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(54) Liquid dispensing device

(57) The present invention relates to a dispensing device comprising a container having a space for containing the fluid, pumping means for sucking and dispensing the fluid to the outside and a trigger for actuating said pumping means. The container space is in communication with a compensation duct (100) comprising a cylindrical narrowing (102) for reducing or preventing fluid leaking to the outside through the compensation duct.

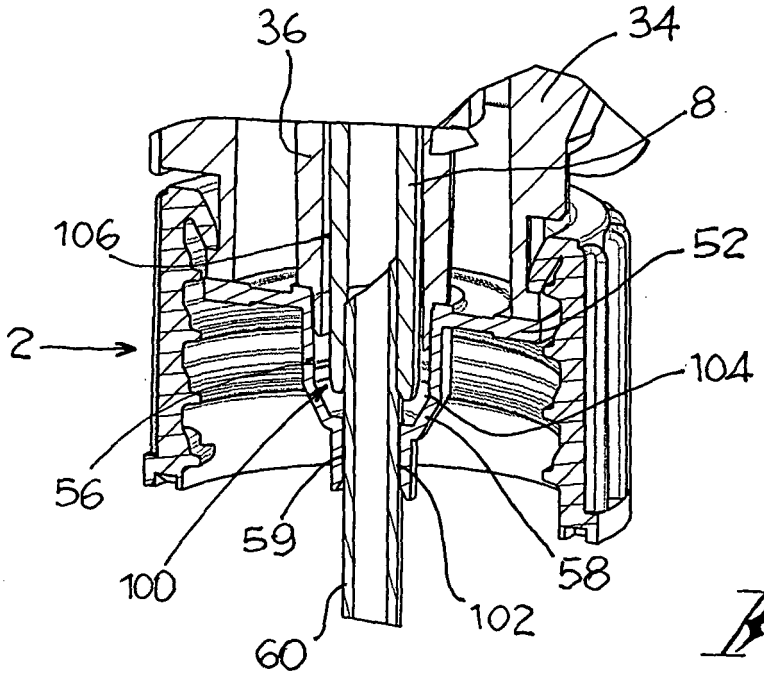

Fig. 3

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Description

[0001] . The object of the present invention is a device for dispensing a fluid, for example a detergent, a disinfectant and the like, adapted for dispensing at least one fluid.

[0002] . A dispensing device, for example with a trigger, generally consists of a container wherein the fluid to be dispensed is held, a pumping device for sucking the fluid from the container and for dispensing the sucked fluid to the outside, and a trigger for actuating the pumping device.

[0003] . The container is put is communication with the atmosphere by a compensation duct.

[0004] . However, the presence of the compensation duct causes fluid leaks from the container to the outside, especially during a usage of said devices in inclined position.

[0005] . Some solutions known in the art exhibit such structural features as to limit the fluid leaks to the outside.

[0006] . For example, a dispensing device exhibits a compensation duct communicating with the container through a small-diameter hole, so as to limit the amount of fluid flowing through the compensation duct. A solution like the one described now is disclosed in document WO 01/26822, by the same Applicant.

[0007] . Further solutions are described, for example, in documents EP-A1-0202380, US 4.161.288 or US 4.606.480.

[0008] . However, the devices known in the art do not allow a suitable limitation of fluid leaks through the compensation duct, with considerable disappointment for the users.

[0009] . The object of the present invention is to reduce or eliminate fluid leaking through the compensation duct.

[0010] . Such object is achieved by a dispensing device obtained according to claim 1. The dependent claims describe other embodiments.

[0011] . The features and advantages of the dispensing device according to the present invention will appear more clearly from the following description, made by way of a non-limiting example with reference to the annexed drawings, wherein:

[0012] . - figure 1 shows a section view of a dispensing head of a device according to a first embodiment of the invention;

[0013] . - figure 2 shows a perspective section view of the dispensing head of figure 1;

[0014] . - figure 3 shows an enlarged detail of the head of figure 2, wherein a compensation element of the device can be seen;

[0015] . - figures 4a and 4b show the compensation element of figure 3;

[0016] . - figure 5 shows a section view of a dispensing head of a device according to a further embodiment;

[0017] . - figure 6 shows a perspective section view of the dispensing head of figure 6;

[0018] . - figure 7 shows an enlarged detail of the head of figure 6, wherein a compensation element of the device can be seen, and

[0019] . - figures 8a and 8b show the compensation element of figure 7.

[0020] . With reference to figures 1 to 4b, reference numeral 1 indicates a dispensing head of a dispensing device adapted for dispensing a fluid.

[0021] . The dispensing device comprises containment means adapted for containing said fluid. For example, said containment means comprise a container which delimits a space for containing the fluid (not shown).

[0022] . The dispensing head 1 is associable to said containment means.

[0023] . For example, said dispensing head 1 is associable to said container through a threaded ring nut 2.

[0024] . The dispensing head 1 comprises pumping means adapted for being actuated for sucking a given amount of fluid from said containment means during a suction step and adapted for dispensing said given amount of fluid outside the device during a dispensing step.

[0025] . Preferably, said pumping means comprise a piston element 6 comprising a tubular stem 8 that extends along a pumping axis X-X, between a bottom end 10, close to the bottom of the container, and a top end 12, opposed to said bottom end 10.

[0026] . Moreover, said piston element 6 comprises a deformable membrane 14, shaped as a cup, that connects to said tubular stem 8 in the proximity of said top end 12.

[0027] . At said top end 12, the tubular stem 8 exhibits a closing wall 16 that blocks said top end 12 of stem 8, partly separated from the remaining portion of stem 8 through a cut.

[0028] . Preferably, moreover, the tubular stem 8 exhibits an annular enlargement 18 on the outer surface thereof.

[0029] . Preferably, moreover, said pumping means comprise a coupling element 20 comprising a delimiting wall 22 adapted for seating, at least partly, said top end 12 of the tubular stem 8.

[0030] . The coupling element 20 comprises a connecting wall 24 and a stop wall 26, radially spaced from one another and having prevailing extension along said pumping axis X-X.

[0031] . Moreover, said coupling element 20 comprises a tubular dispensing element 27 which delimits a dispensing duct 28 that mainly extends along a dispensing axis Y-Y, preferably perpendicular to said pumping axis X-X.

[0032] . Moreover, the dispensing head 1 comprises a support body 30 mainly extending along said pumping axis X-X.

[0033] . Preferably, said support body 30 comprises an outer contrast wall 32, an outer hinging wall 34 and an inner

tubular guide wall 36.

[0034] . Said inner annular wall 36 extends from a bottom end 38, close to the container, to a top end 40, opposed to said bottom end. At said top end 40, the inner annular wall 36 comprises an annular projection 42 protruding inwards.

[0035] . Moreover, the dispensing head 1 comprises a compensation element 50 adapted for being connected to said support body 30 at the bottom end of said support body.

[0036] . The compensation element 50 comprises a perforated plate 52. Said compensation element 50 further comprises an annular compensation wall 54, projecting from said plate 52 around said hole.

[0037] . The annular compensation wall 54 preferably comprises a substantially cylindrical portion 56 connected to plate 52, a truncated-cone portion 58 connected to said substantially cylindrical portion 56, and a cylindrical narrowing portion 59, connected to said truncated-cone portion.

[0038] . In particular, said truncated-cone portion 58 exhibits such pattern as to be converging towards the bottom of said container.

[0039] . Moreover, said dispensing head 1 is associable to an elongated tubular element 60, mainly extending along said pumping axis X-X, adapted for being inserted into said annular compensation wall 54 of the compensation element 50.

[0040] . Moreover, said dispensing head 1 comprises actuating means adapted for being handled by a user for actuating said pumping means.

[0041] . Preferably, said actuating means comprise a trigger 70 adapted for being hinged to said support body 30. Moreover, said actuating means comprise an active portion 72, connected to said trigger 70, adapted for influencing said pumping means for dispensing the fluid.

[0042] . Moreover, the dispensing head 1 comprises opening/closing means adapted for being handled to allow/prevent the fluid dispensing.

[0043] . According to a preferred embodiment, said opening/closing means comprise a closing body 80 adapted for being at least partly inserted into said dispensing duct of the coupling element and adapted for switching from a closed configuration wherein it prevents the fluid dispensing, to an open configuration, rotated relative to said closed configuration, wherein it allows said dispensing.

[0044] . Moreover, said dispensing head 1 comprises covering means adapted for at least partly covering said pumping means.

[0045] . In one embodiment, said covering means comprise a covering wall 90 adapted for being connected to said support body 30 and to said delimiting wall 22.

[0046] . Said covering wall 90 comprises an annular offshoot 92 that protrudes from said wall and is adapted for seating, at least partly, and for holding said delimiting wall 22 of the coupling element 20.

[0047] . Figures 5 to 8b show the device according to the invention in a further embodiment, structurally and functionally similar to the previous one.

[0048] . In particular in said embodiment, the compensation element 50 comprises plate 52 comprising an annular connecting wall 52b, arranged peripherally.

[0049] . Said connecting wall 52b is adapted for resting on the end edge of the container neck.

[0050] . Moreover, in said embodiment, said cylindrical portion 56 comprises a protruding annular portion 56b which protrudes from said plate 52 at a side opposed to said annular compensation wall 54.

[0051] . Moreover, in said embodiment, said plate 52 exhibits a truncated-cone shape, diverging towards said annular compensation wall 54.

[0052] . In said embodiment, device 1 comprises a bayonet system, for connecting the dispensing head to the container.

[0053] . Generally, in the assembly of the dispensing device, the tubular stem 8 is inserted in inner annular guide wall 36 of the support body 30. The annular projection 42 of the inner annular wall 36 is in interference on the annular enlargement 18 of the tubular stem 8.

[0054] . In other words, said annular projection 42 and said enlargement 18 constitute a preferred example of "static" sealing means adapted for preventing fluid leaks from the container.

[0055] . The compensation element 50 is connected to the support body 30.

[0056] . According to an embodiment, plate 52 is in abutment on the outer connecting wall 32 and on the hinging wall 34, whereas the bottom end of the inner tubular wall 36 is at least partly seated in the hole of plate 52 and in abutment on the annular compensation wall 54 (figure 1).

[0057] . In a further embodiment, plate 52 is associated to the edge of the container neck through said peripheral connecting wall 52b and the bottom end of the inner tubular wall 36 is at least partly seated in the hole of plate 52 (figure 5).

[0058] . Moreover, the elongated tubular element 60 is inserted in the annular compensation wall 54 and sealingly connects to the bottom end 10 of the tubular stem 8.

[0059] . A compensation duct 100 is obtained.

[0060] . Said compensation duct 100 comprises a narrowing portion 102 directly in communication with said space of the container and having a crown-shaped passage zone delimited by the elongated tubular element 60 and by the narrowing portion 59 of the compensation element 50, parallel to one another.

[0061] . Said narrowing portion 102 exhibits a greater axial extension than the thickness of the narrowing portion 59. In other words, the crown section extends axially by a portion longer than the thickness or thicknesses of the walls of the compensation element 50.

[0062] . In yet other words, said narrowing portion 102 exhibits an extension not realised only as perforation of a wall of the compensation element 50.

[0063] . Said compensation duct 100 further comprises an expansion portion 104, following said narrowing portion 102.

[0064] . Preferably, said expansion portion 104 exhibits a nominal dimension greater than the diameter of said narrowing portion 102 of duct 100.

[0065] . Said expansion portion 104 in internally delimited by said elongated tubular element 60 and/or by said tubular stem 8. Externally, said expansion portion 104 is delimited by the truncated-cone portion 58 and/or by the cylindrical portion 56 of said compensation element 50.

[0066] . In other words, said expansion portion 104 comprises a truncated-cone portion converging towards said narrowing portion 102 and a cylindrical portion connected to said truncated-cone portion, at a side opposed to said narrowing portion 102.

[0067] . Moreover, said compensation duct 100 comprises an end portion 106 which extends from said expansion portion 104 to said connection between the annular projection 42 of the inner annular guide wall 36 of the support body 30 and the annular enlargement 18 of the tubular stem 8.

[0068] . Said end portion 106 exhibits a tapered passage section, in particular always smaller than the expansion portion 104 towards said projection-enlargement connection.

[0069] . Said tapering is obtained through a suitable taper of the tubular stem 8 or of the inner annular wall.

[0070] . In other words, said compensation duct 100 is delimited, on one side, by a cylindrical narrowing and, on the other side, by the projection-enlargement connection that gives the static seal.

[0071] . Moreover, trigger 70 is hinged to the hinging wall 34 of the support body 30 and the active portion 72 of said trigger 70 arranges below membrane 14.

[0072] . Membrane 14 is held in position between the support body 30 and the coupling element 20. In particular, the delimiting wall 22 arranges axially spaced relative to said membrane 14, delimiting a dispensing chamber 110 therewith for said dispensing head 1.

[0073] . The covering wall 90 arranges in coverage of the coupling element 20, holding the delimiting wall 22 of said coupling element 20 in position through said annular off shot 92.

[0074] . In a first configuration, called rest configuration, the fluid to be dispensed is held in the dispensing chamber 110 and the trigger is arranged in a rest position wherein the active portion 72 does not influence membrane 14 (figures 1 and 5).

[0075] . In said configuration, the annular projection 42 of the inner annular guide wall 36 of the support body 30 is sealed on the annular enlargement 18 of the tubular stem 8, thus obtaining a static seal.

[0076] . Said seal is especially useful during the transport or storage of the dispensing device, to prevent the fluid from being spilled out of the container through the compensation duct.

[0077] . In a further configuration, called dispensing configuration, the trigger is rotated from the rest position and the active portion 72 influences membrane 14, deforming it.

[0078] . Moreover, the tubular stem 8 shifts along said pumping axis X-X, sliding into said inner tubular guide wall 36.

[0079] . Such shifting disconnects the annular projection 42 from the annular enlargement 18 of the tubular stem 8, undoing the static seal mentioned above.

[0080] . A dispensing step is obtained by shifting from the rest configuration to the dispensing configuration.

[0081] . From the dispensing chamber 110, the fluid is pushed towards the dispensing duct 28 and dispensed.

[0082] . The action of the fluid into the dispensing chamber 110 pushes the closing wall 16 towards the tubular stem 8, preventing the fluid from returning in the container through the cut.

[0083] . In other words, said closing wall 16, said cut and said tubular stem 8 form a preferred embodiment of check valve means adapted for preventing the backflow of the fluid from the dispensing chamber 110 to the container during said dispensing step.

[0084] . In an intermediate return configuration, trigger 70 is released and the deformed membrane 14 exhibits the tendency to return to the non-deformed starting configuration.

[0085] . A suction step is obtained from the dispensing configuration to the intermediate return configuration.

[0086] . The increase of the volume of the dispensing chamber 110 causes an action on the closing wall 16, moving it away from the tubular stem 8 and thus opening a passage through which the fluid can be fed to the dispensing chamber 110.

[0087] . The tendency of membrane 14 to return to the non-deformed configuration causes a suction action on the fluid contained in the container, so that a given amount of said fluid flows through the elongated tubular element 60 and goes into the dispensing chamber 110.

[0088] . The passage of said given amount of fluid from the container to the dispensing chamber 110 causes an air

suction action that from outside the container, through said support body 30 and through said compensation duct 100, goes in the container, for compensating the volume of fluid moved to the dispensing chamber.

[0089] . In particular, during the suction step, the moderate opening between the annular projection 42 and the surface of the tubular stem 8 allows the air to pass in the compensation duct 100.

[0090] . In particular, the sucked air passes through the end portion 106, the expansion portion 104 and the narrowing portion 102 of said compensation duct 100.

[0091] . At the end of the suction step, the device is again in the rest configuration, wherein the static seal is restored.

[0092] . By virtue of the configuration of the compensation duct 100, and in particular of the narrowing portion 102 that prevents a sudden and free air flow towards the container space, there is a negative pressure state in the compensation duct when the static seal is restored.

[0093] . The narrowing portion 59 projecting from the truncated-cone portion 58 surrounds the elongated tubular element 60, so as to prevent the free outward flow of the fluid for the entire stroke of membrane 14.

[0094] . Moreover, when the compensation duct 100 is at first filled with air, it further prevents the fluid passage, acting as a plenum chamber. In fact, to go outwards, the fluid should push out an air column that creates between the narrowing portion 102 of the compensation duct 100 and the enlargement-projection connection.

[0095] . Innovatively, during the repeated dispensing and subsequent suction steps, the device has shown a considerable capability of reducing and even eliminating fluid leaks through the compensation duct.

[0096] . Laboratory tests have confirmed the efficacy of the device.

[0097] . A typical test is carried out by arranging ten dispensing devices filled with fluid to be dispensed.

[0098] . The device is inclined relative to the horizontal plane and the trigger is actuated five times. Any leaks of fluid and the amount of such leaks are then assessed.

[0099] . The test is carried out for each device at different inclinations relative to the horizontal plane (30 hexagesimal degrees, 15 hexagesimal degrees and parallel to the horizontal plane). Moreover, the device is inclined both frontally and laterally.

[0100] . The test is repeated every day, once a day, for six days.

[0101] . Between each test, the samples are stored at 40 degrees centigrade in oven.

[0102] . The presence of fluid on the outside is assessed and classified with the codes: 0 if no leak is detected; 1 if a leak contained in the support body is detected; 2 if a leak that wets the hands is detected.

[0103] . The following table summarises the measures obtained for a daily test.

	Test 1					
	Front actuation			Side actuation		
	30°	15°	parallel	30°	15°	parallel
sample 1	0	0	0	0	0	0
sample 2	0	0	0	0	0	0
sample 3	0	0	0	0	0	0
sample 4	0	0	0	0	0	0
sample 5	0	0	0	0	0	0
sample 6	0	0	0	0	0	0
sample 7	0	0	0	0	0	0
sample 8	0	0	0	0	0	0
sample 9	0	0	0	0	0	0
sample 10	0	0	0	0	0	0

[0104] . Similar values were obtained for the tests carried out in the other days.

[0105] . The tests carried out have proved the high efficacy of the dispensing device according to the present invention.

[0106] . Advantageously, moreover, the device prevents fluid leaks during the transport of the devices in their rest configuration.

[0107] . According to a further advantageous aspect, the device according to the present invention exhibits a simple structure, wherein the narrowing is obtained by connecting a perforated element to the device float.

[0108] . It is clear that a man skilled in the art may make several variations and changes to the dispensing device

according to the present invention in order to meet specific and incidental needs, all falling within the scope of protection defined in the following claims.

Claims

1. A dispensing device adapted for dispensing at least one fluid, comprising:

   - containment means adapted for containing said fluid, wherein said containment means comprise a container having a space for containing the fluid;
   - pumping means adapted for being actuated for sucking a given amount of fluid from said containment means during a suction step and adapted for dispensing said given amount of fluid outside the device during a dispensing step;
   - actuating means adapted for being handled by a user for actuating said pumping means;

   wherein said space of the container is in communication with a compensation duct (100) comprising a narrowing portion (102) directly in communication with said space and having a crown-shaped passage section delimited by an inner wall and an outer wall parallel to one another and wherein said outer wall exhibits an axial extension greater than the thickness of said outer wall;
   and wherein said compensation duct (100) further comprises an expansion portion (104), following said narrowing portion (102).

2. A device according to claim 1, wherein said expansion portion (104) exhibits a nominal dimension greater than the diameter of said narrowing portion (102) of duct (100).

3. A device according to claim 1, wherein said expansion portion (104) comprises a truncated-cone portion converging towards said narrowing portion (102).

4. A device according to claim 3, wherein said expansion portion (104) comprises a cylindrical portion connected to said truncated-cone portion, at a side opposed to said narrowing portion (102).

5. An appliance according to any one of the previous claims, comprising static sealing means adapted for eliminating fluid leaking through said compensation duct (100).

6. A device according to claim 5, wherein said expansion duct (100) comprises an end portion (106) delimited by said static sealing means.

7. A device according to claim 6, wherein said end portion (106) is tapered towards said sealing means.

8. A device according to any one of claims 5 to 7, wherein said sealing means comprise a connection between an annular enlargement (18) and an annular projection (42).

9. A device according to claim 8, wherein said enlargement (18) is obtained on an annular stem (8) through which, in said dispensing configuration, the fluid to be dispensed flows.

10. A device according to claim 9, wherein said annular projection (42) protrudes from an inner tubular guide wall (36) of a support body (30), said tubular stem (8) sliding in said inner tubular guide wall (36) during said fluid dispensing step.

11. A device according to any one of the previous claims, comprising a deformable membrane (14) adapted for delimiting, at least partly, a dispensing chamber (110) wherein the fluid to be dispensed is held in a rest configuration of the device.

12. A device according to claim 11, wherein said membrane (14) protrudes from a tubular stem (8) through which, in said dispensing configuration, the fluid to be dispensed flows.

13. A device according to claim 11 or 12, further comprising a coupling element (20) adapted for connecting with said membrane for forming said dispensing chamber (110).

14. A device according to claim 13, wherein said coupling element comprises a dispensing duct (28) adapted for placing said dispensing chamber (110) in fluid communication with the outside of the device.

15. A device according to any one of claims 11 to 14, further comprising check valve means adapted for preventing the backflow of the fluid held in said dispensing chamber (110) during said dispensing step.

16. A device according to any one of the previous claims, comprising covering means, adapted for at least partly covering said pumping means.

17. A device according to any one of the previous claims, wherein said narrowing portion is internally delimited by an elongated tubular element (60) adapted for extending into said container for drawing the fluid to be dispensed and externally by an annular compensation wall (54) of a removable compensation element (50).

18. A device according to claim 17, wherein said compensation element (50) comprises a perforated plate (52) from which said annular compensation wall (54) protrudes.

19. A device according to claim 18, wherein said plate (52) is adapted for being associated to the bottom end (38) of a support body (30).

20. A device according to claim 19, comprising a threaded ring nut (2) for connecting the dispensing head (1) to the container.

21. A device according to claim 18, wherein said plate (52) is adapted for being associated to the edge of the container neck.

22. A device according to claim 21, comprising a bayonet connection for connecting the dispensing head (1) to the container.

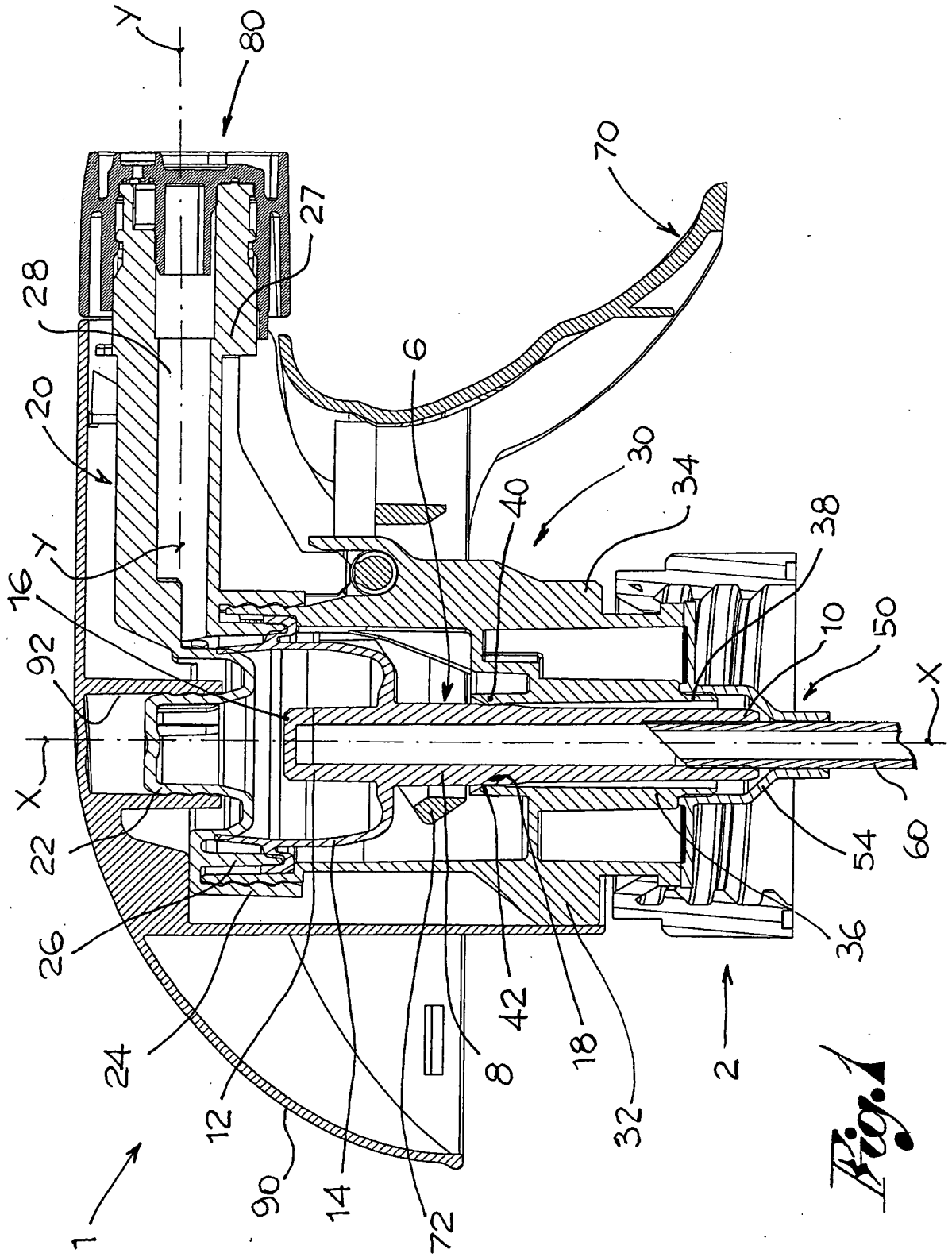
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Fig.1

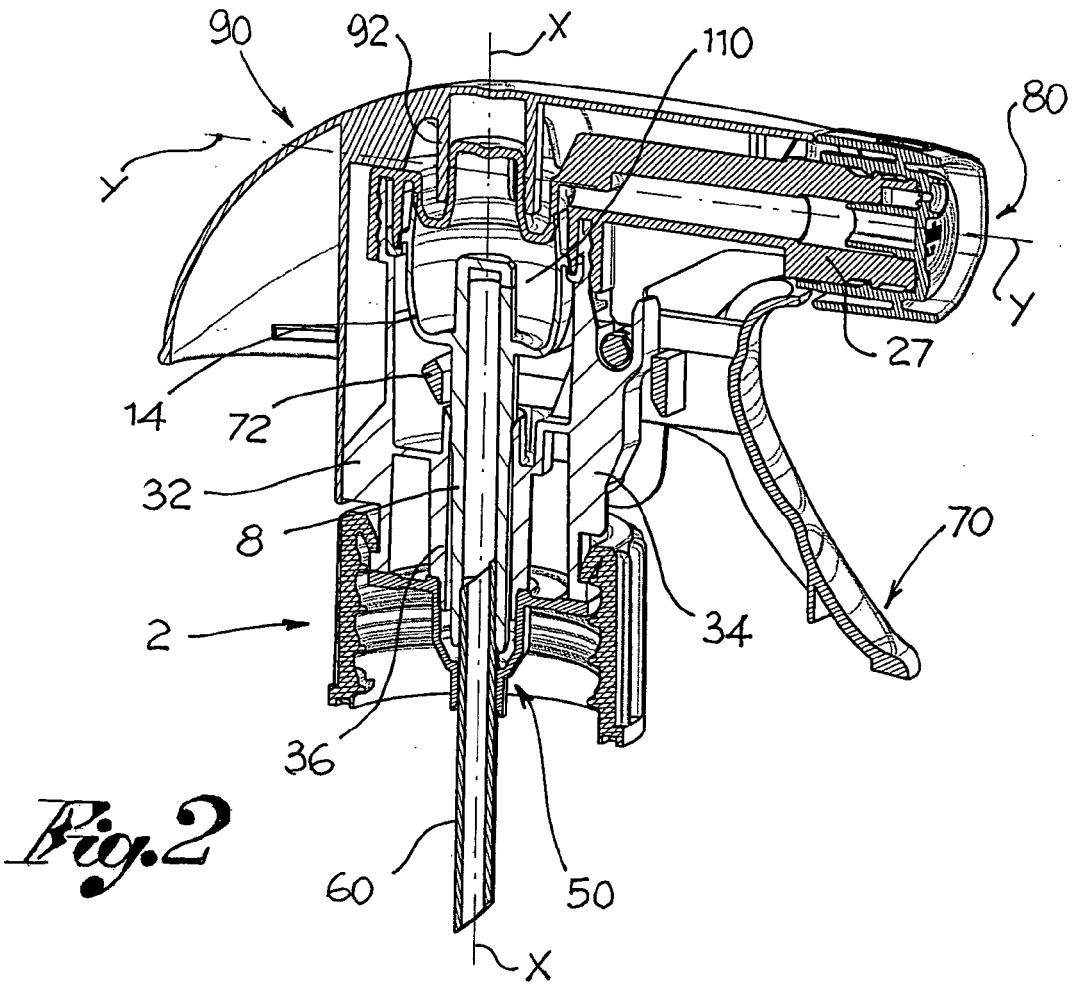
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Fig.2

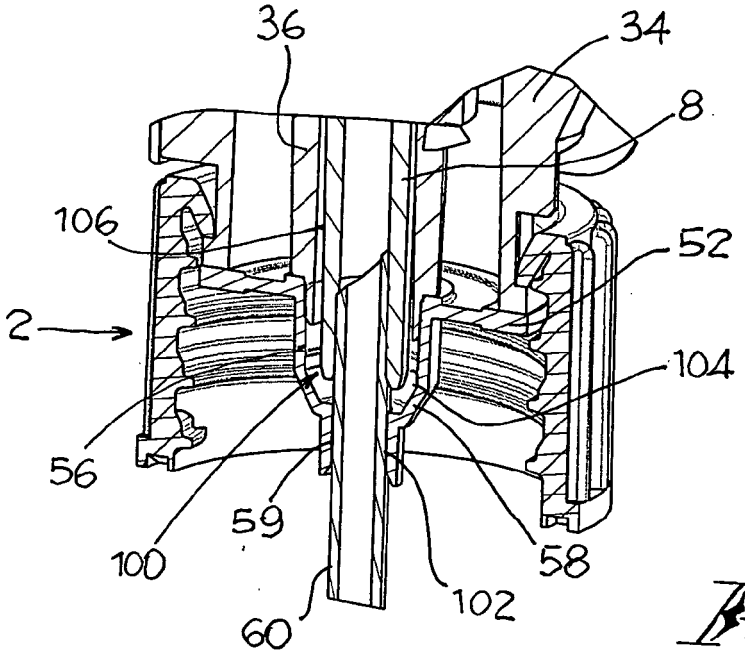
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Fig.3

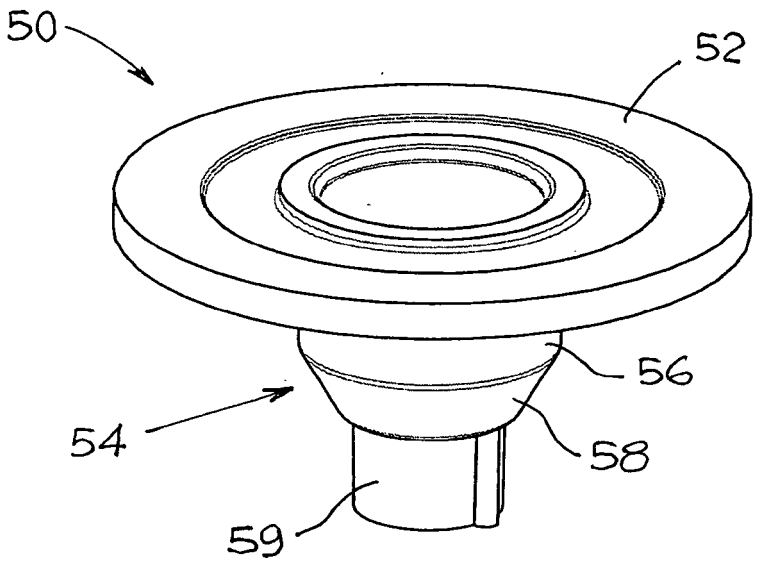

Fig. 4a

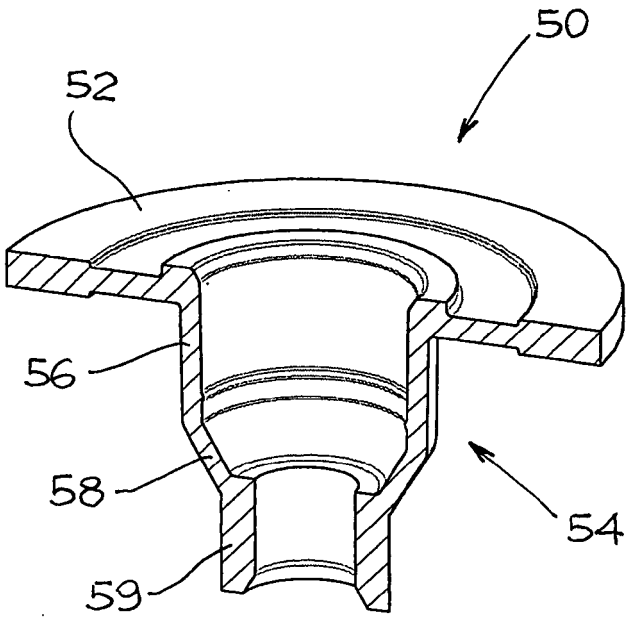

Fig. 4b

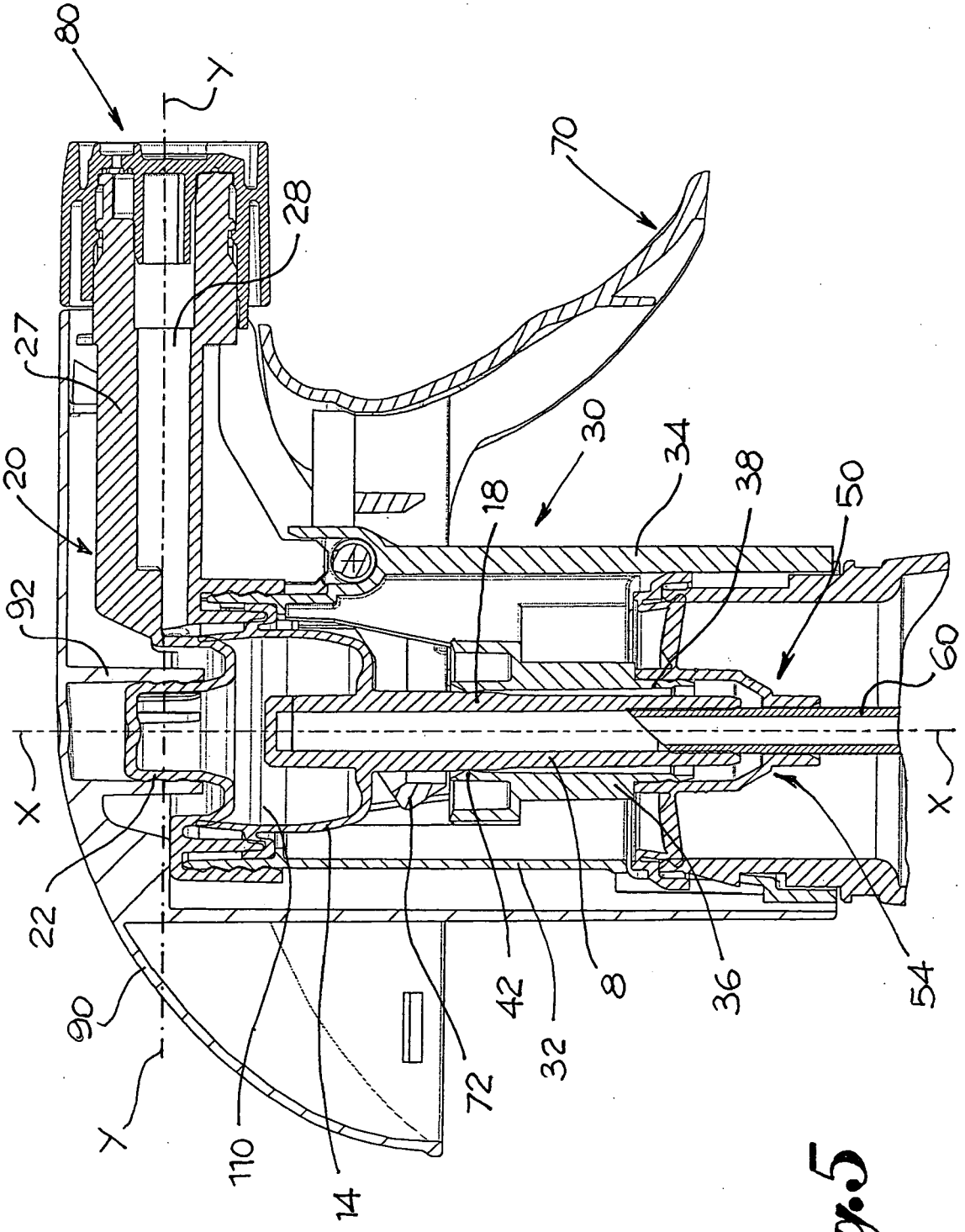

Fig.5

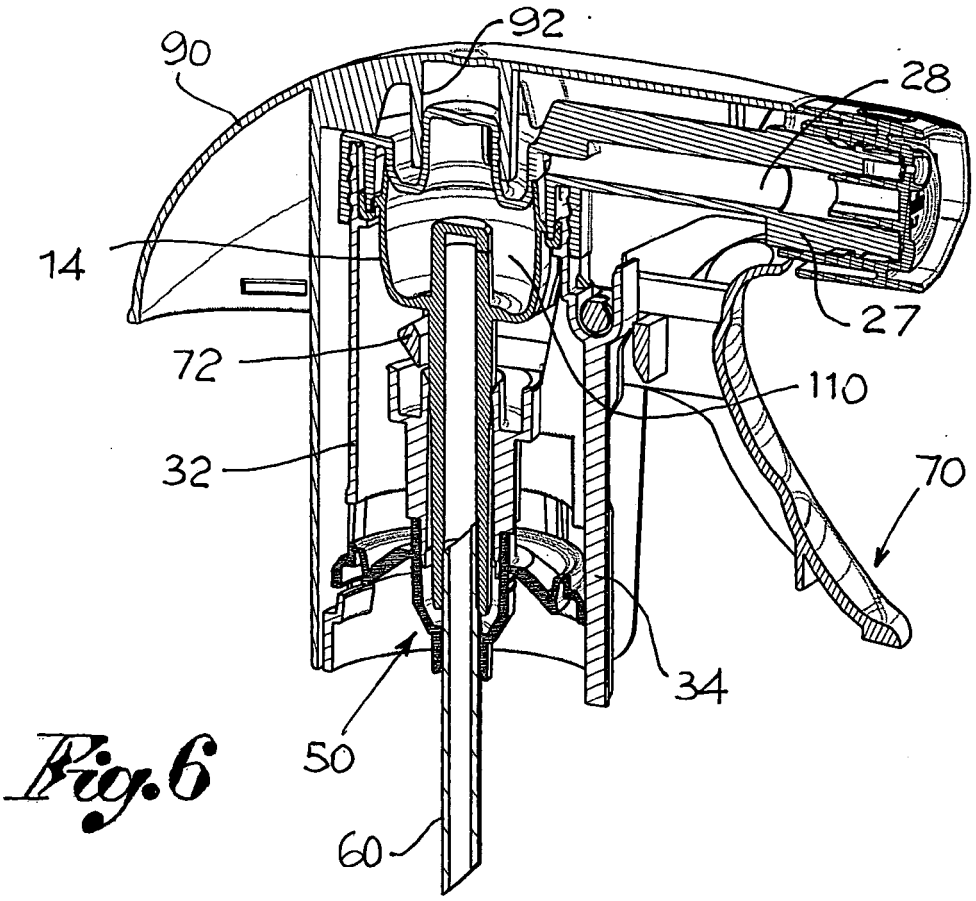
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Fig.6

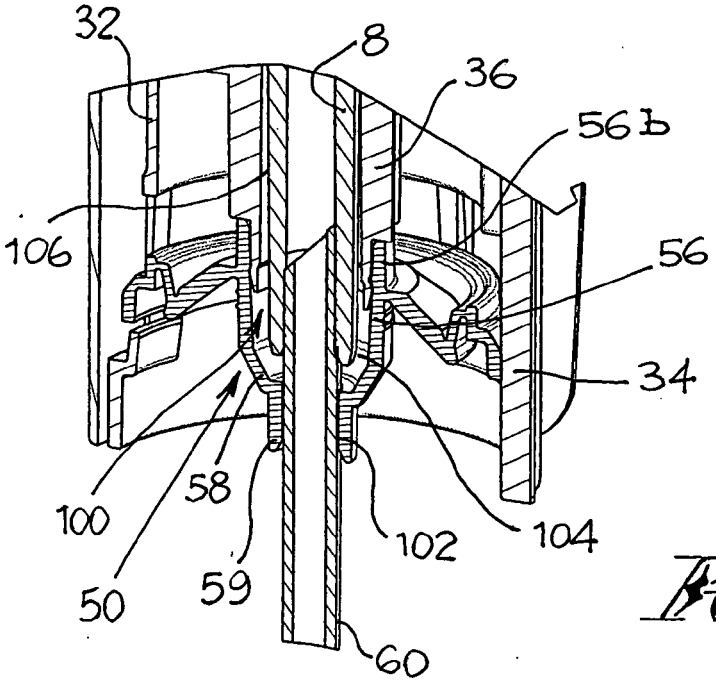
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Fig.7

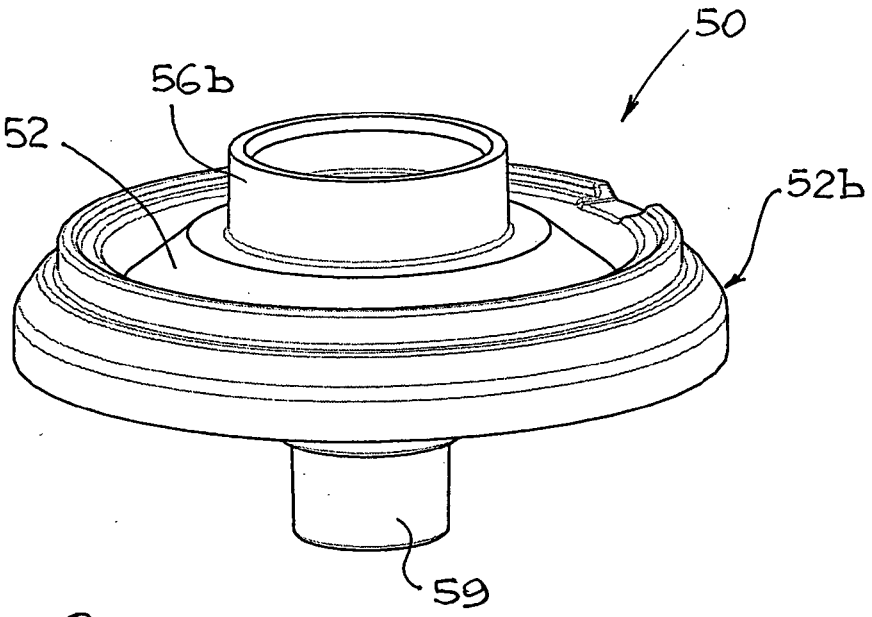

Fig. 8a

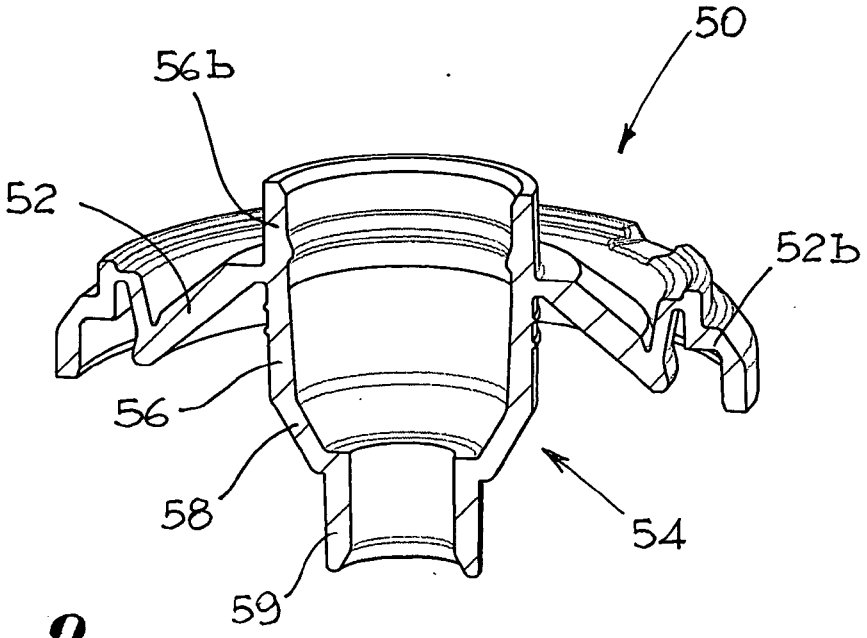

Fig. 8b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5271

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.7)
D,A	WO 01/26822 A (GUALA DISPENSING S.P.A; BISTOLFI, MAURIZIO) 19 April 2001 (2001-04-19) * page 1, line 1 - page 2, line 4 * * page 3, line 21 - page 4, line 4 * * page 6, line 1 - page 10, line 16; figures 1-3,16,17 *	1	B05B11/00
D,A	US 4 606 480 A (RODRIGUEZ GAZULLA ET AL) 19 August 1986 (1986-08-19) * column 3, line 46 - column 7, line 13; figures 1-3 *	1	
A	EP 1 046 428 A (OWENS-ILLINOIS CLOSURE INC) 25 October 2000 (2000-10-25) * paragraph [0004] - paragraph [0006] * * paragraph [0008] - paragraph [0023]; figures 1-7 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 August 2005	van der Bijl, S

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 42 5271

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09-08-2005

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