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(54) METHOD AND DEVICE FOR PREVENTING THE INADVERTENT OUTFLOW OF A FLUID FROM A DRIKING CONTAINER

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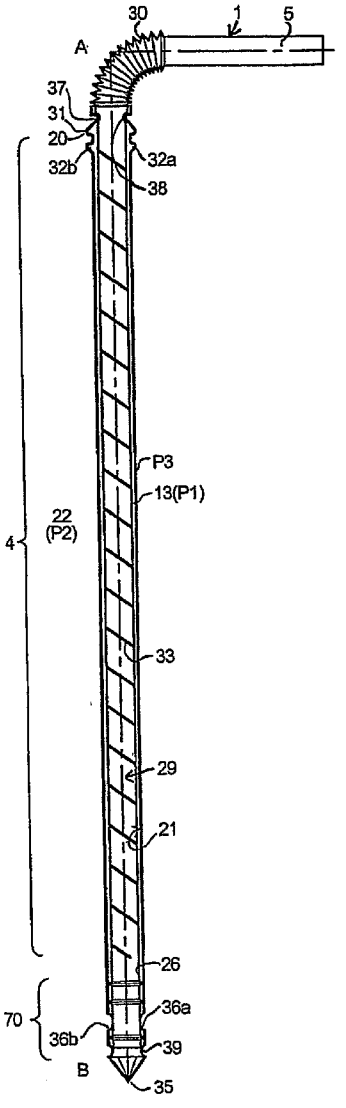
(57) **ABSTRACT**

A method and device for preventing unintended liquid flow from drinking containers are achieved by means of securing an inner tube **(29)** provided with a bellows **(4)** within an outer tube **(1)** and terminating one end of the inner tube **(29)** as a valve **(70, 70')**, whereby the suction force from the user provides a pressure difference across the bellows **(4)**, causing the bellows **(4)** to move the valve **(70, 70')** with sufficient force to open. When the suction force ceases, the valve **(70, 70')** closes, and it remains closed, even when the liquid in the drinking container **(61)** is pressurized with pressure (P3).



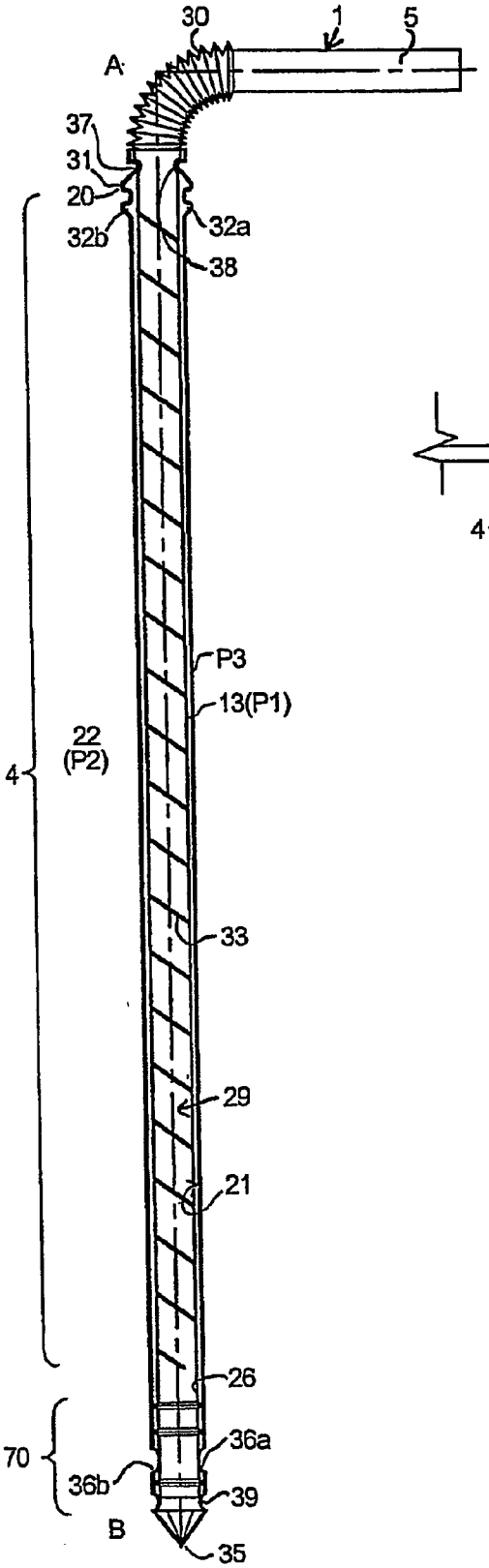


Fig. 1

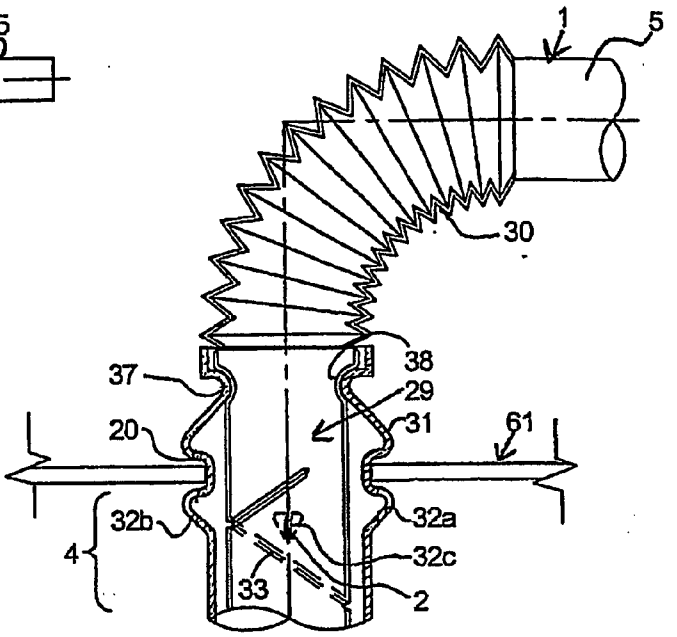


Fig. 2

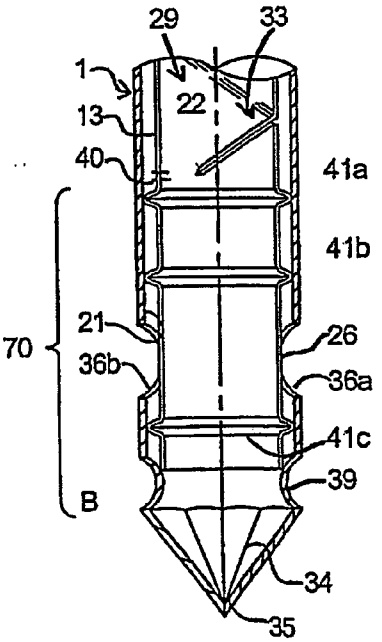


Fig. 3a

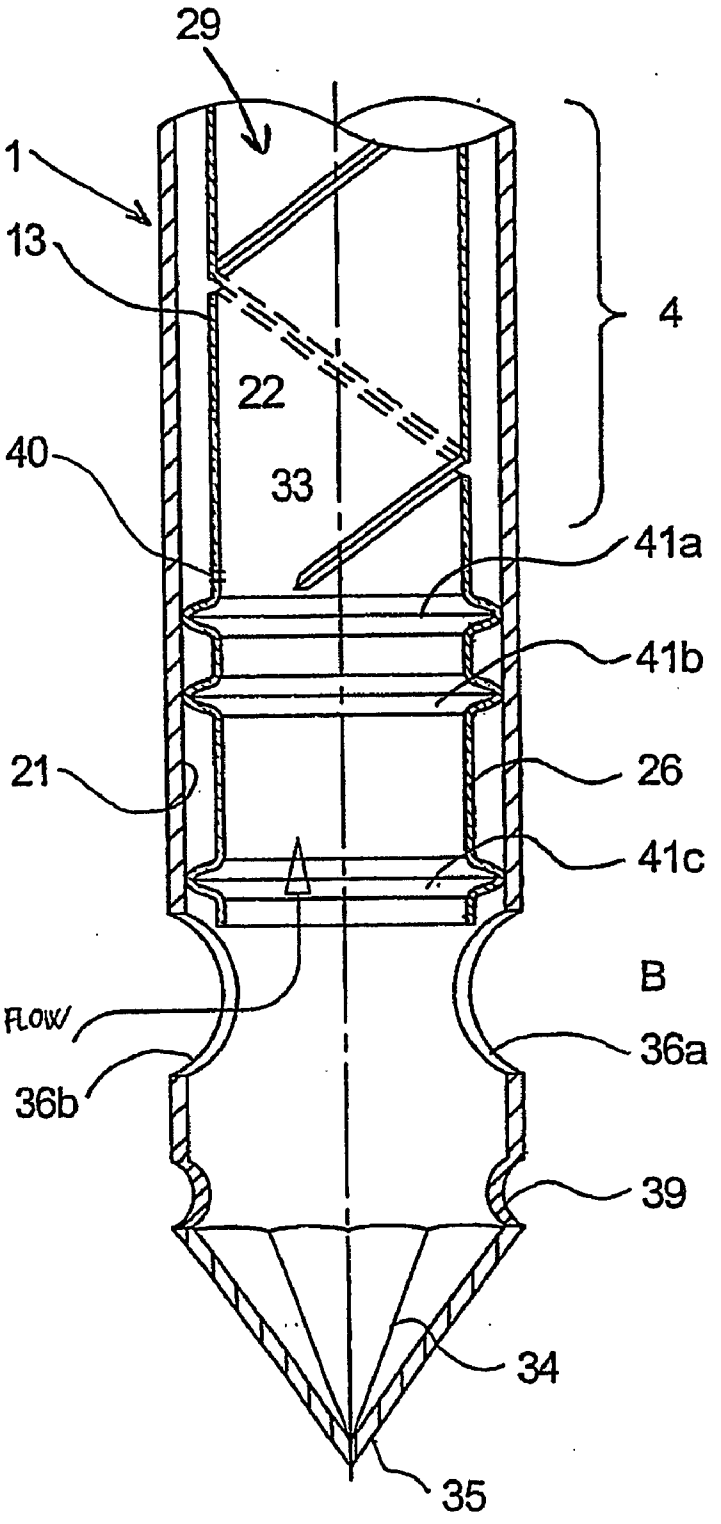


Fig. 3b

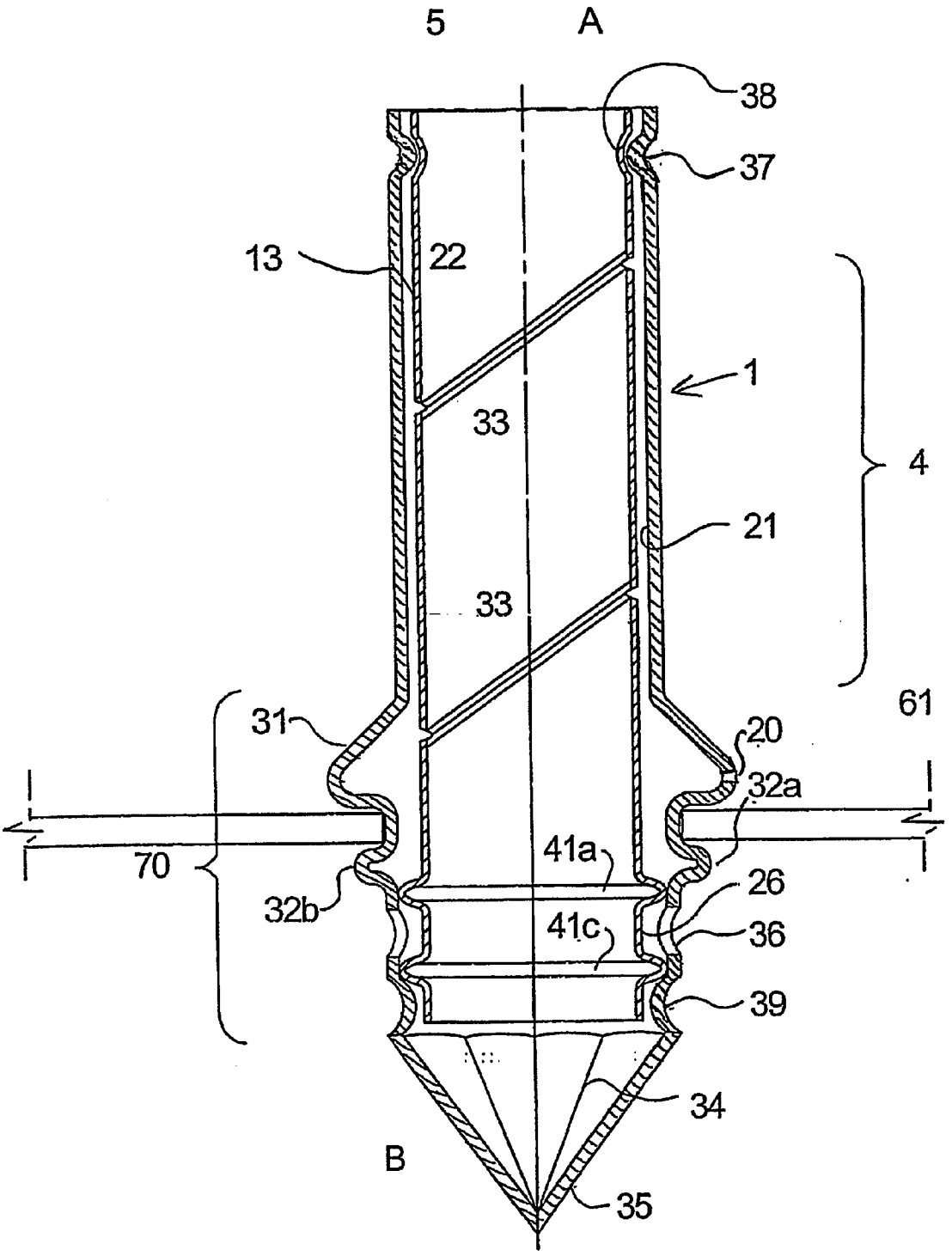


Fig. 4

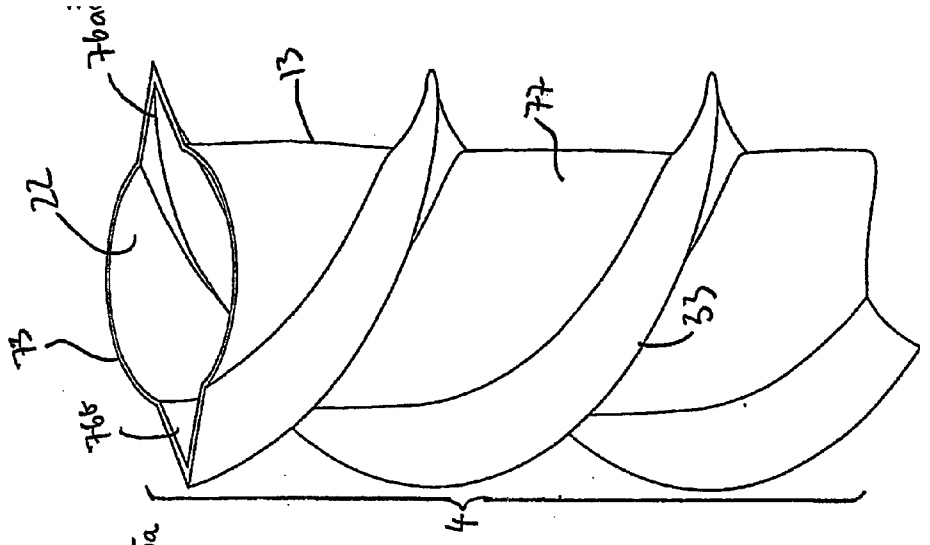


Fig. 8

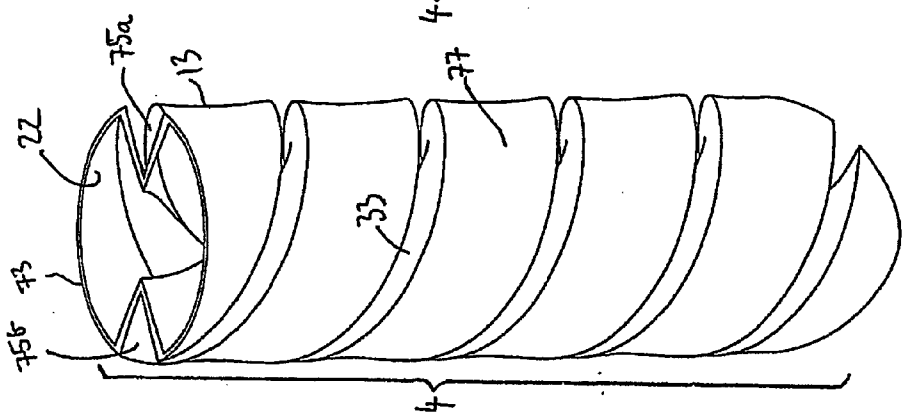


Fig. 7

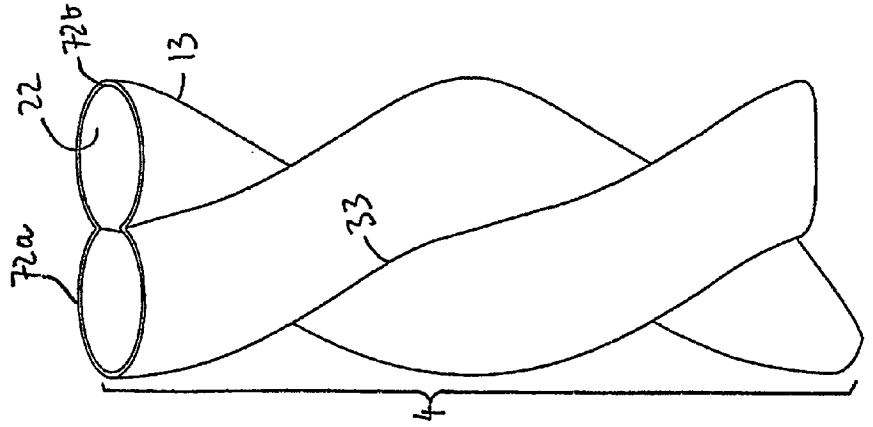


Fig. 6

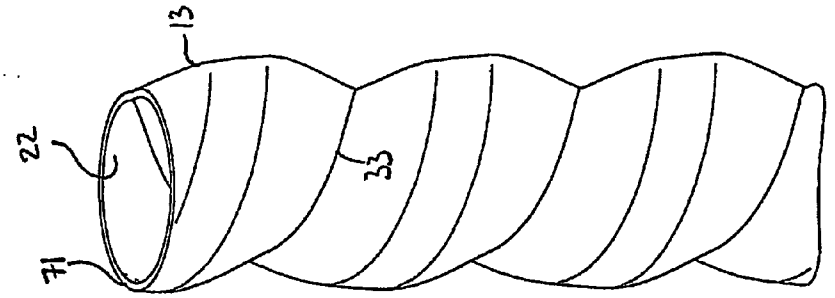


Fig. 5

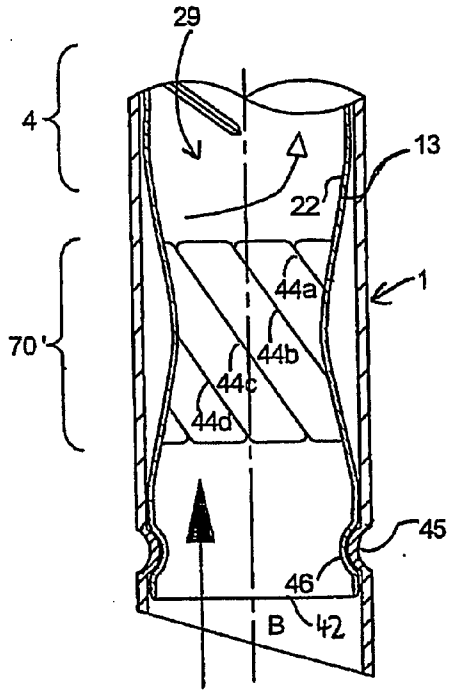


Fig. 9a

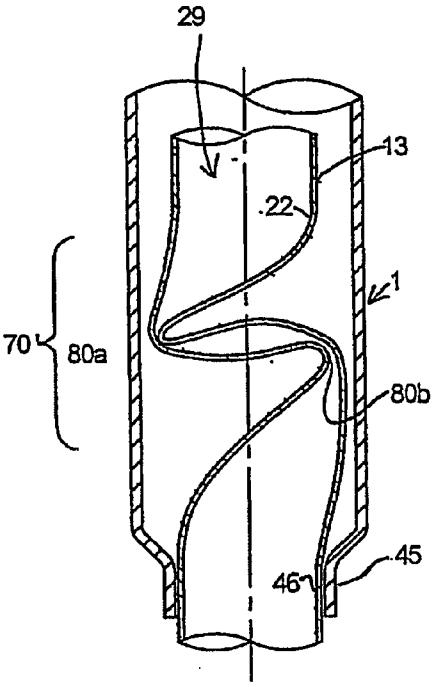


Fig. 10a

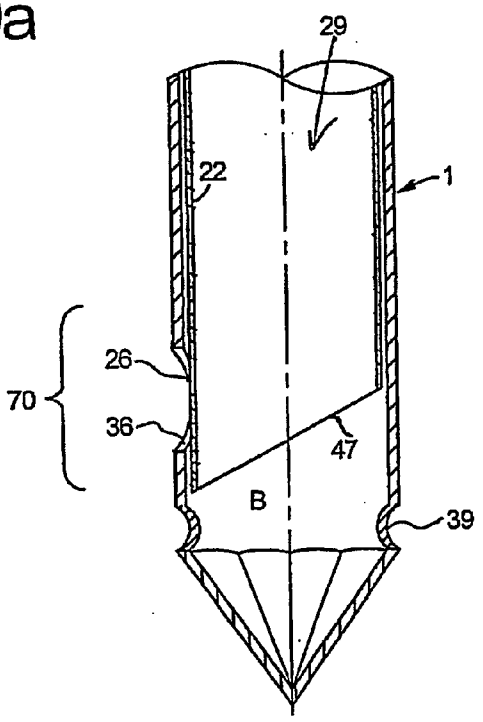


Fig. 11a

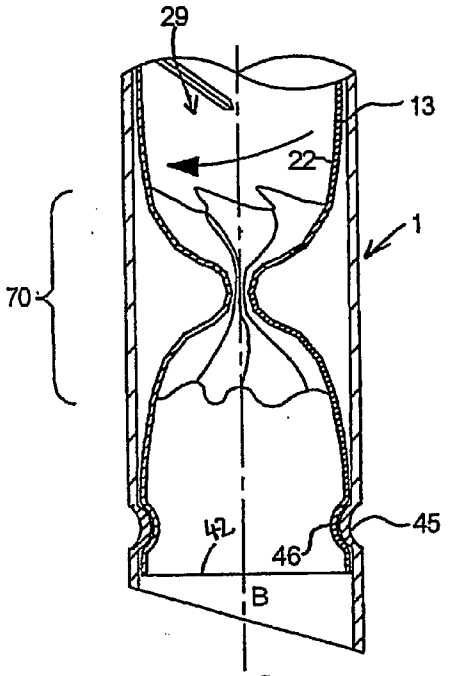


Fig. 9b

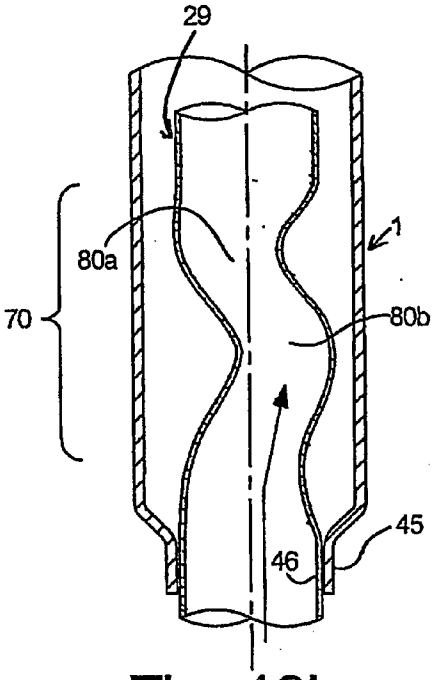


Fig. 10b

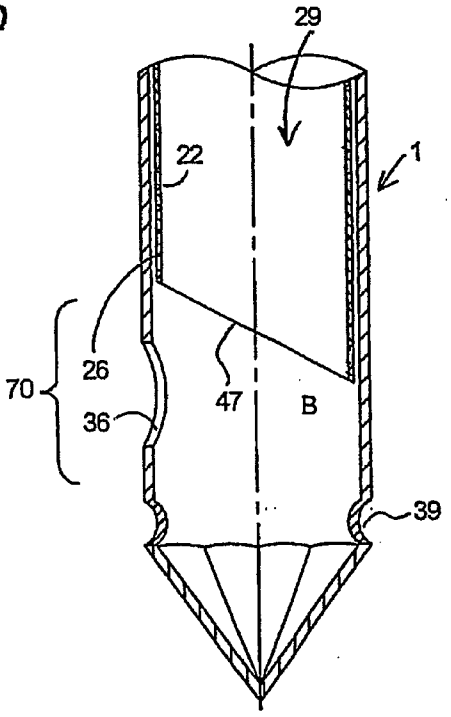


Fig. 11b

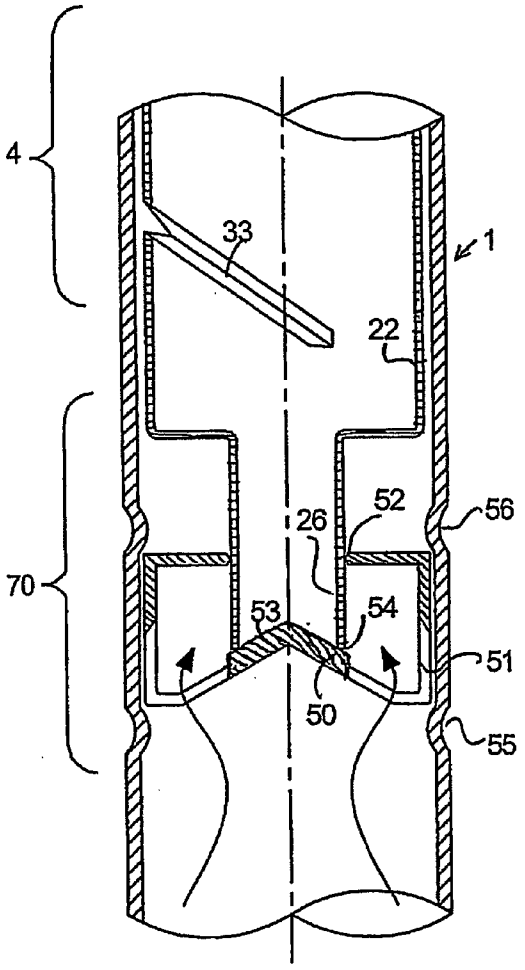


Fig. 12a

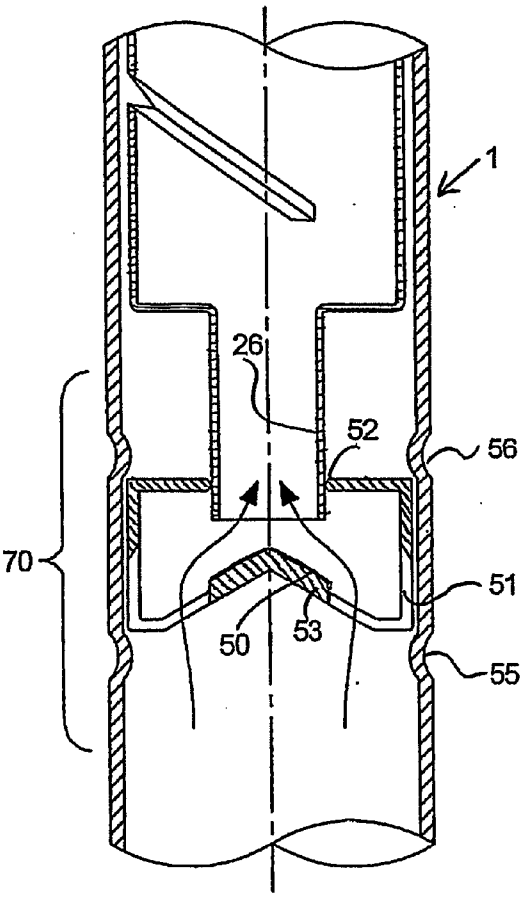


Fig. 12b

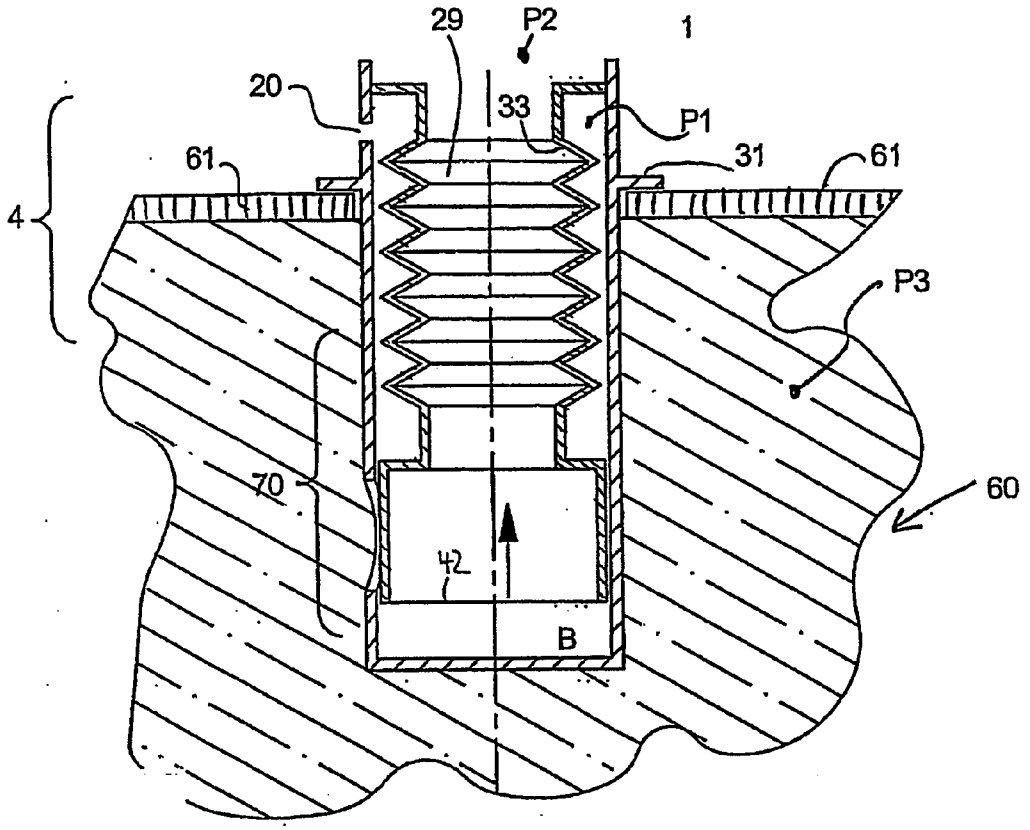


Fig. 13

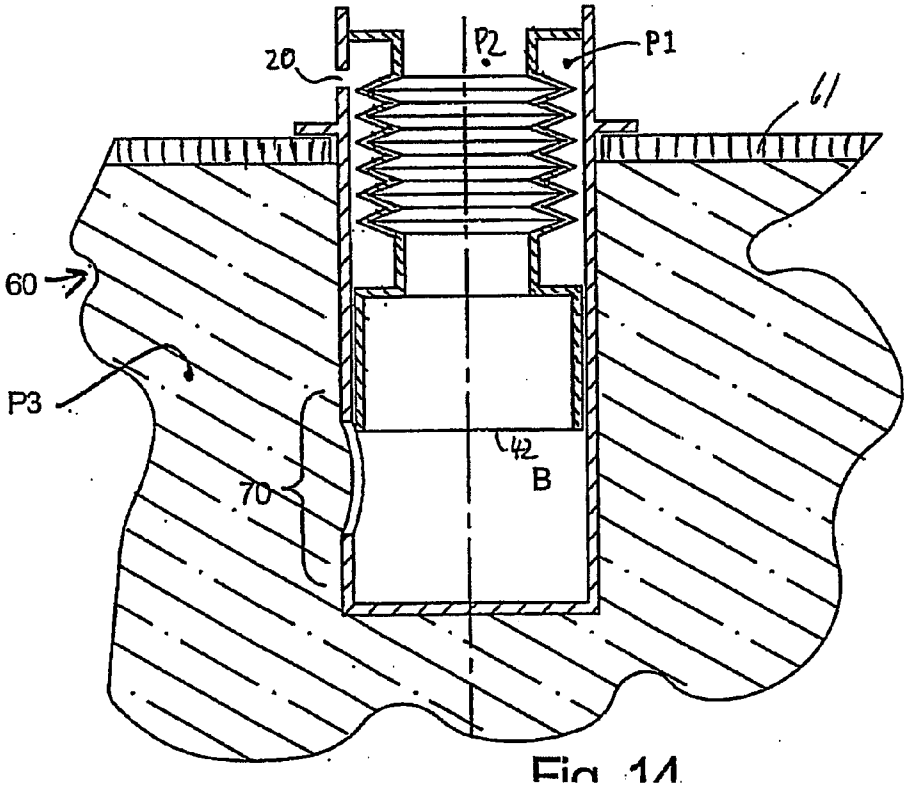


Fig. 14

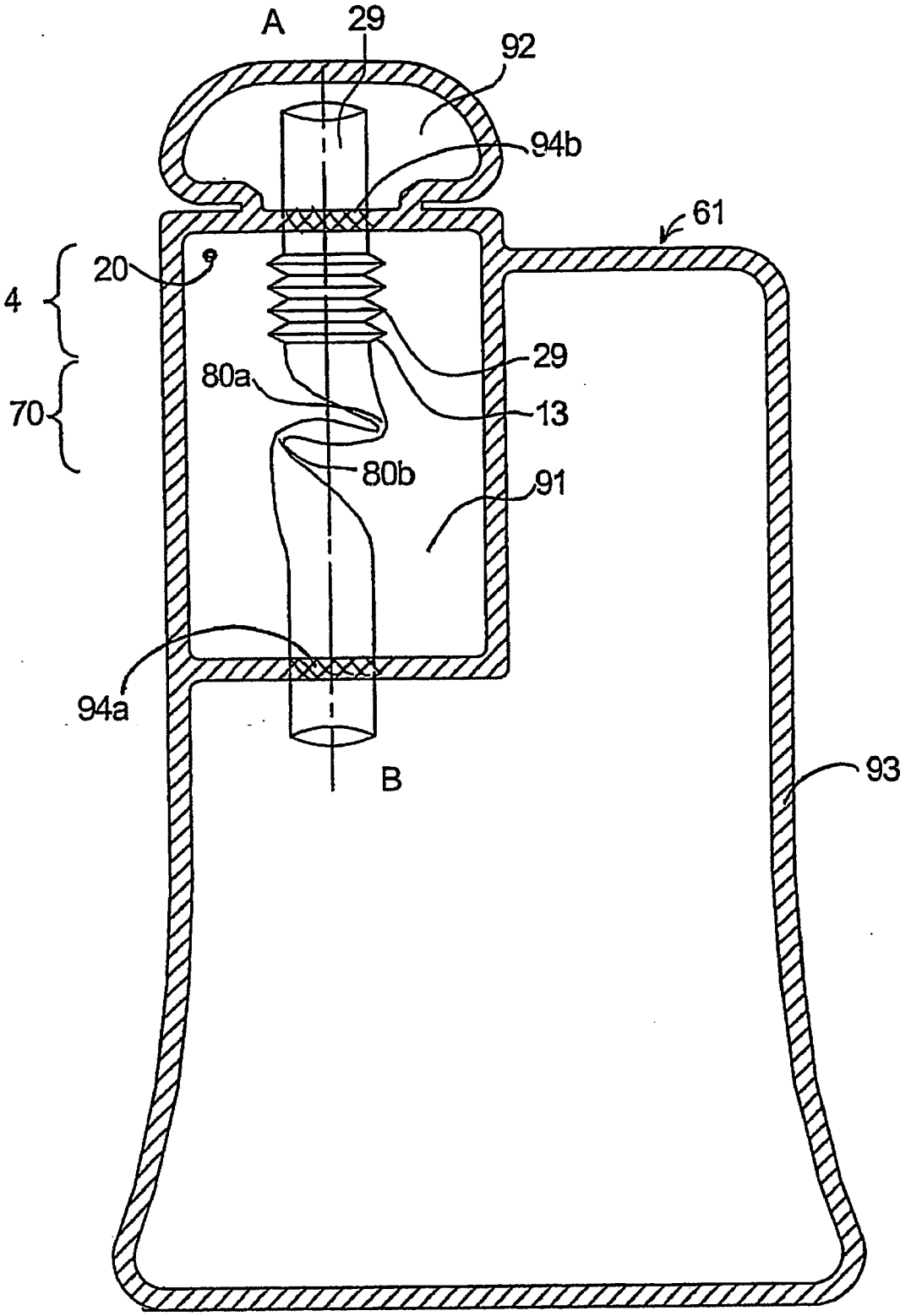


Fig. 15

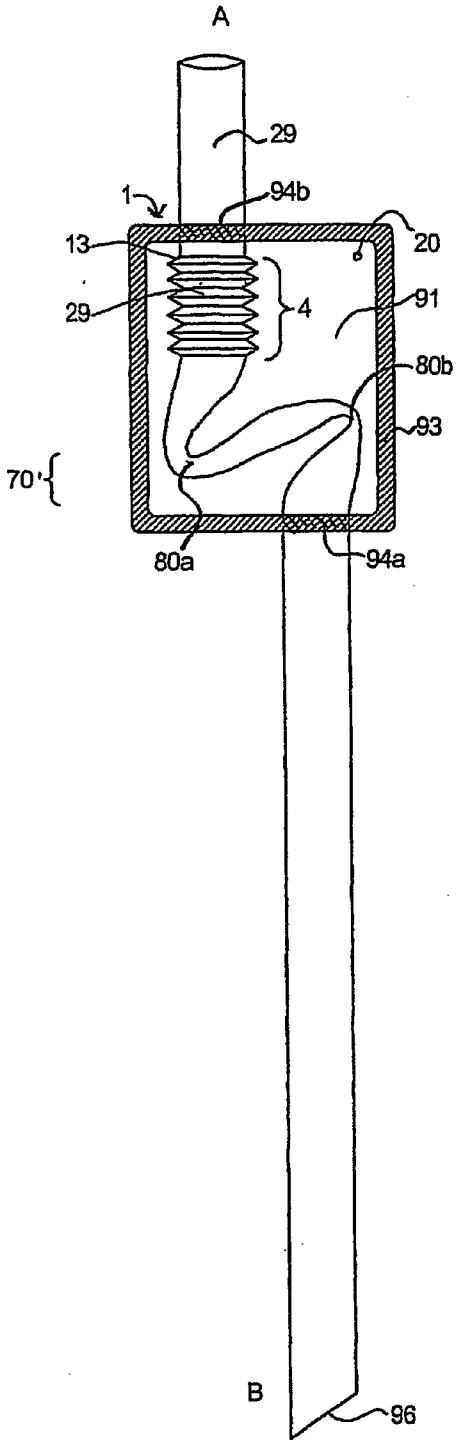


Fig. 16a

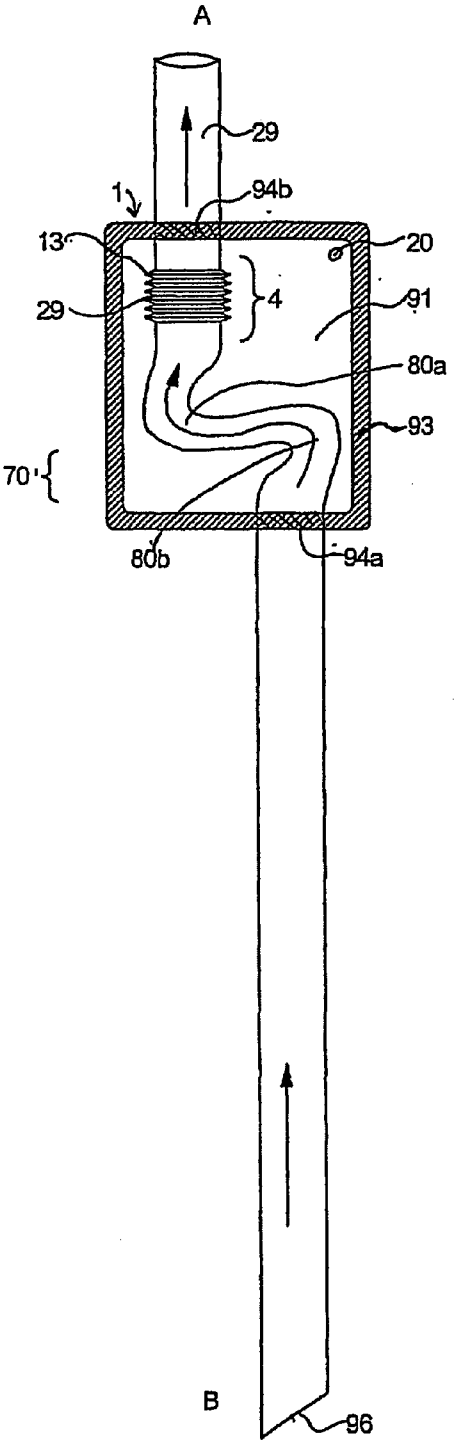


Fig. 16b

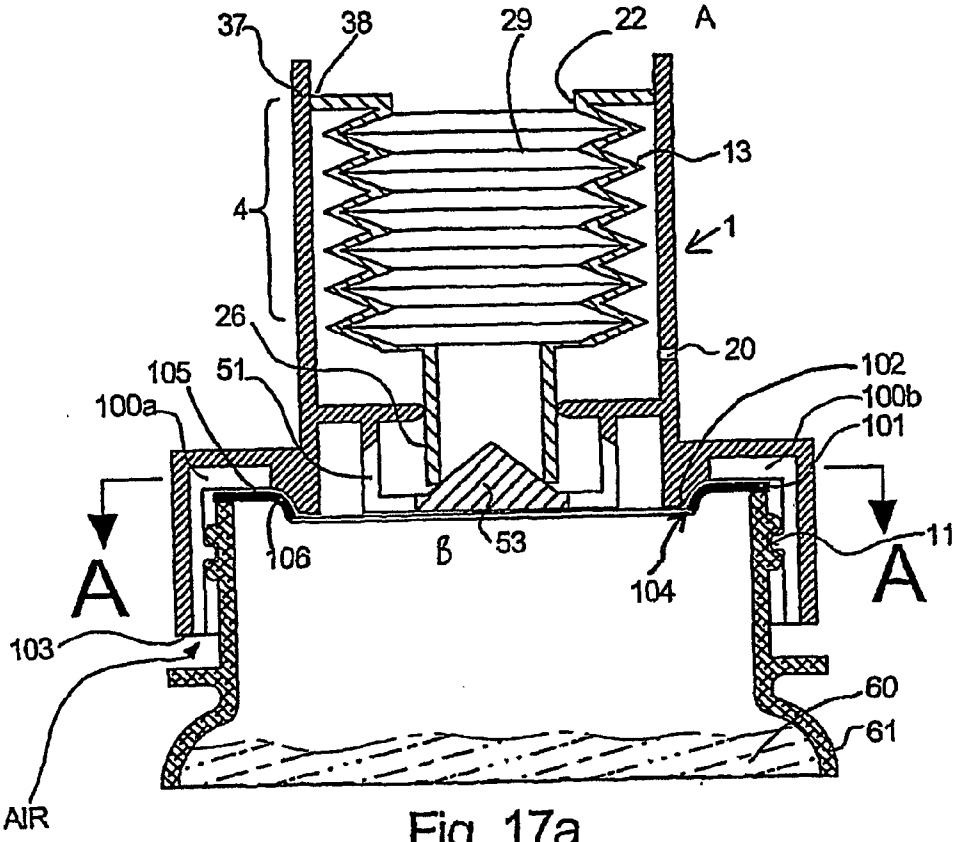


Fig. 17a

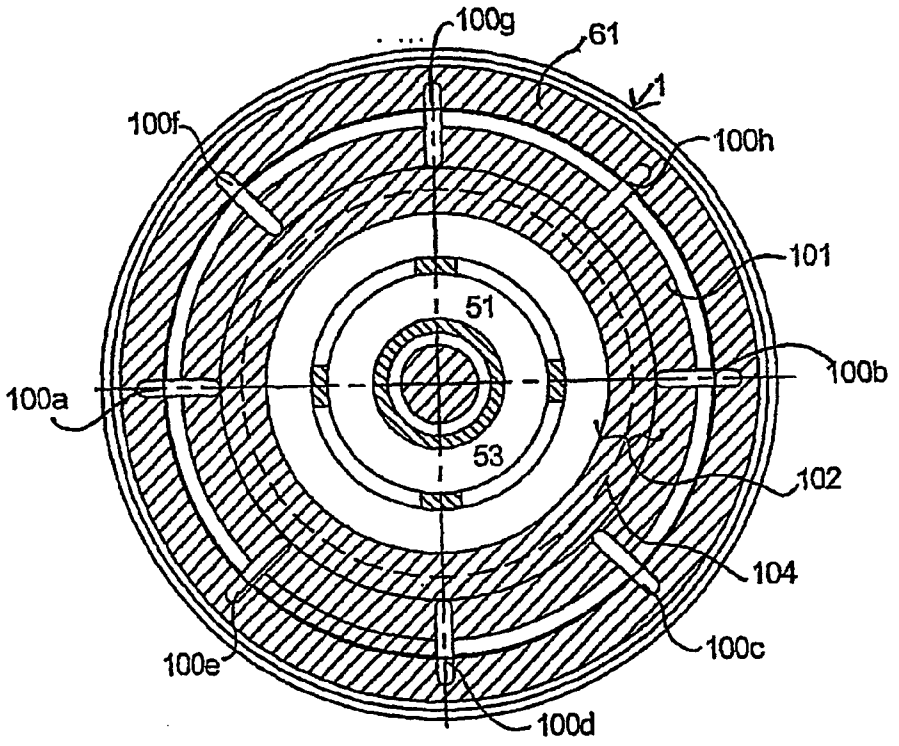


Fig. 17b Snitt A-A

METHOD AND DEVICE FOR PREVENTING THE INADVERTENT OUTFLOW OF A FLUID FROM A DRIKING CONTAINER

[0001] This invention relates to a method and a device arranged to prevent unintended flow of liquid from drinking containers, such as bags, cartons and bottles. The device may be formed, for example, as a drinking straw or as a drinking spout, and thus it could easily replace the current drinking straws in those instances where a spill-free additional function is desired. The flow of liquid is started and controlled by means of the suction force supplied by the user. The flow stops when the suction force ceases, and then a valve seals off the through-flow, even when overpressure is present within the container.

[0002] Besides ordinary drinking straws or drinking spouts, the patent literature discloses several special devices that efficiently prevent liquid from flowing freely from a drinking container. U.S. Pat. No. 5,975,369 and U.S. Pat. No. 5,465,876 provide examples of such devices. These devices do not have automatic closing mechanisms, and the user therefore must carry out a mechanical movement when opening and closing the device. Also, devices having automatic closing functions are known, but they possess other disadvantages, such as low tolerance to pressure differences, relatively high complexity and requirements of specially designed containers. U.S. Pat. No. 5,607,073 provides an example of such a device. Moreover, a device that prevents liquid from leaking out, even if the liquid is pressurized, is known. This is described in. Norwegian patent No. 137258. This type of device enhances the overpressure force of the liquid with the aim of closing the valve, and therefore the device is not suitable for drinking from if the liquid is pressurized. A common feature of all the above-mentioned devices is that they provide for a relatively high production cost, and that the devices thus will be unavailable to the disposable items market.

[0003] The object of the invention is to remedy said disadvantages of the prior art. The object is achieved in accordance with the features specified in the following description of the invention.

[0004] The object is achieved by means of forming a drinking straw or a drinking spout, hereinafter simply termed an outer tube, in such a way that liquid cannot flow or be forced out of the drinking container until the user supplies a suction force.

[0005] The device comprises an outer tube that carries the liquid from the container to the user, that protects an inner tube against external physical loads, and that simultaneously forms a surrounding anchoring object for those parts of the device that move relative to each other when the user supplies a suction force. The outer tube also may have a pointed end that is sufficiently rigid for punching a hole in a drinking container suitable for this.

[0006] The device also comprises an inner tube formed with an attachment device for attaching to the outer tube. In a longitudinal portion the inner tube is formed as a flexible bellows. If the bellows is provided with a longitudinal helical pattern, an increased force and rotation may arise when said suction force is supplied. The design of this pattern is selected on the basis of the force need, the need for free area of liquid flow, available tube length and the nature of the material, so that an acceptable pressure difference between the inside and outside of the bellows give rise to a change in length and/or rotation of the bellows. By making the pattern deep and narrow, a more elastic bellows/helical bellows is achieved, but simultaneously the free area available for liquid flow is reduced. The pitch of the helical pattern **33** substantially determines the transmission ratio between force and movement. A large pitch provides great force but little movement; a small pitch provides the opposite situation. A pitch of between 30 and 60 degrees appears to provide appropriate force and sufficient movement at the same time. Said pattern may be varied substantially and different rotational directions and patterns can be combined in one and the same tube in order to achieve the desired function. In some cases it may be desirable to isolate the movement to vertical movement, only. This may be achieved by combining two or more zones of the bellows having patterns of opposite rotational directions, or by using a bellows provided with ring-shaped recesses. The latter solution provides little excess force, but provides a great deflection relative to the total length of the bellows. It also is possible to isolate the rotational force by combining, for example, a helical pattern and a bellows pattern having at least one ring-shaped recess wherein this bellows part absorbs the vertical movement due to its small vertical rigidity, while efficiently transmitting the rotational force. The movement is transmitted to a portion at the end of the inner tube that is arranged as a valve, and that moves relative to the outer tube in order to open and close.

[0007] For example, the valve mechanism may be made by continuing the tube, from which the bellows is formed, a distance below the bellows and by using it as a valve head that seals against the outer tube, and by providing the outer tube with one or more through-going holes positioned in such a manner that the valve head shuts off fluid flow until the movement displaces it sufficiently upwards for the holes in the outer tube not to be blocked any more by the inner tube.

[0008] Alternatively, the valve may be made by predeforming during production the portion following the bellows in such a way that the valve normally is closed, and that the movement transmitted from the bellows through suction force causes opening of the valve (see **FIGS. 9*a***, **9*b***, **10*a*** and **10*b***). Deformation type valves must be attached to the outer tube at the lower end, too.

[0009] In some cases, a deformation valve will require both rotation and longitudinal movement to operate optimally. It is then essential to lock both the top and bottom of the inner tube to the outer tube in such a way that rotation at the attachment points is prevented, and also that a sufficient seal against the outer tube is maintained. The locking may take place in separate grooves, whereby sealing and locking may be optimised independently of each other. Also, oblique auxiliary flutes or funnel-shaped grooves may be made in one or both parts, correcting the twisting of the valve during fitting.

[0010] Another way of making the valve may be that of introducing an extra part that seals the end of the same tube from which the bellows is formed, and that simultaneously functions as a sliding seal against the valve piece of the inner valve (see the example in **FIG. 12**).

[0011] A valve of the deformation type or of the latter type may be placed freely above or below the liquid level in the

container, inasmuch as it does not require suction of liquid from the sides of the tube. Moreover, it may not require closing of the lower end of the tube to form a functioning valve, which is preferred in some situations.

[0012] When not using the device, the bellows will be subjected to equal pressure on both sides, and no force arises for rotation and/or longitudinal change of the bellows. The valve part then maintains its closed position, even if an overpressure is formed in the drinking container to which it is connected.

[0013] In some cases the tube, from which the bellows is made, advantageously may be coated externally with a different plastics material than that of the inside. For example, the external plastics material may be polypropylene, thus enabling the tube to be secured by welding to an outer tube that may become part of a drinking container, for example a bag. In other cases it may be relevant to use a softer type of plastics on the inside of the tube, whereby a better tube deformation seal may be achieved. A combination of these properties also may be appropriate, whereby the tube may be welded and simultaneously maintain a soft inside that ensures sufficient sealing.

[0014] In most embodiments of the invention at least one vent is conveniently placed in the outer tube to ensure that the space between the bellows and the outer tube always is exposed to full atmospheric pressure. The same holes also may be made sufficiently small for the user to experience a certain delay in the mechanism response time when switched on and off. This adaptation also may dampen any oscillations that may occur when used. Other special adaptations also may be appropriate, such as forming one or more shaped sealing surfaces between the inner and outer tubes. Also, in some instances the bellows advantageously is provided with one or more smaller through-going holes in order to drain liquid from the zone between the outer tube and the bellows.

[0015] Another important detail of the device is that of the air inlet, which may replace the liquid volume consumed from containers, and which allows the container to maintain its physical shape (cartons, bottles and similar rigid containers). The previously mentioned time delay for switching on and off may allow air to enter the container, thereby ensuring that the container maintains its shape. Another method consists in providing one or more one-way valves for air to the outside of the part of the outer tube placed on the inside of the container. For example, one or more of the barbs that secure the device against becoming loose when used, are cut in a manner allowing them to operate as one-way valves. Alternatively, the pointed end of the outer tube may be made as a one-way valve, opening only to overpressure outside of the container. These adaptations will be explained in detail in the following drawings.

[0016] An improved attachment mechanism to prevent the drinking straw/drinking spout from becoming loose when used or when exposed to overpressure in the container, is achieved by providing the outer tube with a stop flange that ensures correct application of the drinking straw/drinking spout, by means of one or more associated barbs. Also, it is possible to make the outer tube into a part of a cap, or to provide the outer tube with threads or other securing mechanisms, whereby it may be applied to bottles or similar containers having standardized or special connectors.

[0017] When using deformation valves it also is possible to encase all or parts of the inner tube within the drinking container itself, for example as part of a bag (see **FIG. 15**), or within a separate bag or rigid casing wherein the inner tube ends are of such an extent that they may be used as a drinking straw (see **FIGS. 16*a***, **16*b***).

[0018] During mass production the drinking straws/drinking spouts may be packed, handled and applied in the same way as that of existing drinking straws/drinking spouts.

[0019] In the following several non-limiting examples of preferred embodiments are described, these being visualized in the accompanying drawings, where:

[0020] **FIG. 1** shows a preferred embodiment of the device according to the invention, the device having a drinking straw arranged thereto;

[0021] **FIG. 2** shows a section of an attachment device and details of the same device;

[0022] **FIG. 3*a*** shows a section of a preferred valve placed in its closed position;

[0023] **FIG. 3*b*** shows the same valve placed in its open position;

[0024] **FIG. 4** shows another embodiment of the device according to the invention;

[0025] **FIGS. 5, 6, 7** and **8** show different embodiments of the bellows incorporated in the device;

[0026] **FIGS. 9*a***, **9*b***, **10*a***, **10*b***, **11*a***, **11*b***, **12*a*** and **12*b*** show different embodiments of the valve incorporated in the device;

[0027] **FIGS. 13 and 14** show a schematic principle drawing of the method and the operation of the device;

[0028] **FIGS. 15, 16*a*** and **16*b*** show an alternative embodiment of the outer tube of the device; and

[0029] **FIGS. 17*a*** and **17*b*** show a further embodiment of the outer tube of the device.

[0030] **FIG. 1** shows a preferred embodiment, in which an outer tube **1** is provided with an inner tube **29**. The tube **29** is partially formed as a bellows **4** having a helical pattern **33**. By means of the bellows **4** the tube may **29** may contract longitudinally upon the pressure P2 on the inside **22** of the tube **29** becoming lower than the pressure P1 on the outside **13** of the tube **29**. At its lower end B the tube **29** terminates as a valve head **26**, cf. **FIG. 3*a***. By means of its shape the valve head **26** functions, among other things, as a seal against the inside **21** of the tube **1**, but also as a valve **70** together with the valve openings **36*a***, **36*b***.

[0031] In its closed position the valve **70** will be sealed, even if the liquid pressure P3 within an associated drinking container exceeds the atmospheric pressure P1.

[0032] When assembling the outer tube **1** and its inner tube **29**, a connecting groove **38** at the upper end A of the tube **29** will engage a complementarily shaped groove **37** of the outer tube **1**. Thereby the tube **29** is attached pressure-sealingly to the inside of the outer tube **1**. The grooves **37**, **38** possibly may be formed through heating subsequent to having fitted the parts together in a mutually fixed position.

[0033] At the lower end of the outer tube **1** the tube **1** is squeezed together into a tight and rigid point **35** for puncturing a drinking container, for example. The outer tube **1** also is provided with a ring **39**, the purpose of which is to stabilize the extent of the folds resulting from the end **35** being squeezed together. Moreover, the device is provided with a stop flange **31** and four barbs **32***a*, **32***b*, **32***c*, **32***d* that ensure correct application, and that prevent the device from being forced out of the container when subjected to overpressure. In one of the barbs **32***a*, **32***b*, **32***c*, **32***d* a slit **2** has been cut forming a one-way and continuous air inlet mechanism into the drinking container **61**. The outer tube **1** is provided with a vent **20** that delivers atmospheric pressure P1 via the slit **2** to the outside **13** of the tube **29** and to the inside of the drinking container **61**.

[0034] Otherwise, the outer tube **1** is formed with a flexible joint **30**, enabling a longitudinal portion **5** of the outer tube **1** to be folded parallel to the remaining length of the outer tube when being packed.

[0035] **FIG. 2** shows a section of the device shown in **FIG. 1** after being inserted into a drinking container **61**.

[0036] **FIG. 3***a* shows a section from a similar device to that of **FIG. 1**, but having a valve portion **70**, in which the valve head **26** is provided with the gaskets **41***a*, **41***b* and **41***c* that maintain proper sealing between the valve head **26**, the outer tube **1** and the pressure zone P1 between the outer tube **1** and the inner tube **29**.

[0037] **FIG. 3***b* shows the same valve as that of **FIG. 3***b*, but in the open position.

[0038] **FIG. 4** shows another embodiment of the device, in which only the lower end of the outer tube **1** is inserted into the container **61**, and in which the outer tube **1** thereby is formed as a drinking spout. The bellows **4** is shorter, and the valve portion **70** has been moved closer to the stop ring **31** and barbs **32***a*, **32***b*, **32***c*, **32***d*. Otherwise, the valve is of the same configuration as that of **FIG. 3**.

[0039] **FIG. 5** shows a helical bellows **4** initially having an oval shape **71** when viewed in cross-section. When the pressure on the inside **22** decreases relative to the pressure on the outside **13**, the oval shape **71** is compressed, thereby changing the shape, length and twisting angle of the bellows **4** due to its pattern **33**.

[0040] **FIG. 6** shows another helical bellows **4** having, when viewed in cross-section, two spherical shapes **72***a* and **72***b*, these forming the basis of the pattern **33**.

[0041] **FIG. 7** shows another helical bellows **4** having, when viewed in cross-section, a circular shape **73** interrupted by two diametrically placed V-grooves **75***a*, **75***b* that extends inwards into the tube **77**.

[0042] **FIG. 8** shows another helical bellows **4** having, when viewed in cross-section, a circular shape **73** interrupted by two diametrically placed V-grooves **76***a*, **76***b* that extends outwards from the tube **77**.

[0043] **FIG. 9***a* shows a section of the device shown in **FIG. 1**, but provided with another type of valve **70'**. This deformation valve **70'** operates in response to the pre-shaped stripes **44***a*, **44***b*, **44***c*, **44***d* being folded and puckered together during production, and then by locking the notch **46** in the opposite notch **45** of the outer cap. Here, the grooves **45** and **46** are made slightly wavy to avoid relative rotation between the grooves of the outer tube **1** and those of the inner tube **29**. Both the rotation and the contraction of the bellows **4** contribute to open the valve **70'**. When the underpressure disappears, the rigidity of the bellows **4** will ensure that the valve **70'** rotates in the opposite direction and is forced back into its closed position again. The arrow indicates the flow direction.

[0044] **FIG. 9***b* shows the same device as that of **FIG. 9***a*, but here in the closed position.

[0045] Resembling that of **FIG. 9**, **FIG. 10***a* shows a deformation valve, but wherein only the vertical movement of the bellows **4** is used to open the compressed zones **80***a* and **80***b* when the user supplies an underpressure to the bellows **4**. The lower part of the inner tube **29** is welded, fused or glued to an outer tube **1** at the surfaces **45'** and **46'**.

[0046] **FIG. 10***b* shows the device of **FIG. 10**, but here in the open state. The arrow indicates the downstream flow direction.

[0047] **FIG. 11***a* shows a section of the device of **FIG. 1**, but provided with another type of valve. Here, both longitudinal shortening and rotation caused by a helical bellows **4** are used to achieve full opening employing the lowest possible user-supplied suction force. The end **47** of the valve head **26** has been cut obliquely, so that a rotation will cause a substantial opening increase as compared to a valve employing only vertical movement of the valve head **26**.

[0048] **FIG. 11***b* shows the device of **FIG. 11***a*, but here in the open state. The arrow indicates the flow direction.

[0049] **FIG. 12***a* shows a section of the device of **FIG. 1**, but provided with another type of valve. Here, the valve head **26** is of a reduced diameter to accommodate a fitted valve counterpart **50** having through-going channels **51** for allowing liquid flow onwards to the valve head **26**. Also, the valve counterpart **50** is provided with a sealing surface **52** that seals against the valve head **26**. The notches **55** and **56** lock the valve part **50** in place in the outer tube **1**.

[0050] **FIG. 12***b* shows the device of **FIG. 12***a*, but here in the open state. The arrows indicate downstream flow of the liquid.

[0051] **FIG. 13** shows a principle drawing according to the method, wherein the pressure difference between the outside **13** of the bellows (atmospheric pressure, P1) and the inside **22** of the bellows (underpressure from the suction force, P2) causes a movement relative to the outer tube **1**. The movement is used to open a valve **70** that otherwise would remain closed, even at overpressure P3 in the associated container **61**. Among other situations, the overpressure P3 may arise when the user squeezes the drinking container **61**, or if the drinking container **61** is left in a horizontal position having a liquid level located higher than the level of the device.

[0052] **FIG. 14** shows a section from **FIG. 13** wherein the valve **70** is in its open state.

[0053] **FIG. 15** shows another embodiment of the present device. Here, the drinking container **61** is a bag. The valve type used in the example substantially resembles the valve of **FIGS. 10***a* and **10***b*. The bellows **4** is vacuum-formed from the tube **95**, which is fixed to the bag by welding or

gluing at the surfaces **94***a* and **94***b*. The remaining part of the bag is welded or glued together along the edge **93**. The membrane **4** and the valve **70'** are encased in the same manner within a separate portion of the container **61**. The device is provided with a vent **20** directing air into the bellows **4**, thereby providing atmospheric pressure to the outside **13** of the bellows **4**. To protect the top of the integrated inner tube **29** against dirt and bacteria, the bag **61** is provided with a protective part **92** that is pulled off before use.

[**0054**] **FIG. 16***a* shows an alternative embodiment of the invention, in which the outer tube **1** is comprised of plastic foils that are vacuum-formed and then fixedly welded or glued together along the entire surface **93** and to the tube **29** at the surfaces **94***a* and **94***b*. The casing encloses, fixes and protects the bellows **4** and the valve **70'**. The tube **29** is terminated in an obliquely cut edge **96** to facilitate insertion of the inner tube **29** into a drinking container **61**. Here, the deformation valve **70'** is shown in its closed state.

[**0055**] **FIG. 16***b* shows the embodiment of **FIG. 16***a*, but here in the open state. The arrows indicate the flow direction of the liquid.

[**0056**] **FIG. 17***a* shows another alternative embodiment of the device according to the invention, in which the outer tube **1** is formed as a cap. The bellows **4** and the valve seat **53** are of corresponding type and provide the same function as the device shown in **FIGS. 12***a* and **12***b*. To ensure efficient air supply to the container **61**, the cap **1** is provided with a device that allows continuous inlet of air, and that consists of one or more grooves **100***a*, **100***b* and a gasket **101** having an inner circular opening **104** that provides sealing against the circular surface **102** when the pressure on the inside **106** of the gasket is equal to or higher than the pressure on the outside **105** of the gasket. The gasket **101** also functions as an ordinary gasket for sealing between the cap **1** and the container **61**. When the pressure of the container **61** (which also acts on the inner gasket surface **106**) becomes lower than the atmospheric pressure (which also acts on the outer gasket surface **105**), the gasket **101** will flex downwards, causing the surfaces **102** and **104** not to seal against each other. Ambient air will then is admitted into the container **61** while the user consumes the contents, thereby obviating a stop in the consumption to let air into the container **61**. The arrows show the liquid flow direction and the air intake through the groove **100***a*.

[**0057**] **FIG. 17***b* shows the device of **FIG. 17***a*, but seen from above.

1. A method of preventing unintended outflow of fluids from drinking containers, characterised in that an inner tube (**29**) is provided with a pattern (**33**) allowing the tube (**29**) to change its shape upon supply of an internal underpressure (P2), and that the inner tube (**29**) is terminated as a valve head (**26**), and that the inner tube (**29**) is anchored to the outer cap (**1**) at the one end (A), and that the other end of the inner tube (**29**) is used as a valve head (**26**) which blocks at least one opening (**36**) of the outer tube (**1**) until the user supplies a sufficient underpressure (P2).

2. A method of preventing unintended outflow of fluids from drinking containers, characterised in that an inner tube (**29**) is provided with a pattern (**33**) allowing the tube (**29**) to change its shape upon supply of an internal underpressure (P2), and that the inner tube (**29**) is terminated as a deformation valve (**70'**), and that the inner tube (**29**) is anchored to the outer cap (**1**) at both ends (A and B), and that the deformation valve (**70'**) remains closed (**9***b*, **10***a*) until the user supplies a sufficient underpressure (P2).

3. A device for preventing unintended outflow of fluids from a drinking container (**61**), the device comprising an outer tube (**1**) and an inner tube (**29**), and the device being provided to the drinking container (**61**), characterised in that one end portion of the inner tube (**29**) is fixedly anchored to the outer tube (**1**), wherein the inner tube (**29**) also is arranged to be movable relative to the outer tube (**1**), and wherein the inner tube (**29**) is provided with at least one valve head (**26**) in its movable region, whereas the outer tube (**1**) is provided with at least one opening (**36***a*, **36***b*), and wherein movement of the at least one valve head (**26**) relative to the openings (**36***a*, **36***b*) opens or closes to through-flow of fluids from the drinking container (**61**), an underpressure in the inner tube (**29**) opening to fluid through-flow, whereas the inner tube (**29**) otherwise is closed to through-flow.

4. A device for preventing unintended outflow of fluids from a drinking container (**61**), the device comprising an outer tube (**1**) and an inner tube (**29**), and the device being provided to the drinking container (**61**), characterised in that both end portions of the inner tube (**29**) are fixedly anchored to the outer tube (**1**), wherein the inner tube (**29**) also is arranged to be movable relative to the outer tube (**1**), and wherein the inner tube (**29**) is provided with at least one deformation valve (**70'**) in its movable region, and wherein the movement of the free end of the bellows (**4**) relative to the anchored end of the valve (**70'**) opens or closes to through-flow of fluids from the drinking container (**61**), an underpressure in the inner tube (**29**) opening the deformation valve (**70'**) to fluid through-flow, whereas the deformation valve (**70'**) otherwise is closed to through-flow.

5. A device according to claim 3, characterised in that the valve (**70'**) uses both the axial and rotational movements of the bellows (**4**).

6. A device according to claim 3, characterised in that the outer tube (**1**) is provided with at least one barb (**32**).

7. A device according to claim 3, characterised in that the outer tube (**1**) is provided with at least one hole (**20**) that allows inlet of air into the drinking container (**61**) during consumption of the liquid (**60**).

8. A device according to claim 3, characterised in that the outer tube (**1**) is formed into a part of a cap or otherwise is provided with threads (**11**) or other fastening devices for connecting with a drinking container (**61**).

9. A device according to claim 3, characterised in that the bellows (**4**) is formed with at least one type of recess (**33**) formed in the inner tube (**29**), and that at least one recess (**33**) is formed as a helix having at least one rotational direction and at least one pitch.

10. A device according to claim 3, characterised in that the outer tube (**1**) is formed from a part of the drinking container (**61**).

11. A device according to claim 3, characterised in that the at least one valve (**70**, **70'**) is positioned on the inside of the drinking container (**61**) after having applied the device.

12. A device according to claim 3, characterised in that the inner tube (**29**) is coated with at least one outer layer of plastics material before heat-welding of the outside (**13**) to other surfaces.

13. A device according claim 4, characterised in that the outer tube (**1**) is formed from a plastic foil (**91**) attached to itself or to each other and to the tube (**29**).

14. A device according claim 4, characterised in that the inner tube (**29**) is coated with at least one inner layer of plastics material that maintains proper sealing of the deformation valve (**70'**).

15. A device for providing a continuous inlet of air to a drinking container (**61**), the device consisting of an outer tube (**1**) provided with a sealing surface (**102**) and at least one groove (**100**) for air through-flow, and a gasket (**101**) having a hole (**104**), characterised in that the at least one groove (**100**) is placed in the surface of the outer tube (**1**) to seal against the gasket (**101**), whereby air may be drawn from the outside of the outer tube (**1**), and the air may be carried onwards to the sealing surface (**102**), thus allowing the outer pressure (P1) to exert a force on the outside (**105**) of the gasket, which thereby opens the valve zone (**102**, **104**) for the intake of air from the outside of the device through the at least one groove (**100**) when sufficient underpressure exists in the container (**61**).

16. A device according to claim 4, characterised in that the outer tube (**1**) is provided with at least one barb (**32**).

17. A device according to claim 4, characterised in that the outer tube (**1**) is provided with at least one hole (**20**) that allows inlet of air into the drinking container (**61**) during consumption of the liquid (**60**).

18. A device according to claim 4, characterised in that the outer tube (**1**) is formed into a part of a cap or otherwise is provided with threads (**11**) or other fastening devices for connecting with a drinking container (**61**).

19. A device according to claim 4, characterised in that the bellows (**4**) is formed with at least one type of recess (**33**) formed in the inner tube (**29**), and that at least one recess (**33**) is formed as a helix having at least one rotational direction and at least one pitch.

20. A device according to claim 4, characterised in that the outer tube (**1**) is formed from a part of the drinking container (**61**).

21. A device according to claim 4, characterised in that the at least one valve (**70**, **70'**) is positioned on the inside of the drinking container (**61**) after having applied the device.

22. A device according to claim 4, characterised in that the inner tube (**29**) is coated with at least one outer layer of plastics material before heat-welding of the outside (**13**) to other surfaces.

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