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(54) Device for filling a receptacle and filling machine

Vorrichtung zum Füllen von Behältern und Füllmaschine

Dispositif pour le remplissage des recipients et machine de remplissage

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Description

[0001] The present invention relates to device for filling a receptacle and a filling machine.

[0002] The reference sector is the bottling of so-called "sensitive" food products, i.e. products that are particularly sensitive to bacteriological contamination and oxidation, such as, for example, isotonic drinks, juices, nectars, soft drinks, tea, milk-based drinks, coffee-based drinks, etc., for which it is fundamental to prevent all microbiological contamination throughout the packaging stages.

[0003] Packaging lines using aseptic technology are already known, wherein the different operations take place in a controlled contamination environment, for which the bottled products are stored for a prolonged period of time and have chemical/physical and organoleptic stability even at room temperature.

[0004] In general, an aseptic packaging line envisages:

- sterilisation of the filling product;
- sterilisation of the containers;
- sterilisation of the closures or caps;
- sterilisation of the environment in which the filling and capping take place and maintenance of the sterile conditions for the entire production period.

[0005] The Applicant has recently developed a system for producing and filling containers wherein all the processing units (parisons sterilisation units, forming, filling and capping units, etc.) are protected by corresponding isolators adapted to define as many controlled contamination environments, while the means for moving the handling members of the parisons and containers are located outside the isolators themselves (European patent EP2279850).

[0006] EP1336588 discloses a device according to the preamble of claim 1.

[0007] The invention proposed herein focuses on the aseptic filling and dosing apparatus for the fluid product.

[0008] In the event of high production rates, the filling apparatuses have a rotary architecture, with a plurality of filling taps or valves arranged on the primitive circumference.

[0009] Among the known filling apparatuses, a distinction must first be made according to the product type:

- filling apparatuses of so-called "flat" products, i.e. products free from carbon dioxide;
- filling apparatuses of carbonated products, i.e. products containing carbon dioxide.

[0010] Generally, the filling of flat products takes place keeping the filling valve at a distance from the mouth of the receptacle so as to avoid any contamination of the receptacle due to contact with the valve itself, and making the product flow into the centre of the receptacle ("central"

filling). On the contrary, the filling of carbonated products almost always takes place by placing the filling valve in contact with the receptacle. In fact, the filling method for carbonated products envisages a pressurisation step of the receptacle performed by hermetically sealing the mouth by the filling valve.

[0011] On the other hand, the presence of carbon dioxide makes carbonated products less sensitive than flat ones, hence less likely to be contaminated.

[0012] A restriction in the filling of carbonated products is reducing or preventing the formation of foam. For that purpose, some known solutions use so-called flow "deflection" techniques. For example, deflection may be obtained by deflectors - i.e. protuberances - which force the flow to open in an umbrella-like fashion, therefore the product is conveyed onto the inner walls of the receptacle, while the air is evacuated from the centre of the receptacle itself. The use of deflectors reduces the turbulence of the fluid during filling, hence limiting the production of foam.

[0013] The main disadvantage of the deflectors is connected with the format change. To obtain good deflection, the protuberances or teeth must be positioned at the connection zone between the body of the bottle and the neck. The location of the deflectors therefore varies according to the format of the receptacle/bottle.

[0014] Alternatively, deflection may be obtained through helixes obtained within the filling valve. The helixes, licked by the product, cause its rotation thus creating a rotational flow that is conveyed onto the inner walls of the receptacle. The air is also evacuated in this case from the centre of the receptacle. The use of helixes resolves the format change problem.

[0015] In some aseptic bottling lines, both flat products and carbonated products need to be filled. When changing from one product type to the other, it is therefore necessary to perform manual operations in order to convert the tap so as to be able to dispense the desired product. In order not to compromise the sterility, such operations are performed using handling gloves, whose use is notoriously difficult and therefore more time consuming.

[0016] Furthermore, the components used for converting the tap are located in a storage area situated within the sterile environment of the filling machine: in fact, such components are sterilised before the start of production, along with the machine itself. Often, the storage area is difficult to access using the handling gloves, therefore the intervention operations take rather a long time.

[0017] On the other hand, if it is necessary to intervene by opening the isolator access door (for example in the plant according to EP2279850), sterility would be lost, which would need to be restored at the end of the operations, with the evident loss of time due to the downtime of the line. Document EP1411023 proposes "central" filling both for flat and carbonated products, while the evacuation of air takes place through a lateral conduit.

[0018] In this context, the technical task at the basis of the present invention is proposing a device for filling a

receptacle and a filling machine which overcome the problems of the prior art cited above.

[0019] In particular, the object of the present invention is to provide a device for filling a receptacle which is "universal", i.e. that can be used to dispense flat and carbonated products without having to perform any manual adaptation interventions.

[0020] Another object of the present invention is to propose a device for filling a receptacle and a filling machine that are able to treat flat products and carbonated products without reducing the productivity of the line.

[0021] Another object of the present invention is to propose a device for filling a receptacle that is compact and structurally simple.

[0022] The technical task set and the objects specified are substantially attained by a device for filling a receptacle and a filling machine, comprising the technical characteristics as set out in claim 1 and 9.

[0023] Further characteristics and advantages of the present invention will more fully emerge from the non-limiting description of a preferred but not exclusive embodiment of a device for filling a receptacle and a filling machine, as illustrated in the accompanying drawings, in which:

- figures 1 and 2 illustrate a device for filling a receptacle according to the present invention, in two different configurations, in a sectional view.

[0024] With reference to the figures, number 1 indicates a device for filling a receptacle 2, in particular for sensitive drinks.

[0025] In particular, the receptacle 2 is a bottle having a tubular body 2a and an externally threaded neck 2b.

[0026] In particular, the receptacle 2 is made of thermoplastic material, for example PET. Alternatively, the receptacle 2 is made of glass.

[0027] The filling device 1 comprises:

- a first passage 3 for the filling fluid;
- a valve 4;
- a dispensing nozzle 5 for dispensing the filling fluid.

[0028] The valve 4 is operatively active on the first passage 3 in order to establish its selective communication with the dispensing nozzle 5.

[0029] In particular, the valve 4 is configurable at least in:

- an open configuration, in which it enables the flow through the first passage 3 as far as the dispensing nozzle 5;
- a closed configuration, in which it stops the flow towards the dispensing nozzle 5.

[0030] The valve 4 comprises a main body 6 and a central portion 7 located at least partially within the main body 6. Preferably the central portion 7 is coaxial with

the main body 6.

[0031] Preferably, the valve 4 has a prevalently longitudinal extension, therefore both the main body 6 and the central portion 7 have a prevalently longitudinal extension.

[0032] Preferably, the valve 4 has an annular seal 11 solidly constrained to the main body 6.

[0033] The central portion 7 has a tip 7a shaped so as to convey the liquid towards the centre of the receptacle 2. Such a tip 7a is identified here with the expression "conveyor tip". In particular, the conveyor tip 7a is located in the proximity of the dispensing nozzle 5.

[0034] Preferably, the conveyor tip 7a is thinner than the body of the central portion 7.

[0035] Preferably, the conveyor tip 7a is substantially cone shaped. In particular, the lateral surface of the cone defined by the conveyor tip 7a has a concave profile, i.e. it curves inwards with respect to the conveyor tip 7a.

[0036] In the embodiments illustrated herein, the conveyor tip 7a has a rounded end.

[0037] The valve 4 further comprises a deflector member 8 solidly constrained to the central portion 7.

[0038] In a first embodiment (not illustrated), the deflector member 8 extends along the central portion 7 and widens in the direction of the conveyor tip 7a.

[0039] For example, the deflector member 8 consists of an annular protuberance of the central portion 7. In particular, the annular protuberance 8 and the central portion 7 are obtained in a single shaped part.

[0040] In a second embodiment, illustrated in figures 1 and 2, the deflector member 8 consists of a helix formed by one or more spirals. In particular, the helix 8 and the central portion 7 are obtained by a single shaped part. Alternatively, the deflector member 8 (for example the annular protuberance or the helix or any other equivalent conformations) is assembled solidly on the central portion 7.

[0041] In the central portion 7 a second passage 9 is obtained for evacuating gas from the receptacle 2 or for pressurising the receptacle 2 itself.

[0042] Means (not illustrated) are also provided for moving the central portion 7 with respect to the main body 6.

[0043] Such means move the central portion 7 between:

- a first configuration in which the central portion 7 is retracted in the main body 6 and only the conveyor tip 7a protrudes from the main body 6 to convey the filling fluid, while the deflector member 8 remains completely within the main body 6 (see figure 1).
- a second configuration in which the central portion 7 at least partially projects out from the main body 6 in such a manner that the deflector member 8 protrudes from the main body 6 so as to deflect the filling fluid to be dispensed (see figure 2).

[0044] For example, the movement means for moving

the central portion 7 are pneumatically or electrically controlled.

[0045] Preferably, when passing from the first to the second configuration, the central portion 7 performs a linear range of travel comprised between 5 mm and 60 mm.

[0046] Preferably, in the proximity of the dispensing nozzle 5 there is a further seal 10.

[0047] The filling machine (not illustrated) proposed herein comprises a plurality of filling stations where the filling devices 1 just described are active. Preferably, the filling machine is of the rotating carousel type. Alternatively, the filling machine is of the linear type.

[0048] Preferably, the filling machine has a centralised activation system for activating the movement means of the central portions 7 and the valves 4. Alternatively, in each filling station a system is provided intended to activate the movement means of the central portion 7 of the corresponding valve 8.

[0049] The operation of the device for filling a receptacle, according to the present invention, is described below.

[0050] First, the case of flat filling fluid is considered, i.e. without carbon dioxide.

[0051] Once it reaches the filling station, the receptacle 2 is located below the filling device 1, without coming into contact therewith. In particular, the mouth 2c of the receptacle 2 is kept at a pre-fixed distance from the dispensing nozzle 5 above it. Preferably, the pre-fixed distance is comprised between 5 mm and 40 mm.

[0052] The flat fluid, coming from the supply means of the known type (not illustrated), descends into the first passage 3.

[0053] The central portion 7 of the valve 4 is in the first configuration, therefore:

- only the conveyor tip 7a protrudes from the main body 6 to convey the filling fluid;
- the deflector member 8 remains completely within the main body 6.

[0054] The valve 4, which is initially in the closed configuration, is taken into the open configuration therefore it enables the flow through the first passage 3 as far as the dispensing nozzle 5. For that purpose, the valve 4 is raised so that the annular seal 11 disengages the first passage 3 (see figure 1). At the dispensing nozzle 5, the fluid is conveyed by the conveyor tip 7a of the central portion 7. Due to its cone shape and, in particular, the concave profile, the fluid is conveyed into the centre of the receptacle 2.

[0055] The dosing of the fluid can be performed by weighing means (for example a load cell), or volumetric means (for example a magnetic flow meter) of the known type.

[0056] Upon reaching the desired weight or volume, the valve 4 returns to the closed configuration therefore it stops the flow towards the dispensing nozzle 5. In par-

ticular, the annular seal 11 engages the first passage 3. The filled receptacle 2 is then ready to be closed through a cap.

[0057] Now consider a carbonated filling fluid, i.e. containing carbon dioxide. Once it reaches the filling station, the receptacle 2 is below the filling device 1. The receptacle 2 is then raised so that the further seal 10 seals the mouth 2c of the receptacle 2.

[0058] The receptacle 2 is then pressurised with carbon dioxide through the second passage 9. At the end of the pressurisation, the gas inside the receptacle 2 is at the same pressure as the gas present in the tank containing the carbonated liquid.

[0059] The central portion 7 of the valve 4 is in the second configuration, therefore the deflector member 8 protrudes from the main body 6 to deflect the filling fluid to be dispensed.

[0060] Preferably, the movement means for moving the central portion 7 are activated through the gas present in the filling fluid tank.

[0061] The valve 4, which is initially in the closed configuration, is taken into the open configuration therefore it enables the flow through the first passage 3 as far as the dispensing nozzle 5. For that purpose, the valve 4 is raised so that the annular seal 11 disengages the first passage 3 (see figure 2). At the dispensing nozzle 5, the fluid is deflected by the deflector member 8.

[0062] In particular, if the deflector member 8 consists of an annular protuberance, the flow is opened in an umbrella-like fashion, therefore the fluid is conveyed onto the inner walls of the receptacle 2. Preferably, to obtain good deflection in the event of an annular protuberance, the latter must be located in the proximity of the connection between the body of the receptacle 2a and the neck 2b. Therefore, the central portion 7 must perform a linear range of travel comprised between 5 mm and 60 mm in the passage from the first to the second configuration.

[0063] If the deflector member 8 consists of a helix (see figures 1 and 2), the fluid is placed in rotation by the helix itself, therefore a rotational flow is created which is conveyed onto the inner walls of the receptacle 2. In fact, the helix geometry imposes a whirling motion on the fluid therefore the velocity of the fluid has a tangential component which allows its adhesion to the inner walls of the receptacle 2.

[0064] In this case, it is sufficient for the central portion 7 to perform a linear range of travel comprised between 5 mm and 20 mm in the step from the first to the second configuration.

[0065] Since, with respect to the path of the fluid, the deflector member 8 is upstream of the conveyor tip 7a, the fluid is deflected by the deflector member 8 - which directs it towards the inner walls of the receptacle 2 - before being able to reach the conveyor tip 7a.

[0066] During filling, the gas is evacuated through the second passage 9.

[0067] The dosing of the fluid can be performed by weighing means (for example a load cell), or volumetric

means (for example a magnetic flow meter) of the known type.

[0068] Upon reaching the desired weight or volume, the valve 4 returns to the closed configuration therefore it stops the flow towards the dispensing nozzle 5. In particular, the annular seal 11 engages the first passage 3.

[0069] At this point, the receptacle 2 is depressurised, i.e. returned to atmospheric pressure. The receptacle 2 is then lowered with respect to the filling device 1 and is ready to be closed via a cap.

[0070] The characteristics of the device for filling a receptacle and the filling machine, according to the present invention, are clear, as are the advantages.

[0071] In particular, the filling device proposed is universal, i.e. able to dispense both flat products and carbonated products without having to perform any manual adaptation/conversion intervention.

[0072] This is made possible by the conformation of the central portion of the valve, which has:

- a conveyor tip, essential for conveying the flow of flat products centrally into the receptacle, and
- a deflector member, which is extracted in the filling of carbonated products, imposing the latter to enlarge the flow towards the inner walls of the receptacle.

[0073] With respect to the path of the fluid, the deflector member is upstream of the conveyor tip, however:

- when filling with flat products, the deflector member remains hidden within the valve, therefore it does not come into contact with the product;
- when filling with carbonated products, the fluid is deflected by the deflector member - which directs it towards the inner walls of the receptacle - before being able to reach the conveyor tip, even if this still projects out of the valve.

[0074] Furthermore, the sliding assembly of the central portion with respect to the main body of the valve ensures that:

- when filling with flat products there is no contact between the filling device and the receptacle, so as to prevent the contamination of the latter;
- when filling with carbonated products, the filling device forms a seal on the receptacle to allow it to be pressurised.

[0075] The embodiment with a deflector member consisting of a helix is even more advantageous since it is sufficient to make the central portion only perform a linear range of travel (maximum 20 mm), regardless of the format of the receptacle.

[0076] To pass from operation with flat products to operation with carbonated products it is sufficient to move the central part of the valve, hence preventing manual

interventions with machine downtime. Hence the productivity of the line is preserved.

[0077] The passage from one type of operation to the other is therefore automated and does not require either the use of handling gloves (inconvenient) or the opening of the isolator access doors.

[0078] Finally, the version with a centralised activation system for activating the movement means allows the components of the filling machine to be further reduced.

Claims

1. A device for filling (1) a receptacle (2), comprising:

a dispensing nozzle (5) for dispensing the filling fluid;
a first passage (3) for the filling fluid;
a valve (4) that is operatively active on said first passage (3) so as to establish selective communication thereof with said dispensing nozzle (5), said valve (4) comprises:

a main body (6);
a central portion (7) at least partially situated inside the main body (6), said central portion (7) having a tip (7a) shaped in such a manner as to convey the fluid towards the centre of the receptacle (2), said tip (7a) being located in the proximity of said dispensing nozzle (5);
a deflector member (8) solidly constrained to said central portion (7);
a second passage (9), afforded in said central portion (7), for evacuating gas from the receptacle (2);
movement means for moving said central portion (7) between a first configuration, wherein said central portion (7) is retracted in said main body (6) so that only said tip (7a) protrudes from the main body (6) so as to convey the filling fluid, said deflector member (8) remaining completely inside said main body (6), and a second configuration, wherein said central portion (7) at least partially projects out from the main body (6) in such a manner that said deflector member (8) protrudes from the main body (6) so as to deflect the filling fluid to be dispensed,
characterised in that said deflector member (8) is located upstream of said tip (7a) of the central portion (7), with respect to the course of the fluid in the first passage (3).

2. The device (1) according to claim 1, wherein said tip (7a) of the central portion (7) is substantially cone-shaped.

3. The device (1) according to claim 2, wherein the lateral surface of the cone defined by said tip (7a) has a concave profile, that is, it curves inwards with respect to said tip (7a). 5
4. The device (1) according to any one of the preceding claims, wherein said deflector member (8) extends along said central portion (7) and widens in the direction of said tip (7a) of the central portion (7). 10
5. The device (1) according to claim 4, wherein said deflector member (8) consists in an annular protuberance of the central portion (7).
6. The device (1) according to claims 1 to 3, wherein said deflector member (8) consists in a helix formed by one or more spirals. 15
7. The device (1) according to any one of the preceding claims, further comprising a seal (10) placed in the proximity of said dispensing nozzle (5). 20
8. The device (1) according to any one of the preceding claims, wherein said central portion (7) has a linear range of travel comprised between 5 mm and 60 mm in passing from the first to the second configuration. 25
9. A filling machine for filling receptacles (2), comprising a plurality of devices (1) according to any one of the preceding claims. 30

Patentansprüche

1. Vorrichtung zum Füllen (1) von Behältern (2), umfassend: 35
 - eine Abgabedüse (5) zum Abgeben der Füllflüssigkeit;
 - einen ersten Durchlauf (3) für die Füllflüssigkeit; 40
 - ein Ventil (4), das auf dem ersten Durchlauf (3) zur Herstellung dessen selektiven Kommunikation mit der Abgabedüse (5) operativ aktiv ist, wobei das Ventil (4) Folgendes umfasst:
 - einen Hauptkörper (6);
 - ein mindestens teilweise innerhalb des Hauptkörpers (6) befindliches Mittelteil (7), wobei das Mittelteil (7) ein Ende (7a) hat, das so ausgebildet ist, dass es die Flüssigkeit zur Behältermitte (2) leitet, wobei das Ende (7a) sich in der Nähe der Abgabedüse (5) befindet; 45
 - ein Ableitelement (8), welches mit dem Mittelteil (7) fest verbunden ist;
 - einen zweiten Durchlauf (9), ausgebildet in dem Mittelteil (7), zur Gasabführung vom Behälter (2); 50

Bewegungsmittel zum Bewegen des Mittelteils (7) zwischen einer ersten Konfiguration, in der das Mittelteil (7) im Hauptkörper (6) zurückgezogen ist, so dass nur das Ende (7a) vom Hauptkörper (6) herausragt, um die Füllflüssigkeit abzuleiten, wobei das Ableitelement (8) gänzlich innerhalb des Hauptkörpers (6) bleibt, und einer zweiten Konfiguration, in der das Mittelteil (7) mindestens teilweise vom Hauptkörper (6) herausragt, so dass das Ableitelement (8) vom Hauptkörper (6) herausragt, um die zu abgebende Füllflüssigkeit abzuleiten, **dadurch gekennzeichnet, dass** das Ableitelement (8) sich vor dem Ende (7a) des Mittelteils (7) relativ zum Verlauf der Flüssigkeit im ersten Durchlauf (3) befindet.

2. Vorrichtung (1) nach Anspruch 1, wobei das Ende (7a) des Mittelteils (7) eine im Wesentlichen konische Form aufweist.
3. Vorrichtung (1) nach Anspruch 2, wobei die seitliche Oberfläche des vom Ende (7a) definierten Konus ein konkaves Profil hat, das heißt es ist relativ zum Ende (7a) nach innen gebogen.
4. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei das Ableitelement (8) sich längs des Mittelteils (7) erstreckt und sich in Richtung des Endes (7a) des Mittelteils (7) erweitert.
5. Vorrichtung (1) nach Anspruch 4, wobei das Ableitelement (8) aus einem ringförmigen Vorsprung des Mittelteils (7) besteht.
6. Vorrichtung (1) nach den Ansprüchen 1 bis 3, wobei das Ableitelement (8) aus einer aus einer oder mehreren Spiralen gebildeten Schraube besteht.
7. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, umfassend zudem eine Dichtung (10), die sich in der Nähe der Abgabedüse (5) befindet.
8. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei das Mittelteil (7) einen Linearhub zwischen 5 mm und 60 mm beim Übergang von der ersten zur zweiten Konfiguration ausführt.
9. Füllmaschine zum Füllen von Behältern (2), umfassend eine Vielfalt von Vorrichtungen (1) nach einem der vorhergehenden Ansprüche.

Revendications

1. Dispositif pour le remplissage (1) de récipients (2), comprenant :

une buse de distribution (5) destinée à distribuer le fluide de remplissage ;
un premier conduit (3) destiné au fluide de remplissage ;
une vanne (4) étant fonctionnellement active sur ledit premier conduit (3) de sorte à établir la communication sélective de celui-ci avec ladite buse de distribution (5), ladite vanne (4) comprenant :

un corps principal (6) ;
une partie centrale (7) située au moins partiellement à l'intérieur du corps principal (6), ladite partie centrale (7) ayant une pointe (7a) ayant une forme qui permet de diriger le fluide vers le centre du récipient (2), ladite pointe (7a) étant située à proximité de ladite buse de distribution (5) ;
un organe de déviation (8) solidaire de la ladite partie centrale (7) ;
un second conduit (9), réalisé dans ladite partie centrale (7), destiné à évacuer du gaz du récipient (2) ;
des moyens de déplacement destinés à déplacer ladite partie centrale (7) entre une première configuration, dans laquelle ladite partie centrale (7) est rétractée dans ledit corps principal (6) de sorte que seule ladite pointe (7a) dépasse du corps principal (6) de manière à dévier le fluide de remplissage, ledit organe de déviation (8) restant complètement à l'intérieur dudit corps principal (6), et une seconde configuration, dans laquelle ladite partie centrale (7) dépasse au moins partiellement du corps principal (6) de manière à ce que ledit organe de déviation (8) dépasse du corps principal (6) de sorte à dévier le fluide de remplissage à distribuer,
caractérisé en ce que ledit organe de déviation (8) est situé en amont de ladite pointe (7a) de la partie centrale (7) par rapport au parcours du fluide dans le premier conduit (3).

2. Dispositif (1) selon la revendication 1, dans lequel ladite pointe (7a) de la partie centrale (7) est substantiellement en forme de cône.
3. Dispositif (1) selon la revendication 2, dans lequel la surface latérale du cône défini par ladite pointe (7a) possède un profil concave, c'est-à-dire qu'il s'incurve vers l'intérieur par rapport à ladite pointe (7a).
4. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel ledit organe de déviation (8) se prolonge le long de ladite partie centrale (7) et s'élargit dans la direction de ladite pointe (7a) de la partie centrale (7).

5. Dispositif (1) selon la revendication 4, dans lequel ledit organe de déviation (8) consiste en une saillie annulaire de la partie centrale (7).

6. Dispositif (1) selon les revendications de 1 à 3, dans lequel ledit organe de déviation (8) consiste en une hélice formée d'une ou plusieurs spirales.

7. Dispositif (1) selon l'une quelconque des revendications précédentes, comprenant de plus un joint d'étanchéité (10) placé à proximité de ladite buse de distribution (5).

8. Dispositif (1) selon l'une quelconque des revendications précédentes, dans lequel ladite partie centrale (7) effectue une course linéaire comprise entre 5 mm et 60 mm lors du passage de la première à la seconde configuration.

9. Machine de remplissage destinée au remplissage de récipients (2), comprenant une pluralité de dispositifs (1) selon l'une quelconque des revendications précédentes.

FIG. 1

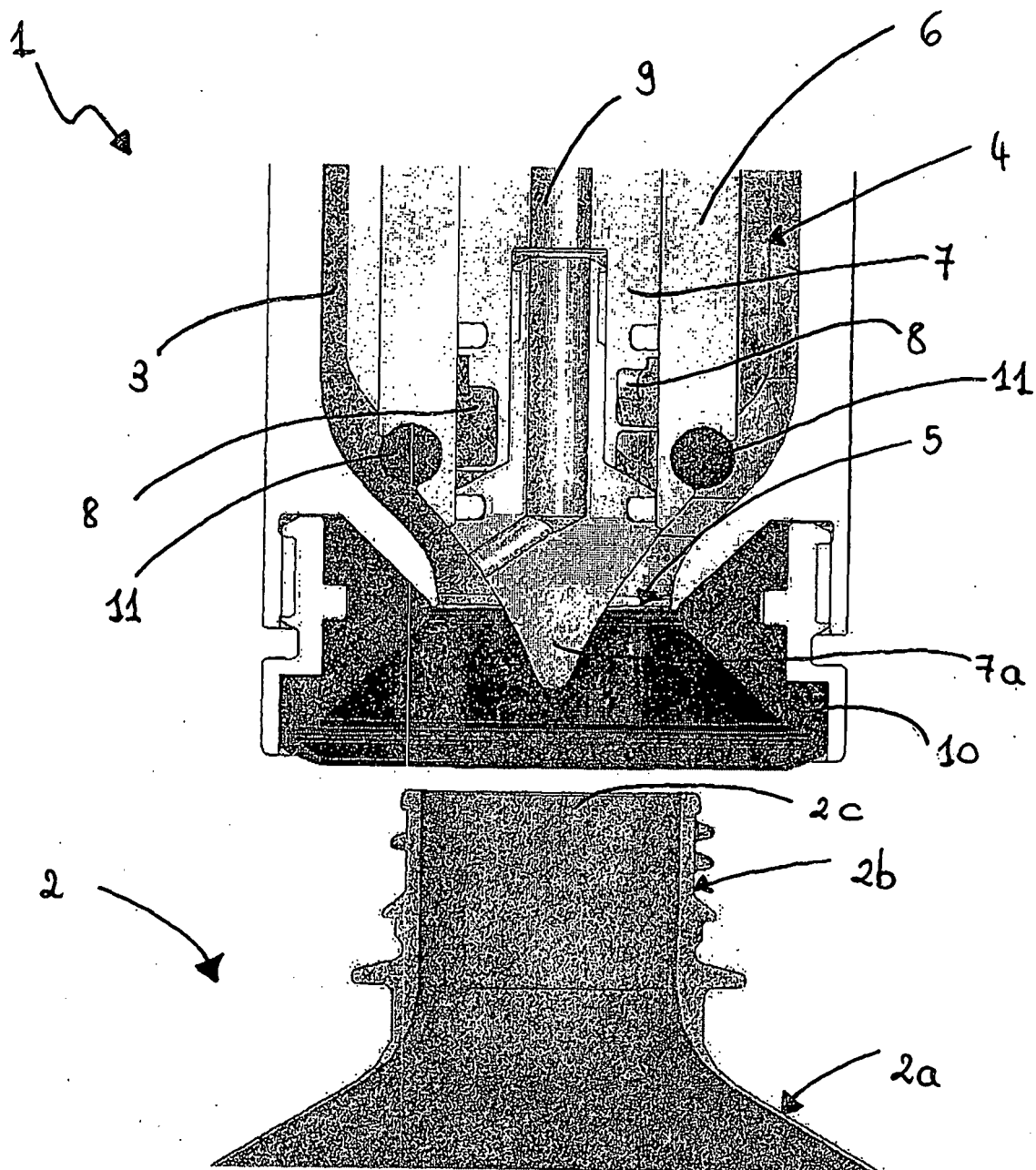
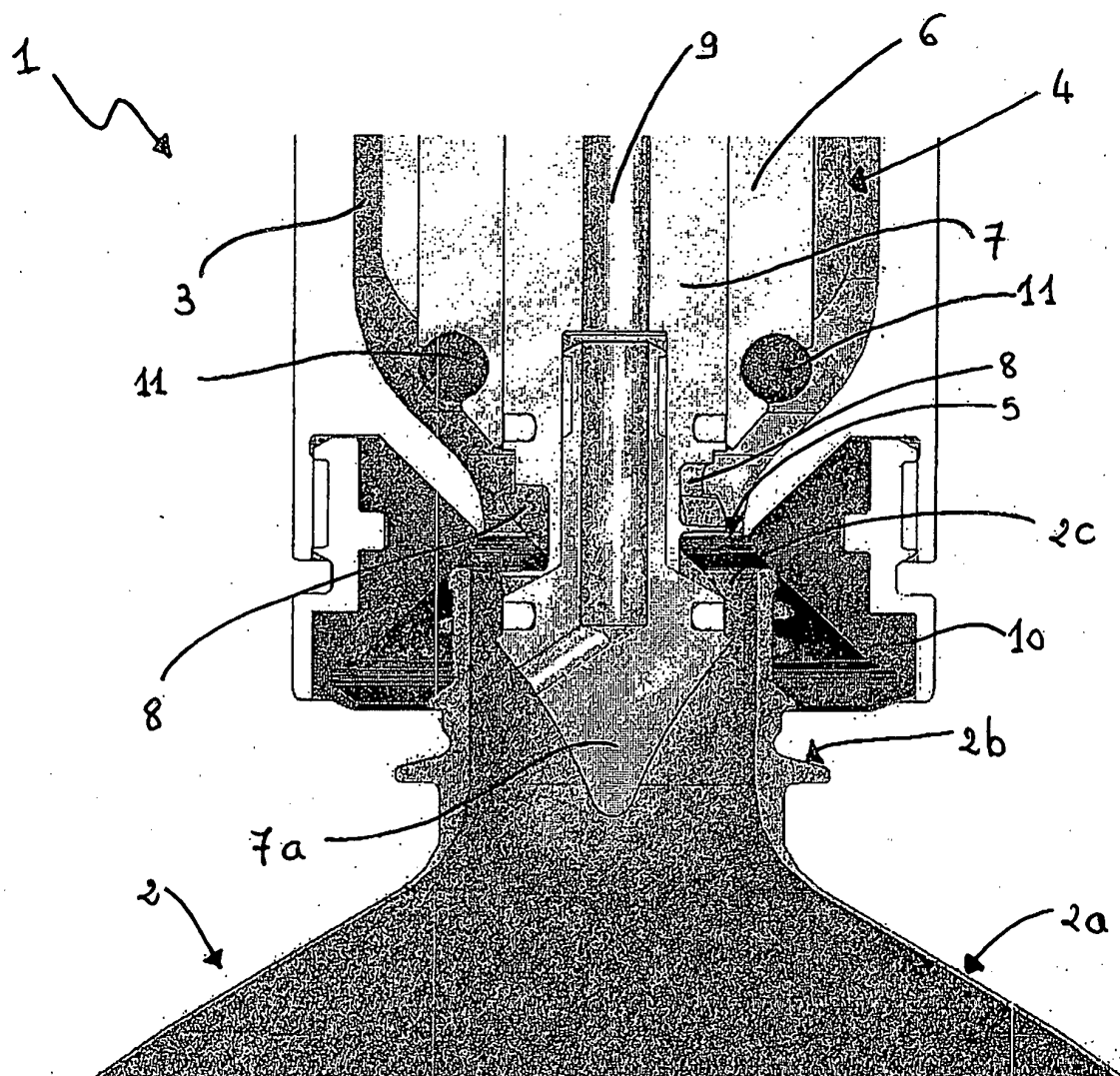


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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