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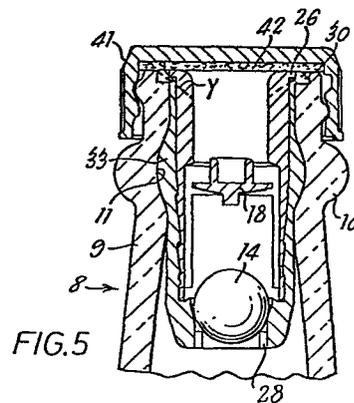
71 Applicant: SEAGRAM DISTILLERS LTD.
111-113 Renfrew Road
Paisley, PA3 4DY Scotland(GB)

72 Inventor: Snedker, Robert
12 Cardy Road Boxmoor
Hemel Hempstead Hertfordshire(GB)

74 Representative: Jenkins, Richard Gray et al,
R.G.C. Jenkins & Co. 12-15, Fetter Lane
London EC4A 1PL(GB)

54 Improvements relating to tamper resistant closure devices for bottles.

57 An anti-tampering bottle closure comprising an outer member (15) in the form of a sleeve which is insertable into the neck of a bottle (8) and an inner member (13) in the form of a tubular valve body made of a substantially more rigid material than the sleeve. A ball valve (14) is trapped within the valve body and adapted to allow liquid to be poured from the bottle when it is inverted but prevent liquid from being poured into the bottle when it is upright. The sleeve has a thickened wall portion (33) and the valve body is axially insertable into the sleeve to compress the thickened wall portion against the neck of the bottle so as to resist radially inward deformation of the thickened wall portion of the sleeve and thereby lock the closure in the neck of a bottle. Preferably, the thickened wall portion (33) of the sleeve forms an inwardly convex annular protrusion (34) which is deformed outwardly into locking engagement with the bottle neck when the valve body is inserted into the sleeve.



IMPROVEMENTS RELATING TO TAMPER RESISTANT CLOSURE
DEVICES FOR BOTTLES

This invention relates to a tamper resistant closure for bottles and more particularly concerns a closure intended to prevent or impede the addition of adulterating liquid to the contents of a bottle.

5 In order to prevent the contents of a bottle from being adulterated or diluted it is necessary to provide a closure which incorporates a one way valve which will allow the contents to be poured fully from the bottle when it is inverted but will prevent liquid from
10 being poured into the bottle when it is upright. It is also necessary for the valve to be protected so that it cannot be held open when the bottle is upright.

It is further necessary for the closure to be locked permanently in the neck of the bottle so that it
15 cannot be removed without breaking the bottle. The closure must also be designed so that it is difficult and preferably impossible to cut the valve portion away thereby opening the bottle while leaving portions of the closure locked in the neck.

20 Many attempts have been made in the past to design a closure which will meet these requirements but so far as we are aware the known closures have always been susceptible to some form of damage or interference, or they have been expensive to manufacture or they have
25 been difficult to assemble in the bottle neck. It is

therefor an object of the present invention to provide a tamper resistant bottle closure which will meet these requirements and which, at the same time is inexpensive to manufacture and easy to insert in a bottle neck.

5 According to one aspect of this invention there is provided a tamper resistant bottle closure comprising an outer member in the form of a sleeve which is insertable into the neck of a bottle, an inner member in the form of a tubular valve body made of a substantially more rigid
10 material than the sleeve and a ball valve trapped within the valve body and adapted to allow liquid to be poured from the bottle when it is inverted but substantially prevent liquid from being poured into the bottle when it is upright, characterised in that the sleeve has a
15 thickened wall portion and the valve body is axially insertable into the sleeve to compress the thickened wall portion against the neck of a bottle and thereafter resist radially inward deformation of the thickened wall portion of the sleeve to thereby lock the closure in the neck of
20 the bottle.

 According to a further aspect of the invention we also provide the combination of a bottle incorporating a closure as defined in the preceding paragraph, in which the internal surface of the neck of the bottle is formed with
25 an annular groove and the closure is located in the neck of the bottle, characterised in that the thickened wall

portion of the sleeve is located adjacent and expanded into the annular groove in the bottle so as to substantially fill the groove and in that the valve body is located within the sleeve so as to support the thickened wall portion and lock the closure in place and resist withdrawal from the bottle.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

10 Figure 1 is an exploded sectional elevation of the components of a closure device according to the invention, and shows also the neck portion of a bottle to receive the closure,

15 Figure 2 is an external elevation of the assembled closure prior to securing,

Figure 3 shows the assembled closure in position in the bottle neck and about to be secured,

Figure 4 shows the closure secured in the bottle, and

20 Figure 5 shows the finished bottle equipped with a screw cap.

Most bottles are manufactured with an external enlargement on the neck, known as a transfer ring, which is formed during the initial stage of manufacturing the bottle to enable the gob of molten glass from which the bottle is formed to be held securely during its transfer to a hollow mould for blowing into the required form. Subsequently the transfer

ring may serve to enable a closure to be held in place on the neck or to retain a security, or so-called pilfer-proof, band. During cooling of the bottle the provision of the transfer ring results in the formation
5 of a shallow groove on the internal surface of the neck at a location opposite the transfer ring. In the arrangement illustrated in the drawings the groove is used to provide an anchorage for a tamper resistant closure device mounted within the neck of the bottle.

10 Referring to Figure 1 of the drawings, a bottle is indicated generally at 8, the bottle 8 having a neck portion 9. The bottle neck 9 has a transfer ring 10 and an internal groove 11. Above the ring a short external screw thread 12 is provided for retaining a
15 cap.

The closure, also shown in Figure 1, comprises an inner part in the form of a tubular valve body 13, an outer part in the form of a sleeve 15 and a non-return valve comprising a valve ball 14 and a
20 valve seat 27 on the lower end of the sleeve 15.

The valve body is moulded from a tough relatively hard plastics material such as polypropylene and has four internal lengthwise-extending ribs 17 which serve to guide the movement of the ball 14, and
25 an integral transversely extending circular baffle 18 which limits upward movement of the ball and

protects the ball from interference. The baffle 18 is joined to the radially inner edges of the ribs 17.

Beneath a cylindrical outer surface portion 19 the body is formed with a series of axially spaced annular upwardly pointing teeth or ridges 20, each comprising an upwardly and outwardly inclined annular shoulder 21 and a conically inclined surface 22 adjoining the shoulder 21 at a circumferential edge 23 to produce a barb-like configuration. Beneath the lowermost tooth 20 and near the lower end of the body, is an upwardly-facing abutment shoulder 24 and below this shoulder 24 is an annular groove 25. At the bottom of the body is a downwardly facing shoulder 39. At its upper end, the body has an outwardly projecting flange 26.

The outer sleeve 15 is moulded from a tough but relatively deformable resilient plastics material, such as polyethylene, and is formed at its lower end with an internal frusto-conical seat 27 for the ball 14. Below the seat, the sleeve 15 has four radially-inwardly projecting ribs 28 which prevent the ball from becoming jammed against the seat and which also prevent the valve from forming a complete seal, for a reason which is given herein later. Immediately above the seat 27 is an upwardly facing annular abutment shoulder 40 against which the shoulder 39 of the valve

body 14 can abut. The external surface 29 of the sleeve 15 at its lower end is frusto conical.

Above the surface 29, the sleeve 15 is generally cylindrical with a radially-outwardly extending flange 30 at its upper end to seat within an annular rebate 35 formed at the upper end of the bottle neck. The flange has an upstanding ridge 31 and radially inwardly thereof a rebate 32 to accommodate the flange 26 of the tubular valve body. The cylindrical wall of sleeve 15 is not of uniform thickness, but has an annular thickening or protuberance 33 which presents a convexly curved radially inner surface 34. The positioning and shape of the protuberance 33 is such that when the flange 30 is in the rebate 35 of the bottle, insertion of the valve body into the sleeve will cause deformation of the sleeve 15 and a radially outward expansion of the protuberance 33 into the shallow groove 11 in the neck of the bottle.

The axial distance X between the bottle mouth and the inner edge of the groove 11 is customarily less than the internal diameter d of the bottle mouth and the protuberance 33 is positioned accordingly, i.e. so that the innermost point of the protuberance is spaced from that part of the sleeve which will lie outermost in the neck, disregarding the flange 30, by a distance less than the outer diameter of the sleeve.

The closure is assembled by placing the ball 14
in the sleeve 15, and then inserting the valve body
within the sleeve 15 so that a rib 36 at the upper end
of the sleeve engages in the external groove 25 in the
5 lower end portion of the body to secure the two
components together temporarily.

The closure now has an external appearance
as shown in Figure 2, the protuberance of the sleeve
remaining in its initial inwardly projecting position,
10 and the closure is presented to the bottle in this
condition after the bottle has been filled in
manufacture. By means of an assembly tool having a
collet 37 (see Figure 3) which engages only the
flange 30 of the sleeve 15, the closure is pressed
15 into the bottle until the flange 30 seats in the rebate
35 at the top of the bottle. A plunger 38 within the
sleeve 37 of the assembly tool is then employed (see
Figure 4) to press the tubular valve body downwardly
until its upper flange 26 seats in the rebate 32 of the
20 flange 30, in which condition the upper faces of the
flanges 26 and 30 are substantially flush. During
this downward movement of the valve body the groove 25
in the valve body disengages from the rib 36 in the
sleeve and the lower edge of the valve body engages
25 the internal convex surface 34 of the protuberance
33 and forces the protuberance outwardly into firm

engagement with the internal groove 11 in the bottle neck. In the final part of the movement of the valve body the lower shoulder 39 of the valve body 13 comes into abutment with the shoulder 40 of the sleeve to prevent further movement of the valve body into the sleeve. During the downward movement of the valve body, which is a force-fit into the sleeve, the relatively hard teeth 20 bite into, and produce a resilient deformation of, the inner surface of the relatively soft and deformable sleeve. The shallow angle of outward inclination of surfaces 22 permits the insertion of the valve body into the sleeve. However in the final position of the body, as can be seen in Figure 4, the teeth prevent or inhibit withdrawal of the valve body from the sleeve by providing a ratchet action in which the upwardly pointing teeth tend to bite further into the sleeve if withdrawal is attempted.

Referring now to Figure 5, a screw-cap 41 with or without a sealing wad 42 is then applied to the bottle so as to form a seal with the ridge 31 on the flange of the sleeve, and seat on the flush upper surfaces of the bottle neck, flange 26 and flange 30.

When the screw-cap 41 is removed, the contents of the bottle can be poured out in the ordinary way, the liquid pushing the ball 14 off its seat and flowing past the ball and the baffle 18 when the

bottle is tilted. When the bottle is returned to its vertical position the slight leakage permitted by the presence of the ribs 28 which space the ball slightly from the valve seat 27 enables the residual liquid above the ball to seep slowly back past the ball. However, the valve prevents the addition of adulterating liquid to the remaining contents of the bottle except at a very slow rate and thus substantially hinders and discourages attempts at adulteration.

10 It will be understood that the ball must have a density in excess of that of the liquid contents of the bottle.

 Since the bottle, when fitted with an anti-tampering closure as described above presents a substantially flat annular upper surface, by virtue of rebating of the bottle neck at 35 and of the upper flange 30 of the sleeve 15, metal closures of the roll-on and roll-on pilfer proof types can readily be used in place of the screw cap 41 of Figure 5.

20 The describes device is of simple construction, since it comprises only three separate parts, namely the tubular valve body, the sleeve, and the valve ball and is readily assembled into a condition in which it is locked in the bottle neck. The configuration of the closure is such that in this locked condition any axial movement of the tubular

body and consequently of the whole closure, either inwardly or outwardly of the bottle, is extremely difficult. More particularly, the teeth 20 inhibit withdrawal of the valve body from the sleeve, and an attempt to push the valve body into the bottle, even if a circumferential cut is made in the mouth of the bottle along line Y (see Figure 5) to shear away and remove the retaining flange 26 of the tubular body, will fail due to the retaining affect provided by the abutment of surface 39 against the abutment shoulder 40.

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CLAIMS:

1. A tamper resistant bottle closure comprising an outer member in the form of a sleeve which is insertable into the neck of a bottle, an inner member in the form of a tubular valve body made of a substantially more rigid material than the sleeve and a ball valve trapped within the valve body and adapted to allow liquid to be poured from the bottle when it is inverted but substantially prevent liquid from being poured into the bottle when it is upright, characterised in that the sleeve (15) has a thickened wall portion (33) and the valve body (13) is axially insertable into the sleeve (15) to compress the thickened wall portion (33) against the neck of a bottle and thereafter resist radially inward deformation of the thickened wall portion (33) of the sleeve (15) to thereby lock the closure in the neck of a bottle.

2. A tamper resistant bottle closure as claimed in claim 1, characterised in that the thickened wall portion (33) of the sleeve (15) forms an inwardly convex annular protrusion (34) which is deformed outwardly into locking engagement with the bottle neck when the valve body is inserted into the sleeve.

3. A tamper resistant bottle closure as claimed in claim 1 or claim 2, characterised in that the valve body (13) is formed with a plurality of projections (20) adapted to bite into the sleeve (15) in the region of the thickened wall portion (33) to resist withdrawal
5 of the valve body from the sleeve.

4. A tamper resistant bottle closure as claimed in claim 3 characterised in that the projections (20)
10 are in the form of a plurality of annular teeth (20).

5. A tamper resistant bottle closure as claimed in any preceding claim, characterised in that the sleeve (15) has an internal abutment surface (40)
15 adapted to limit movement of the valve body (13) into the sleeve (15).

6. A tamper resistant bottle closure as claimed in any preceding claim, characterised in that the ball
20 valve (14) is trapped and movable between a baffle (18) which is integral with the valve body (13) and a valve seat (27) formed on the sleeve (15).

7. A tamper resistant bottle closure as claimed in any preceding claim, characterised in that the valve body (13) has axially extending ribs (17) which are adapted to guide movement of the ball valve (14) within
5 the valve body (13).

8. A tamper resistant bottle closure as claimed in any preceding claim, characterised in that the valve body (13) has an external flange (26) at one end which
10 is adapted to seat in a rebate (32) formed in the sleeve (15) when the valve body (13) is inserted fully into the sleeve (15).

9. A tamper resistant bottle closure as claimed
15 in any preceding claim, characterised in that the sleeve (15) is formed with an external flange (30) at one end which is adapted to seat in a rebate in the bottle neck when the sleeve (15) is inserted into a bottle.

20 10. A tamper resistant bottle closure as claimed in any preceding claim, characterised in that the sleeve (15) and the valve body (13) are provided with an interlocking rib and groove arrangement (25,36) enabling the valve body to be displaceably attached to the sleeve
25 prior to slidable insertion therein.

11. A tamper resistant bottle closure as claimed
in any preceding claim, characterised in that the
thickened wall portion (33) of the sleeve (15) is spaced
from the end of the sleeve adapted to receive the
valve body by a distance less than the external diameter
of the sleeve.

12. A tamper resistant bottle closure as claimed
in any preceding claim, characterised in that the
baffle (18) in the valve body (13) is so positioned
within the valve body that it is located generally
adjacent the thickened portion (33) of the sleeve when
the valve body is fully inserted within the sleeve.

13. The combination of a bottle incorporating
a closure as claimed in any preceding claim, in which
the internal surface of the neck of the bottle is
formed with an annular groove and the closure is located
in the neck of the bottle, characterised in that the
thickened wall portion (33) of the sleeve (15) is
located adjacent and expanded into the annular groove
(11) in the bottle (10) so as to substantially fill the
groove and in that the valve body (13) is located within
the sleeve (15) so as to support the thickened wall
portion (33) and lock the closure in place so as to
resist withdrawal from the bottle (8).

14. A tamper resistant bottle closure substantially as described herein with reference to the accompanying drawings.

5 15. The combination of a bottle incorporating a closure substantially as described herein with reference to the accompanying drawings.

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FIG. 1

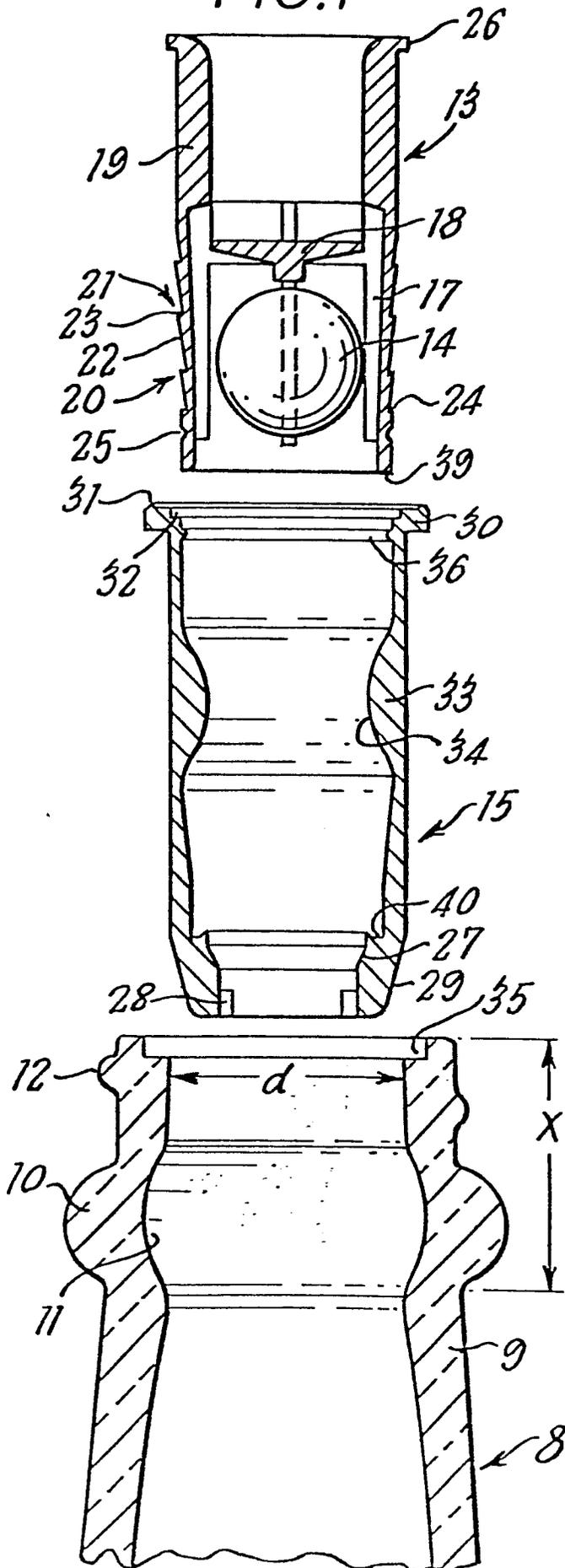
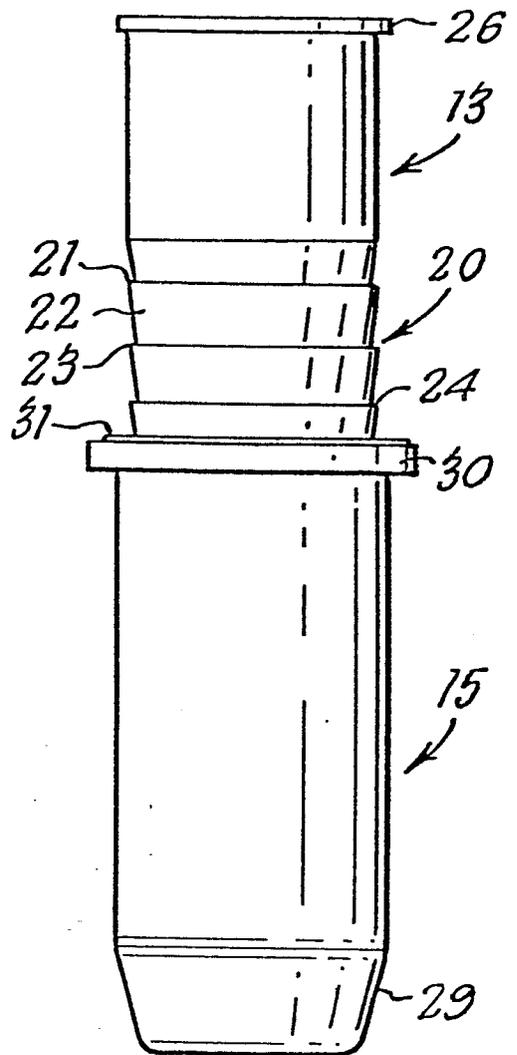


FIG. 2



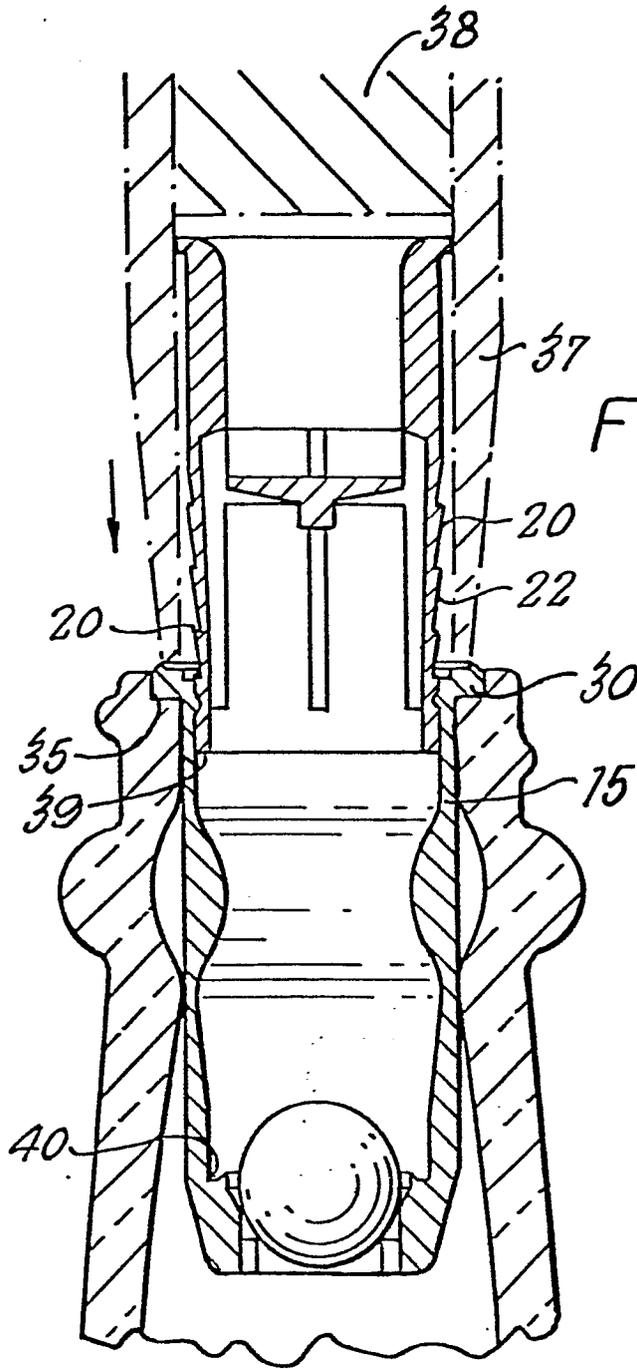


FIG. 3

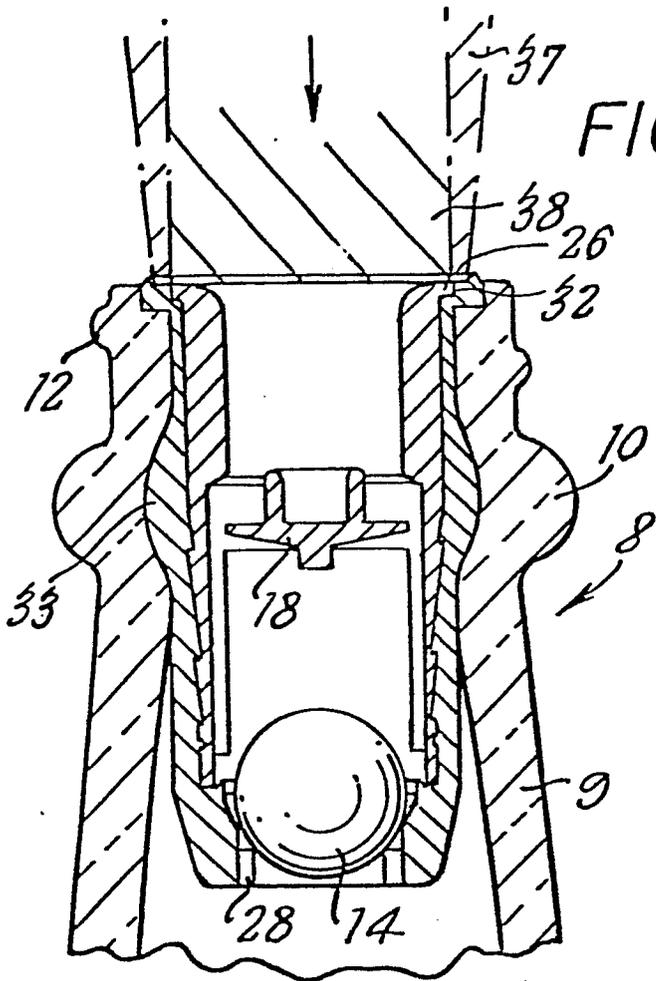


FIG. 4

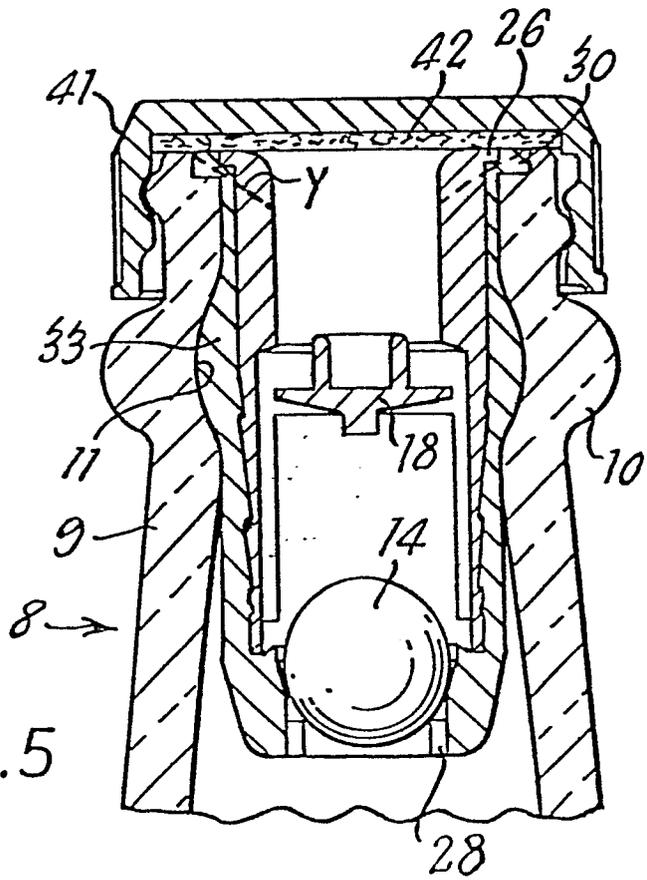


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 8)
X	EP-A-0 035 918 (SEAGRAM) * Page 4, line 8 - page 7, line 22; figures *	1, 2, 7 10, 13 14, 15	B 65 D 49/02
Y	---	3, 4, 5 6, 8, 9 11, 12	
Y	US-A-2 038 392 (WANDELL) * Whole document *	3, 4	
Y	GB-A-1 532 652 (MONTGOMERY) * Page 2, lines 20-120; figures *	5, 6, 9	
Y	US-A-3 073 470 (GREENE) * Column 1, line 50 - column 3, line 32; figures *	8, 11, 12	TECHNICAL FIELDS SEARCHED (Int. Cl. 8) B 65 D
A	FR-A-1 113 454 (GILLET) * Page 1, left-hand column, line 1 - right-hand column, line 3; figures 1-4 *	1, 2, 11 , 13, 14 , 15	
A	FR-A-2 123 201 (WASSILIEFF) * Page 7, line 7 - page 8, line 34; figures 4a-4d *	1	
	--- -/-		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 04-05-1983	Examiner MARTENS L.G.R.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	US-A-2 079 775 (SIMONS) * Page 1, left-hand column, line 55 - right-hand column, line 5; figure 1 *	9	
A	<p style="text-align: center;">---</p> US-A-2 079 125 (MacBEAN) <p style="text-align: center;">-----</p>		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
Place of search THE HAGUE		Date of completion of the search 04-05-1983	Examiner MARTENS L.G.R.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	