

(12) UK Patent Application (19) GB (11) 2559453 (13) A

(43) Date of A Publication 08.08.2018

(21) Application No: 1718540.6
(22) Date of Filing: 09.11.2017
(30) Priority Data:
(31) 1702249 (32) 11.02.2017 (33) GB
(31) 1711995 (32) 25.07.2017 (33) GB

(51) INT CL:
B65D 81/32 (2006.01) B65D 51/28 (2006.01)

(56) Documents Cited:
WO 2008/153660 A US 3156369 A
US 20110174642 A

(58) Field of Search:
INT CL B65D
Other: EPODOC, WPI

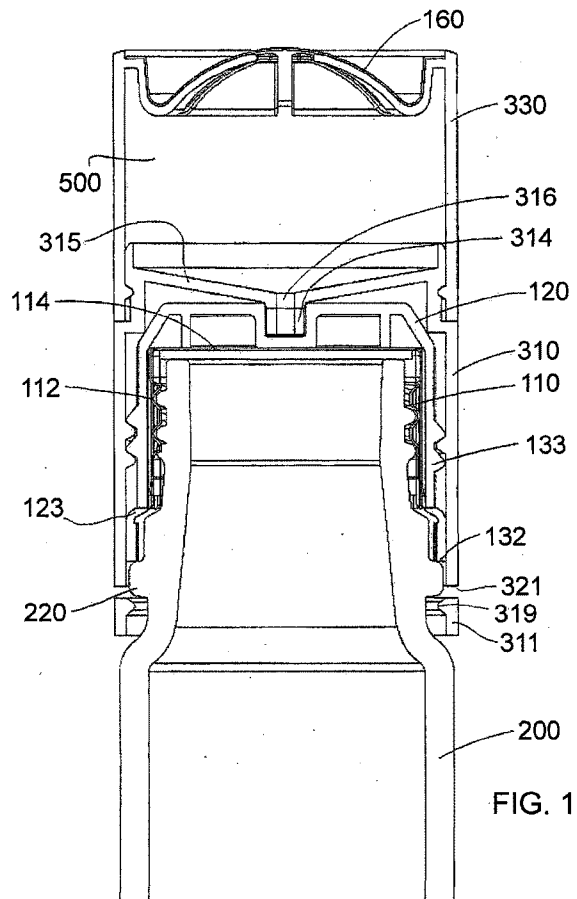
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(54) Title of the Invention: **A liquid container with a piston dispenser**
Abstract Title: **A LIQUID CONTAINER WITH A PISTON DISPENSER**

(57) A liquid container enclosing a reservoir 500 comprising an over-cap 310 outside the reservoir which detachably connects the container to a bottle cap 120, with a dispensing portion comprising a piston 160 displaceable in the reservoir to dispense a beverage from the reservoir by a nozzle 316. The reservoir may be bounded by the piston and a cylinder 300 in which the piston is displaced, with the piston comprising a sliding seal against the cylinder. The cylinder may be open ended and the piston may close the end of the cylinder. The reservoir may also be enclosed by a partition 315 which separates the reservoir from an opening in the cylinder which receives the over-cap. The piston and partition may have matching contours which deprive the reservoir of volume when brought into contact. The piston may reduce the reservoir volume until stopped by the partition. The container may surround the neck of a bottle 110, and the over-cap may surround the neck of a bottle or a spout through the bottle neck. The over-cap may be removable. The nozzle may be through the partition and may protrude from the partition toward the opening.



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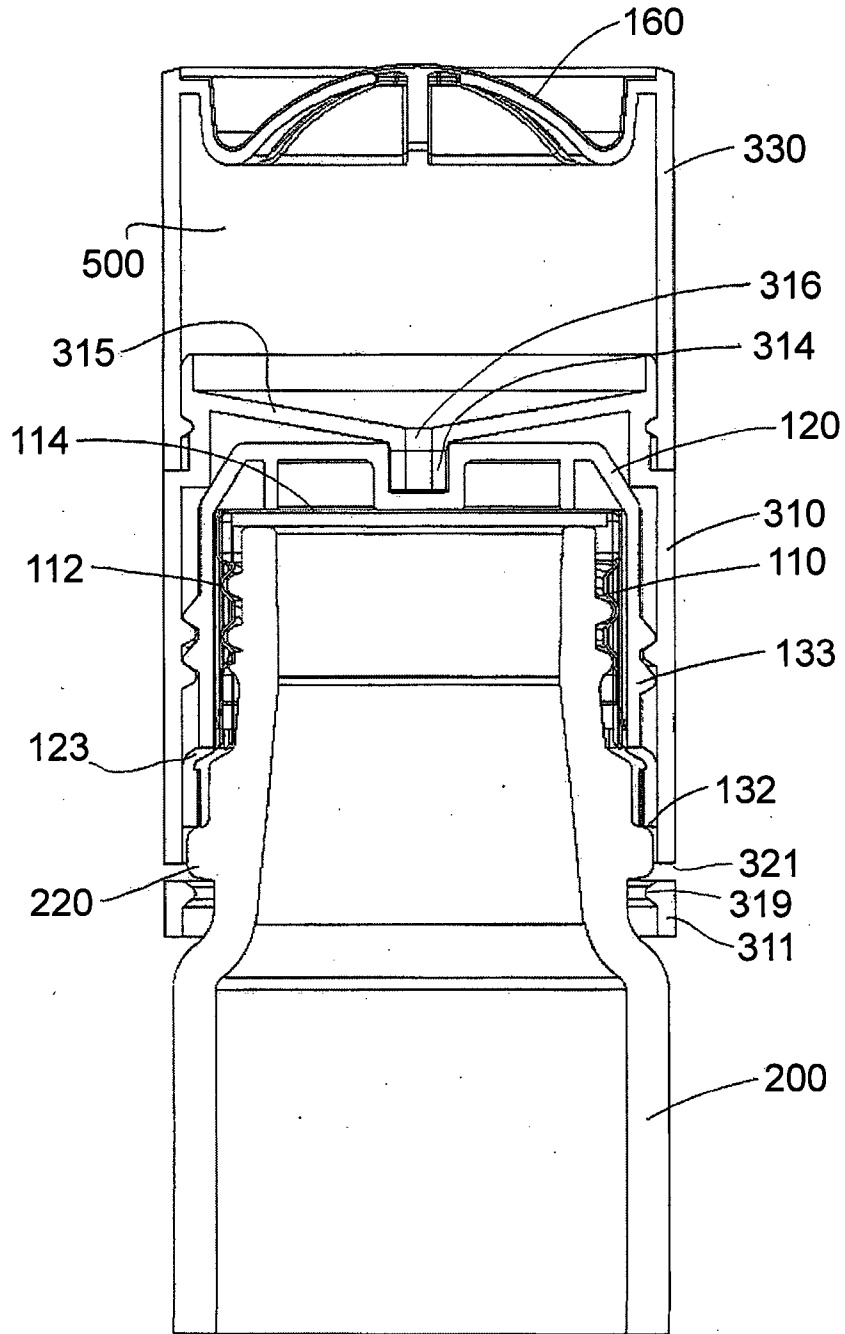


FIG. 1

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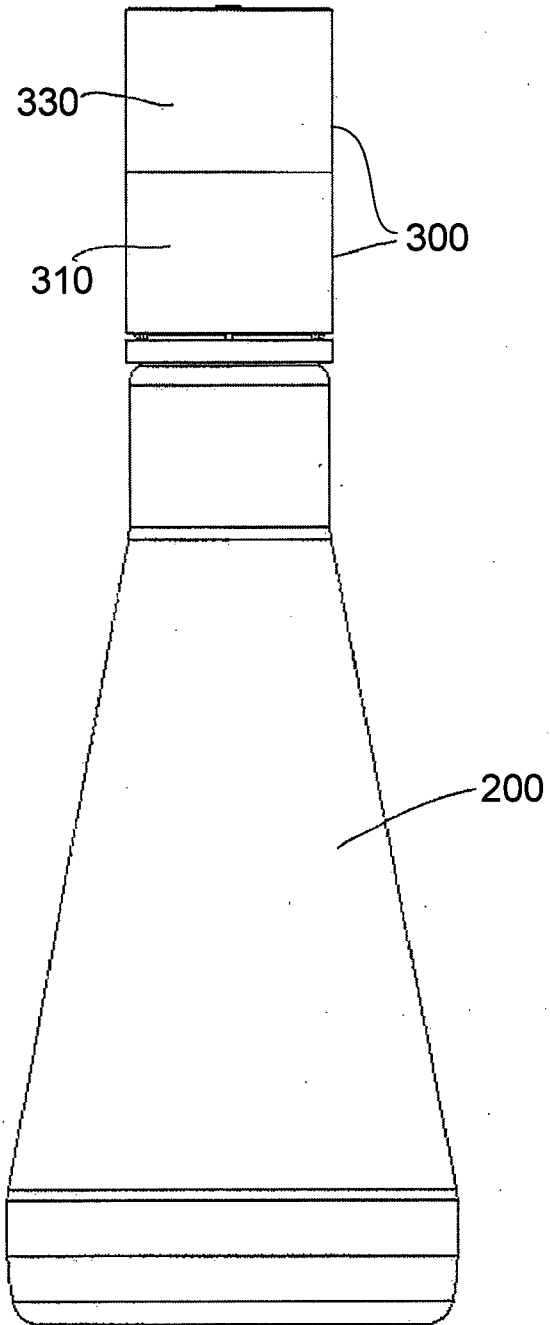


FIG. 2

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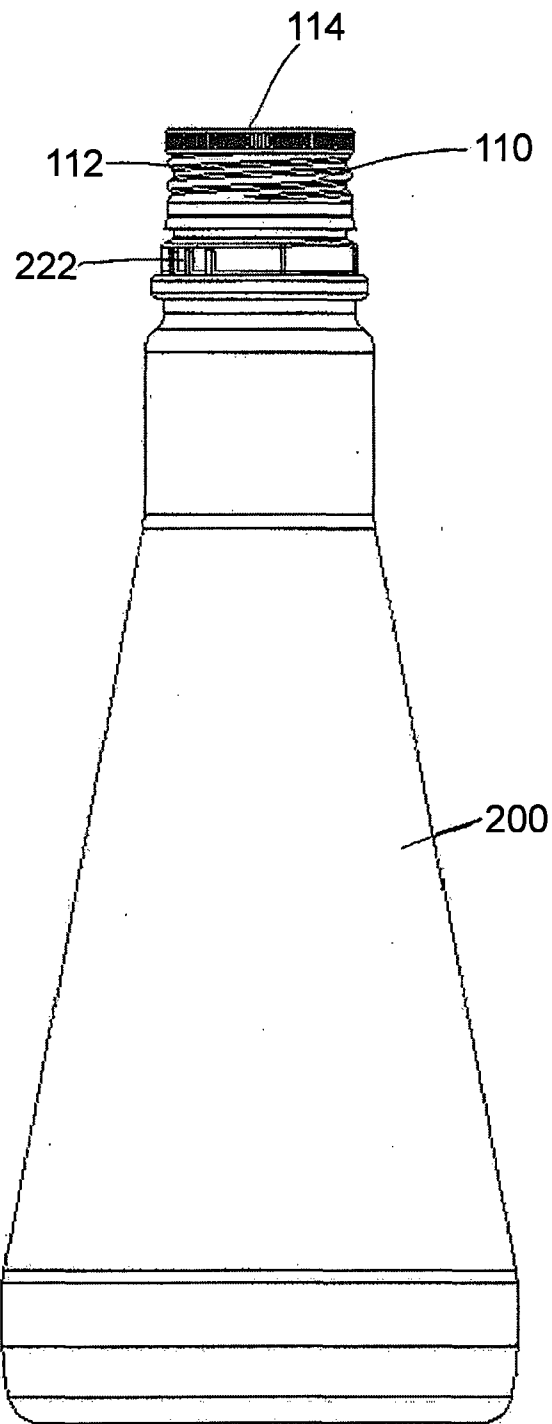


FIG. 3

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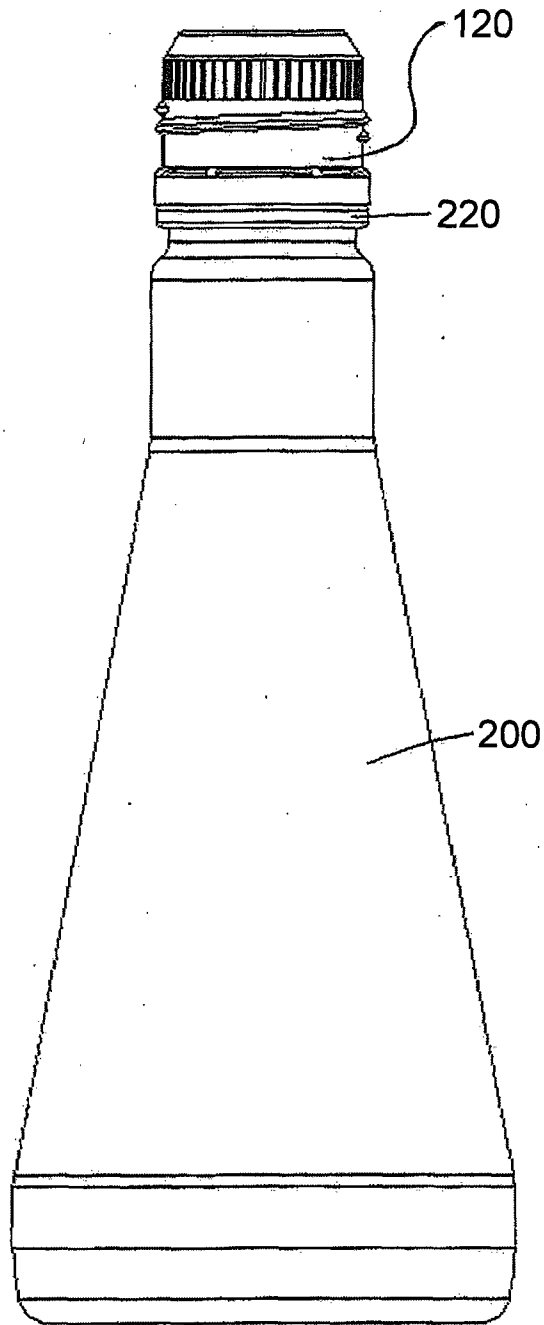


FIG. 4

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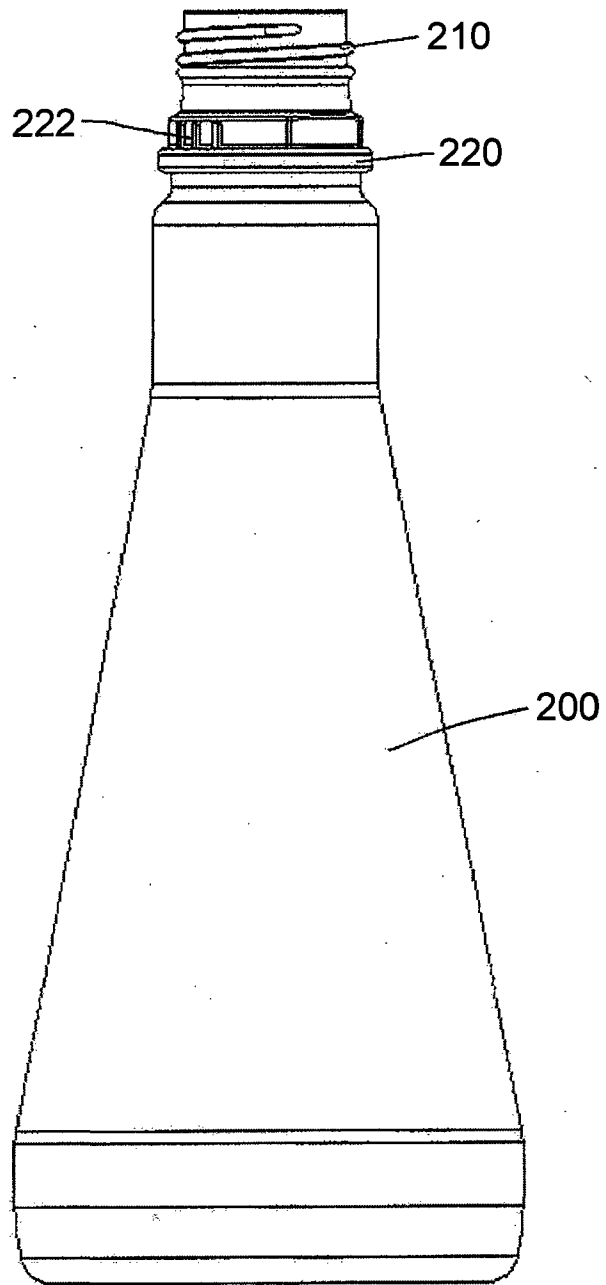


FIG. 5

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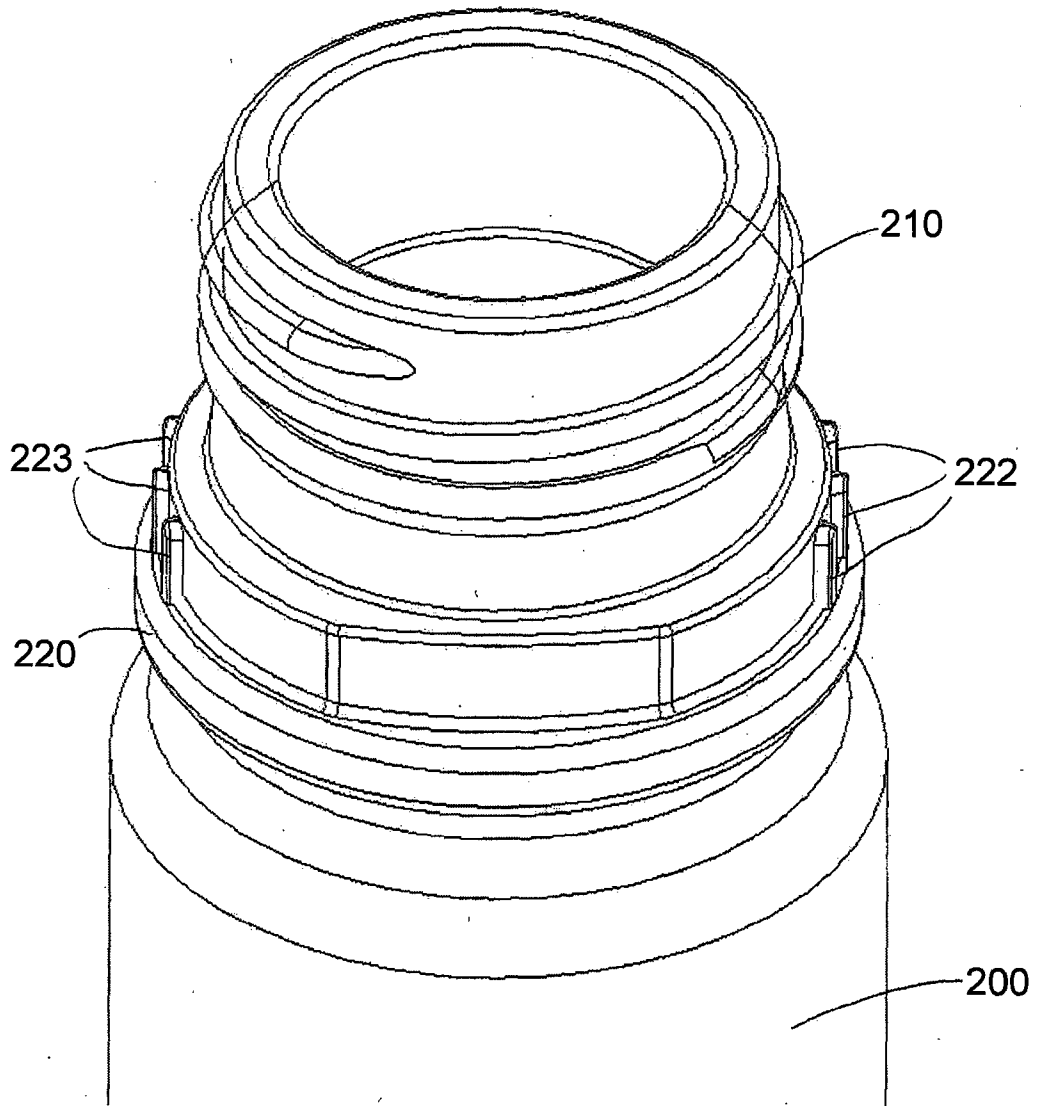


FIG. 6

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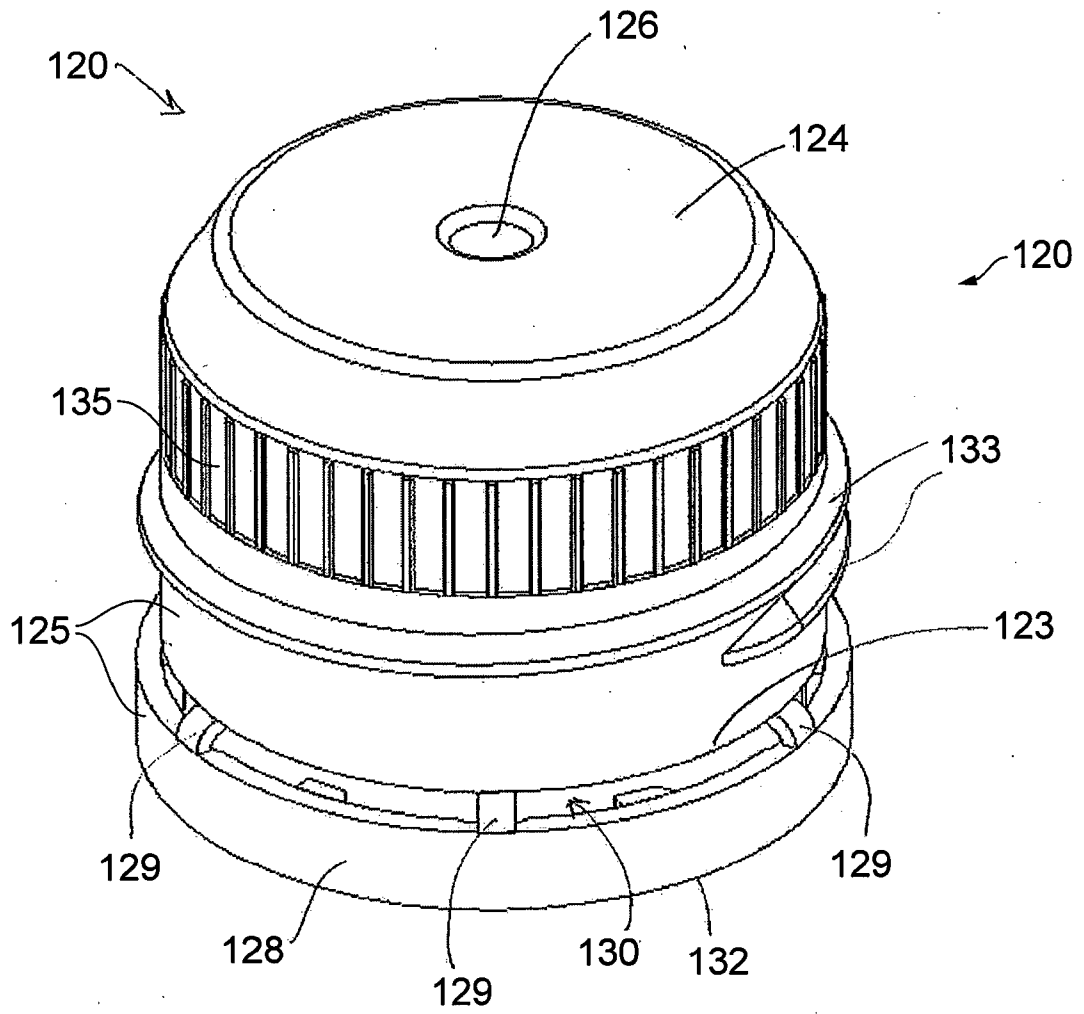


FIG. 7A

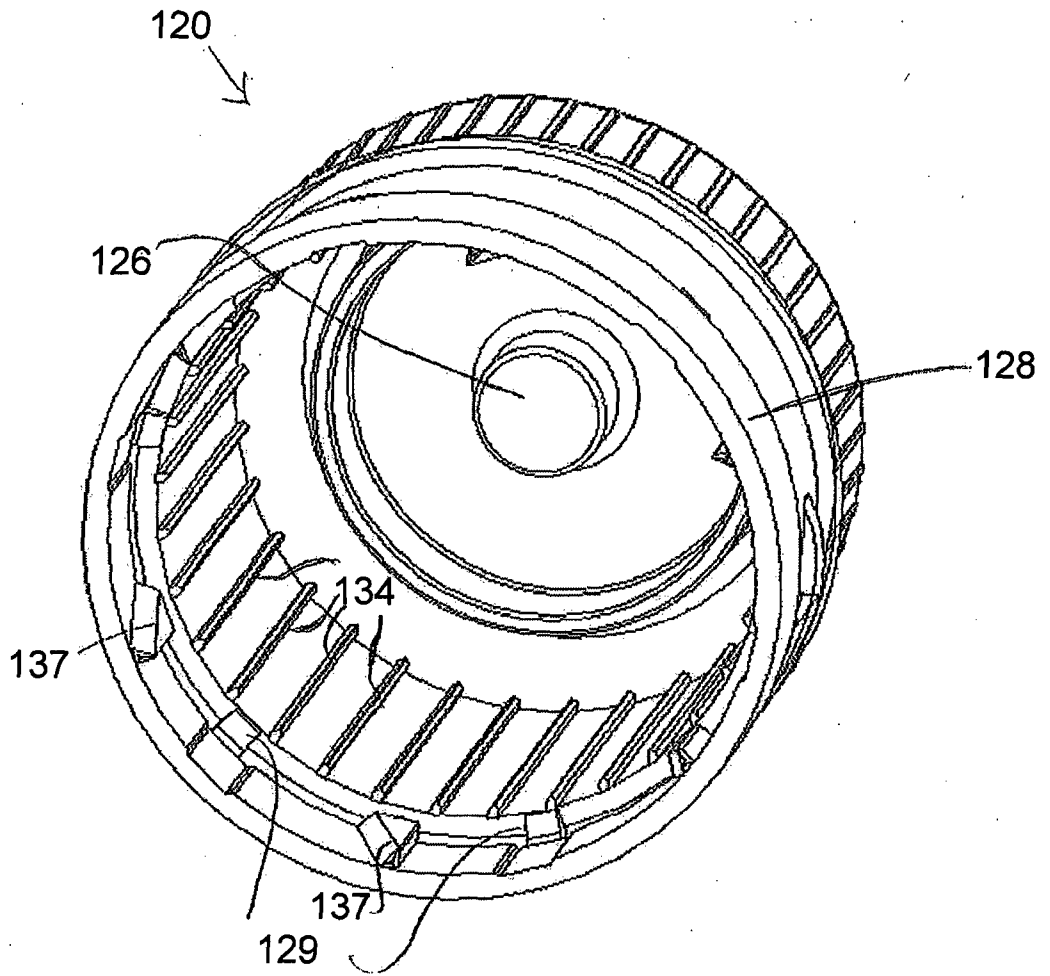


FIG. 7B

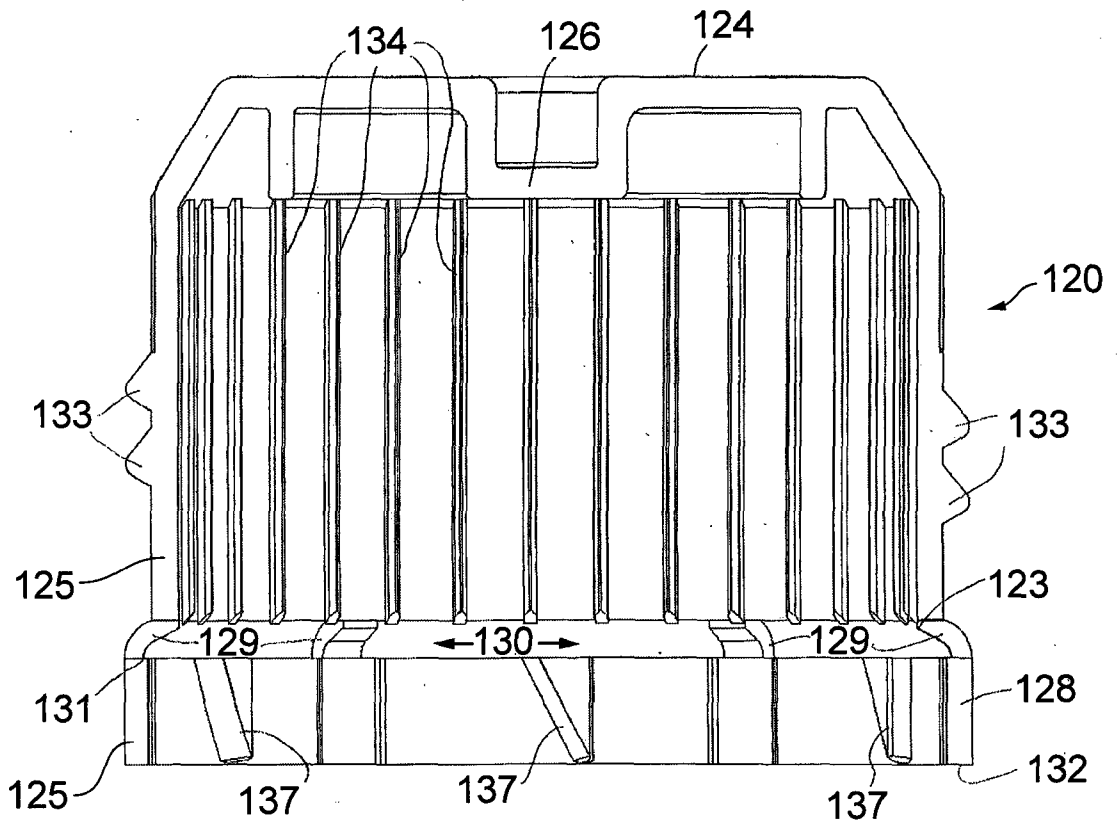


FIG. 7C

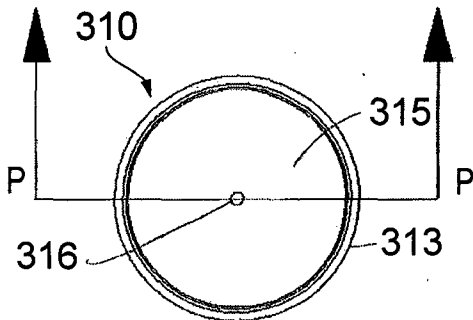


FIG. 8A

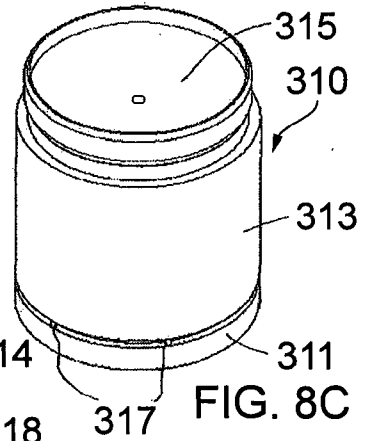


FIG. 8C

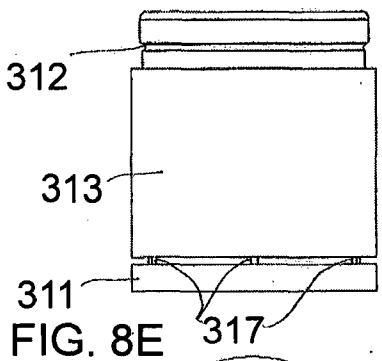


FIG. 8E

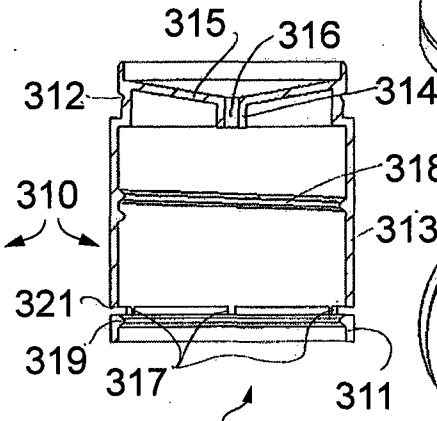


FIG. 8B

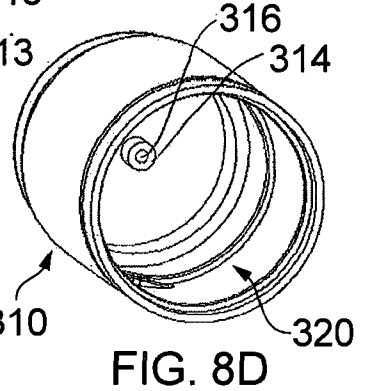


FIG. 8D

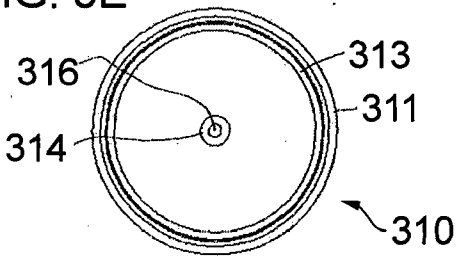


FIG. 8F

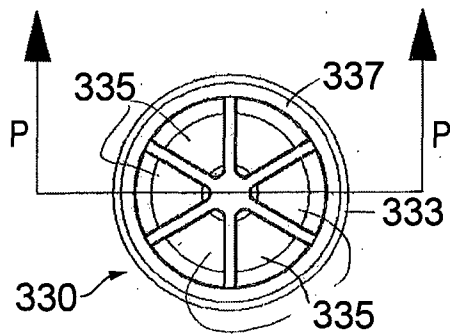


FIG. 9B

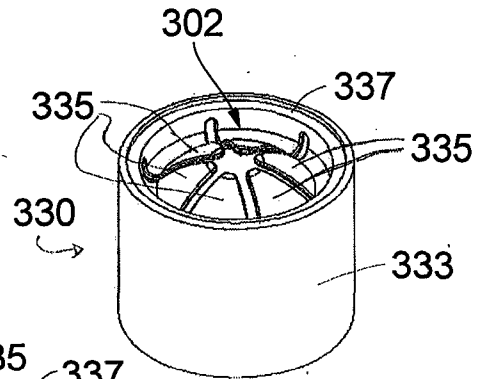


FIG. 9A

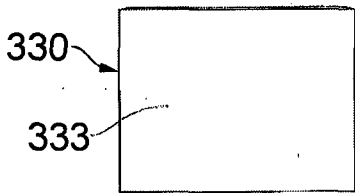


FIG. 9D

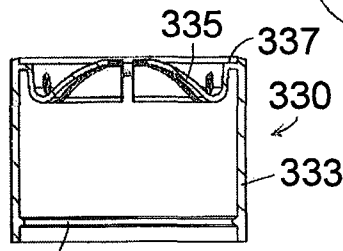


FIG. 9C

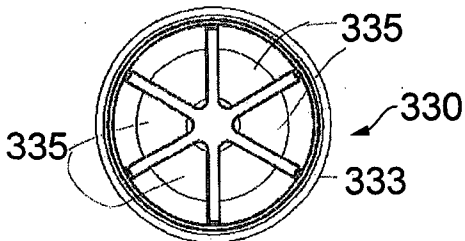


FIG. 9F

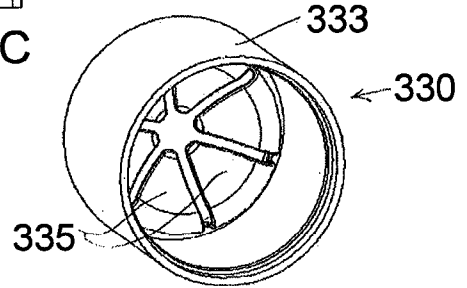


FIG. 9E

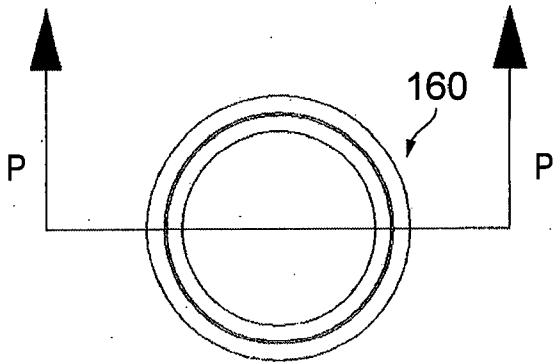


FIG. 10A

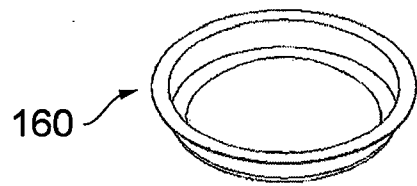


FIG. 10C



FIG. 10D

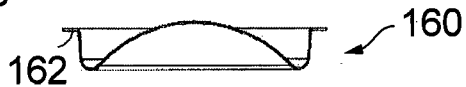


FIG. 10B

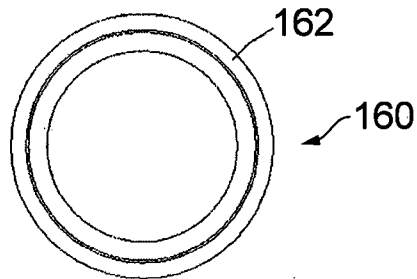


FIG. 10E

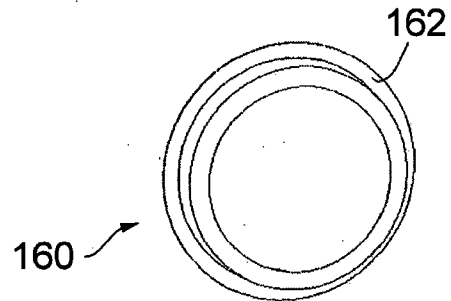


FIG. 10F

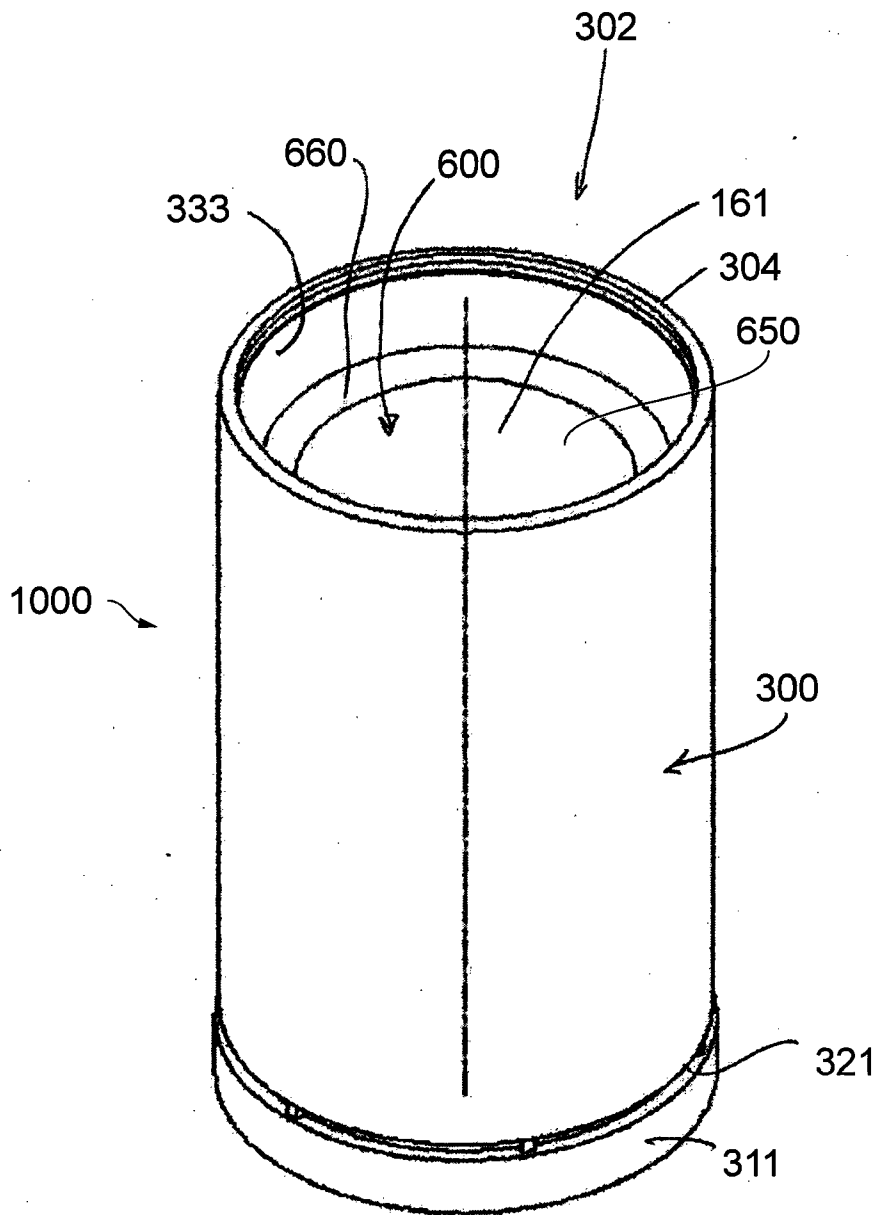


FIG. 11

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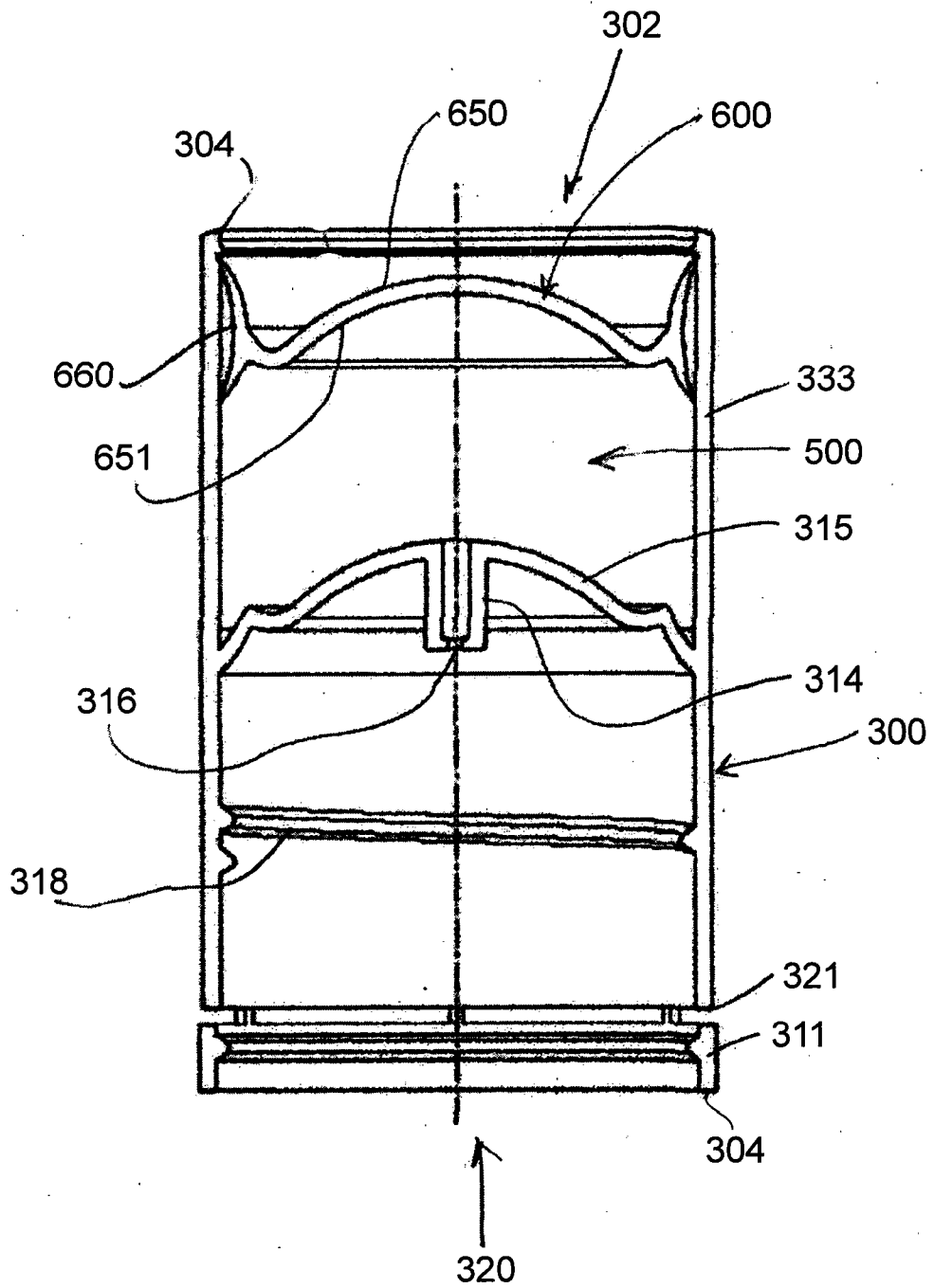


FIG. 12

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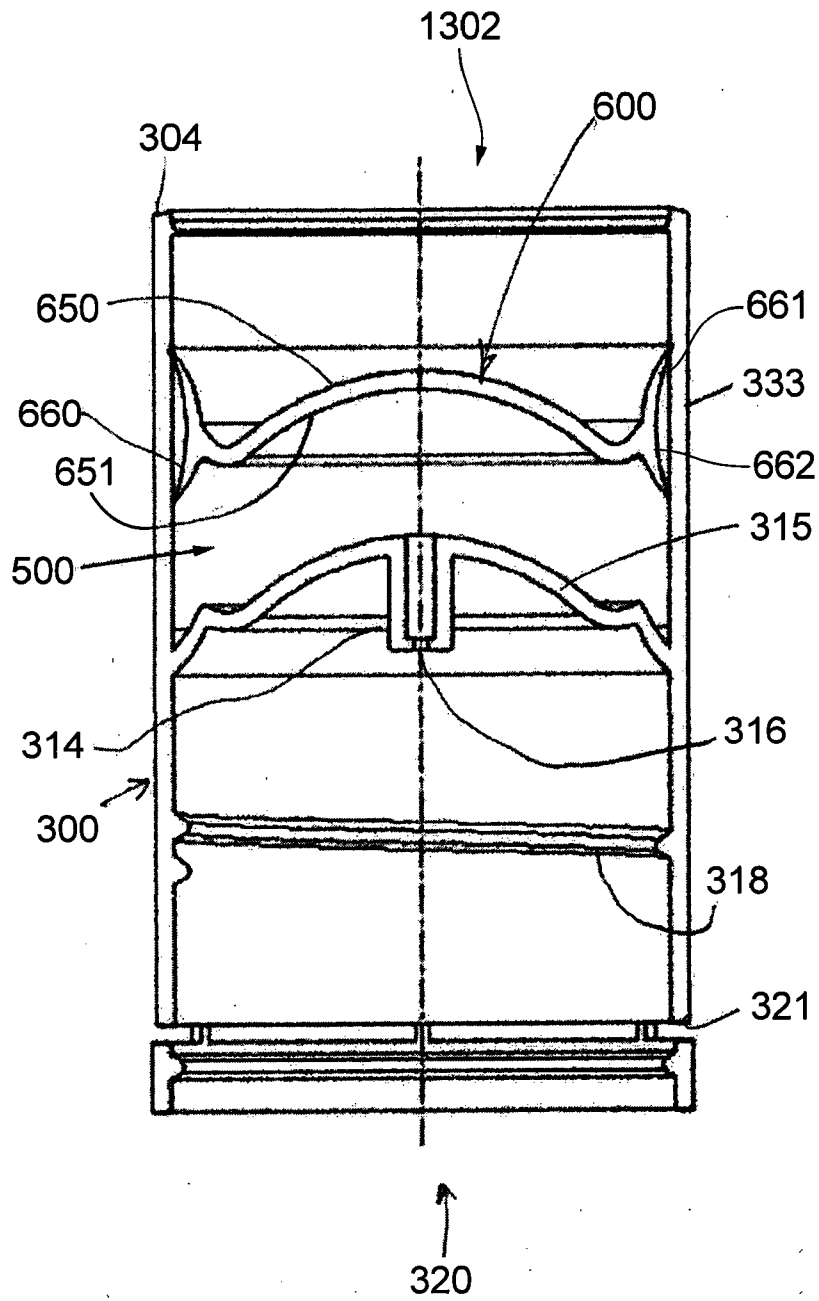


FIG. 13

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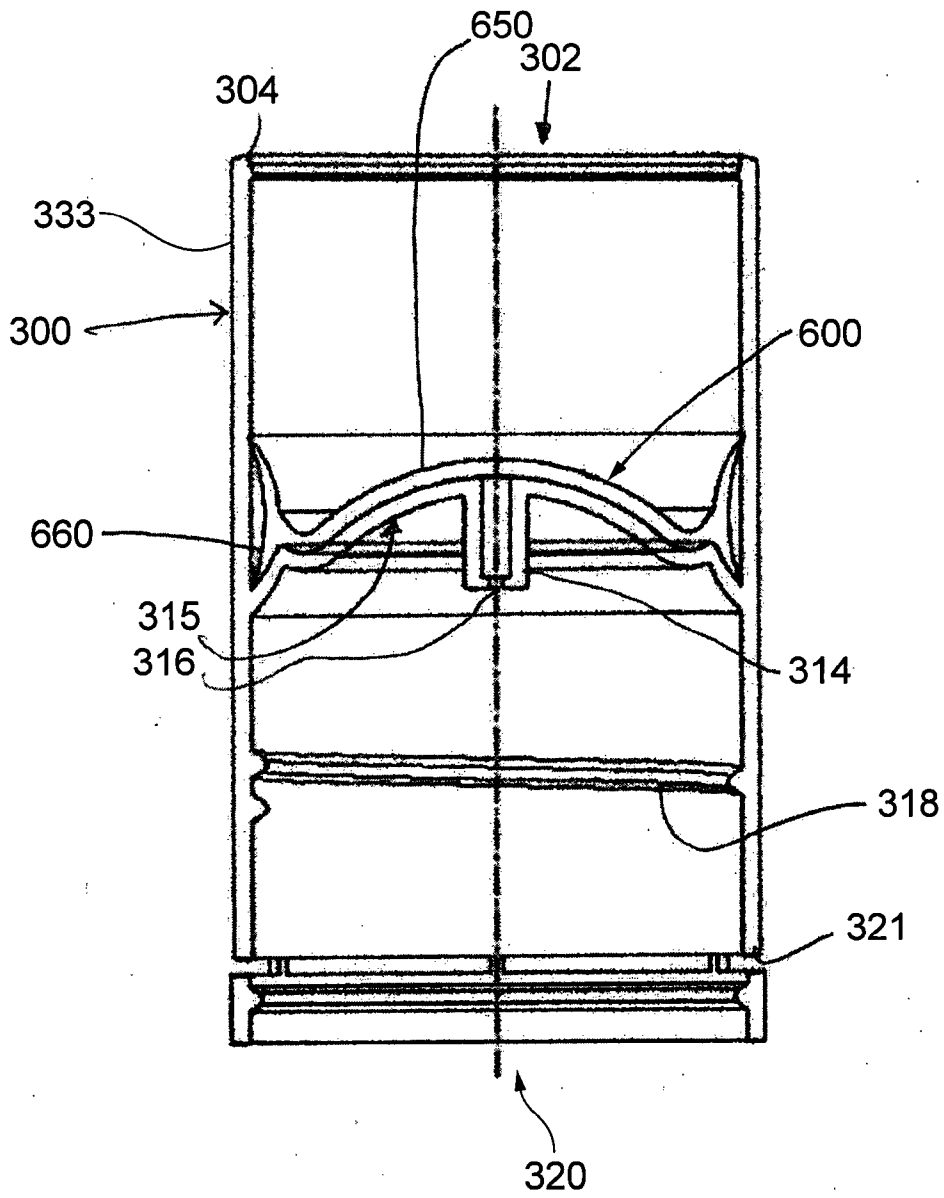


FIG. 14

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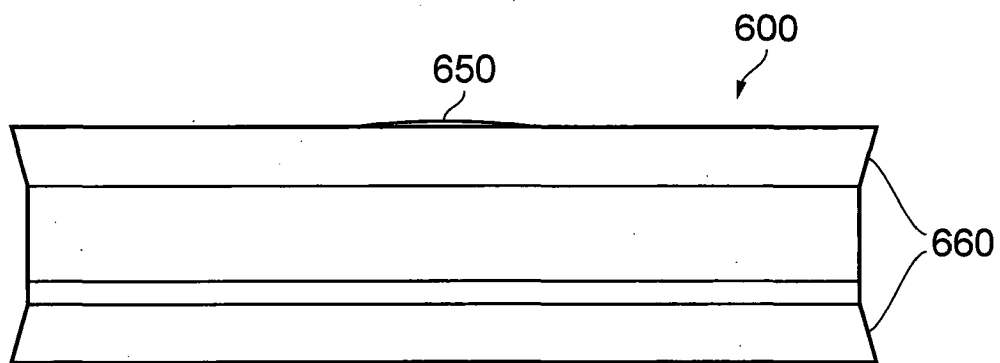


FIG. 15

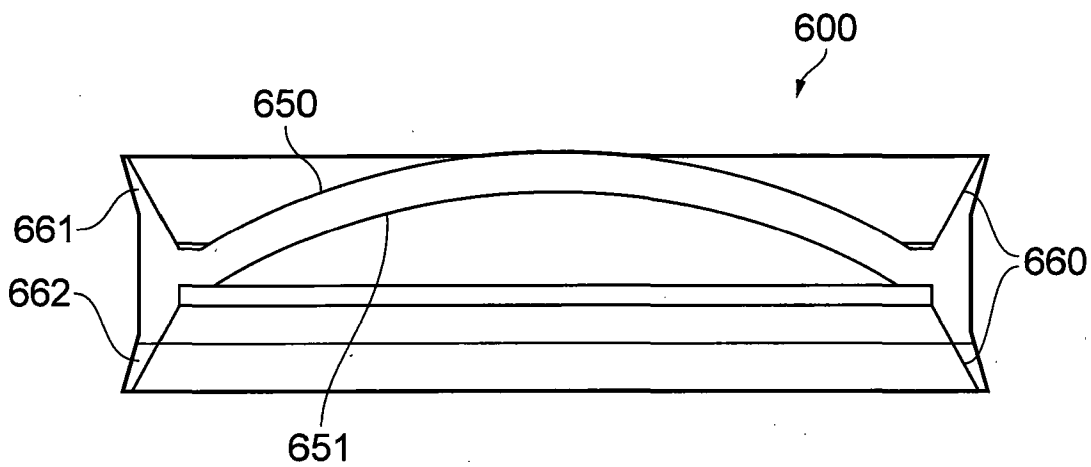


FIG. 16

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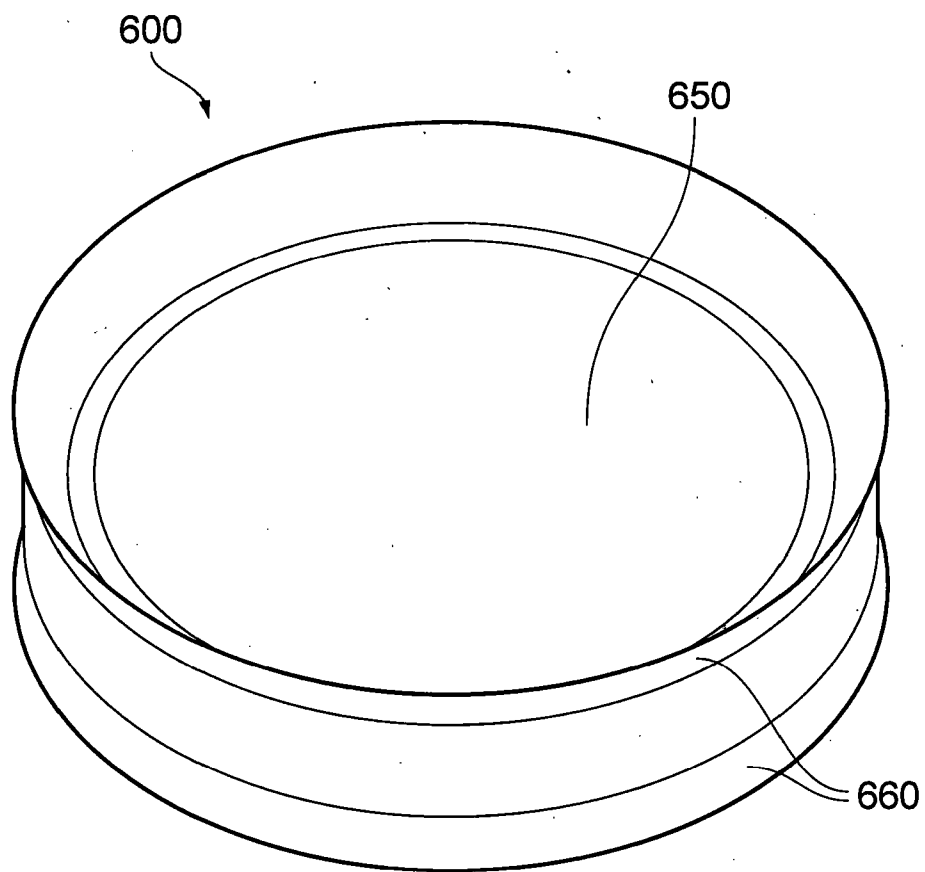


FIG. 17

A LIQUID CONTAINER WITH A PISTON DISPENSER

Field of the Invention

This invention relates generally to devices in the form of a bottle closure to dispense a measured amount of liquid. More specifically the invention relates to devices adapted
5 dispense the liquid as a cordial for flavouring or nutritional supplement into a vessel of another liquid for drinking.

Background

Sealed drinks bottles are used to store and preserve liquids for drinking. Most drinks bottles contain a single liquid sealed inside.

10 Some liquid flavourings such as natural juices deteriorate quickly unless kept pure and sealed. Some liquid flavourings decompose when mixed with other liquids.

So, some mixed liquids have short shelf lives even in sealed bottles.

Prior Art

From the distant past, flavourings which decompose when mixed with another liquid
15 have simply been stored in a separate bottle from the other liquid. This has always had the disadvantage of requiring two bottles.

More recently metered trap dispenser caps have been introduced such as that in Dejonge US20090139882. However, these caps are permanently fixed to the bottle so that the advantage of being able to mix liquids from any two bottles is lost.

20 Summary of the Invention

According to a first aspect of the invention there is a liquid container which encloses a reservoir for containing a beverage, comprising: an over-cap outside the reservoir which detachably connects the liquid container to a bottle cap, wherein the liquid container has a dispensing portion comprising a piston displace-able in the reservoir
25 which when displaced dispenses the beverage from the reservoir via a nozzle.

Preferably the reservoir is bounded by the piston and a tube or cylinder in which the

piston is displaceable. The tube preferably has a cross section which is other than cylindrical.

Preferably the reservoir is partially enclosed by an open-ended compartment of the liquid container. Preferably the compartment is the tube or cylinder.

- 5 Preferably the compartment is open ended and in particular the tube or cylinder is open ended as it has a first open end to receive the piston.

Preferably the piston is displaceable in the tube or cylinder. Preferably the piston received in the tube or cylinder closes off the first open end so that the reservoir is bounded by the piston and the cylinder in which the piston is displaceable.

- 10 Preferably the piston comprises a circumferential sliding seal against the tube or cylinder. The seal prevents liquid beverage in the reservoir from by passing the piston and escaping through the first open end.

Preferably the piston comprises a head circumscribed by the seal. The piston is displaceable by pushing on the piston through the first open end of the tube or cylinder.

- 15 Advantageously the piston is easily pushed on the piston head.

Preferably the cylinder in which the piston is displaceable is proximate the first open end to form the reservoir maximum volume.

Preferably the open end of the tube or cylinder is closed off by the piston.

- 20 Preferably the piston is displaceable by pushing on the piston through the open end of the cylinder.

Preferably the compartment is open ended and in particular the tube or cylinder has a second end which is closed off by a partition. Preferably the partition separates the reservoir from a second opening in the tube or cylinder. Preferably the second opening is arranged to receive the over-cap.

- 25 Preferably the reservoir is enclosed by the tube or cylinder, the piston, and the partition that separates the reservoir from the opening in the container for receiving the over-cap.

Preferably the piston and partition have matching contours which when brought into contact by displacement of the piston deprive the reservoir of volume.

5 Preferably the piston is displaceable to reduce the reservoir volume until stopped by the partition. Where the piston is proximate the first open end, the cylinder is at maximum volume. Where the piston is pushed until in contact with reservoir, the reservoir has nil volume.

Preferably the piston is a one-piece unit.

10 Preferably the container is adapted to surround the neck of a bottle. Preferably the over-cap is adapted to surround the neck of the bottle. Preferably the over-cap is adapted to cover a spout through the bottle neck.

Preferably the over-cap attaches to a bottle cap while the bottle cap is on the bottle.

Preferably the over-cap is removable to divide the liquid container. Advantageously the liquid container is removable from the over-cap while the over-cap covers a bottle cap and while the over-cap is attached to the bottle.

15 Preferably the over-cap is functional as a bottle cap so that a separate bottle cap is not necessary.

20 Preferably the container is in the form of a tube and has a partition intermediate an opening for receiving the over-cap and the reservoir. Preferably the partition separates the reservoir from the opening. Preferably the partition is intermediate the opening and the dispensing portion.

Preferably the dispensing portion closes off the reservoir.

Preferably a tube or a tubular section of the liquid container defines a boundary of the reservoir. Preferably the partition divides the tube or tubular portion.

25 Preferably the dispensing portion of the container when squeezed dispenses the liquid. Preferably the dispensing portion is a collapsible portion of the container. Squeezing the collapsible portion decreases the volume of the reservoir. Preferably the collapsible portion is a resiliently deformable boundary or wall of the reservoir.

Preferably the nozzle is through the partition. Preferably the nozzle protrudes from the partition towards an opening in the container for receiving the over-cap.

5 According to a second aspect of the invention there is a liquid dispenser, comprising: an over-cap for capping over a bottle opening; an outer casing to temporarily encase the over-cap and enclosing a reservoir within a tube having a partition intermediate an opening to receive the over-cap and a collapsible portion to change the volume of the reservoir; a nozzle passes through the partition for a liquid to exit the reservoir.

Preferably the dispensing portion comprises a depress-able button to aid a user to change the volume of the reservoir.

10 Preferably the depress-able button forms a boundary of the reservoir at an end of the reservoir distal from the nozzle.

Preferably the depress-able button forms an end of the tube distal from the opening.

15 Preferably the button is sealed around the end of the tube. Preferably the button is sealed around the end of a tube or a tubular section of the liquid container defining a boundary of the reservoir and exterior surface of the liquid dispenser.

Preferably the button comprises a resiliently deformable portion connected to a wall the tube to urge the button from a depressed position to an undepressed position.

20 Preferably the resiliently deformable portion comprises a flap which extends from a wall of the tube into the reservoir to lift the button from the depressed position to the undepressed position.

Preferably the tube is comprised of a container part comprising the collapsible portion and a receiver part comprising the partition.

Preferably the container part joins to the receiver part by a liquid tight joint to enclose the reservoir.

25 Preferably the container part and receiver part connect by a snap fit or a press fit or a screw thread.

Preferably the nozzle protrudes from the partition towards the opening.

Preferably the over-cap comprises a cap top to cover the bottle opening, wherein the cap top comprises depression to temporarily receive the nozzle and seal the reservoir closed.

5 Preferably an edible liquid flavouring within the reservoir is contained as the liquid in the reservoir.

Preferably the over-cap is arranged to cap over a screw-on cap screwed onto the bottle.

Preferably the liquid dispenser comprises the screw-on cap.

10 According to another aspect of the invention there is a method of filling a liquid dispenser comprising: an over-cap for capping over a bottle opening; an outer casing to temporarily encase the over-cap and enclosing a reservoir within a tube having a partition intermediate an opening to receive the over-cap and a collapsible portion to change the volume of the reservoir; a nozzle passes through the partition for a liquid to exit the reservoir, wherein the tube is comprised of a container part comprising the
15 collapsible portion and a receiver part comprising the partition; the method including inverting the container part so that its open end opens upwards, urging a liquid into the open end, and joining the receiver part to the open part.

Advantageously the liquid dispenser is useable to either dispense a liquid from the reservoir into the bottle or into another container.

20 Preferably the reservoir is at least partially filled with the liquid. Preferably the liquid is an edible flavouring for flavoring another liquid in the bottle.

Advantageously a user can readily observe that depressing the button on the end of the outer casing can be done with just one hand.

25 Advantageously each time the button is depressed a known metered amount of the liquid in the reservoir is ejected.

While the dispenser is standing upright, a liquid will rest in reservoir with an open space between the liquid and the button. The liquid rests on the partition through which the aperture of the nozzle passes. The dispenser is preferably filled with liquid when the

dispenser is inverted so the liquid rests on the button. When the dispenser is turned back upright, there will be a space between the liquid surface and the button which is relatively low pressure compared to the pressure outside the reservoir.

5 After the button is depressed to dispense liquid through the aperture of the nozzle and springs back, there will be more space between the liquid surface and the button. The pressure in the space is relatively low pressure compared to the pressure outside the reservoir.

Advantageously, after the button springs back flow of liquid out of the reservoir will be shut off by the pressure differential and not leak down into the bottle.

10 Advantageously, the liquid dispensing system is preferably comprised of parts approved by regulatory authorities for use with food and drink.

15 Advantageously the liquid dispensing system is economically mass produced, and its components may be preferably manufactured from plastic polymers that can be injection moulded. Polymers approved for use by the authorities are advantageously suitable.

20 Advantageously, the button is easily sealed to the container part with an automatic machine. The button is moved straight along the central axis of the container part cylinder wall until the button is joined to the container. Preferably the button is joined to the container after the reservoir is filled with a liquid; or also preferably the button is first joined to the container, and then the container is inverted for filling with the liquid t.

The outer casing along with the reservoir contents cannot be released from the bottle without leaving a break-away ring behind on the neck. So advantageously tampering would be evident.

25 Typically fruit juice in a bottle is be carbonated and autoclaved. This means that the bottle screw-on cap must withstand autoclaving temperatures over the required time whilst retaining the pressure. Advantageously the liquid dispensing system is compatible with an aluminium screw-on cap which is used, as standard in the trade. A fruit drink may therefore be filled in the bottle and capped and processed by a standard

method.

5 Some polymers which are otherwise suitable for the dispensing system components cannot withstand heat or pressure of a heated and pressurized autoclave. Typically, a glass bottle is filled and then closed with an aluminium screw-on cap before autoclaving the closed bottle. Advantageously the over-cap and outer casing are attachable to the bottle after the bottle covered by the screw-on cap has been subjected the heat and pressure within the autoclave.

10 Another alternative is to use an aseptic filling line on a bottle made from plastic material such a PET. Autoclaving may be executed before filling and so a PET bottle and a plastic screw-on cap can be used.

Advantageously an outer casing and an over-cap can be replaced. Hence multiple liquids are dispensable into the bottle.

Advantageously the outer casing is preferably one packaging which can be separated from the bottle before use.

15 Preferably the liquid container is a bottle augmentation device for containing and dispensing a liquid, comprises: a container containing a reservoir for liquid; an over-cap outside the reservoir which detachably connects the container to a bottle cap or directly to bottle neck to close the bottle opening; and a dispenser enclosing the reservoir which when displaced dispenses the liquid from the reservoir via a nozzle.

20 According to another aspect of the invention there is a method of supplying a liquid dispenser with a liquid to be dispensed comprising inverting the container part so that its open end opens upwards, urging a liquid into the open end to put the substance into the container part, snapping the bottom part onto a rim of the cylinder wall portion of the open end of the container part to seal the liquid into a reservoir.

25 In a preferable method, the liquid dispensing system is filled with a liquid by supplying the outer casing in two parts. One of the two parts is the container part sealed by the button, and the other of the two parts is the bottom part screwed onto the over-cap. The container part is inverted so that its open end opens upwards. Then a liquid is urged into the open end to put the liquid into the container part sealed at one end by

the button. The bottom part with over-cap is snapped onto the rim of the open end of the container part to seal the liquid into a reservoir.

Alternatively, the outer casing can be supplied in two parts: one part is a combination of the bottom part and the container part without a spring or flap for the button; and the
5 second part is the spring or flaps.

In another preferable method of filling the liquid dispensing system, three parts (container part, bottom part, and over-cap) are pre-assembled. The container part is filled from the top, through the space between the spring parts. Then the filled container is closed by sealing the flexible button on top of the cylinder.

10 The liquid container, and the dispensing system and method described herein comprise features and steps combinable in ways which are industrially applicable. The container and system provide a means enabling steps of the method.

For example, the container is useful to introduce variety of liquids into either another vessel or the bottle to which the container is attachable. The reservoir is arranged to
15 hold a variety of flavours in the form of liquid intended for any beverage category. The variety includes: liquid vitamins, vitality, nutritional compounds and healthy elixir like Echinacea; mood enhancers including but not only alcohol; sugary liquids; spirits for cocktails and mixers; coffee, tea, and other botanical extracts; milk and milk alternative which may be added to coffee or tea which is either hot or especially iced.

20 Hence advantageously the container and system provide a means for separating a flavouring liquid and storing it in a useful way that enables a consumer to decide on the quantity of flavour or sweetness they want by ejecting from the reservoir into their vessel a quantity of the flavouring liquid that they want.

The invention will now be described, by way of example only, with reference to the
25 accompanying drawings in which:

Brief Description of the Figures

Figure 1 is a section view showing parts assembled into a liquid container according to the invention;

Figure 2 is a view of an outer casing of a liquid container in situ on a bottle neck according to the invention;

Figure 3 is a view a screw-on cap covering the opening of a bottle neck according to the invention;

5 Figure 4 is a view of an over-cap covering the screw-on cap in situ on a bottle neck according to the invention;

Figure 5 is a side view of a bottle having a bottle neck to receive a liquid container according to the invention;

10 Figure 6 is a view into an opening of a bottle having a bottle neck to receive a liquid container according to the invention;

Figures 7A, 7B, and 7C are views of the outside, inside, and cross-section respectively of an over-cap according to the invention;

Figures 8A, 8B, 8C, 8D, 8E, and 8F are views of the top, cross-section, outside, inside, side, and bottom respectively of a bottom part according to the invention;

15 Figures 9A, 9B, 9C, 9D, 9E, and 9F are views of the outside, top, cross-section, side, inside, and bottom respectively of a container part according to the invention;

Figures 10A, 10B, 10C, 10D, 10E, and 10F are views of the top, cross-section, outside, side, bottom and inside respectively of a button according to the invention;

20 Figure 11 shows an isometric view of the exterior of a liquid container comprising a piston type dispensing portion;

Figure 12 shows a cross section of the liquid container in Figure 11 wherein the piston is located most distal from the partition and reservoir is at maximum volume;

Figure 13 shows the cross section of the liquid container wherein the piston is located where the reservoir is at half volume;

25 Figure 14 shows the cross section of the liquid container wherein the piston is located

where the reservoir is at nil volume;

Figure 15 shows an edge view of the piston;

Figure 16 shows a cross section of the piston; and

Figure 17 shows an isometric view of the piston.

5

Detailed Description of the Invention

Referring to the Figures, there is shown a liquid container 1000 according to the invention. There is shown in Figure 1 a section view and in Figure 2 a view of the exterior of an outer casing 300 of a liquid container fitted to a bottle 200. The liquid container, comprises: an over-cap 120 for capping over a bottle opening; an outer casing 300 to temporarily encase the over-cap 120 and enclosing a reservoir 500 within a tube having a partition 315 intermediate an opening to receive the over-cap 120 and a collapsible portion 160 to change the volume of the reservoir 500; a nozzle 315 passes through the partition 315 for a liquid to exit the reservoir.

10
15
Screwed onto the neck of the bottle is a screw-on cap 110. The screw-on cap has a top 114. The over-cap 120 covers the screw-on cap 110. The outer casing 300 covers the over-cap 120.

The outer casing 300 comprises a cylinder wall 313, 333 visible in Figure 8 and Figure 9. The outer casing is part of the tube. The outer casing 300 is closed at an end by a depress-able button 160 which forms the collapsible portion. The button is visible in Figure 1 and Figure 10.

The outer casing has an open end to receive the over-cap 120, and a base 315 which forms the partition. The base 315 closes the cylinder wall 313 from within the tube. The base forms a boundary of the reservoir 500.

20
25
A nozzle 314 extends axially from the base 315. The nozzle is sealed by connection with the over-cap 120. The nozzle 316 is visible in Figure 1 and Figure 8.

The button 160 is depress-able into the reservoir 500 to change the volume of the reservoir. Depressing the button urges any liquid in the reservoir 500 out through the nozzle 314. However, until the outer casing 300 is disconnected from the over cap 120 any liquid within the reservoir cannot escape because the nozzle is sealed by connection with the over-cap 120.

The bottle 200 has neck proximate the bottle opening. The neck has a screw-thread 210 to engage the screw-on cap 110. The screw-thread is located intermediate the bottle opening and a circumferential ridge 220 on the neck.

The screw-on cap 110 also has a screw-thread 112 to engage with the screw-thread 210 on the neck of the bottle.

An over-cap 120 covers the bottle neck and bottle opening. The over-cap 120 also covers the screw-on cap 110 screwed onto the neck. The over-cap 120 is visible in Figure 1, Figure 4, and Figure 7.

The over-cap 120 has a form of an open-ended cylinder with a first rim 123 of the open end.

As shown in Figure 7B and 7C there are axially aligned ribs 134 on the inner surface of the cylindrical wall of the over-cap 120. The ribs 134 of the over-cap 120 grip the cylindrical wall of the screw-on cap so that the screw-on cap is unscrewed from the bottle together with the over-cap 120.

The over-cap has a top 124 which closes one end of the open-ended cylinder. The top 124 is therefore at the distal of the open-ended cylinder from the first rim 123.

The over-cap top 124 has a central depression 126. The central depression 126 is urged into contact with the top 114 of the screw-on cap when the over-cap is secured to the neck of the bottle.

The over-cap 120 protects the top 114 of the screw-on cap from damage. The central depression comprises a portion which intervenes between the nozzle and the top 114 of the screw-on cap. The portion shields the top from damage by the nozzle if the nozzle is deflected downward by overpressure in the reservoir as the button is depressed.

The over-cap fits tightly on to the top 114 of the screw-on cap to stop any rotating movement over the screw-on cap.

5 The over-cap 120 also comprises a separate ring 128 having a circumference with which greater than the circumference of the first rim 123. The separate ring 128 is separated from the first rim 123 by a circumferential gap 130. The separate ring 128 is connected to the first ring by fingers 129 across the circumferential gap 130.

The separate ring 128 provides the over-cap 120 with a second circumferential rim 131 which located more distal from the top 124 of the over-cap 120 than the first rim 123.

10 The separate ring fits over vertical raised stops 222 on the bottle neck. The separate ring has locking protrusions 137 which come up against the vertical stops on the bottle neck and will prevent any turning of the over-cap when the outer case 300 is being unscrewed from the over-cap.

15 Axially aligned ribs 134 shown in Figure 7B and 7C on the inner surface of the outer wall of the over-cap interfere with axially aligned ribs shown in Figure 3 on the cylindrical portion of the screw-on cap. So, when unscrewing the over-cap, the screw-on cap will be unscrewed from bottle.

20 The over-cap 120 can only been unscrewed from the bottle after the outer casing 300 has been unscrewed from the over-cap 120. The outer casing 300 completely covers the over-cap so the over-cap cannot be touched. Lugs (teeth) 137, 222 between the over-cap (inside the bottom ring) and on the bottle neck prevents the over-cap from unturning and becoming accidentally unscrewed because the separate ring 128 of the over-cap can only 'jump' over the lugs 137 when the separate ring can move to a larger diameter. The outer wall 313 of the bottom part 310 prevents the over-cap from expanding so the lugs 137 on the over-cap cannot jump over the lug 222 on the neck
25 of the bottle.

As the outer case 300 is removed from the over-cap 120 the seal between the nozzle 316 and the over-cap 120 is also removed. The outer case is thereby readied to dispense any liquid within the reservoir through the nozzle by collapsing the collapsible portion, which is effected by depressing the button.

The over-cap 120 seats onto the screw-on cap. The central depression 126 on the top of the over-cap 120 is screwed into contact with the top 114 of the screw-on cap 110. So, the inside top of the over-cap 120 at the bottom of the depression 126 contacts the top of the screw-on cap 110 when assembling. Clearance space remains
5 between the separate ring 128 and the circumferential ridge 220 on the neck of the bottle.

The central depression 126 is a sink in the center of the top 124 of the over-cap 120. The central depression accepts the nozzle defined by the protrusion 314 and aperture 316 protruding from the base 315 of the bottom part 310. The nozzle is 316 is sealed
10 into the central depression.

The central depression seals around the protrusion 314 of the nozzle and acts as a hermetic seal to stop any ingress of oxygen which will degrade a liquid in the bottle or reservoir over time and any loss of liquid from the reservoir due to an extended shelf life or aggressive handling.

15 The seal also prevents liquid in the reservoir 500 from being dispensed, even if a squeezable portion of the outer casing 300 for collapsing the reservoir 500, such as the button 160 is depressed.

Protruding inwards from the internal side of the separate ring 128 is a tooth 137. The tooth protrudes inwards toward the centre of the ring. The tooth 137 extends from the
20 edge of ring 128 adjacent to the circumferential gap 130. The tooth 137 extends along the internal surface about halfway to the second rim 132. Another tooth 222 on the neck of the bottle on the side of the bottle screw-thread and distal from the bottle opening engages the tooth 127 on the separate ring when the over-cap 120 is fully screwed on the bottle.

25 On the external side of the cylinder portion of the over-cap 120 is an external screw thread 133. The external screw-thread 133 traverses one turn around the external side of the cylinder portion. The external screw-thread 133 engages an internal screw thread 318 on a bottom part 310 of an outer casing 300.

The outer casing 300 can be unscrewed from the screw-on cap and covering over-cap
30 120, thereby breaking the tamper evident break-away ring 311 because of

circumferential ridge 220 the bottle neck. The break-away ring 311 remains on the bottle. Removing the outer casing 300 releases the nozzle protrusion 314, ready for ejecting a liquid from the reservoir into any space.

5 While unscrewing the outer casing 300 from the bottle 200 the over-cap 120 will be blocked from turning because of the tooth 137 on the separate ring 128 of the over-cap 120 and corresponding tooth 222 on the bottle neck. The cylinder wall of the bottom part 310 covering the bottom ring of the over-cap 120 prevents the tooth 137 on the separate ring 128 slipping over the corresponding tooth 222 on the bottle neck.

10 After the outer casing 300 has been unscrewed from the bottle, the over-cap is left on the bottle.

The tooth 137 in the over-cap can jump over the tooth 222 on the bottle once the outer casing is removed. It is then possible to unscrew the over-cap 120 and the screw-on cap inside this over-cap 120. When unscrewing the exposed over-cap 120 that is locked to the screw-on cap, the over-cap 120 unscrews the screw-on cap 110 from the bottle 200 in the normal way.

The bottom part 310 of the outer casing 300 covers the screw-on cap 110 and the outer cap 120. The outer casing is visible on the bottle neck covering the bottle opening as shown in Figure 2. The screw-on cap 110 and the outer cap 120 cannot be seen unless the outer casing 300 is transparent.

20 The outer casing 300 comprises the bottom part 310 and a container part 330. The bottom part 310 is snap connected to the container part 330.

The general form of the bottom part 310 is an open-ended cylinder with a cylindrical wall 313, one end closed by a base 315 and the distal end open. There is a circumferential slot 312 around the top rim of the cylindrical wall 313.

25 The general form of the container part 330 is an open-ended cylinder with one end an open separated by a cylinder wall 333 from the other end. The other end is partially closed by flexible flaps 335.

Proximate the open-end rim of the container part 330 is a circumferential ridge 332. The circumferential ridge 332 is snapped into the circumferential slot 312 of the bottom

part 310, thereby connecting the bottom part 310 to the container part 330. A reservoir 500 bounded by the base 315 of the bottom part 310 and the cylindrical wall of the container part 330 is thereby formed.

5 The cylindrical wall of the container part 330 is resiliently flexible for the circumferential ridge 332 to be snapped into the circumferential slot 312. A liquid tight seal is thereby formed.

The container part 330 and the bottom part 310 are made from polypropylene. The over-cap 120 is made from polyethylene.

10 These materials are flexible. Separate ring 128, break-away ring 311, and flexible flaps 335 can stretch and bend and can spring to move back to their original position when bent or stretched.

The cylindrical wall 313 of the bottom part 310 has the same diameter as the cylindrical wall 333 of the container part 330.

15 The bottom part 310 comprises a break-away ring 311 having the same diameter as the cylindrical wall 313 of the bottom part.

The cylindrical wall 313 of the bottom part has an inner diameter the same as the outer diameter of the circumferential ridge 220 on the neck of the bottle 200.

20 The length of the cylindrical wall 313 is sized such that the bottom part 310 is screwed onto the over-cap 120 until it is blocked by the nozzle axial protrusion 314. The rim of the open end 321 of the cylindrical wall 313 extends to the circumferential ridge 220 of the bottle neck.

The break-away ring 311 is joined by fragile stringers 317 to the rim of the open end 321 of the cylindrical wall 313. The break-way ring 311 is separated from the rim by a cylindrical gap.

25 The break-away ring 311 comprises a dimple or circumferential ridge 319 extending radially inwards. The dimple or ridge 319 extends radially inward further than the diameter of the circumferential ridge 220 on the neck of the bottle.

The fragile stringers 317 are resiliently flexible to allow the break-away ring 311 including the circumferential ridge 319 to temporarily stretch over the circumferential ridge 220 on the neck of the bottle.

5 When the bottom part 310 is screwed onto the over-cap 120 the break-away ring 311 is driven over the circumferential ridge 220. The break-away ring 311 then snaps back. The bottom part 310 cannot be removed without breaking the fragile stringers 317 because the dimple or circumferential ridge 319 on the break-away ring is blocked by the circumferential ridge 220 on the bottle.

10 The outer casing 300 is only removable from the bottle by breaking the fragile stringers 317 and leaving the break-away ring 311 behind on the bottle. This is because the outer casing 300 comprises the bottom part 310 and a container part 330 snapped together.

15 The base 315 of the bottom part 310 blocks closed the open end of the container part 330. The base 315 is the bottom of the reservoir 500 formed by the container part 330 being snap connected to the bottom part 310.

The base 315 of the bottom part has a general form of a circular plate. The base 315 is slightly conical as shown in Figure 1 and Figure 8B to more easily empty all the liquid from the reservoir 500.

20 At the center of the base 315 is a nozzle axial protrusion 314. The nozzle axial protrusion 314 extends into the hollow interior of the bottom part 310.

The nozzle axial protrusion 314 has an aperture 316. The aperture 316 extends through the base 315 of the bottom part. The aperture 316 provides an escape conduit out of the reservoir 500 for a liquid within the reservoir 500.

25 There is an internal screw-thread 318 on the cylinder wall of the bottom part 310. The internal screw-thread 318 is located intermediate the base 315 and the open end 320 of the cylinder wall 313. The internal screw-thread 318 traverses a single turn around the interior of the cylinder wall 313.

The bottom part 310 is connected to the over-cap 120 by inserting the top of over-cap 120 into the cylindrical interior of the bottom part 310. The bottom part is then screwed

onto the over-cap 120 so that the internal screw-thread 318 engages the external screw-thread 133. The bottom part 310 may be screwed until the axial protrusion 314 contacts the seal of the depression 126 in the over-cap top 124.

5 The axial protrusion 314 fits into the central depression 126 of the over-cap 120. The axial protrusion 314 of the base 315 of the bottom part is set against the over-cap central depression 126. The over-cap central depression 126 is in turn set against the top 114 of the screw-on cap 110.

10 The protrusion 314 and aperture 316 form a nozzle to direct a stream of liquid out of the reservoir. The nozzle is a specific diameter and length so that when the button 160 returns to its start position after ejecting liquid, gas will be drawn back into the reservoir through the nozzle and no liquid will drip from the nozzle. At this position of the button the remaining liquid in the reservoir cannot escape as the liquid is blocking the aperture 316 nozzle opening and therefore entry to gas usually air. In use, the liquid container is usually removed from the bottle when button 160 is operated. So, when the button returns to its start position, air from outside the container is drawn back into the reservoir.

As an alternative to the open nozzle aperture 316 shown in Figure 8, the nozzle comprises a 2-way valve to block the aperture.

20 'To open the bottle, the outer casing 300 is removed by unscrewing and breaking the fragile stringers 317. The over-cap 120 and screw-on cap 110 are unscrewed from the bottle opening.'

25 After being assembled the over-cap 120 and screw-on cap 110 stay connected. The vertical ribs 134 in the over-cap 120 inner wall shown in Figure 7B and 7C mesh with the ribs on the top end of the vertical cylinder of the screw-on cap 110 shown in Figure 3. The meshed ribs transfer the turning force on the over-cap 120 when unscrewing to the screw-on-cap 110.

The end of the outer casing 300 most distal from the bottle comprises the end of the container part partially closed by flexible flaps 335. The flexible flaps 335 extend radially inwards from a smooth seat 337 on the inner surface of the cylinder wall 333.

A button 160 has a circular sealing surface 162 to be seated on the smooth seat 337. A seal to the button is achieved by inserting the button 160 into the end of the outer casing comprising the flaps 335 until the circular sealing surface is sealed against the smooth seat 337. The circumferential perimeter of the button is fixed at the end of the
5 outer casing and permanently located there.

The flaps 335 are directly underneath and in contact with the top flexible button. There are six upwardly curved moulded flaps 335 with spaces in between. As the flexible button 160 is pressed down, so are the moulded flaps. As the flaps 335 are a moulded part of the container part 330 extending from the cylinder wall 333 and are
10 made from an injection moulded polymer which has a stiffness and memory, the flaps 335 act as a spring, increasingly resisting the downward pressure on the button until no further travel is possible. At this point the spaces between the flaps have disappeared also stopping any further movement downwards.

This amount of travel of the depressed button defines the volume of the dose of liquid
15 from the reservoir into the bottle. The spring effect of the flaps returns the flexible button to its original position ready for the next dose.

The reservoir 500 bounded by the base 315 of the bottom part 310 and the cylindrical wall of the container part 330 is thereby enclosed by the button 160. The reservoir is sealed liquid tight.

20 The button 160 has a flexible convex rise from the circular sealing surface to the button center. Depressing the flexible convex rise over-pressurizes a liquid in the reservoir 500.

The distal wall of the reservoir 500 from the button 160 is the base 315 of the bottom part 310.

25 Figures 11, 12, 13, 14, 15, and 16 illustrate a liquid container 1000 comprising a dispensing portion comprising a piston 600. The piston slides in a cylinder of the liquid container 300. The piston is displaceable.

In Figure 11, the exterior surface of the piston head 650 is visible through the open end 302 of the reservoir 500 closed off by the piston 600. A portion of the cylinder

wall 333 is visible intermediate the piston 600 and the rim 304 of the open end.

From Figures 12 to 14 it can be seen how the dispensing portion comprises a piston 600 displaceable in the reservoir. The reservoir 500 is bounded by the piston 600 and a cylinder 333 formed in the liquid container.

- 5 In Figure 12 a cross section of the liquid container 1000 is shown except for the over-cap. The cross section of the outer casing 300 of the container. The outer casing is tubular and has two opposite open ends 302, 320 separated by a partition 315.

The piston 600 slides along cylinder wall 333 from the partition 315 to the rim 304 of the open end 302 of outer casing 300 which is closed off by the piston.

- 10 As shown in Figure 12, where the piston 600 is proximate the rim 304 the reservoir 500 has maximum volume. When the piston is at this position the reservoir holds the maximum amount of liquid.

- The reservoir is enclosed by the cylinder 333, the interior surface of the piston head 651, and the partition 315 that separates the reservoir 500 from the opening 320 in the container 300 for receiving the over-cap 120.
- 15

In Figure 13, the piston 600 is shown midway intermediate the rim 304 and the partition 315 and the reservoir has half of the maximum volume. Half of the liquid which was in the reservoir when the reservoir was at maximum volume has been forced out through there aperture 316 in the nozzle 315 in partition 315.

- 20 In Figure 14 interior surface 651 of the piston 600 is shown abutted against the partition 315. Displacing the piston 600 to this position forces the remaining liquid out of the reservoir 500. There is no liquid left in liquid container 1000 because the reservoir has no volume. The piston 600 interior surface 651 and partition 315 have matching contours which when brought into contact by displacement of the piston deprive the
- 25 reservoir of volume.

Around the perimeter of the piston head is a sliding seal 660 comprising a resilient lip which slides along the cylinder wall 333. The piston head is relatively rigid to keep the resilient sliding seal pressed against the cylinder wall even when force is applied by a user to the exterior surface 650 of the piston head to squeeze liquid out of the

reservoir. The user inserts their fingers through the open end 302 of the reservoir to push the piston 600.

5 In the example shown the reservoir cylinder is a circular cylinder. Other perimeters for the piston such as oval, rectangular, square, and polygonal are possible. Circular and oval perimeters make the most inexpensive leak proof sliding seal to prevent liquid in the reservoir leaking past the seal.

10 Figures 15, 16, and 17 show the piston 600 in detail in an edge view, cross section through the edge, and isometric view. As shown the piston 600 comprises a piston head having an exterior surface 650 and interior surface 651. The interior surface is a bounding surface of the reservoir 500.

The piston is mouldable as single unit with a thicker head portion and a thinner more sliding seal.

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The invention has been described by way of examples only. Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since
5 numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the claims.

Claims:

1. A liquid container which encloses a reservoir for containing a beverage, comprising: an over-cap outside the reservoir which detachably connects the container
5 to a bottle cap, wherein the container has a dispensing portion comprising a piston displace-able in the reservoir which when displaced dispenses the beverage from the reservoir via a nozzle.

2. A liquid container according to claim 1 wherein the reservoir is bounded by the
10 piston and a cylinder in which the piston is displaceable.

3. A liquid container according to claim 2 wherein the piston comprises a circumferential sliding seal against the cylinder.

- 15 4. A liquid container according to claim 3 wherein the piston comprises a head circumscribed by the seal.

5. A liquid container according to claim 2, 3, or 4 wherein the cylinder is open ended.
20

6. A liquid container according to claim 5 in which the open end of the cylinder is closed off by the piston.

7. A liquid container according to claim 5 or 6 wherein the piston is displaceable
25 by pushing on the piston through the open end of the cylinder.

8. A liquid container according to any one of claims 2 to 7 wherein the reservoir is enclosed by the cylinder, the piston, and a partition that separates the reservoir from an opening in the cylinder for receiving the over-cap.

5

9. A liquid container according to claim 8 wherein the piston and partition have matching contours which when brought into contact by displacement of the piston deprive the reservoir of volume.

10 10. A liquid container according to claim 8 or 9 wherein the piston is displaceable to reduce the reservoir volume until stopped by the partition.

11. A liquid container according to any preceding claim wherein the piston is a one-piece unit.

15

12. A liquid container according to any preceding claim which is adapted to surround the neck of a bottle.

13. A liquid container according to claim 12 wherein the over-cap is adapted to surround the neck of the bottle.

20

14. A liquid container according to claim 12 or 13 wherein the over-cap is adapted to cover a spout through the bottle neck.

15. A liquid container according to any preceding claim from which the over-cap is removable.

5 16. A liquid container according to claim 8, 9, or 10 wherein the nozzle is through the partition.

17. A liquid container according to claim 16 wherein the nozzle protrudes from the partition towards the opening.

10 18. A liquid container according to claims 16 or 17 wherein the partition is intermediate the opening and the dispensing portion.

19. A liquid container according to any preceding claim wherein the dispensing portion closes off the reservoir.

15

Amendments to claims have been filed as follows

Claims:

1. A liquid container which encloses a reservoir for containing a beverage, the container comprising: a dispensing portion, an over-cap outside the reservoir which detachably connects the dispensing portion to a bottle cap, and an opening in the dispensing portion in which the over-cap is received, wherein the dispensing portion comprises a piston displaceable in the reservoir which when displaced dispenses the beverage from the reservoir via a nozzle, characterised in that the over-cap is removable from the dispensing portion through the opening to divide the container and unblock the nozzle.
2. A liquid container according to claim 1 wherein the reservoir is bounded by the piston and a cylinder in which the piston is displaceable.
3. A liquid container according to claim 2 wherein the piston comprises a circumferential sliding seal against the cylinder.
4. A liquid container according to claim 3 wherein the piston comprises a head circumscribed by the seal.
5. A liquid container according to claim 2, 3, or 4 wherein the cylinder is open ended.
6. A liquid container according to claim 5 in which the open end of the cylinder is closed off by the piston.

25 06 18

7. A liquid container according to claim 5 or 6 wherein the piston is displaceable by pushing on the piston through the open end of the cylinder.

5 8. A liquid container according to any one of claims 2 to 7 wherein the reservoir is enclosed by the cylinder, the piston, and a partition that separates the reservoir from the opening in the cylinder for receiving the over-cap.

9. A liquid container according to claim 8 wherein the piston and partition have matching contours which when brought into contact by displacement of the piston
10 deprive the reservoir of volume.

10. A liquid container according to claim 8 or 9 wherein the piston is displaceable to reduce the reservoir volume until stopped by the partition.

15

11. A liquid container according to any preceding claim wherein the piston is a one-piece unit.

12. A liquid container according to any preceding claim which is adapted to
20 surround the neck of a bottle.

13. A liquid container according to claim 12 wherein the over-cap is adapted to surround the neck of the bottle.

14. A liquid container according to claim 12 or 13 wherein the over-cap is adapted to cover a spout through the bottle neck.

15. A liquid container according to any preceding claim comprising the bottle cap.

5

16. The liquid container according to claim 15, wherein the bottle cap has the form of a screw-on cap on which the over-cap fits tightly to stop rotation of the over-cap over the screw-on cap.

10 17. A liquid container according to claim 8, 9, or 10 wherein the nozzle is through the partition.

18. A liquid container according to claim 17 wherein the nozzle protrudes from the partition towards the opening.

15

19. A liquid container according to claims 17 or 18 wherein the partition is intermediate the opening and the dispensing portion.

20 20. A liquid container according to any preceding claim wherein the dispensing portion closes off the reservoir.

21. A system including a liquid container according to any preceding claim, the bottle cap, and a bottle closed by the bottle cap, wherein the liquid container is attached to the bottle by the over-cap attached to the bottle cap.

25 06 18

22. A system according to claim 21 including a first beverage in the reservoir.
23. A system according to claim 21 or 22 including a second beverage in the bottle.



Application No: GB1718540.6

Examiner: Mr Aidan Black

Claims searched: 1-19

Date of search: 16 March 2018

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 2, 5, 8, 12-19	US2011/174642 A (COON) See figure 11 in particular.
X	1-7, 11-15, 17-19	US3156369 A (ETHICON) See figures in particular.
X	1-8, 11-19	WO2008/153660 A (SORENSEN) See figures 2 and 6 in particular.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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Worldwide search of patent documents classified in the following areas of the IPC

B65D

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
B65D	0081/32	01/01/2006
B65D	0051/28	01/01/2006