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(54) **A closure with built-in storing compartment**

(57) The present invention is a closure (1) suitable for closing a container containing a first product, said closure being an assembly of less than four independent pieces, and having external side walls (3), a top wall (4), and an internal skirt (5) extending downwardly inside the side walls (3) from the top wall (4), **characterized in that :**

(i) the internal skirt (5) comprises an opening disposed

in the top wall (4) of the closure, said opening being closed by a membrane, so as to define at least one compartment to store a second product separately from said first product, and

(ii) the membrane (11) closing the top wall opening is made of an oxygen-barrier material, so that said compartment (6) is free of oxygen contamination from ambient air when said closure (1) is screwed onto the neck (2) of said container.

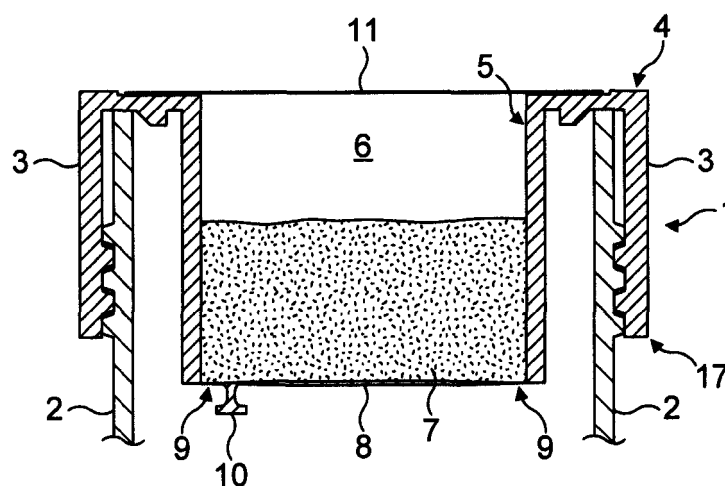


FIG. 1

Description

Field of the invention

[0001] The present invention concerns a closure with built-in storing compartment. More particularly, it is directed to a closure with a storing compartment having oxygen-barrier properties.

Background of the invention

[0002] For a long time, closures for containers have been developed, which allow to pack a first ingredient or mix of ingredient into the main container, while another ingredient or mix of ingredients is contained in a smaller receptacle located into the closure. Such packaging systems allow to store for an extended period of time, in the same packaging, ingredients that would otherwise react or degrade when put in contact before the storage period. In this case, the consumer opens the closure receptacle and mixes the product contained into said receptacle into the product contained into the main container, immediately prior to consumption.

[0003] Such packaging closing systems have been described in various prior art documents, some of which are hereafter cited and briefly described.

[0004] WO 2006046721 (filed on 25.10.2005 by Coca-Cola) deals with a cap with a storage chamber for storing an ingredient to be added to a liquid content within a container that includes a base to be attached to a mouth portion of the container, which has a spout for allowing passage of the liquid content out of the container. A lid is fastened by screwing to the base and includes the storage chamber and a thin sheet for sealing it. The base has an annular part fixed to an inner wall of the spout, for maintaining a channel communicating with an interior space of the container. The base has a slanted blade which comes into contact with the thin sheet as the lid is moved downwards, for cutting the thin sheet and allowing the ingredient in the storage chamber to fall into the interior space of the container and mixed with the content therein.

[0005] WO 2004031047 (filed on 22.09.2003 by Boehringer Ingelheim Int.) relates to a packaging unit for two substances to be mixed, which are to be stored separately before utilization, more particularly a fluid and a powder substance. The invention comprises a first container and a second container that can be moved in the neck of the first container. The second container is moved and thereby opened by screwing on the closing cap of the first container.

[0006] EP 1270435 (filed on 08.03.2002 by Makita Masayuki) is about a bottle cap or closure member with a first fixed portion and a second movable portion which are separably screwed to each other. The fixed portion is for supporting the movable portion and has an attaching portion for connection to the neck of a bottle and a through hole on an axial line. The removable portion has

an inner plug portion which protrudes from a face thereof on the axial line and passes through and seals the through hole. The inner plug portion is provided with a chamber for raw material and pressurized gas. An opening at the other end of the chamber is sealed by a plug. Between the plug and the fixed portion, there exists a plug opening means and the plug is arranged to be opened by the plug opening means during relative movement of the fixed portion and the removable portion.

[0007] All of the above described closures fail in providing an economic and easy to use solution. The problem in the solutions of the prior art described above is that the overall cost of the package is multiplied by 3 to 5, because of the cost of the closure. This is clearly not acceptable as these higher costs have then to be forwarded to the end consumer, who pays a higher price than normal for the product.

[0008] Moreover closures comprising a breakable compartment, such as a deformable compartment which is pressed onto by the consumer to break it and release the contents, require a manipulation which is dependent on the force or ability of the consumer, and which restricts utilization to certain populations, preferably adults having a good handling capabilities. Such consumers as children, teenagers, elderly or disabled people, may have difficulties in performing correctly all the operations required for opening the closures described above, for instance, screwing then unscrewing the closure, or opening a portion of the closure, then press onto an element to rupture a membrane, or such other mechanical manipulations of the closure as squeezing, pressing, pulling, twisting or similar. Shortly said, all closure solutions requiring a determined sequence of handling operations to release the closure contents into the main container, are not sufficiently consumer friendly.

[0009] In that view, EP 0552105 (filed on 14.01.1993 by Remy Deslandes) aims at providing a more simple solution that is economically viable. The invention described in EP'105 concerns a container for consumption of a dose of liquid product intended for consumption, the container being characterized in that it comprises in particular a closure lid containing a reserve of an additive intended for optional instantaneous mixing with the individual dose of basic liquid. The lid comprises for this purpose a member for isolating the said reserve of additive from the dose of basic liquid, and the container comprises means for destroying these said isolation means, and is subjected to a first manual actuation operation outside the lid with a view to carrying out the said mixing, as well as means for manual actuation in a second operation of the lid with a view to removing it after or without prior mixing.

[0010] Furthermore, the different systems currently proposed require a separate packing operation of the product to be filled into the closure, and then a transfer to the factory that will place the closures on the bottles in parallel with bottle filling. Sensitive products to be packed in the closure must therefore be protected from

moisture and oxygen through expensive technologies and packages, during the transfer between the closure filling line and the bottles closing line. What is more, hygiene treatments to the closure prior to its positioning onto the bottles are very difficult to achieve technically, although required. Last, but not least, the fact that the closure needs to be filled separately from the bottle closing step requires that a stock of pre-filled closures is made, because forecasts of production of bottles are difficult to plan. This stock of pre-filled closures is not necessarily adequate and sometimes leads to waste of pre-filled closures when the number of bottles to be capped is not as high as the closure stock that was constituted. Given the price of product filled into the closures, such a waste is highly undesirable for economic reasons.

[0011] It is therefore a main purpose of the present invention to provide a closure for containers that allows to pack at least one oxygen-sensitive product separately from the contents of the main container, that is inexpensive and easy to produce, and which is such that the manufacturing, filling and closing process of the closure onto bottles is as simple as possible and can be performed in one step.

Summary of the invention

[0012] The above listed purpose and needs are met by the present invention with a closure suitable for removably closing a container containing a first product, said closure being an assembly of less than four independent pieces, and having external side walls, a top wall, and an internal skirt extending downwardly inside the side walls from the top wall, characterized in that :

- (i) the internal skirt comprises an opening, disposed in the top wall of the closure, said top opening being closed by a top closing means, so as to define at least one compartment to store a second product separately from said first product, and
- (ii) the closing means closing the top wall opening is made of an oxygen-barrier material, so that said compartment is free of oxygen contamination from ambient air when said closure is screwed onto the neck of said container.

[0013] Advantageously, the opening of the internal skirt located in the top wall has a diameter comprised between 15 and 50 mm, preferably between 28 and 38 mm. Such a diameter range corresponds to standard stretch blow molded bottle necks. However, the previous diameter ranges should not be considered as limiting, since the closure of the present invention can be much bigger in size, and/or can be adapted to containers having a smaller, or larger neck diameter than the preferred dimensions indicated above.

[0014] In a first possible embodiment of the present invention, the said top closing means is a sealed membrane.

[0015] In a second possible embodiment, said top closing means is a lid formed integrally with the rest of the closure, that is hinged to the side walls and/or top wall of said closure, said lid further comprising an oxygen-barrier means.

[0016] In another possible embodiment of a closure according to the invention, the internal skirt can further comprise a second opening in its lower part, that is closed either by:

- a peelable lower membrane, or
- a bottom wall that is formed integrally with the closure skirt, and linked to the latter by a circular thin wall having a thickness of not more than 300 μm , preferably a thickness of less than 200 μm , more preferably a thickness of less than 170 μm .

[0017] Preferably, said peelable lower membrane or bottom wall comprise respectively an integrated easy-opening tab (for the lower membrane), or a pin (for the detachable bottom wall), for allowing the consumer to grab and detach said lower membrane, respectively said bottom wall.

[0018] A closure according to the present invention can advantageously comprise an internal skirt that is a cylinder having at least one vertical wall extending all along its height so as to divide said compartment into at least two sub-compartments. In this way, it is possible to pack and store two or more products separately in each sub-compartment of the closure, under powder, gel, liquid, or other form.

[0019] In a highly preferred embodiment of the present invention, the internal skirt of the closure downwardly extends in height from the top wall of the closure, below the level of the lower edge of the closure side walls.

[0020] Advantageously, the closure of the invention can be an injected thermoplastic closure, said thermoplastic being chosen in the list of: polyethylene (PE), polypropylene (PP), polystyrene (PS), or a combination thereof.

[0021] In another possible embodiment of the invention, the closure is a screw cap comprising screwing threads disposed at the internal surface of said side walls, for cooperating with corresponding screw threads of the container's neck.

[0022] The present invention is further directed to a process for manufacturing, filling and closing a closure suitable for closing a container containing a first product, said closure having at least one compartment, characterized in that it comprises the steps of, in order:

- (i) molding a closure according to the embodiments described hereinbefore,
- (ii) closing the lower opening of the internal skirt, in case said skirt comprises a lower opening ;
- (iii) screwing said closure onto the neck of a container that was previously filled with a first product ;
- (iv) filling said compartment through the top opening

with at least one second product ;
 (v) closing said top opening by sealing a non-removable membrane, or by pivoting a lid around its hinge and clipping it into the said top opening if the closure comprises such a lid, so as to entirely close said compartment.

[0023] Preferably, the closing step (i) of a skirt lower opening, if necessary, is achieved by sealing a membrane, or by attaching a bottom wall molded independently from the rest of the closure.

[0024] Also preferably, the process described above is performed under aseptic conditions.

[0025] Preferably, in any of the embodiments of a closure, or in the process described above, the first product is a liquid, semi-liquid, gel, powder, or granulate composition selected from the list of : shelf-stable or chilled dairy products, fruit-based compositions, fermented or non-fermented cereal-based compositions, soy-based products, or coffee products, and the at least one second product is a liquid, semi-liquid, gel, powder, or granulate composition selected from the list of : vitamins, energy-boosting ingredients, fruit juice, probiotics, flavours, colorants, sweeteners, minerals, gas-releasing ingredients such as carbonate salt, or a combination thereof.

Brief description of the drawings

[0026] Additional features and advantages of the present invention are described in, and will be apparent from, the description of the presently preferred embodiments which are set out below with reference to the drawings in which:

Figure 1 is a schematic profile cut view of one embodiment of a closure per the invention ;

Figure 2 is a schematic profile cut view of a second embodiment of a closure per the invention ;

Figure 3 is a schematic profile cut view of a third embodiment of a closure per the invention ;

Figure 4 is a schematic profile cut view of a fourth embodiment of a closure per the invention ;

Figures 5A to 5D illustrate different steps of the use of a closure according to the fourth embodiment of the invention ;

Figures 6A to 6D illustrate different steps of the use of a closure according to the second embodiment of the invention ;

Detailed description of the invention

[0027] The closure 1 illustrated in figures 1, 2, 3 is suitable for removably closing a container containing a first type of product (not shown in the drawing). The drawings illustrates only the neck 2 of the such a container.

[0028] The closure 1 has external side walls 3, a top wall 4, and an internal skirt 5 extending downwardly inside the side walls 3 from the top wall 4. The internal skirt

5 comprises at least one opening. This part of the closure is moulded integrally into polypropylene (PP) or polyethylene (PE) by an injection-moulding or compression process.

[0029] According to the invention, the closure 1 comprises one closed compartment 6 inside said closure to store a second product 7 separately from said first product.

[0030] The internal volume of the closed compartment 6 is comprised between 1 and 50ml, preferably between 7 and 30ml, more preferably between 10 and 20 ml, thus allowing to pack a quantity of second product 7 - if under powder or granulate form - which is comprised between 2 and 50g. The volume of the compartment 6 could however be increased above 50ml if needed (up to at least 100ml), by increasing the height of the internal skirt and/or by increasing the diameter of said skirt 5. With the invention, it is therefore possible to increase a lot the volume of the compartment 6, even though the height of the closure walls, or total diameter of the closure are limited.

[0031] In a first possible embodiment of the present invention illustrated in figure 1, the internal skirt 5 of the closure 1 comprises one upper opening disposed in the top wall 4 of the closure 1. The lower part of the said skirt is closed by a bottom wall 8 that is formed integrally with the rest of the closure. As shown in figure 1, the portion 9 between the lower edge of the internal skirt 5 and the bottom wall 8 is thinner than the adjacent parts of the closure. For instance, if the walls of the internal skirt 5 and bottom wall 8 is about 700 μm , the reduced thickness in portion 9 will be less than 200 μm , preferably less than 170 μm , so as to allow easy opening through tearing so as to detach said bottom wall 8 from the internal skirt walls. The material thickness in this area is less than 200 μm . Furthermore, the lower surface of the said bottom wall 8 comprises a handling means such as for instance a pin 10 as illustrated in the figure 1.

[0032] In this first embodiment, the closure 1 is transported to a closing machine of the factory, where it is then screwed onto the neck of a bottle that has previously been filled with a liquid, for instance a liquid yogurt. The bottle is made out of a material which is barrier to oxygen. The closure compartment 6 is then filled with a second product 7 in powder form - eg. a mix of probiotics, vitamins, and minerals - through the top opening of the internal skirt 5, under aseptic conditions, after which filling, an aluminium membrane 11 is sealed onto the top 4 of the closure 1. In that way, the skirt 5 closed with the aluminium membrane 11 defines a closed compartment 6 that is filled with the second product 7.

[0033] By "aluminium membrane", it is meant a membrane made of aluminium that further comprises a sealing layer such as eg. polyethylene (PE) or polypropylene (PP), so that the membrane can be sealed to the closure by heat sealing or ultrasonic sealing techniques for instance. Alternatively, a suitable membrane could be made of a polyethyleneterephthalate (PET) + EVOH

(ethylvinylalcohol) multilayer.

[0034] Once the closure 1 is screwed onto the neck 2 of the bottle, the compartment 6 is entirely surrounded by walls that have oxygen barrier properties, since it is located inside the bottle, with only its top wall 4 in contact with ambient air, which is closed by the oxygen-barrier membrane 11. The first product contained into the bottle, as well as the second product 7 contained into the closure compartment 6 can be stored for several weeks as they are disposed in separate locations of the packaging. The shelf life of the whole product is therefore extended compared to the situation where the two products would be mixed and stored in the same location of the packaging.

[0035] Just prior to consumption as illustrated in figures 6A to 6D, the consumer unscrews the closure 1 from the bottle's neck 2 (Figure 6A), turns the closure 1 upside-down and pulls the pin 10 as shown in Figure 6B, so as to detach and peel off the bottom wall 8 of the internal skirt 5, hence opening the compartment 6. Then the consumer pours the second product 7 contained into the compartment 6 into the bottle as illustrated in Figure 6C, and then screws the closure 1 back onto the neck 2 of the bottle. Finally, as shown in Figure 6D, the consumer shakes the reclosed bottle so as to correctly mix the first and second products contained into the said bottle.

[0036] In a second possible embodiment of the present invention shown in figure 2, the closure 1 is moulded substantially as a cylinder so that the internal skirt 5 comprises two openings: one upper opening, and a lower one. After injection, the lower opening of the internal skirt is closed by a lower membrane 12, that is sealed in a removable manner onto the lower edge 13 of the internal skirt walls. Preferably, as shown in figure 2, the peelable lower membrane 12 comprises at least one extension 14 directed outwardly outside of the closure compartment 6, that is such as to provide an easy-opening feature for the said lower membrane 12.

[0037] Once the lower opening of the internal skirt 5 is closed, the second product 7 to be contained into the closure compartment 6 can be filled through the top opening of said skirt 5, which has a diameter comprised between 15 mm and 50 mm preferably from 28 to 38 mm, so as to allow correct filling of the compartment 6 in automated lines, without spillage. After the filling step, the said upper opening is closed by sealing a membrane 11 made of an oxygen barrier material onto the top wall 4 of the closure 1. Preferably, this upper membrane 11 is sealed in a non removable manner. This can be achieved by choosing a very thick or mechanically resistant material for the membrane, and/or increasing the surface of the sealing area between the membrane and the top walls of the closure.

[0038] For the consumer, the steps for opening the compartment 6, mixing the contents 7 with the first product contained into the bottle prior to consumption, are almost the same as what is described above for the first possible embodiment of the invention, also in reference to the drawing Figures 6A to 6D.

[0039] In a third possible embodiment of the present invention which is illustrated in Figure 3, the closure 1 is injection-moulded as a cylinder, wherein the internal skirt 5 comprises two, upper and lower, openings. The lower opening is then closed by fixing an additional wall 15 to close the lower opening of the said skirt 5. As illustrated in Figure 3, this additional lower wall 15 can be attached by screwing, or clipping (by mechanical means), and is preferably done in a way such that the said lower wall of the internal skirt cannot be removed. This additional bottom wall 15 is a rigid part that is injection moulded separately from the rest of the closure.

[0040] The closure opening in the top wall is suitable for filling the compartment 6 with the second product 7, as it has an opening diameter comprised between 15 mm and 50 mm, preferably from 28 to 38 mm. Once the closure compartment 6 is filled, it is then closed by attaching a membrane 11 that is sealed in a removable manner. Preferably, the said membrane comprises a tab extending outwardly so that it is easy to grab by the consumer, as an easy-opening means (not shown in the drawing).

[0041] The steps for opening the closure compartment 6, dispensing and then mixing the second product 7 contained in the latter with the first product contained into the main bottle, are shown in the drawing, Figures 5A to 5D. As shown in figure 5A, the consumer first unscrews the closure 1 from the bottle neck 2, then peels off the upper membrane 11 as shown in Figure 5B. Then the consumer turns the closure 1 upside down above the bottle neck 2 so as to be able to pour the closure contents 7 into the bottle as shown in figure 5C. Once this is done, the closure 1 is screwed back onto the bottle's neck 2 as illustrated in figure 5D, and the closed bottle is shaken vigorously to mix the first and second products together before consumption.

[0042] In a fourth possible embodiment of the invention illustrated in Figure 4, the closure 1 is very similar to the closure described for the third embodiment above. However in this particular case, the bottom wall 16 of the closure internal skirt is moulded integrally with the rest of the closure.

[0043] In all of the preceding embodiments of the invention described herein above, the skirt 5 preferably downwardly extends in height from the top wall 4 of the closure 1, below the level of the lower edge 17 of the closure side walls 3. This can be seen clearly, for instance on Figures 1 to 4. Finally, the closure 1 is preferably secured onto the neck 2 of the bottle by screwing, and to this effect, the closure side walls 3 comprise screw threads 18 disposed along the internal surface of the side walls 3 of the closure. The screw threads are means to cooperate with corresponding screw threads 19 of the container neck 2.

[0044] The present invention is further directed to a process for filling and closing a closure suitable for closing a container containing a first product, said closure having at least one compartment according to claims 4 to 12, characterized in that it comprises the steps of, in

order:

- (i) closing, if necessary, the lower opening of the internal skirt with a peelable membrane ;
- (ii) screwing said closure onto the neck of a container that was previously filled with a first product ;
- (iii) filling said compartment through the top opening with at least one second product ;
- (iv) closing said top opening by sealing a non-removable membrane, or by pivoting a lid around its hinge and clipping it into the said top opening if the closure comprises such a lid, so as to entirely close said compartment.

[0045] The closure of the present invention allows an online production and filling of bottles with a first product (eg. a liquid dairy composition such as liquid yogurt), on the same production line that is also used for manufacturing and filling the closure with a second type of product (eg. a probiotics powder) . After screwing the closure on the filled bottle, the closed bottle is led to the filling stage for filling with the powder. Hygienic conditions are maintained all along the production line from the bottle filling, up to the closure filling and sealing. The logistic is therefore obviously much easier than all existing prior systems that require a stock of prefilled closures as previously explained.

[0046] One example of second product that can be packed into the closure compartment is formulated as follows:

Ingredient	RECIPE (%)
Apple juice	45.94
Banana puree	27.96
Blackcurrant puree	5.99
Blueberry puree	3.99
Orange juice	9.99
Raspberry puree	5.99
Echinacea Frutarom 85787	0.12
ST11	0.02

[0047] In the above example, the second product is under liquid or semi-liquid form. It could however be treated to be packed under a powder form, that is more convenient for dispensing and mixing to the main container contents by the consumer.

[0048] In all the packaging solutions described in the prior art, none of them is meant of disclosed to be barrier to oxygen. Therefore, they require a secondary packaging that fulfils the oxygen barrier properties, such as a polyethyleneterephthalate (PET) over-wrap, that is placed all around the closed bottle. Such a secondary packaging is not only complex to produce, but also increases the

overall cost of the package, which is clearly undesirable.

[0049] The present invention provides a very efficient solution for packing under a non liquid form some essential ingredients for nutritional products. For instance, iron or other metal salts that generally develop a bad taste after storage under liquid form, can be packed separately from the main liquid product in a closure according to the present invention, under a powder or granulate form. In that way, the consumer can benefit from a final product under liquid form wherein iron (or other metal) salts are added just prior to consumption, so that no bad / metallic taste appears, and even though the shelf life of the product is extended compared to existing products. The present invention is also suitable for packing nutritional or medical molecules - for instance glutamine - that are not stable (and therefore cannot be stored) under liquid form, so that such ingredients can be added at the last minute before consumption.

[0050] It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the present invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be covered by the appended claims.

Claims

1. A closure (1) suitable for removably closing a container containing a first product, said closure being an assembly of less than four independent pieces, and having external side walls (3), a top wall (4), and an internal skirt (5) extending downwardly inside the side walls (3) from the top wall (4), **characterized in that :**

(i) the internal skirt (5) comprises an opening, disposed in the top wall (4) of the closure, said top opening being closed by a top closing means (11), so as to define at least one compartment (6) to store a second product (7) separately from said first product, and

(ii) the closing means (11) closing the top wall opening is made of an oxygen-barrier material, so that said compartment (6) is free of oxygen contamination from ambient air when said closure (1) is screwed onto the neck (2) of said container (1).

2. A closure (1) according to claim 1, wherein the opening of the internal skirt (5) located in the top wall (4) has a diameter comprised between 15 and 50 mm, preferably between 28 and 38 mm.
3. A closure according to claims 1 or 2, wherein said top closing means is a sealed membrane (11).

4. A closure (1) according to claims 1 or 2, wherein said top closing means (11) is a lid formed integrally with the rest of the closure, that is hinged to the side walls and/or top wall of said closure, said lid further comprising an oxygen-barrier means. 5
5. A closure (1) according to any of the claims 1 to 4, wherein the internal skirt (5) further comprises a second opening in its lower part, that is closed by a peelable lower membrane (12). 10
6. A closure (1) according to any of the preceding claims 1 to 4, wherein the internal skirt (5) further comprises a second opening in its lower part, that is closed by a bottom wall (8) that is formed integrally with the closure skirt, and linked to the latter by a circular thin wall (9) having a thickness of not more than 300 μm , preferably not more than 200 μm , more preferably not more than 170 μm . 15
7. A closure (1) according to any of the preceding claims 5 or 6, wherein said peelable lower membrane (12) or bottom wall (8) comprise respectively an integrated easy-opening tab, or a pin (10), for allowing the consumer to grab and detach said lower membrane (12), respectively said bottom wall (8). 20
8. A closure (1) according to any of the preceding claims, wherein said internal skirt (5) is a cylinder having at least one vertical wall extending all along its height so as to divide said compartment (6) into at least two sub-compartments. 30
9. A closure (1) according to any of the preceding claims, wherein the skirt (5) downwardly extends in height from the top wall (4) of the closure, below the level of the lower edge (17) of the closure side walls (3). 35
10. A closure (1) according to any of the preceding claims, which is an injected thermoplastic closure, said thermoplastic being chosen in the list of: polyethylene (PE), polypropylene (PP), polystyrene (PS), or a combination thereof. 40
11. A closure (1) according to any of the preceding claims, which a screw cap comprising screwing threads (18) disposed at the internal surface of said side walls, for cooperating with corresponding screw threads (19) of the container's neck (2). 45
12. A process for manufacturing, filling and closing a closure (1) suitable for closing a container containing a first product, said closure (1) having at least one compartment (6), **characterized in that** it comprises the steps of, in order: 50
- (i) moulding a closure according to claims 3 to 11,
- (ii) closing the lower opening of the internal skirt (5), in case said skirt comprises a lower opening ;
- (iii) screwing said closure (1) onto the neck (2) of a container that was previously filled with a first product ;
- (iv) filling said compartment (6) through the top opening with at least one second product ;
- (v) closing said top opening by sealing a non-removable membrane, or by pivoting a lid around its hinge and clipping it into the said top opening if the closure comprises such a lid, so as to entirely close said compartment.
13. A process according to claim 12, wherein the closing step (i) of a skirt (5) lower opening, if necessary, is achieved by sealing a membrane (11), or by attaching a bottom wall (15) moulded independently from the rest of the closure. 55
14. A process according to any of the claims 12 or 13, which is performed under aseptic conditions.
15. A closure, or a process, according to any of the preceding claims, wherein:
- (i) said first product is a liquid, semi-liquid, gel, powder, or granulate composition selected from the list of : shelf-stable or chilled dairy products, fruit-based compositions, fermented or non-fermented cereal-based compositions, soy-based products, or coffee products, and
- (ii) said at least one second product is a liquid, semi-liquid, gel, powder, or granulate composition selected from the list of : vitamins, energy-boosting ingredients, fruit juice, probiotics, flavours, colorants, sweeteners, minerals, gas-releasing ingredients such as carbonate salt, or a combination thereof.

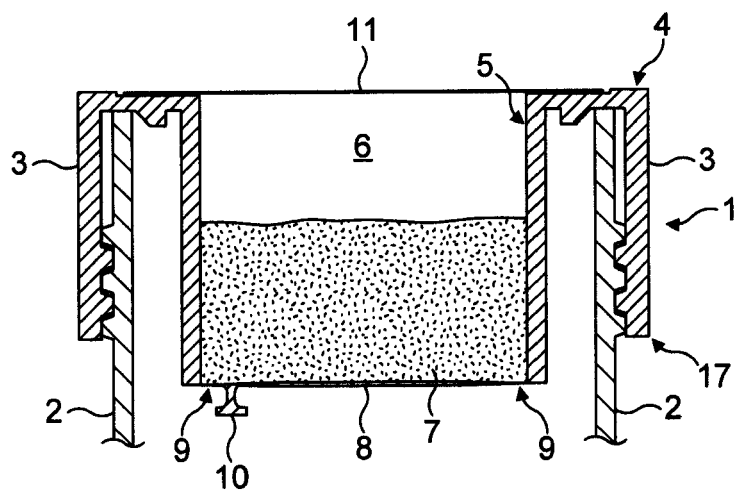


FIG. 1

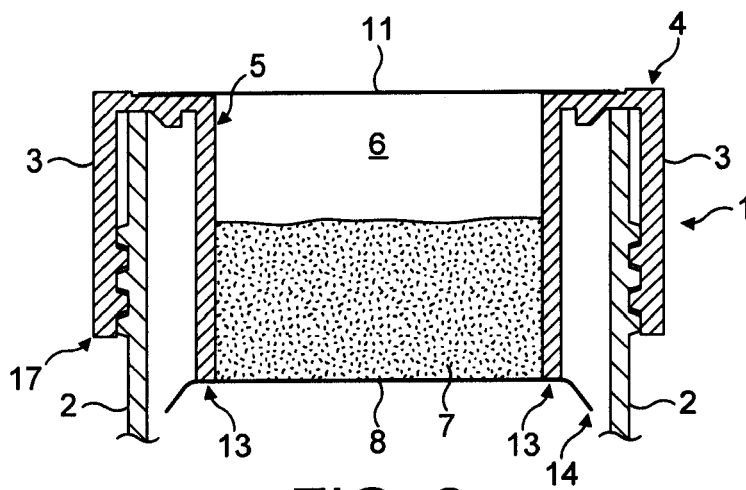


FIG. 2

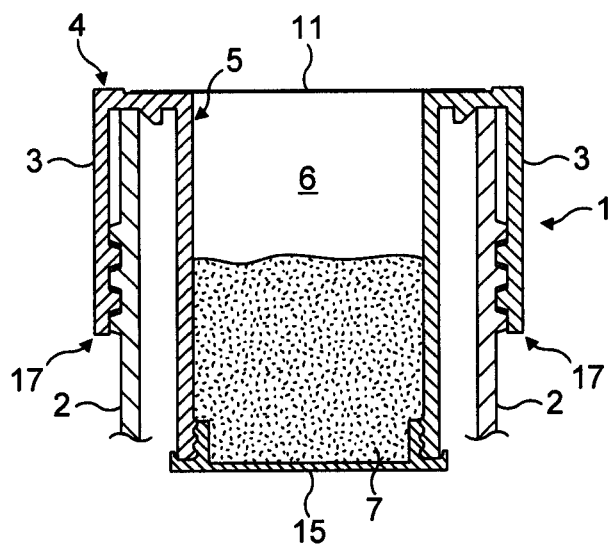


FIG. 3

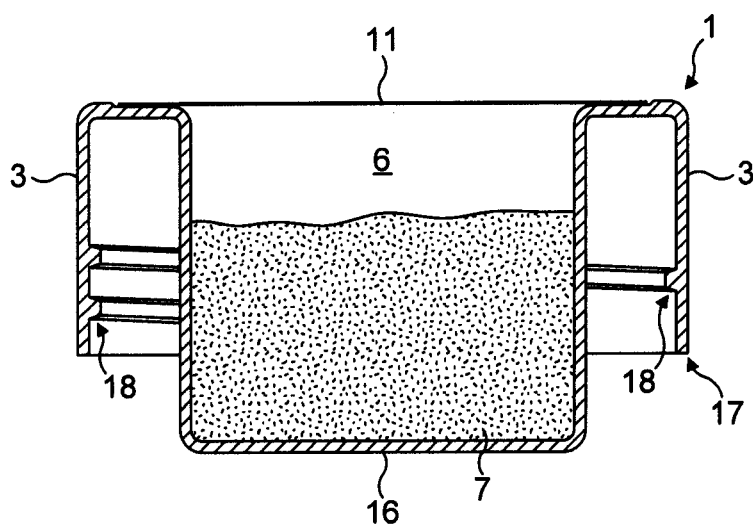


FIG. 4

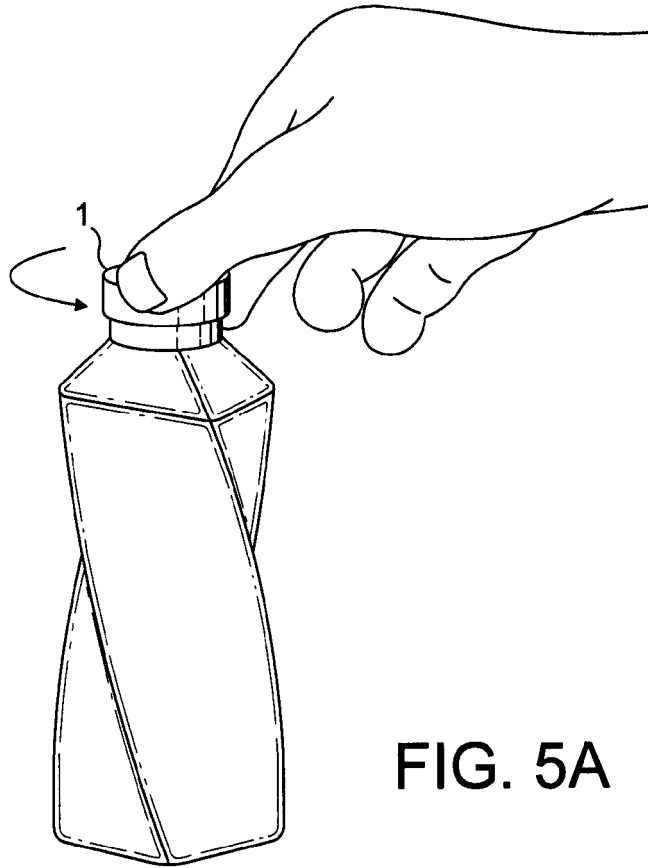


FIG. 5A

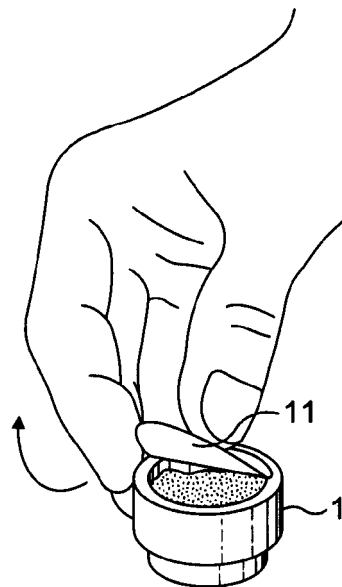


FIG. 5B

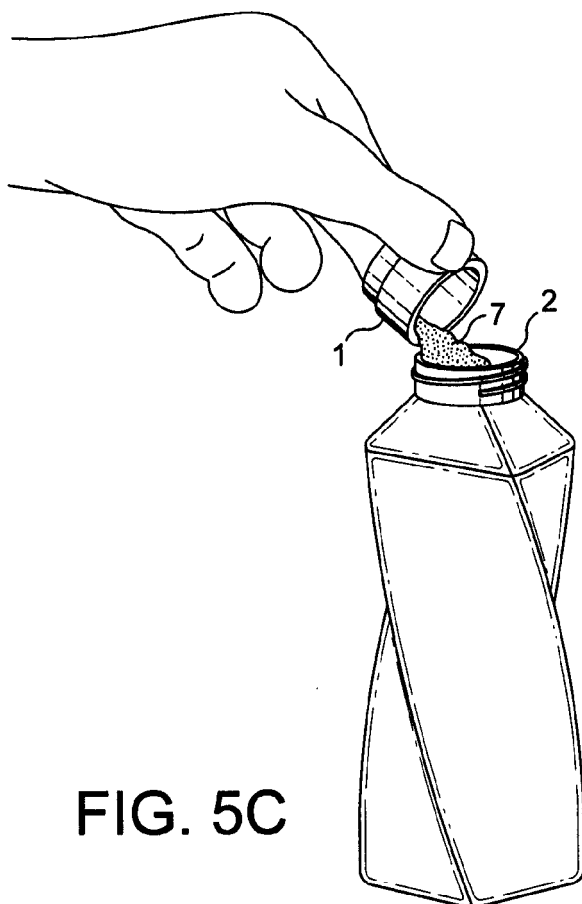


FIG. 5C

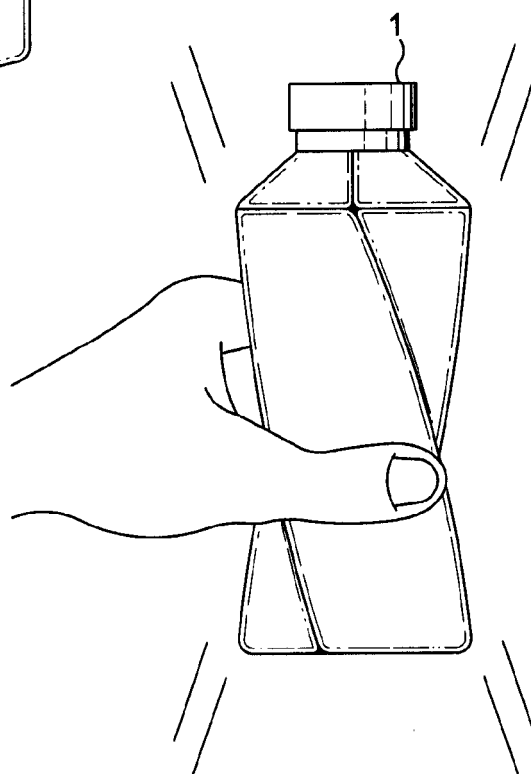


FIG. 5D

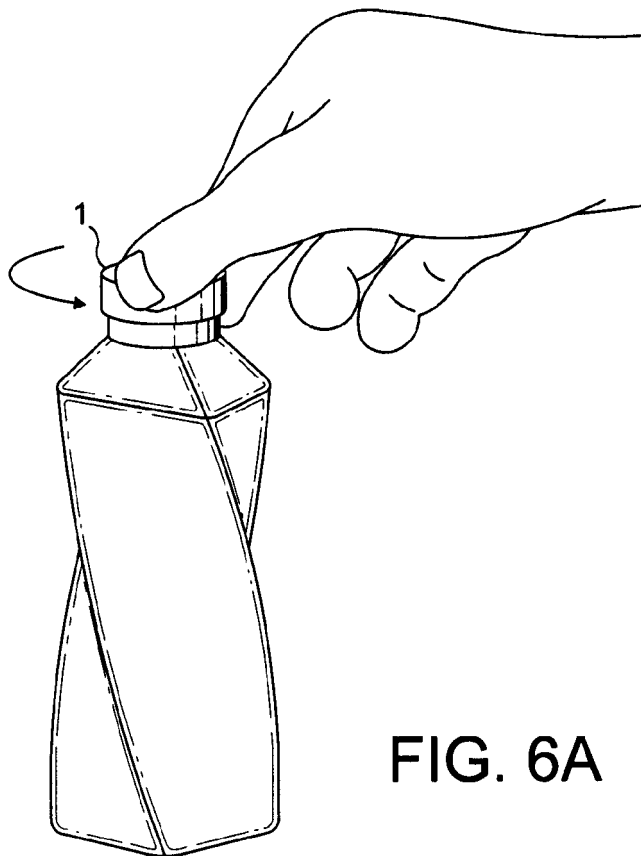


FIG. 6A

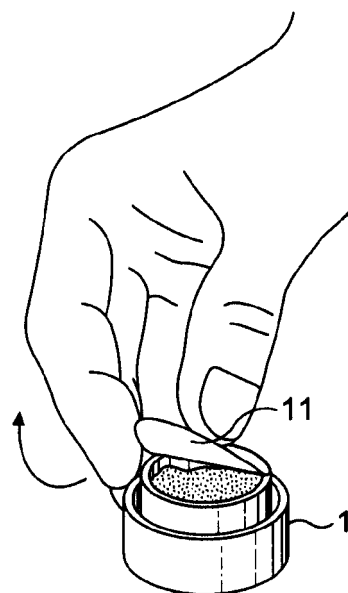


FIG. 6B

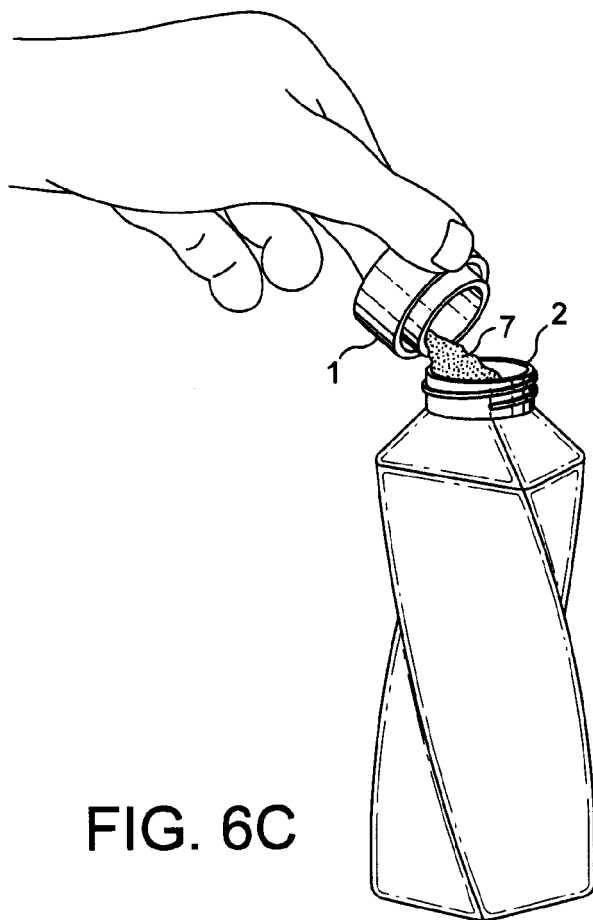


FIG. 6C



FIG. 6D



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EUROPEAN SEARCH REPORT

Application Number
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