

(19)



(11)

EP 2 345 480 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

20.07.2011 Bulletin 2011/29

(51) Int Cl.:

B05B 11/00 (2006.01)

B05B 1/16 (2006.01)

B05B 1/12 (2006.01)

B05B 1/34 (2006.01)

(21) Application number: **10195007.9**

(22) Date of filing: **14.12.2010**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

(71) Applicant: **Guala Dispensing S.p.A.**
15047 Alessandria (IT)

(72) Inventor: **Contiero, Paolo**
I-15073, Castellazzo Bormida, ALESSANDRI (IT)

(74) Representative: **Pulieri, Gianluca Antonio**
Jacobacci & Partners S.p.A.
Piazza della Vittoria, 11
25122 Brescia (IT)

(30) Priority: **15.01.2010 IT BS20100003**

(54) **Multipurpose spray nozzle**

(57) A multipurpose dispenser head (1) of a liquid comprises, on the top of the nozzle (50) a sealing device

(30), to prevent leakages of liquid between the apertures (62, 64) enabling different types of jet to be dispensed.

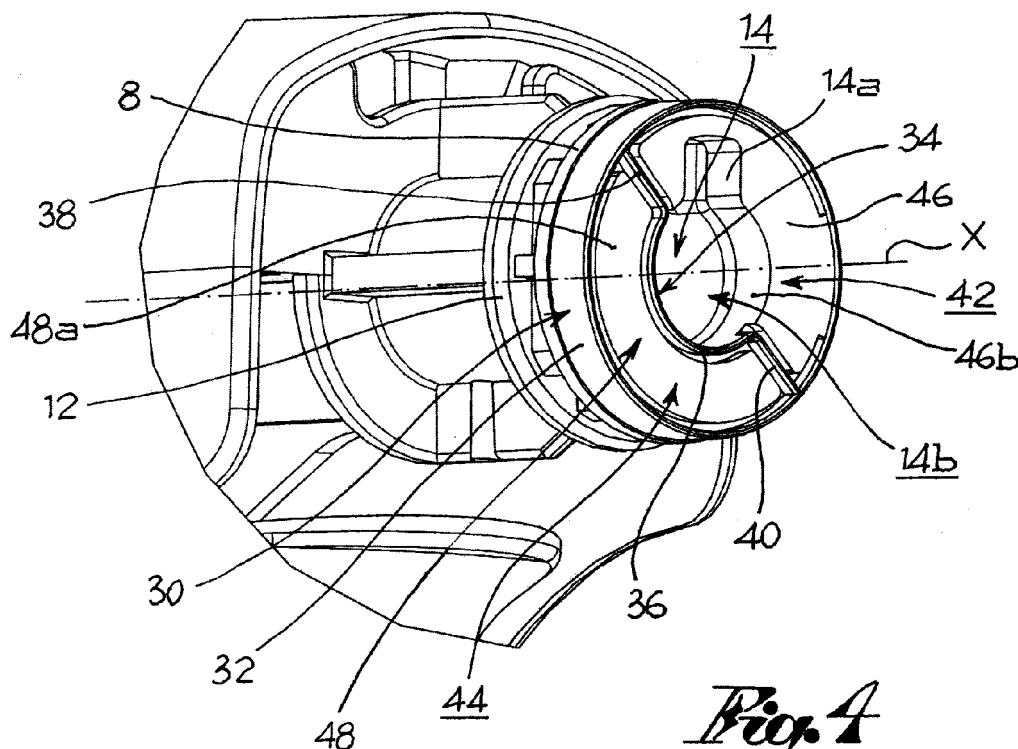


Fig. 4

EP 2 345 480 A1

Description

[0001] The present invention relates to a dispenser device of a liquid, manually operated, for example by a trigger. In particular, the present invention relates to a trigger-operated dispenser device able to dispense liquid according to at least two types of jet dispensed. Such type of dispenser device is known in the trade as a "multipurpose" dispenser device.

[0002] In the dispenser devices sector, and in particular that of devices intended for domestic use, the need to spray liquid in many types of jet is strongly felt, for example so as to obtain an almost continuous jet in a clearly specified direction, or more of a spray more widely distributed through the air. The two jets are usually dispensed from two separate openings present on the nozzle.

[0003] Many solutions of multipurpose dispensing devices exist. Some solutions are illustrated for example in the documents US 6,997,397, US 6,536,686, US 6,446,882, US 6,382,527, US 5,664,732 and IT 1311301.

[0004] However, the prior solutions have a number of drawbacks, due to the manufacturing complexity of the components of the device and their limited functionality. Often, in fact, the prior multipurpose dispenser devices present a discharge of liquid both from the active opening of the nozzle, corresponding to the desired jet, and from the other opening, on account of leakage between the components.

[0005] The purpose of the present invention is to satisfy the aforementioned requirements while at the same time overcoming the drawbacks of the prior solutions. Such purpose is achieved by a dispenser device made according to claim 1.

[0006] The characteristics and advantages of the dispenser device according to the present invention will be evident from the following description, made by way of a nonlimiting example, with reference to the attached drawings, wherein:

[0007] - figure 1 shows a dispenser head of a dispenser device according to the present invention, fitted with a nozzle;

[0008] - figure 2 shows the head in figure 1 without the nozzle;

[0009] - figure 3 shows a cross-section view of a portion of the dispenser head in figure 1;

[0010] - figure 4 shows an enlargement of the area IV in figure 2;

[0011] - figure 5 shows the inside of the nozzle in figure 1;

[0012] - figures 6a and 6b show the dispenser head in a first dispensing configuration;

[0013] - figures 7a and 7b show the dispenser head in a second dispensing configuration; and

[0014] - figure 8 shows the dispenser head in a closed configuration.

[0015] According to the present invention, a manually operated dispenser device of a liquid, for example trigger-

operated, comprises a container to contain the liquid and a dispenser head 1, mechanically associable with the container, to dispense the liquid.

[0016] In particular, the head 1 can be connected to the neck of the container, for example by a threaded connection or a bayonet connection.

[0017] The head 1 comprises pumping means suitable to aspirate the liquid from the container and dispense it towards the outside environment to dispense the liquid.

[0018] For example, the pumping means comprise a pumping chamber suitable for being placed in fluidic communication with the chamber of the container, a dispenser duct 2 suitable for being placed in communication with the pumping chamber and with the outside environment, and a piston sliding so as to be airtight in the pumping chamber.

[0019] Furthermore, the head 1 comprises manual operating means suitable for being manually operated to activate the pumping means.

[0020] For example, the operating means comprise a trigger 4 mechanically connected to the piston of the pumping means.

[0021] The dispenser duct 2 extends along a rectilinear dispenser axis X and is annularly delimited by a duct wall 6, which extends from an entrance end to an opposite exit end 8 towards the outside environment, having a front surface 8a, for example lying on an imaginary plane perpendicular or incident to the dispensing axis X.

[0022] The duct wall 6 comprises at least one support section 10 having a lateral circular surface cylindrical to the dispensing axis X.

[0023] According to a preferred embodiment, between the support section 10 and the front surface 8a of the exit end 8, the duct wall 6 comprises an annular boss 12, projecting radially externally.

[0024] The dispenser duct 2 ends towards the outside environment in a mouth 14 comprising a lateral aperture 14a asymmetric to the dispensing axis X.

[0025] In other words, the mouth 14 has a central portion 14b, for example circular and intercepted by the dispensing axis X, and said lateral aperture 14a, which extends on one side only from the central aperture 14b and is therefore asymmetric to the dispensing axis.

[0026] Preferably, the duct wall 6 is made in a plastic material, for example in polypropylene, for example in RE420MO made by Borealis A/S; for example, the material of the duct wall has a hardness of 50 to 70 Shore D.

[0027] Furthermore, the dispenser head 1 comprises a sealing device 30 positioned on the top of the duct wall 6.

[0028] The sealing device 30 is made preferably in a softer material than the material of the duct wall; for example, the sealing device is made in a plastic material, for example a thermoplastic elastomer such as Laprene® 979, made by So.F.Ter. S.p.A.; for example, the material of the sealing device has a hardness of 50 to 60 Shore A.

[0029] In other words, the septum 34 and the front wall 52 of the nozzle 50 are made from different materials,

one more yielding than the other, to ensure tightness against the leakage of liquid.

[0030] According to a preferred embodiment, the sealing device 30 comprises an outer ring 32, preferably continuous, projecting axially from the front surface 8a of the duct wall 6; for example, the outer ring 32 is a cylindrical circular wall, having a height A1, measured axially from the front surface 8a, and is positioned along the peripheral rim of the front surface 8a.

[0031] Preferably moreover, the sealing device 30 comprises a septum 34 which joins two points of the outer ring 32, such as two diametrically opposite points, without crossing the mouth 14.

[0032] In other words, the septum 34 comprises a main section 36 which peripherally skirts the mouth 14, and in particular the central aperture 14b of it, so as not to cross it.

[0033] According to a preferred embodiment, the septum 34 comprises two lateral sections 38, 40 which extend from the ring 32 inwards, for example radially, and the main section 36, which connects the two lateral sections 38, 40, for example in an arched pattern.

[0034] The septum 34 projects axially from the front surface 8a of the duct wall 6; preferably the septum 34 has a height A2, measured axially from the front surface 8a, substantially equal to the height of the ring 32.

[0035] The septum 34 divides the front surface 8a into an active area 42, which contains the lateral aperture 14a of the mouth 14, and an inactive area 44.

[0036] Preferably, moreover, the sealing device 30 comprises a first island 46, in the active area 42, axially lowered in relation to the height of the ring 32 and of the septum 34 and having a front surface 46a, lying on an imaginary plane perpendicular to the dispensing axis X, separated along the peripheral rim from the ring 32 and from the lateral sections 38, 40 of the septum 34.

[0037] Moreover, the first island 46 has a lateral surface 46b, which is a cylindrical surface formed of generators parallel to the dispensing axis X, shaped so as to define the lateral aperture 14a of the mouth 14 and partially the central aperture 14b of said mouth 14. The remaining part of the central aperture 14b of the mouth 14 is delimited by the central section 36 of the septum 34.

[0038] Preferably, the first island is connected on the bottom to the ring 32 and to the septum 34.

[0039] Furthermore, according to one embodiment, the sealing device 30 comprises a second island 48, in the active area 44, axially lowered in relation to the height of the ring 32 and the septum 34 and having a front surface 48a lying on an imaginary plane perpendicular to the dispensing axis X, separated along the peripheral rim from the ring 32, by the lateral sections 38, 40 of the septum 34 and by the central section 36 of said septum.

[0040] Preferably, the second island 48 is connected on the bottom to the ring 32 and to the septum 34.

[0041] According to one embodiment, the sealing device 30 is made in a single piece, by moulding, as a separate component from the other components of the dis-

penser head 1, and subsequently attached to the duct wall 6.

[0042] According to a preferred embodiment, the sealing device 30 is made in a single piece, by co-moulding together with the duct wall 6.

[0043] Furthermore, the dispenser head 1 comprises a nozzle 50, applied to the exit of the dispensing duct 2, that is to say, to the exit end 8 of the duct wall 6.

[0044] The nozzle 50 comprises a front wall 52, axially overlapping the sealing device 30, so that the ring 32 and the septum 34 are axially compressed.

[0045] The nozzle 50 comprises connection devices suitable to connect the nozzle 50 to the duct wall 6 in a rotatable manner around the dispensing axis X, constraining it axially.

[0046] According to one embodiment, the connection devices comprise an annular connection wall 54, which extends axially from the front wall 52, having a cylindrical circular inner surface in contact with the outer surface of the support section 10 of the duct wall 6.

[0047] Moreover, the connection devices comprise a nozzle boss 56, projecting radially inwards from the connection wall 54, to snap-engage with the annular boss 12 of the duct wall 6, axially constraining the nozzle 50 to said duct wall 6 and compressing the ring 32 and the septum 34 of the gasket 30.

[0048] Preferably the nozzle 50 comprises an annular skirt 60, positioned radially outside the connection wall 54 and joined to it and/or the front wall 52. The skirt 60 is suitable to be rotated manually, to perform rotation of the nozzle 50.

[0049] Preferably the skirt 60 has, on its outer surface, explanatory indications 60' of the functioning configuration of the dispenser head. For example, the skirt 60 has indentations on its outer surface which form the words "ON" or "OFF" or symbols identifying the type of jet obtainable when said symbol is aligned with a fixed indicator in relation to rotation of the nozzle.

[0050] The front wall 52 has an inner surface 52a, facing towards the sealing device 30 and in contact with the ring 32 and the septum 34 of it, and an opposite outer surface 52b.

[0051] The nozzle 50 further comprises a first opening 62 and a second opening 64, made as through apertures through the axial thickness of the front wall 52 having the intake on the inner surface 52a, positioned angularly spaced out in relation to the dispensing axis X, for example by 180°.

[0052] On the inner wall 52a of the front wall 52, a first channel 62' and a second channel 64 are provided; each channel 62', 64' extends respectively from the first opening 62 or second opening 64, terminating in a respective channel end 62", 64" angularly spaced out from each other; for example the two channel ends 62", 64" are angularly spaced out by 180°.

[0053] By rotating the nozzle 50 around the dispensing axis X, the first opening 62 and the second opening 64 are selectively in communication with the mouth 14 of

the duct 2, so as to select the type of jet desired.

[0054] In a first dispensing configuration, corresponding to a first angular position of the nozzle (figures 6a and 6b), the first channel 62' partially overlaps the mouth 14, and in particular the lateral aperture 14a of it; a duct is formed between the first channel 62' and the first island 46 of the sealing device 30, so that the mouth 14 is in fluidic communication with the first opening 62, which the liquid can come out of.

[0055] In the first configuration, the first opening 62 and the first channel 62' entirely overlap the active area 42 of the sealing device.

[0056] In said configuration, however, the second opening 64 is not in fluidic communication with the mouth 14 and said second opening 64 and the second channel 64' entirely overlap the inactive area 44 of the sealing device 30.

[0057] Moreover, on the inner surface 52a, the first opening 62 and the first channel 62' are separated from the second opening 64 and the second channel 64' by the compressed septum 34, which ensures tightness.

[0058] Rotating the nozzle 50 from the position of the first configuration, for example by 180°, a second dispensing configuration is achieved (figures 7a and 7b), wherein the second channel 64' partially overlaps the mouth 14, and in particular the lateral aperture 14a of it; a duct is formed between the second channel 64' and the first island 46 of the sealing device 30, so that the mouth 14 is in fluidic communication with the second opening 64, which the liquid can come out of.

[0059] In the second configuration, the second opening 64 and the second channel 64' entirely overlap the active area 42 of the sealing device.

[0060] In said configuration, however, the first opening 62 is not in fluidic communication with the mouth 14 and said first opening 62 and the first channel 62' entirely overlap the inactive area 44 of the sealing device 30.

[0061] Moreover, on the inner surface 52a, the second opening 64 and the second channel 64' are separated from the first opening 62 and the first channel 62' by the compressed septum 34, which ensures tightness.

[0062] According to a preferred embodiment, moreover, the nozzle 50 has at least one vortication chamber, upstream of the opening and downstream of the respective channel of the same, able to place the dispensed liquid in vortication.

[0063] In the embodiment shown (figure 5), the nozzle 50 comprises a first vortication chamber 62'', upstream of the first opening 62 and downstream of the first channel 62' made simply as a smooth compartment; the nozzle 50 further comprises a second vortication chamber 64'', upstream of the second opening 64 and downstream of the second channel 64', made as a compartment which at least one vortication boss 64a projects into.

[0064] In particular, several vortication bosses 64a are foreseen, one of which 64a' is positioned immediately at the entrance of the second channel 64' into the vortication chamber 64'', to shatter the liquid emitted into the cham-

ber; the other vortication bosses 64a are positioned so as to create a whirling path for the outgoing liquid.

[0065] According to a preferred embodiment, moreover, the nozzle 50 comprises a central annular stem 80, projecting axially from the inner surface 52a of the front wall 52, and such as to axially penetrate through the mouth 14 as far as the duct 2.

[0066] In particular, the stem 80 is tubular and the inner compartment 82 is in communication with the outer surface 52b of the front wall 52 through a compartment aperture 84, while it is closed on the bottom 86, inside the duct 2.

[0067] Preferably the stem 80 comprises, proceeding axially from the inside of the duct 2 outwards, said closed bottom 86 having a cylindrical circular outer surface 86', a diverging section 88 which diverges from the inside outwards, having a truncated-cone shape outer surface 88', and a final section 90, having a cylindrical circular outer surface 90', in relation to the dispensing axis X.

[0068] The final section 90 crosses the sealing device 30 through the mouth 14, and in particular occupies the central aperture 14b of said mouth 14, while the divergent section 88 then reduces the size of the insert, to enable the transit of liquid to be dispensed.

[0069] This way, the pressure of the liquid striking the stem 80 during use of the dispensing device, and which insists on the central section 36 of the septum 34 tending to invade the inactive zone 48 of the sealing device is even further limited by the presence of the final section 90 of the stem, which is practically adherent to the central section 36 of the septum 34. The normal escape route of the liquid is therefore through the lateral aperture 14a of the mouth 14, and therefore through the opening selected for dispensing.

[0070] According to a preferred embodiment, moreover, the dispenser head 1 comprises an insert 100, externally attached to the nozzle 50, provided with at least one dispensing circuit in fluidic communication with the respective nozzle opening to dispense the product in the form of foam or to nebulise or vaporise the product.

[0071] In particular, according to the embodiment shown (figures 6b and 7b), the insert 100 comprises a first circuit emerging on the outside through a first window 102 and in fluidic communication with the first opening 62, and a second circuit emerging on the outside through a second window 104, for example fitted with rotating elements, in fluidic communication with the second opening 64.

[0072] The liquid dispensed is placed in rotation by the rotatory elements of the window 104, generating foam, generally of limited density, with a high surface coverage.

[0073] According to one embodiment, the insert 100 comprises a net, for example in polypropylene, positioned on the window 102, for example on the outer surface of the insert 100, able to generate, by impact of the liquid upon it, very dense foam.

[0074] Rotating the nozzle, selecting the first dispensing configuration, and operating the pumping means by

means of the trigger 4, the liquid is dispensed from the first opening 62, crossing the first vortication chamber 62", and comes out in the outside environment from the first window 102, in the form of foam, nebulised or vaporised, according to the characteristics of the first circuit of the insert 100.

[0075] Rotating the nozzle, selecting the second dispensing configuration, and operating the pumping means by means of the trigger 4, the liquid is dispensed from the second opening 64, crossing the second vortication chamber 64", and comes out in the outside environment from the second window 104, in the form of foam, nebulised or vaporised, according to the characteristics of the second circuit of the insert 100.

[0076] Preferably moreover, the dispenser head envisages a closed configuration (figure 8), wherein the nozzle is an intermediate angular position between that of the first dispensing configuration and that of the second dispensing configuration.

[0077] In the closed configuration, both the first opening 62 with respective first duct 62', and the second opening 64 with respective second duct 64', are fluidically separate from the lateral aperture 14a and/or from the mouth 14, so that the liquid cannot be dispensed outwards.

[0078] According to a further embodiment variation (not shown), the head 1 comprises a door joined to the insert, so as to close the two windows to prevent dispensing of the liquid, even if the nozzle is in the first dispensing configuration or in the second dispensing configuration.

[0079] Innovatively, the dispenser head according to the present invention is extremely reliable during use, especially as regards the selection of a specific type of jet.

[0080] Advantageously, moreover, the production of the head is simplified in that the high level of reliability is achieved by fitting a further component, easy to produce, or by means of co-moulding.

[0081] According to a further advantageous aspect, the dispenser device can be used in a very intuitive manner, in that the jet of liquid dispensed always maintains the same fixed position in relation to the dispenser device, thereby avoiding confusion for the user. For example, in the embodiment shown, looking at the insert in figures 6b or 7b from the front, dispensing is always from the right hand window, while by rotating the nozzle the type of jet dispensed is changed.

Claims

1. Dispenser head (1) of a liquid comprising:

a) pumping means suitable to be operated manually, for example by a trigger, to aspirate the liquid from a container and dispense it outwards, comprising a duct wall (6) extending along a dispensing axis (X) and terminating in a front surface (8a), in which the duct wall (6) delimits a duct (2) terminating in a mouth (14) comprising

a lateral aperture (14a);

b) a nozzle (50) positioned downline of the duct (2) and rotatable around the duct axis (X), comprising a front wall (52) having an inner surface (52a) facing towards the lateral aperture (14a), in which the front wall (52) is provided with a first opening (62) and a second opening (64), wherein the openings (62, 64) have the relative intakes on the inner surface (52a), through the front wall (52) and are suitable to be alternatively placed in fluidic communication with the lateral aperture (14a) of the duct (2) by means of rotation of the nozzle (50);

c) a sealing device (30) comprising a septum (34) projecting axially from the front surface (8a) of the duct wall (6), placed in abutment with the inner surface (52a) of the front wall (52), to fluidically separate the intake of the first opening (62) from the intake of the second opening (64).

2. Head according to claim 1, wherein the septum (34) and the front wall (52) of the nozzle (50) are made from different materials, one more yielding than the other.

3. Head according to claim 2, wherein the septum (34) is made from material yielding in relation to the material of the front wall (52) of the nozzle (50).

4. Head according to any of the previous claims, wherein

- the mouth (14) comprises a lateral aperture (14a), distanced from the dispensing axis (X) and asymmetric to it, and a central aperture (14b) intercepted by the dispensing axis (X); and
- the septum (34) comprises a central "U"-shaped section (36) which peripherally partially delimits the central aperture (14b).

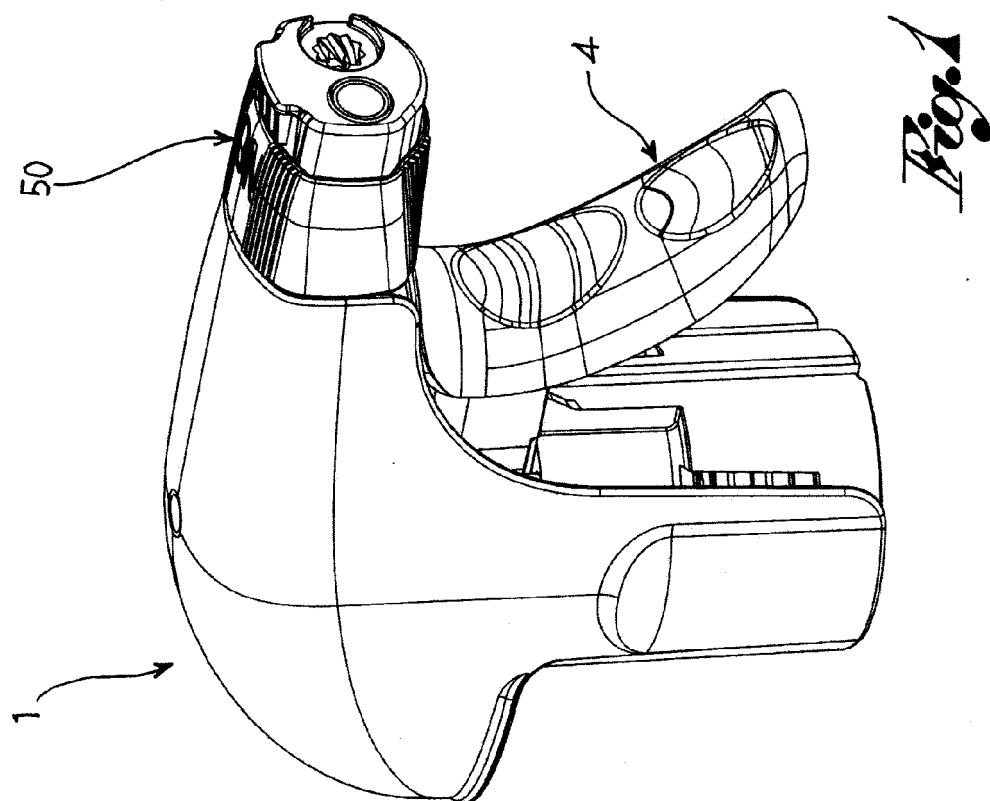
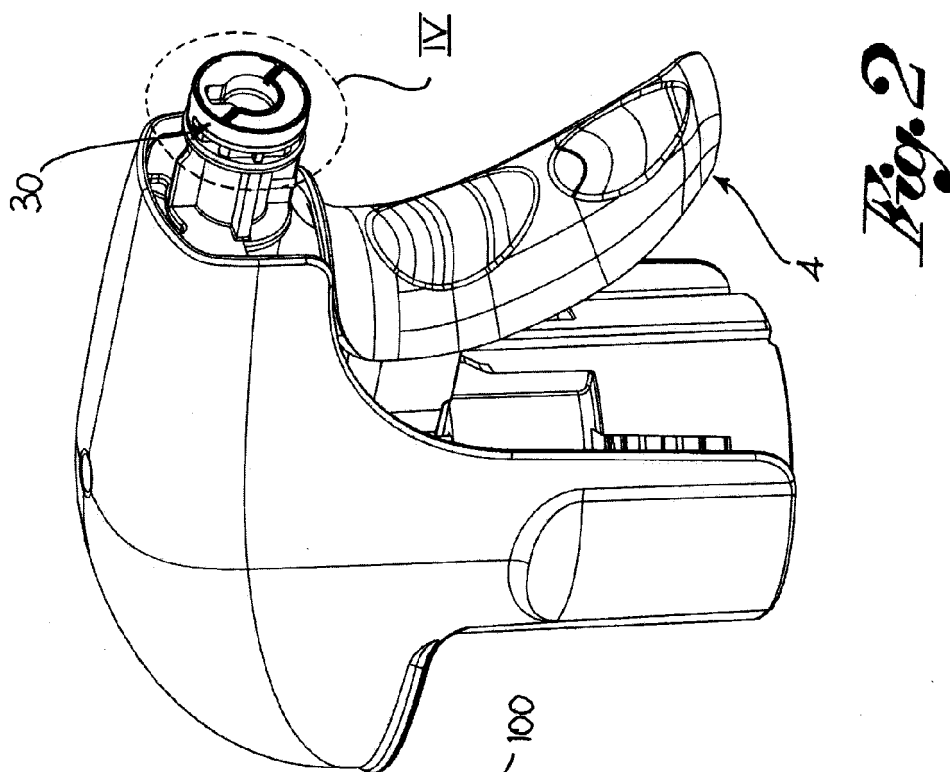
5. Head according to any of the previous claims, wherein the sealing device (30) comprises an outer ring (32) projecting axially and positioned peripherally to the front surface (8a), radially external to the openings (62, 64), in which the septum (34) is connected to the extremities by said ring (32).

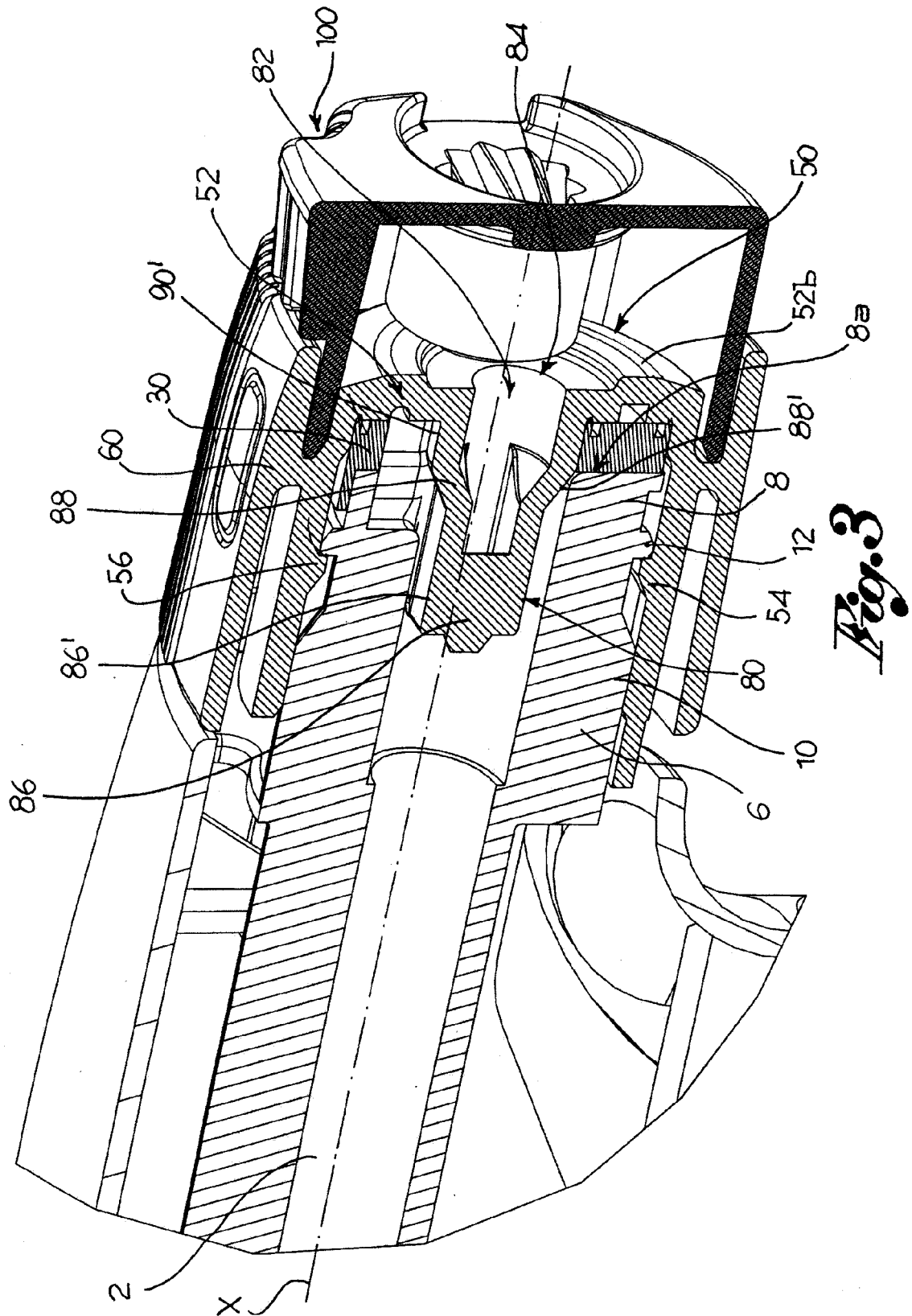
6. Head according to claim 5, wherein the septum (34) is connected to the ring (32) in diametrically opposite points.

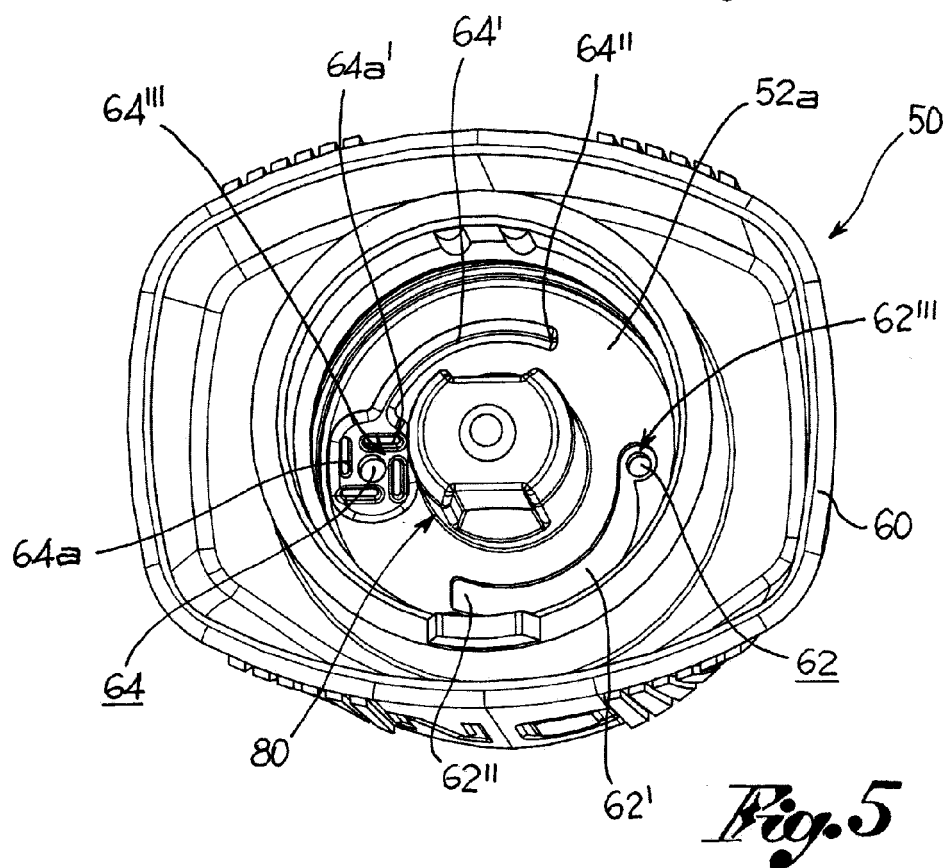
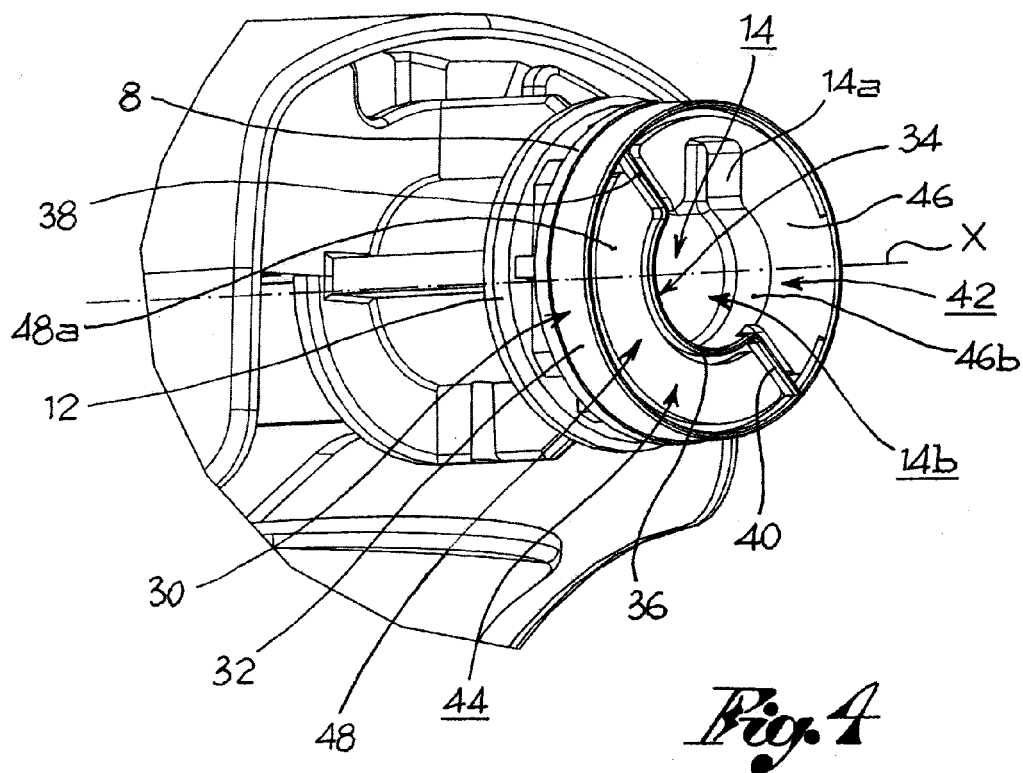
7. Head according to any of the previous claims, wherein the sealing device (30) comprises:

- a first island (46), positioned in an active area (42) on one side of the septum (34), shaped so as to delimit the lateral aperture (14a) and at least partially the central aperture (14b), axially

- lowered in relation to the septum (34);
and wherein the nozzle (50) has, on the inner surface (52a):
- a first channel (62') connected on one side to the first opening (62) and on the other side extending as far as a first end of the channel (62");
 - a second channel (64') connected on one side to the second opening (64) and on the other side extending as far as a second end of the channel (64");
- wherein the first channel (62') or the second channel (64') form a duct with the first island (46) for the liquid being dispensed from the lateral aperture (14a) to the first opening (62) or second opening (64) respectively.
- 8.** Head according to claim 7, wherein the sealing device (30) comprises:
- a second island (48), positioned in an inactive area (44) on the other side of the septum (34), shaped so as to delimit at least the remaining part of the central aperture (14b), axially lowered in relation to the septum (34).
- 9.** Head according to any of the previous claims, wherein the sealing device (30) is made in one piece.
- 10.** Head according to claim 9, wherein the sealing device is applied to the duct wall (6).
- 11.** Head according to claim 9, wherein the sealing device is co-moulded with the duct wall (6).
- 12.** Head according to any of the previous claims, wherein the nozzle (50) comprises, on the inner surface (52a) of the front wall (52), a first vortication chamber (62'') upline of the first opening (62) and a second vortication chamber (64'') upline of the second opening (64).
- 13.** Head according to any of the previous claims, wherein the nozzle (50) comprises a stem (80) projecting axially from the inner surface (52a) of the front wall (52), penetrating the duct (2) through the mouth (14), at least partially in contact with the walls delimiting it.
- 14.** Head according to any of the previous claims, comprising an insert (100) attached to the outside of the nozzle (50) and comprising:
- a first circuit emerging on the outside through a first window (102) and in fluidic communication with the first opening (62)); and
 - a second circuit emerging on the outside through a second window (104), for example fitted with spray elements, in fluidic communication with the second opening (64).
- 15.** Dispenser device of a liquid comprising:
- a container to contain the liquid;
 - a dispenser head (1) mechanically associable with the container, made according to any of the previous claims.







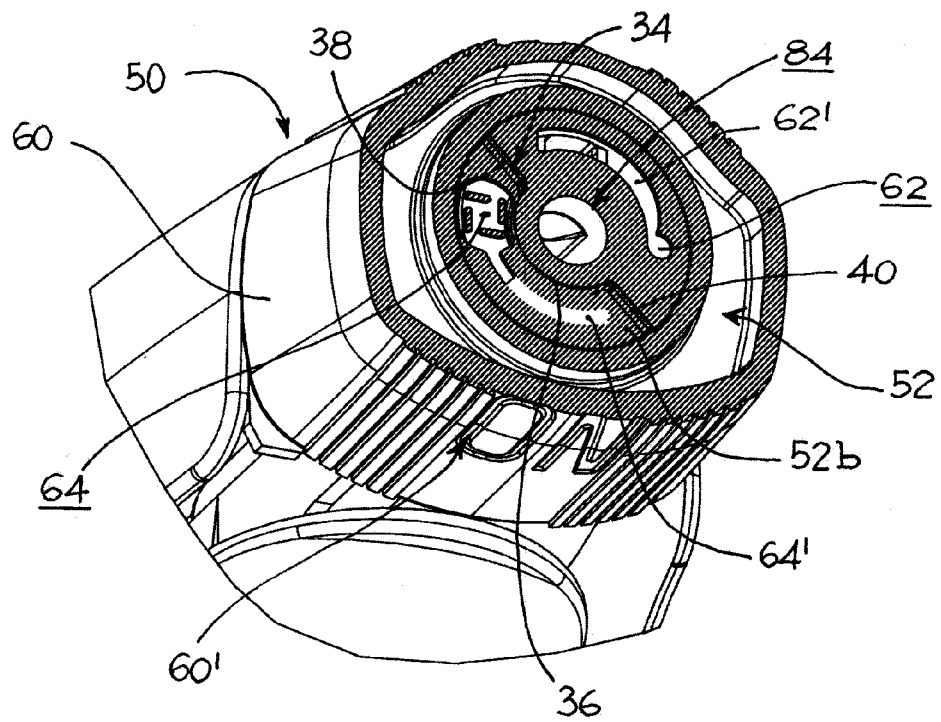
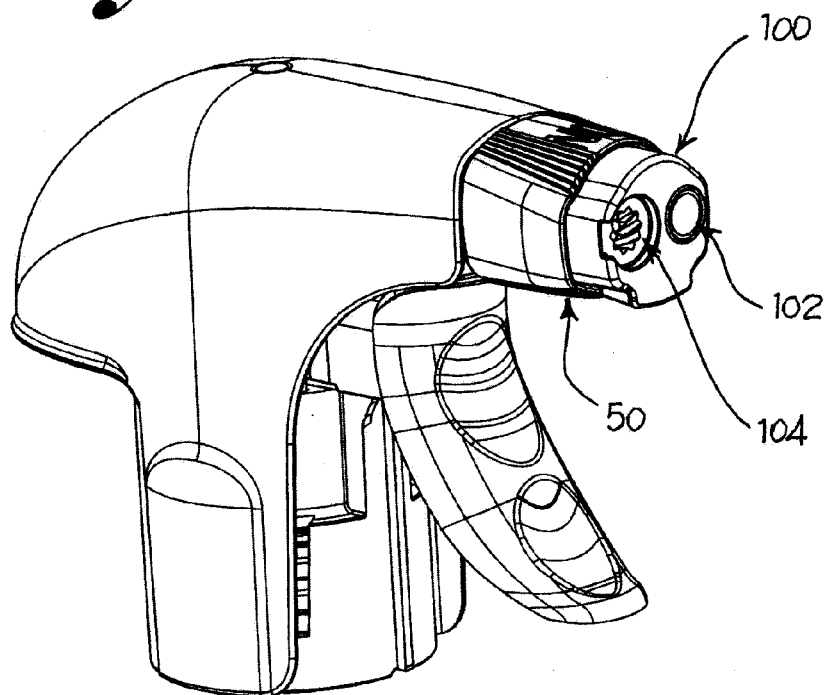


Fig. 6a

Fig. 7b



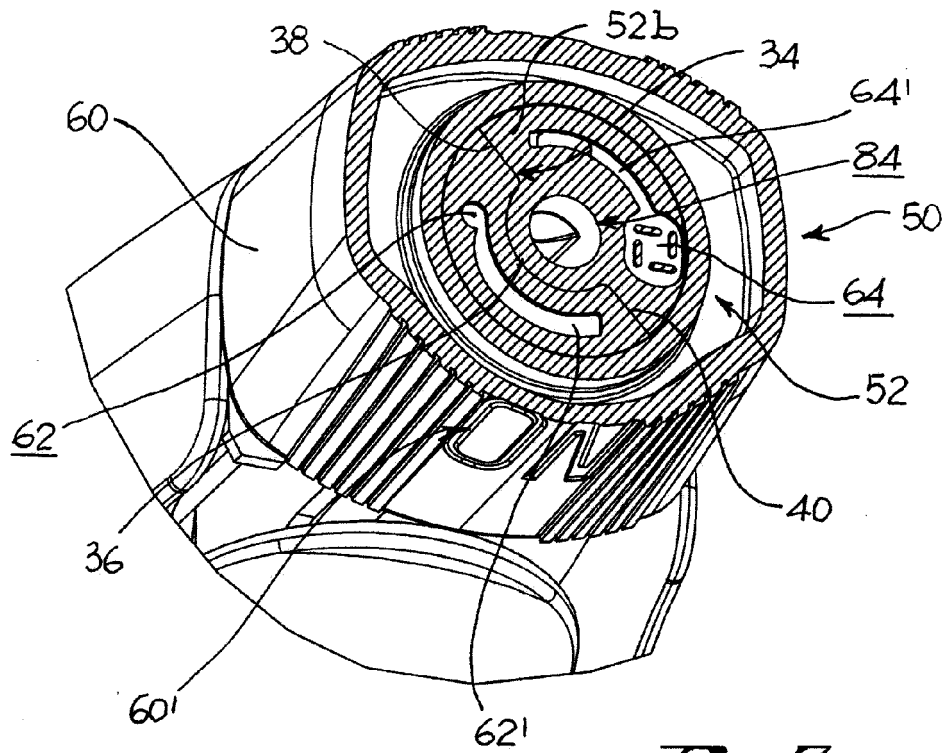


Fig. 7a

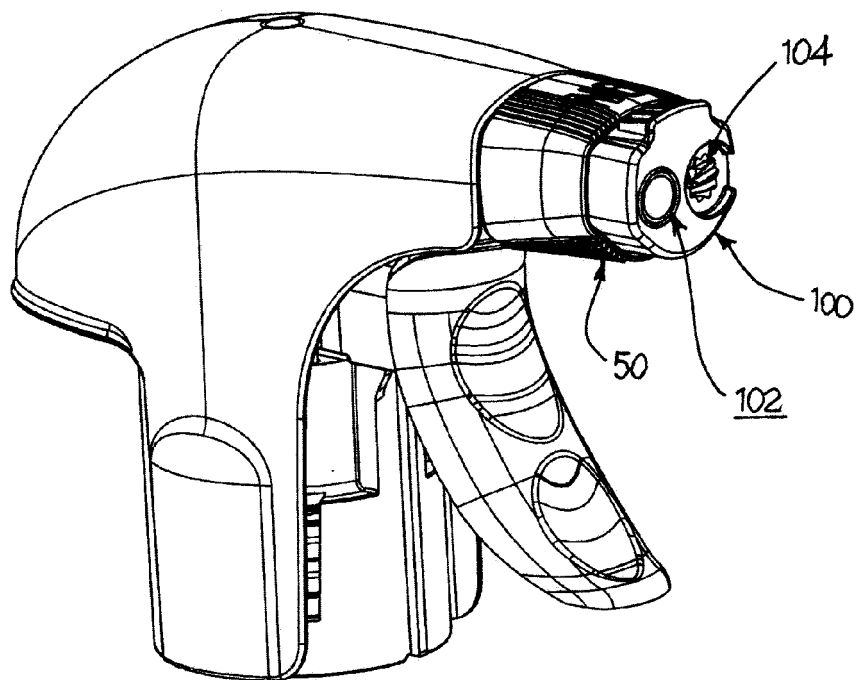


Fig. 6b

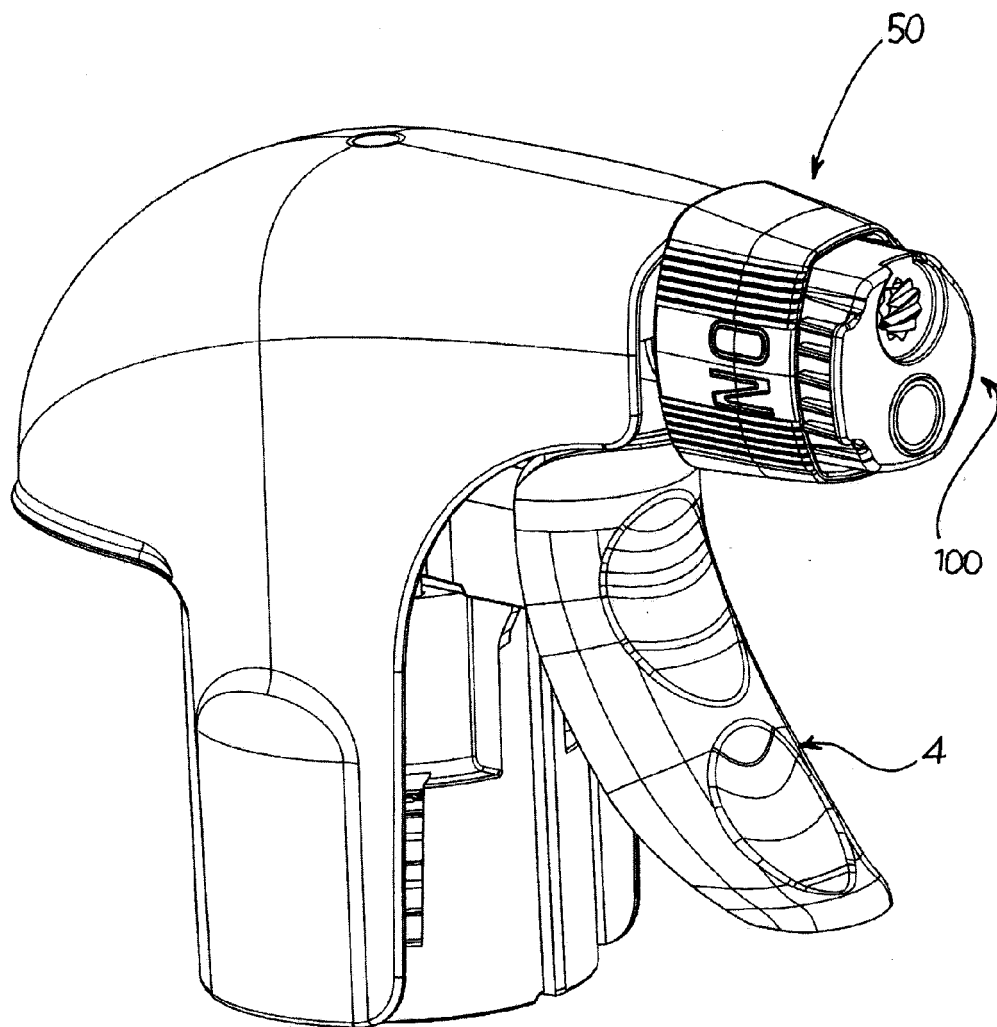


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 10 19 5007

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 100 58 029 A1 (GUALA DISPENSING SPA [IT]) 13 June 2001 (2001-06-13) * column 2, line 61 - column 3, line 8 * * column 3, line 9 - column 5, line 30 * * figures *	1-4,9-15	INV. B05B11/00 B05B1/16 B05B1/12 B05B1/34
Y	US 7 007 867 B1 (DRAPEAU RAOUL EAST [US]) 7 March 2006 (2006-03-07) * column 5, line 4 - column 6, line 20 * * column 7, line 3 - line 8 * * figures *	1-4,9-15	
A	US 4 247 048 A (HAYES THOMAS H) 27 January 1981 (1981-01-27) * column 2, line 40 - line 57 * * column 3, line 17 - column 6, line 58 * * figures *	1-15	
A	US 7 036 689 B1 (LAFHEY MARTIN S [US]) 2 May 2006 (2006-05-02) * column 2, line 30 - column 3, line 60; figures *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		13 April 2011	Endrizzi, Silvio
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			

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 19 5007

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-04-2011

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 10058029	A1	13-06-2001	IT	T0991073 A1	06-03-2000
US 7007867	B1	07-03-2006	NONE		
US 4247048	A	27-01-1981	CA	1137141 A1	07-12-1982
US 7036689	B1	02-05-2006	NONE		

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6997397 B [0003]
- US 6536686 B [0003]
- US 6446882 B [0003]
- US 6382527 B [0003]
- US 5664732 A [0003]
- IT 1311301 [0003]