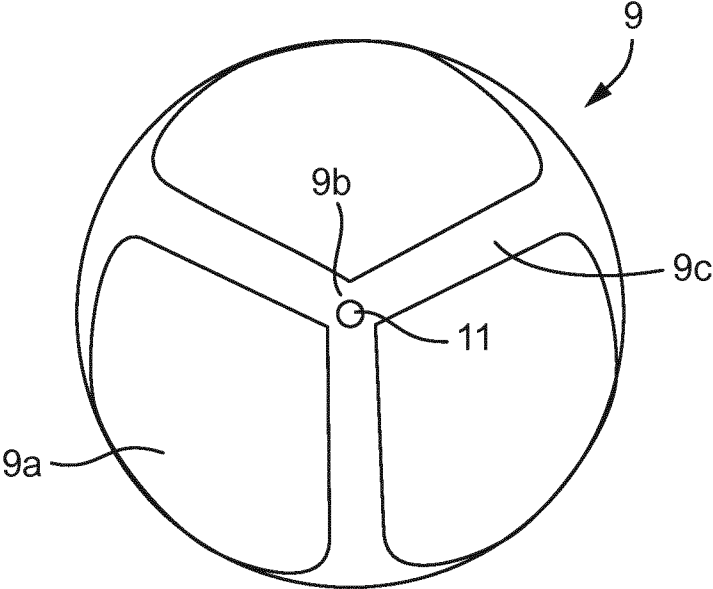


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/061804

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	A23G9/28 B65D85/78	B67D7/02 B65D83/00 B67D1/00 B67D1/04
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) A23G B67D B65D		
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, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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Y	paragraphs [0039], [0042] paragraph [0042] - paragraph [0051] paragraphs [0064], [0069], [0076], [0078]; claim 1; figures 1-3, 10	1,2
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 19 June 2017		Date of mailing of the international search report 27/06/2017
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Fiorenza, Francesca

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/061804

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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