United States Patent [19]

Zanardo

[11] **3,907,167**

[45] **Sept. 23, 1975**

[54] **APPARATUS FOR DISPENSING AND MIXING LIQUID SUBSTANCES IN METERED VOLUMES**

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[52] **U.S. Cl.** **222/57**; 222/162; 222/207; 222/485; 137/625.32; 251/345

[51] **Int. Cl.** **B67d 5/56**

[58] **Field of Search** 222/57, 162, 207, 214, 222/325, 484, 485; 251/344, 345; 137/625.32

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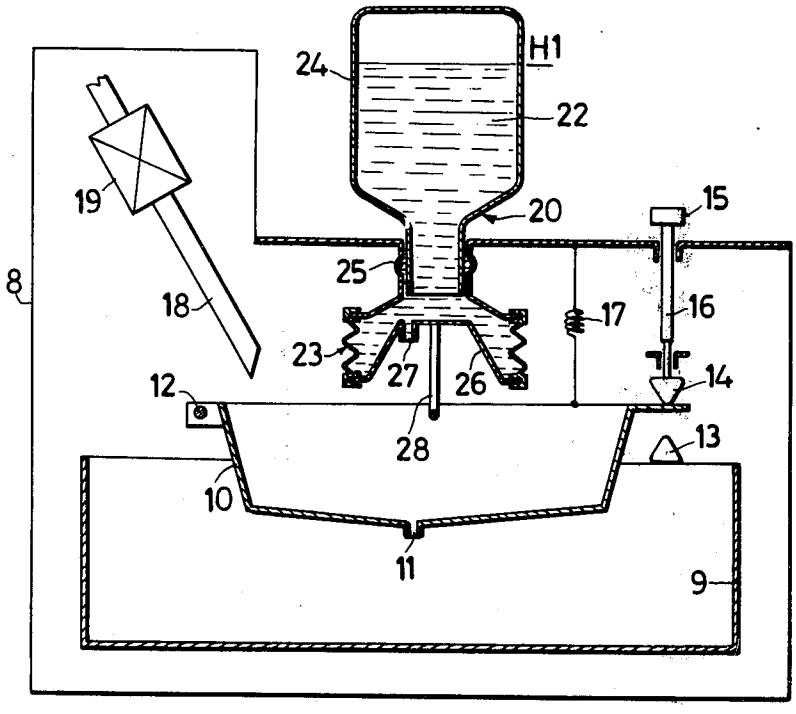
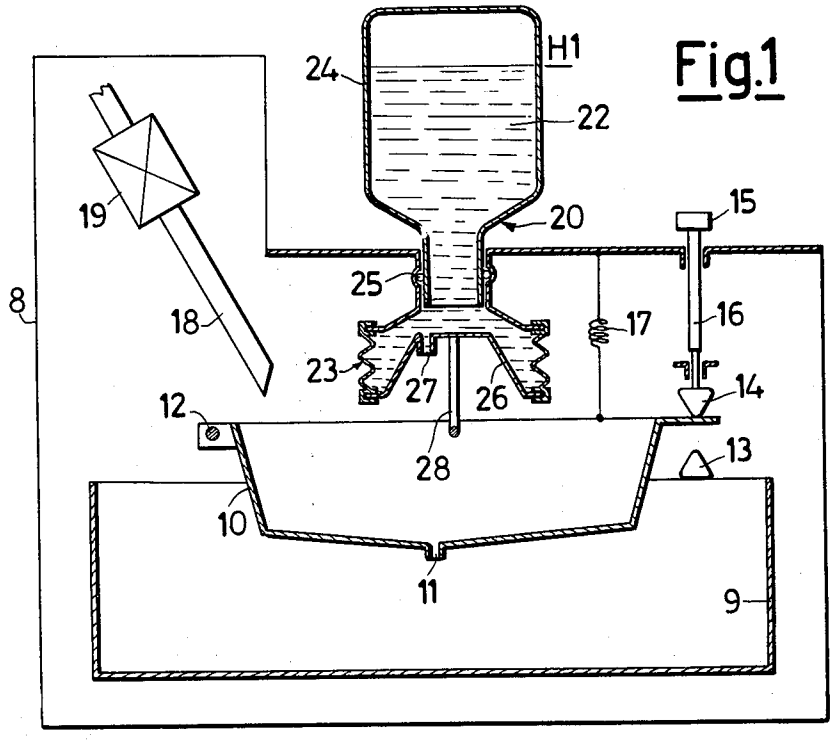
Assistant Examiner—Frederick R. Handren
Attorney, Agent, or Firm—Holman & Stern

[57] **ABSTRACT**

A device is disclosed for dispensing and blending liquid substances, for example beverages, in metered amounts. The device is of the kind in which a blending tray receives a first liquid from a tube, the tray being swingable between an empty position and a filled position, and having a perforation through its bottom wall, and a hermetically closed container placed above the tray and containing the second liquid component of the blend, the improvement consisting in that at least a portion of the container is deformable between an expanded and a compressed position, these positions corresponding to the empty position of the tray and to the filled position of the tray, respectively.

12 Claims, 7 Drawing Figures




H1
24
22
19
20
15
25
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18
17
16
23
27
26
14
12
28
13
10
11
9

Fig.1

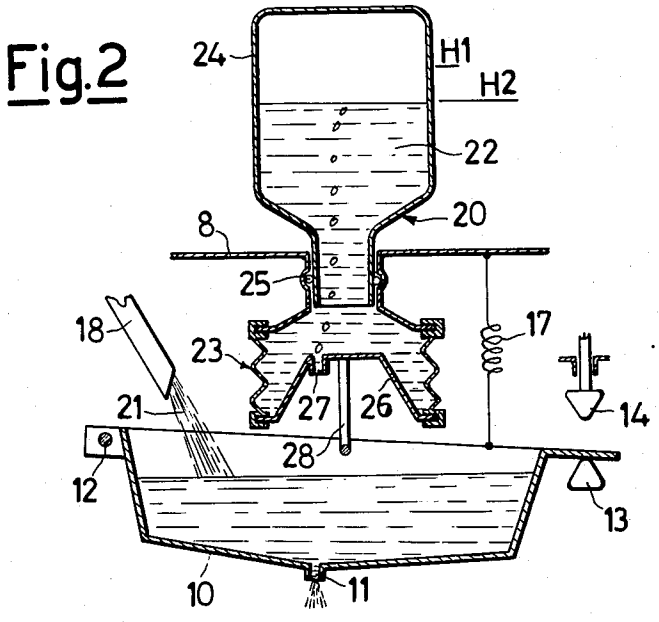
24
H1
H2
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Fig.2

Fig.3

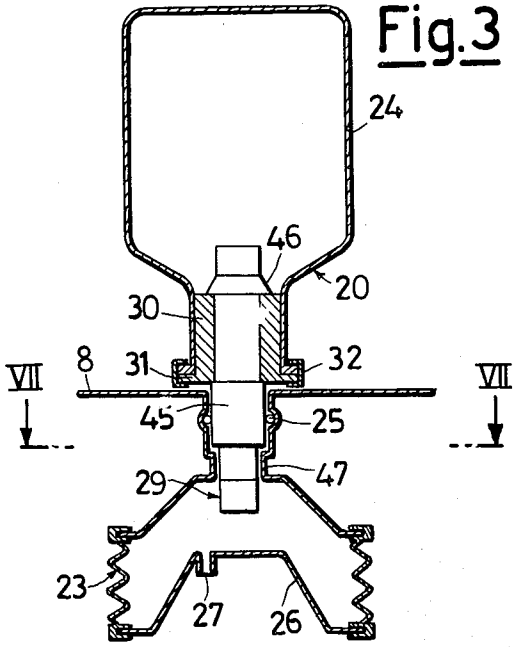


Fig.4

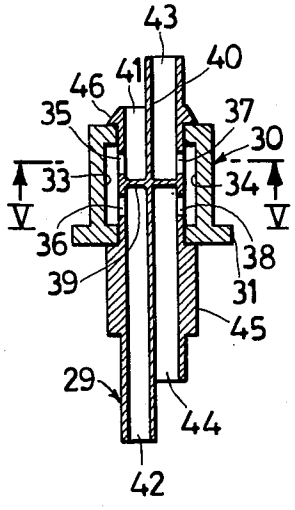


Fig.5

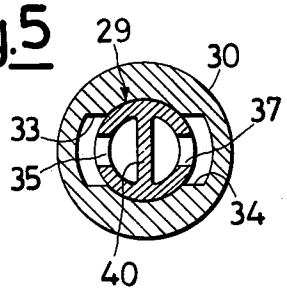


Fig.7

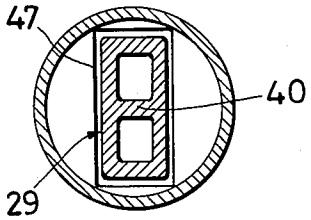
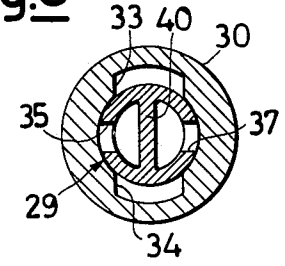


Fig.6



APPARATUS FOR DISPENSING AND MIXING LIQUID SUBSTANCES IN METERED VOLUMES

This invention relates to an automatic apparatus for dispensing and mixing different liquid substances in metered amounts.

A device is known for the dispensing of mineral substances in tabloid, which are dissolved into and then admixed with a predetermined liquid volume. Such a dispensing machine comprises a vessel for mineralizing said liquid and a feed duct for mineral salts in tabloids, which opens into said vessel. On either end of the vessel there is pivotally mounted a lever whose second end has detent teeth which project the ones against the others and are staggered along the lever axis by the diameter of a single tabloid. At an intermediate point of the lever a foraminous-bottom tank is fastened, which is adapted to receive a preselected unit dosage of liquid, whose weight causes the lever to be rotated, against the bias of a return spring, towards a position wherein the outermost tooth engages and holds the last but one tabloid in the end portion of said feeding duct. The other of said teeth, conversely, clears the last tabloid in said duct, thus allowing the tabloid freely to drop into said mineralization vessel.

The dispensing apparatus as disclosed has a completely automatic and reliable operation, and its construction is also simple and rational.

On the other hand, the use of solid additives (tabloids) involves the necessity, on account of the fact that these substances are usually hygroscopical, of providing an appropriate protection such as to ensure a satisfactory storage of the tabloids up to the time of their use. At any rate, the tabloids (or the like) contain inert solid substances which take part in the mineralization step without any desired chemical contribution thereto.

It would be desirable, and this is an object of the invention, to employ, in a dispensing machine of the kind referred to above, additives in the liquid state, which would permit to overcome the drawbacks outlined above. Especially in the preferred case in which said liquid additives are stored in a vessel which is required to deliver dosage units which are constantly proportional to the amounts of the other liquid to be dispensed, however, well known difficulties arise for making the dispensing apparatus in a simple, rational and economically acceptable manner.

According to the invention, these defects are overcome by an apparatus for dispensing and mixing liquid substances in metered amounts, comprising in a housing a duct for feeding in a preselected amount of a first liquid in a foraminous-bottom basin swingable between a first position corresponding to an empty condition and a second position corresponding to conditions of substantial filling with said first liquid, the opening through said bottom having an output capacity which is lesser than that of said duct, a hermetically sealed container arranged above said basin, for a second liquid to be admixed with the first, and a blending tank adapted to receive the liquids issuing from said opening. The apparatus is characterized in that at least one portion of said hermetically sealed container is resiliently deformable between an expanded configuration and a compressed configuration, and vice versa, said portion having at least an opening on its bottom wall and being mechanically connected in a linkable manner with said basin, so that when the latter is switched from said first to said second position, the deformable portion of the container is in its expanded configuration, the result being that a certain volume of atmospherical air penetrates into said container. As the basin is switched in the reverse direction, the deformable portion of the container is in the compressed configuration, so that a volume of said second liquid, equal to the air volume aforesaid issues from the container through said opening and drops into said basin. The apparatus is further characterized in that said deformable portion of the container is fixedly housed in the apparatus as such and the remaining rigid portion of the container is removable and is connected with the deformable portion by hermetic sealing means.

The features and advantages of the invention will become clearer from the ensuing description, given by way of nonlimiting example, with reference to the accompanying drawings, wherein;

FIG. 1 diagrammatically shows the machine according to the invention, in a preferred embodiment thereof, in a first operational stage.

FIG. 2 is a partial showing of the machine of FIG. 1, in a second operational stage.

FIG. 3 shows a diagrammatical cross-sectional view of a detail of the machine according to FIG. 1.

FIG. 4 shows an axial cross-sectional view of the detail of FIG. 3.

FIGS. 5 and 6 show a cross-sectional view taken along the line V—V of the detail shown in cross-section in FIG. 4, in a first and a second operational position, respectively.

FIG. 7 shows a diagrammatical cross-sectional view taken along the line VI—VI of the detail shown in FIG. 3.

With reference to FIGS. 1 and 2, the apparatus according to the invention comprises a housing 8 containing a blending tank 9, above which a tray 10 is arranged, which has a hole 11 formed through its bottom wall. The tray is pivoted at 12 at either end, so that it is allowed to swing between a first and a second position, a defined by the respective abutments 13 and 14, the latter being adjustable by manually manipulating a knob 15 of a conventional screw device 16. The abutments are arranged in correspondence with the other end of the tray, which is connected to the housing 8 by a return spring 17. The housing also contains the end portion 18 of an induction duct for a first liquid 21 (for example demineralized water). The duct 18 has an output which is greater than that of the hole 11 and is adapted to pour into the tray 10 a predetermined amount of the first liquid by the controlled actuation (for example by a programming device, not shown) of an electro-magnetic valve 19, or another known device. The apparatus, in addition, comprises a sealtight container 20 for a second liquid 22 (for example liquid mineral salts) to be admixed with the first. Such container is substantially formed by a bellows-like portion (or metering box) 23, fixedly mounted in the housing 8, and by a rigid portion (or dispenser) 24 which is removable and is adapted to be connected to the portion 23 by sealtight means. Such sealing means are formed, for example, by a resilient ring-like gasket 25. The metering box 23 comprises, in its turn, on its bottom wall, a movable bell 26 equipped with a hole 27 providing a small output flow and which establishes a communication between the interior of the container 20 and the space (preferably sterilized in a conventional manner)

of the housing 8. The bell 26, in addition, is linkably connected to the tray 10 by means of a rod 28.

In operation, as the programming device of the machine is energized for controlling a blending stage, the opening and following closure of the electro magnetic valve 19 allow the duct 18 to pour a predetermined amount of water 21 into the tray 10, so that the latter tends to become filled (FIG. 2) even though a part of the water drips into the tank 9 through the hole 11. Due to the effect of the weight of the water which has been accumulated, the tray 10 is displaced, overcoming the bias of the return spring 17 and the resistance offered by the bellows 23, from the at rest position of FIG. 1 (determined by the abutment 14) to the position of FIG. 2 (determined by the abutment 13). By the agency of the rod 28, the tray 10 drags in its displacement the bell 26 so that the bellows 23 is expanded and causes a negative pressure to obtain within the container 20 which is balanced by the induction, through the opening 27, of a volume of air which is proportional to the distance between the two abutments 13 and 14. The liquid mineral salts 22 are thus brought from an initial level H1 (FIG. 1) to a level H2 (FIG. 2) lower than the former.

Meanwhile, the electromagnetic valve 19, as outlined above, is closed again, so that the tray 10 is gradually emptied and the weight of water thereon is released. Summing up, the tray is recalled by the spring 17 to the previous position. Likewise, also the bell 26 is restored to its initial position, by originating in the interior of the container 20 a pressure which causes the ejection, through the opening 27, of a liquid volume 22 equal to the air volume which had been previously introduced into the container concerned. It is understood that the opening 27 should be proportioned, in connection with the fluidity of the liquid 22, so as to permit the introduction of air as well as the ejection of the liquid only whenever required in the stages of the operative cycle of the machine. The liquid 22 which emerges drips, preferably through the tray 10 and the hole 11, into the tank 9 so that the two liquids can be admixed together spontaneously or through conventional devices which are adapted to the purpose. It is apparent that the dosage of the liquid 22 which is dispensed every time by the container 20 is a function of the distance between the abutments 13 and 14, so that it is possible to vary the dosage itself (and thus the water to mineral salts ratio) by adjusting said distance by the knob 15; to this purpose, the knob can be equipped with a graduated scale (not shown). As soon as the liquid, 22 is exhausted, the rigid dispenser 24 of the container 20 can be replaced without any difficulty.

As it appears in FIGS. 1 and 2, this dispenser has virtually the shape of a bottle whose mouth is connected in a sealtight manner with the metering unit 23 by means of the gasket 25. To effect this connection, the dispenser 24 should thus be placed upside down as shown in the drawings; in this connection, for hygienic reasons and to prevent possible spillages of the salts 22, between the dispenser and the metering unit a shutter device is preferably inserted, which will now be described with reference to FIGS. 3, 4, 5, 6, 7.

The shutter comprises a hollow body 29 which is substantially cylindrical and is partially surrounded by a ring 30 (preferably of a resilient material) whose inner surface is equipped, for example, with tiny transversal ribs (not shown) which are adapted to ensure a tight seal with the body 29. The outer surface of the ring 30 is equipped with a projection 31, which is locked in a sealtight manner to the mouth of the dispenser 24; the fastening of the projecting portion (and thus of the entire shutter) is carried out with known means such as a metal strip 32.

The ring 30 has in its interior a hollow space which is partitioned by the body 29 into two symmertrical parts 33 and 34. In correspondence with said hollow space the side surface of the hollow body 29 is equipped with two pairs of holes 35, 36 and 37, 38, which are set diametrically opposite to each other. The holes of each pair are axially spaced apart, each in the opposite direction, by a horizontal diaphragm 39 which interrupts the inner hollow space of the body 29.

The latter is divided also axially in its interior by a vertical diaphragm 40, which, together with the horizontal one 39, partitions the interior of the body 29 into two upper ducts 41, 43 and two lower ducts 42, 44. The two ducts 42 and 44 (and preferably also the ducts 41, 43) are properly staggered with respect to each other.

On a side of the ring 30, the body 29 has an enlarged portion 45, whereas, on the other side, the body has a detent tooth 46; the latter and the enlarged portion 45 prevent any axial displacement between the body 29 and the ring 30, whereas the relative rotation therebetween is permitted. As soon as the dispenser 24 (and thus the ring 30) is positioned with respect to the body 29 in the angular position shown in FIG. 5, the couples of holes 35, 36 and 37, 38 are in communication with the hollow spaces 33 and 34, respectively. The ducts 41 and 43 are thus connected with the ducts 42 and 44, respectively. The dispenser 24 can thus pour its liquid contents (along the route 41, 35, 33; 36, 42) into the metering bellows 23 to which it is connected as outlined above. The staggered relationship between the ducts of the body 29 permits the obtention of the physical conditions which are adapted, as is known, to have a correct pressure balance between the liquid emerging from the dispenser 24 and the air entering along the route 44, 38, 34, 37, 43.

When the ring 30 is in the position shown in FIG. 6 (that is rotated through about 20° relative to the position shown in FIG. 5), the pairs of holes 35, 36 and 37, 38 of the body 29 are shuttered by the inner walls of the ring, so that the ducts 41 and 43 (and thus the interior of the dispenser 24) are no longer in communication with the respective ducts 42, 44. Thus the dispenser 24 is hermetically sealed and can either be inserted into or withdrawn from, the remaining part of the machine without any risk of spilling the liquid 22. For hygienic reasons, as the dispenser is withdrawn, the portion of the duct 29 which projects at the outside of the dispenser can be protected from the contact with foreign matter (such as dust) by conventional means, such as a specially provided hood (not shown). It should be noted that the hygienic question is of utmost importance, especially in the case considered herein, in which the liquids 21 and 22 to be admixed are components of a beverage or anyhow a substance intended for direct consumption by the user. In this connection, 90° is preferred (as outlined above) that the interior of the housing 8 is sterile so that the air entering the dispenser 24 through the bellows 23 is also sterile, during the operative stages described hereinabove.

To afford a supplementary hygienic safety, the portion of the ducts 42 and 44 projecting from the en-

larged portion **45** of the body **29** is shaped with a rectangular cross-sectional shape (FIG. 7). This portion is adapted to be received by a fixed seating **47**, also of rectangular cross-sectional shape, with which the bellows **23** is equipped, It is thus apparent that the relative rotation between the body **29** and the ring **30** can be effected by merely rotating the dispenser **24**. By so doing any manual contact with the portion **29** projecting from the dispenser is prevented.

Obviously, there can be provided (these are not shown) stop means or indexing means for the end of stroke, which are adapted correctly to define the positions of relative rotation as shown in FIGS. **5** and **6**.

From the foregoing, it is clear which are the features of constructional simplification and functionality of the machine in question, along with the total hygienic reliability in use. Inter alia, the shutter as described prevents (or anyhow makes it difficult) to reload the dispenser **24** with substances other than those as originally contained therein, the latter being preferably sterilized, whereas the only manual operation (adjustment of the unit dosage) is carried out from the outside of the machine (knob **15**).

Obviously, the machine in question can have applied thereto all the modifications which lie within the scope of the invention; without thereby changing the characteristic constructional features thereof.

What is claimed is:

1. An apparatus for dispensing and blending liquid substances in metered quantities, comprising in a housing a duct for feeding-in a predetermined amount of a first liquid in a foraminous-bottom tray swingable between a first position corresponding to an empty condition and a second position corresponding to conditions of substantial filling with said first liquid, the perforation through said bottom wall having an output less than that of said duct, a hermetically sealed container, arranged above said tray, for a second liquid to be admixed with the first, and a blending tank adapted to receive the liquids issuing from said hole, characterized in that at least one portion of said hermetically sealed container is elastically deformable between an expanded position and a compressed position, and vice versa, said portion being equipped with at least an opening on the bottom wall and being mechanically connected in a linkable manner to said tray, so that when the latter is switched from said first to said second position the deformable portion of the container is in an expanded position, so that through said opening a certain volume of atmospherical air enters said container and when the tray is switched in the reverse direction, the deformable portion of the container is under compression conditions, so that through said opening there emerges and drops in said tray a volume of said second liquid which is equal to said volume of air.

2. An apparatus according to claim **1**, characterized in that it comprises in addition at least two devices, known per se, adapted to define said first and said second position, respectively, of said tray having a foraminous bottom wall, at least one of said abutments being equipped with adjustment means adapted to vary their mutual distance and thus to vary said volume of the second dispensed liquid.

3. An apparatus according to claim **1**, characterized in that said deformable portion of the container is housed in a fixed manner in the apparatus and the remaining rigid portion of the container is removable and is connected to the deformable portion by hermetic sealing means.

4. An apparatus according to claim **3**, characterized in that said deformable portion is formed by a metering bellows unit whose bottom wall is formed by a rigid bell through which said opening is formed and to which there is pivoted either end of a rod which is pivoted at the opposite end to said tray.

5. An apparatus according to claim **3**, wherein the removable portion of the container is shaped substantially in the form of a bottle having a single mouth, characterized in that said removable portion is adapted to be connected to said deformable portion in an inverted posture, that is with said mouth pointing downwards.

6. An apparatus according to claim **5**, characterized in that the mouth of said removable portion in the form of a bottle is equipped with a shutter device capable of giving a tight seal and to be rotated from a closing position to an opening position, and vice versa.

7. An apparatus according to claim **6**, characterized in that said shutter comprises a substantially cylindrical body in whose interior there are formed a first and a second upper duct and a first and a second lower duct, each duct being connected with the ambient air outside said body by corresponding holes formed through the side surface of said body, the latter being inserted in a sealtight manner, at least along the axial length within which said holes are contained, into a ring provided in its inside with two hollow spaces through which, in said opening position, said first and said second upper ducts a communicate with said first and said second lower duct, respectively, by means of their respective holes, whereas in said closure position said holes are closed by the inner walls of the ring.

8. An apparatus according to claim **7**, characterized in that said first lower duct of the cylindrical body axially projects with respect to said second lower duct and, preferably, said second upper duct is likewise protruding with respect to said first upper duct.

9. An apparatus according to claim **7**, characterized in that the inner hollow spaces of said ring are symmetrical and opposed, as diametrically opposite are said holes of the first upper duct and the first lower duct with respect to the holes of said second upper duct and said second lower duct, respectively.

10. An apparatus according to claim **7**, characterized in that said cylindrical body is equipped, on a side of said ring, with an enlarged portion and, on the other side, with a detent tooth so as to prevent any axial displacement between the body and the ring while permitting a relative rotation therebetween.

11. An apparatus according to claim **7**, characterized in that the outer surface of said ring is equipped with a projection which is locked in a sealtight manner in a conventional way to the mouth of said removable portion of the container.

12. An apparatus according to claim **7**, wherein said first and said second lower duct of the shutter project along a second at the outside of said rigid portion of the container, characterized in that at least the end portion of said second is shaped with a noncylindrical cross-sectional shape and is inserted into a similar fixed seating formed in said deformable portion of the container, so as to allow the displacement from said closure position to said opening position of the shutter, and vice versa, when the removable portion of the container is rotated.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,907,167

DATED : September 23, 1975

INVENTOR(S) : Glacinto Zanardo

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[30] Foreign Priority Data:

Italian No. 45714 A/73 filed November 22, 1973

Signed and Sealed this

sixteenth Day of *December 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks