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(54) **NO-SPILL DRINKING CUP APPARATUS**

AUSLAUFGESCHÜTZTES TRINKBECHER

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## Description

**[0001]** The present application claims all rights of priority to U.S. Patent Application Serial No. 09/138,588, filed August 21, 1998, and to U.S. Patent Application Serial No. 09/271,779 filed March 18, 1999, the disclosures of which are fully incorporated herein by reference. The disclosure of U.S. Provisional Patent Application No. 60,056,218, filed August 21, 1997 is fully incorporated herein by reference, as well.

## Field of the Invention

**[0002]** The present invention relates to a no-spill cup assembly with an improved valve mechanism to prevent liquid from flowing out of the cup when not desired.

## Background of the Invention

**[0003]** No-spill cup assemblies are well known in the art (see document US-A-5 706 973). In the past, a variety of such assemblies have been developed and marketed. In general, the goal of a no-spill cup is to provide a construction which minimizes or prevents liquid from emerging out of the cup when liquid flow is not desired, i.e. when the user is not drinking. However, though the assemblies of the prior art are intended to avoid such accidents, their construction is such that they generally do not provide a secure enough protection against undesirable spilling or leakage. Thus, when such cups are inverted, or more significantly, when they are shaken vigorously, liquid will often emerge from them. This can be a particular problem with young children, for whom these cups are usually intended. Accordingly, there is a need in the art for an improved cup assembly for preventing undesired spilling of liquids.

## Summary of the Invention

**[0004]** It is an object of the present invention to provide an improved no-spill cup assembly.

**[0005]** It is a further object of the present invention to provide a cup assembly which prevents liquid from flowing out of the cup when the user is not drinking.

**[0006]** It is a further object of the invention to provide a cup assembly which minimizes and/or eliminates accidental or undesirable liquid flow or spillage out of the cup.

**[0007]** It is a further object of the invention to provide a cup assembly which provides the ability to regulate the flow rate of liquid out of the cup.

**[0008]** It is a further object of the invention to provide a cup assembly which can be used by young children, to avoid accidental spilling of liquid therefrom.

**[0009]** Further objects of the invention will become apparent in conjunction with the disclosure herein.

**[0010]** Accordingly the present invention provides a no spill drinking apparatus (7), comprising:

a cap (11) and a cup (22), said cap (11) being removably attachable to and detachable from said cup (22), said cap (11) comprising a soft spout (14, 130, 140);

a valve, said valve comprising a flexible material (126) having an opening (118), said valve further comprising a protruding member (108), said protruding member (108) extending into said opening (118), said valve having a resting position and an open position, wherein in said resting position liquid is blocked from passing through said opening (118) and through said spout (14, 130, 140);

a valve holder (31) which holds said flexible material, said valve holder (31) being attachable to said cap (11) and separable from said cap (11); and an air vent,

wherein the apparatus is configured such that application of negative pressure through said spout (14, 130, 140) causes said flexible material (126) to move, with said opening (118) of said flexible material (126) moving along said protruding member (108) toward said spout (14, 130, 140), such that liquid passes through said opening (118) and out of said spout (14, 130, 140) and further such that air passes into said apparatus through said vent.

**[0011]** In accordance with the invention, an improved cup construction and valve assembly is provided which provides an extremely secure seal against accidental liquid flow from the cup spout. Further to the invention, a user places his or her mouth against the spout of the cup assembly to suck liquid out of the cup when desired. The act of sucking at the spout of the cup creates negative pressure or a partial vacuum against a valve in the cup spout, causing the valve to begin to invert, or turn inside out, thereby unblocking an opening such as an orifice or slit in the valve. In the present invention, the application of negative pressure to the top of the valve causes an opening in a portion of the valve to move up off of the base of a protruding member extending through that opening. Once the opening is unblocked, liquid can flow freely through the valve and spout.

**[0012]** In contrast, when not in use, the valve sits in a resting, closed position, with the opening pressed against the center seal-off, thereby sealing off the opening, slit or orifice in the valve assembly. Thus, in its relaxed state, with no negative pressure applied, the valve sits in a closed position with the fluid opening sealed by the center seal-off. In the preferred embodiment, the protruding member extends through the opening in a male to female relationship such that the orifice sits tightly on the protruding member against the protruding member's bottom portion and the center seal-off or sealing member's base.

**[0013]** In one embodiment, a dual valve device is provided having an adjacent valve which similarly seals when no negative pressure is applied, thereby blocking off the air vents in the cover of the cup, and further preventing the possibility of fluid flow.

**[0014]** In each of the embodiments of the invention,

the closed valve position provides an extremely secure seal against fluid leakage, such that inadvertent spills or even deliberate attempts to force liquid outside of the cup, such as by turning the cup upside down, or shaking the cup, are ineffective.

**[0015]** In a further embodiment of the invention, the cup assembly allows liquid flow to be regulated between regular or maximum flow and minimal flow levels or rates by rotating the position of a valve assembly in the cap or cover of the cup. The valve holder is constructed as a two subunit assembly, with one subassembly holding a valve with a larger slit or orifice for fluid flow than the valve in the second subunit. Thus, upon rotation of the valve holder, either a low-flow valve or a higher flow valve can be positioned in the hole leading to the spout. In this manner, a dual position valve assembly is provided allowing either regular flow or minimal liquid flow conditions.

#### Brief Description of the Drawings

#### [0016]

Figure 1(a) is an exploded front view of a no-spill cup assembly in accordance with the present invention. Figure 1(b) is an exploded perspective view of the no-spill cup assembly of Figure 1(a).

Figure 2(a) is an exploded front view of a second embodiment of a no-spill cup assembly in accordance with the present invention. Figure 1(b) is an exploded perspective view of the no-spill cup assembly of Figure 2(a).

Figure 3 is a perspective view of a valve assembly useful for understanding the present invention.

Figure 4 is an exploded, perspective view of another example of the valve assembly of the no-spill cup, which is useful for understanding the present invention.

Figure 5(a) is an exploded front view of the cup assembly of the present invention, showing the rotation of the valve holder or assembly, into two alternate positions for placement in the cap or cover of the cup. Figure 5(b) is an exploded perspective view, showing the placement of the valve holder into the cap, in either of the two positions illustrated in Figure 5(a).

Figure 6 (a) - (e) are a series of additional views of the valve holder or assembly of Figure 3 - (Figure. 6 (a)-(c) show examples useful for understanding the present invention). Figure 6(a) is a top view of the valve holder. Figure 6(b) is a front view of the valve holder. Figure 6(c) is a side view of the valve holder. Figure 6(d) is a cross-sectional view of the valve

holder wherein the valve is in a relaxed state, sealing off fluid flow. Figure 6(e) is a cross-sectional view of the valve holder, showing the valve in an inverted state, to allow fluid flow through the valve.

Figure 7 is an exploded, perspective view of another example of the valve assembly of the no-spill cup, which is useful for understanding the present invention.

Figure 8 (a) - (e) are a series of additional views of a further example of the valve assembly shown in Figure 6. Figure 8(a) is a top view of the valve holder or assembly. Figure 8(b) is a front view of the valve holder. Figure 8(c) is a side view of the valve holder. Figure 8(d) is a cross-sectional view of the valve holder wherein the valve is in a relaxed state, sealing off fluid flow. Figure 8(e) is a cross-sectional view of the valve holder, showing the valve in an inverted state, to allow fluid flow through the valve.

Figure 9 (a) - (e) are a series of additional views of another example : of the valve assembly shown in Figure 8. Figure 9(a) is a top view of the valve holder or assembly. Figure 9(b) is a front view of the valve holder. Figure 9(c) is a side view of the valve holder. Figure 9(d) is a cross-sectional view of the valve holder wherein the valve is in a relaxed state, sealing off fluid flow. Figure 9(e) is a cross-sectional view of the valve holder, showing the valve in an inverted state, to allow fluid flow through the valve.

Figure 10 is a side view of a no-spill cup with a soft gripping area, in accordance with the present invention.

Figure 11 (a) - (c) are a series of views of an embodiment of the cap of the present invention. Figure 11 (a) is a partial sectional view of a cap with an insert molded or glued in gasket, in accordance with the invention. Figure 11(b) is a side sectional view of the cap of Figure 11(a). Figure 11(c) is a top sectional view of the cap of Figure 11(b).

Figure 12 (a) - (c) are a series of additional views of another embodiment of the cap of the present invention. Figure 12(a) is a partial sectional view of a cap with a molded lip which wedges against into the inside surface of the cup, in accordance with the invention. Figure 12(b) is a side sectional view of the cap of Figure 12(a). Figure 12(c) is a top sectional view of the cap of Figure 12(b).

Figure 13 is a side sectional view of a cap having a soft spout, in accordance with a further embodiment of the invention.

Figure 14 is a side sectional view of a cap having a

reduced volume spout, in accordance with a further embodiment of the invention.

Figures 15(a) - (f) are a series of additional views of a preferred embodiment of the present invention in which the center stop has been modified, and the opening in the valve is an approximately circular orifice or hole.

Figure 15 (a) is a top view of the valve holder, holding the modified valve, in accordance with the invention.

Figure 15(b) is a cross sectional view of the valve holder of Figure 15(a) showing the modified valves therein, including a modified center stop having a protruding member. The valve includes an approximately circular opening in the valve that is blocked by the protruding member, which extends there-through.

Figure 15(c) is a side view of the valve holder of Figure 15(a).

Figure 15(d) is an end view of the valve holder of Figure 15(a).

Figure 15(e) is a cross sectional view of the valve within the valve holder of Figure 15 (a), showing the fast flow valve, in accordance with the embodiment of the invention in which the center stop has been modified to include a protruding member extending therefrom.

Figure 15(f) is a cross sectional view of the valve within the valve holder of Figure 15(a), showing the slow flow valve, in accordance with the embodiment of the invention in which the center stop has been modified to include a protruding member extending therefrom.

Figures 16(a)-(d) are a series of views of one of the valve holder subunits of the valve holder shown in Figures 15 (a) - (f). Figure 16(a) is a top view of the valve holder subunit, for attachment to a cap of a no spill cup. Figure 16(b) is a cross sectional view of the valve holder subunit of Figure 16(a). Figure 16 (c) is a side view of the valve holder subunit shown in Figure 16(a). Figure 16(d) is a perspective view of the valve holder subunit.

Figures 17(a)-(d) are a series of views of the valve, in accordance with the preferred embodiment of the invention shown in Figures 15(a) - (f), and Figures 16(a)-(d). Figure 17(a) is a top view of the valve, for placement within a valve holder subunit, as shown in Figures 16(a)-(d) and/or placement in a valve holder, as shown in Figures 15 (a) - (f). Figure 17(b) is a cross sectional view of the valve of Figure 17(a). Fig-

ure 17(c) is a side view of the valve shown in Figure 17(a). Figure 17(d) is an exploded view of a portion of the valve shown in Figure 17(b).

## 5 Detailed Description of the Invention and the Preferred Embodiments (and also examples useful for understanding the present invention)

[0017] As will be shown in conjunction with the attached drawings, a novel cup assembly is disclosed for providing prevention against accidental liquid spills. Figures 1(a) and 1(b) are a front view and a perspective view, respectively, of an embodiment of the cup assembly, in accordance with the present invention. The volume of the cup or liquid holding portion of the assembly can be adjusted as desired. In one embodiment, a 7 oz. drinking cup is provided, as shown in Figure 1. Alternatively, a 9 oz. drinking cup, as shown in Figure 2, a 6 ½ oz. cup, or any other desired size can be provided, as well.

[0018] The sides of the cup can be provided with no handles, one handle, two handles or any other number of handles, for the user's use to grip the cup. This handle or handle is preferably sized for a child's hands. In addition, the outside appearance of the cup and/or the cap can be a solid color, or can be printed with any desired design.

[0019] In a further embodiment of the invention, a no spill cup with a soft gripping area can be provided, as shown in Figure 10. In accordance with this embodiment, a soft ring 102 is provided around the outside of the cup. This ring can be of any width desired, and serves as a finger grip, to make it easier to grasp the cup securely. Preferably, the ring is approximately two inches (2") wide. In a preferred embodiment, the soft ring 102 has shapes or designs 106 cut out of it, such as stars, ovals, or so forth. The hard cup, in turn, has raised areas or protuberances corresponding to those shapes or designs. The soft ring fits snugly over these raised areas of the cup, each of the protruding hard shapes fitting into the cutouts of the soft ring, with the surface of the raised areas and the soft ring being flush when the ring is inserted onto the cup.

[0020] In one embodiment of the invention, the cup is constructed from polycarbonate. In an alternate embodiment, the cup is constructed from polypropylene. If desired, clear polypropylene can be utilized. Alternatively, any other suitable materials can be used for the components of the no-spill cup. The components of the cup are all made of durable materials, resistant to breakage, dishwasher safe, and preferably color fast.

[0021] In accordance with the invention, cup 7 includes a no-spill cap or cover 11, a valve holder or assembly 31 and tumbler cup 22. No-spill cap 11 includes a spout 14 for drinking liquid from the cup. The spout is sized to allow an individual to place his or her mouth over the spout to drink therefrom. In the preferred embodiment, the spout is sized for the mouth of a child, particularly for a child of a young age.

**[0022]** No-spill cap 11 forms a cover for placement over tumbler cup 22. When attached to the cup 22, a secure seal is formed such that no liquid can emerge through the connection between the cap 11 and cup 22. In use, cap 11 is sufficiently secured to cup 22 such that shaking the cup assembly, dropping the cup on the floor, or other vigorous movement of the cup assembly, or application of sharp force thereto, is insufficient to separate the cap from the cup.

**[0023]** In one embodiment, no-spill cap 11 and tumbler cup 22 include mating male and female screw threads, such that the cap 11 is a screw-on cap which can be easily rotated onto the tumbler cup 22, as shown in Figure 2. In an alternative embodiment, a snap-on cap is used, as shown in Figure 1. In this embodiment, a resilient ring portion of cap 11 securely fits over lip 10 of tumbler cup 22, as is well known in the art. Although a screw-on cap or a snap-on cap are shown as two preferred embodiments, alternatively, any other suitable mechanism to secure the cap to the tumbler cup can be utilized.

**[0024]** Either the screw-on cap and/or the snap-on cap can be further provided with a gasket 110 between the tumbler cup and the cap, to further seal the connection between the cup and the cap. This gasket can be part of the tumbler cup 22 or the cap 11, or can be a separate element inserted between the cap and the cup. In a preferred embodiment, the gasket 110 is part of cap 11, as shown in Figures 11(a)-(c).

**[0025]** Alternatively, the cap can be provided with a small annular inner lip, on the inside of the cap, which acts as a gasket. This lip, as shown in Figures 12(a)-(c), wedges inside the cup when the cap is screwed or placed upon it. The lip acts to further prevent the possibility of liquid flow through the contact between the cup and the cap.

**[0026]** In a preferred embodiment, finger grips are provided on the outside of the cap, such as grooves or the like. These grips facilitate removal and application of the cap, particularly in embodiments requiring the screwing of the cap on and off of the cup.

**[0027]** The cap is also preferably interchangeable with numerous tumbler cups of different sizes. In this embodiment, the rim of the tumbler cups are all of the same diameter, although the tumbler cups themselves are of different volumes. For example, the same sized cap could be used on a 6 ½ oz. cup and/or a 7 oz. cup and/or a 9 oz. cup, and so forth.

**[0028]** In a further embodiment of the cap, the cap has a soft spout 130 as shown in Figure 13. Preferably, the spout is made of a thermo-elastimer. Spout 130 can be insert molded to a polypropylene cap, providing a combination cap having a hard section for attachment to the cup, and a soft spout portion. Preferably, the spout has a small channel extending therethrough to reduce the liquid volume which can be trapped within the spout portion.

**[0029]** In a further embodiment of the cap, the cap has a reduced volume spout as shown in Figure 14. Reduced

volume spout 140 is designed to reduce the volume of liquid which can be trapped within the spout. Reduced volume spout 140 has a volume reduction member 144 inserted therein to reduce the internal volume of the spout, and to provide a channel 148 for liquid flow. Preferably, valve assembly subunit 142 extends up into spout 140 to further reduce the amount of liquid which can be trapped in spout 140. Valve assembly subunit 142 can, for example, extend into volume reduction member 144. Accordingly, this embodiment reduces the space between the valve and the opening of the drinking spout, to reduce the amount of liquid potentially trapped in this area.

**[0030]** As shown in Figure 1(b), no-spill cap 11 includes valve assembly carriers 16 and 18. In the preferred embodiment, valve assembly carriers 16 and 18 are tapered holes provided on the underside of the cap. Valve assembly carrier or tapered hole 18 leads to an open spout 14, providing a path for liquid flow. Thus, valve assembly carrier or hole 18 is fully open on both sides, both on its top surface, which leads to spout 14, and on its bottom surface opposite tumbler cup 32, for the flow of liquid out of tumbler cup 22 through hole 18 and through spout 14 into the user's mouth.

**[0031]** Valve assembly carrier or tapered hole 16, in contrast, provides a passage for the flow of air into the cup during use, allowing liquid to exit through opposing hole 18 and spout 14. Hole 16 is open on one side, i.e. on its lower surface opposite tumbler cup 22. On the opposing side, hole 16 merges into the inner surface of cap 11. The inner surface of cap 11 is further provided with one or more, preferably small, vents or holes for air flow, allowing air to flow through the vents of cap 11 and through hole 16 into the cup assembly during use.

**[0032]** As shown in Figures 1 and 2, no-spill cup 7 further includes valve holder or assembly 31. Valve holder 31 is preferably constructed from a high temperature ABS material, and is dimensioned to fit snugly into cap 11. In the preferred embodiment, valve holder is a separate assembly which fits into cap 11. Alternatively, the valve holder can be provided as an integral part of cap 11 and/or cup 7. For example, valve holder 31 can be molded as a part of cap 11, such that the valve holder is inseparable from the cap.

**[0033]** In the preferred embodiment, valve holder 31 is a two-subunit assembly connected by bridge 34. Each subunit of the two-subunit assembly is sized to frictionally fit into and be held by either one of tapered holes 16 and 18. The spacing between tapered holes 16 and 18 is the same as between the subunits of valve holder 31, such that the valve holder can be easily secured within cap 11. The sizing and tapering of holes 16 and 18 and the sizing of valve holder 31 are dimensioned so as to provide a secure, snug mating between the valve assembly and the tapered holes. In a preferred embodiment, the top of the valve holder (i.e. the side facing the spout) and the bottom of the valve holder (i.e. the side facing the cup) has two different diameters. The top is proportioned to

fit snugly into the tapered hole, and the bottom is proportioned such that it cannot be inserted into hole 16 or 18. In this way, a mechanism is provided to prevent the valve holder from being inserted into the holes in the wrong orientation, i.e. upside down.

**[0034]** Figure 3 is an enlarged, exploded, perspective view of a valve holder useful for understanding the present invention. Valve holder 31 consists of two valve holder subunits 37 and 39, connected by a bridge 34. Each valve holder subunit is intended to hold a single valve therein. As shown in the figure, valve or valve member 42 is intended for placement in subunit 37, and valve or valve member 45 is intended for placement in subunit 39. Valves 42 and 45 each include a slit or orifice for the passage of liquid. The slit or orifice is preferably through the center portion of the valve, and is dimensioned to allow a predetermined flow level or rate of liquid therethrough, as desired.

**[0035]** Valve holder subunits 37 and 39 open into sealing units 37a and 39(a) and valve retainers or endcaps 37b and 39(b), respectively. Taking subunit 37 as an example of the function of each subunit, as shown in Figure 3, subunit 37 is initially in an open position in which the sealing unit and the valve retainer have been pulled or hinged apart. In one example, the sealing unit and the valve retainer have a tab 60 connecting them, to prevent the components from being permanently separated accidentally. Alternatively, the valve retainer can be welded into place (e.g. by sonic welding), as shown in Figures 4 and 7. The sealing units each have at least one open section 58, such that, in the valve assembly's disassembled state, fluid can pass, unobstructed, through the sealing unit since no valve is in place. Likewise, the valve retainers are open on both sides for unobstructed passage of fluid through the valve retainer in the disassembled state when no valve is in place.

**[0036]** To assemble the valve assembly, valve 42 is inserted into the valve holder by placement of the valve between sealing unit 37a and valve retainer 37b. After a valve has been placed into one or both of the subunits, the valve retainers can each be folded or hinged back about tab 60, over the sealing unit 37 (or under sealing unit 39, in the orientation shown in the figure) and snapped into place to close the subunits, as shown in Figure 5. The resilience of the sealing unit allows for a tight seal to be established between the valve retainer and the sealing unit. When closed, each subunit secures or encapsulates a valve tightly therein, maintaining the valve in place in the valve holder. For clarity, reference is primarily made to subunit 37, although subunits 37 and 39 are preferably the same in all features other than the size of the valve opening. For the purposes of the present discussion, it is assumed that subunit 37 is the subunit intended for initial placement into hole 18.

**[0037]** As shown in Figures 5, 6, 8 and 9, upon closing a subunit (e.g. subunit 37 in Figure 3), valve 42 sits securely against center seal-off stop or center stop 52 in sealing unit 37a, with the opening 70 in valve 42 being

flush against center seal-off stop 52. Valve 42 includes a top, proximal side which will face the spout of the cap, and a distal side which rests against the center seal-off stop when the valve is placed in valve holder 31.

**[0038]** Center stop 52 functions as a sealing member or blocking element of the valve assembly which seals off and blocks the flow of fluid through the valve. In one example, center stop 52 consists of a solid substantially flat central area or portion 56 which is impenetrable to the flow of liquid therethrough. In an embodiment of the present invention, center stop or seal off 101 is provided with a protruding member 108 extending off of the base of the center seal off, as shown in Figure 15.

**[0039]** Surrounding the central area or portion 56, a peripheral area or region 58 can be provided having open areas such as slots or so forth, for allowing the passage of liquid therethrough, as shown, for example in Figure 8(a). Central area 56 or center stop 52 can further include stems 74. As shown in Figure 9, stems 74 can further be reinforced with braces 72, which are reinforcing elements, which provide additional material strength to the connection between the stems and the valve holder.

**[0040]** When in the normal resting position, valve 42 relaxes to sit securely against the center stop 52, as shown in Figure 8(d). In this resting position, opening or orifice 70 of valve 42 presses firmly against the central area 56 of center stop 52, preventing any fluid flow through the valve, and maintaining the valve in a closed configuration. In an embodiment of the present invention, the orifice can sit firmly against and upon a protruding member 108, as shown in Figure 15.

**[0041]** To drink from the cup, a user raises the cup to his or her mouth and begins to suck liquid through spout 14. In the process, the user creates negative pressure or a partial vacuum against the top of valve 42 in subunit 37. In one embodiment, valve 42 is constructed of a flexible material which is designed to fully invert and turn inside out, or to begin to invert and turn inside out, upon creation of a partial vacuum against the top of the valve 42, as shown in Figure 8(e). For example, valve 42 can be a membrane, either in whole or in part. Preferably, the valve is constructed of Kraton or silicone. If silicone is used, a 45 durometer silicone such as Lims 6045 is preferred, which is available from General Electric or from Wacker (a subsidiary of Bayer) of Germany. The materials used for the valve assembly and its components are sufficiently durable and heat resistant that the entire valve assembly can be placed in a dishwasher or boiled.

**[0042]** In one embodiment, the valve material is constructed of a single material with a greater thickness of material on the center area which seals off on the center stop, and with a thinner portion of material on the sidewalls. Providing a thinner sidewall portion contributes to the flexibility of the valve at its edges, which further assists and encourages inversion of the valve, by causing the valve to flex at the sidewalls first upon application of negative pressure thereto. Preferred dimensions for the valve thickness are approximately 0.4 mm of thickness

on the sidewalls and approximately 0.9 mm of thickness on the center area.

**[0043]** In a first embodiment, upon inversion of valve 42, opening or orifice 70 is displaced away from central area 56 of center stop 52. The inversion of the valve therefore unblocks opening 70 allowing fluid flow through the subunit. As negative pressure is being applied to the top of the valve 42 located next to the spout, negative pressure is likewise being applied to the bottom of the adjacent valve in the other subunit, located in the other tapered hole of the cup cover. Thus, this negative pressure, opens the second valve as well, by displacing the opening in the other valve away from its center stop. Inversion of valves 42 allows fluid flow to proceed through both subunits of the assembly. Liquid will flow through one subunit of the valve assembly, the subunit connected to the spout, concurrently accompanied by air flow through the other subunit of the assembly, the subunit connected to the air vents. In this manner, liquid smoothly and easily flows through the valve assembly, the spout, and out of the cup.

**[0044]** In a further example, the valve assembly is provided with a flow bridge 84. Flow bridge 84 blocks movement or expansion of the valve 42 beyond a certain maximum distance to prevent the valve from overextending itself, or from being subjected to excessive strain or distortion, as shown in Figure 8(e). Thus, the flow bridge prevents the valve from inverting beyond the point where it can no longer easily revert to its original position. In addition, the flow bridge provides a shield or a barrier preventing the valve from damage. Thus, it blocks objects such as a spoon or so forth, whether in a dishwasher or otherwise, from easily damaging the valve.

**[0045]** When negative pressure is released or removed from the spout, the valve reverts back to its resting position, and fluid cannot flow through the closed slit or orifice in the valve. In the resting position, no liquid will spill from or emerge out of the cup.

**[0046]** Further examples useful for understanding the valve holder and assembly of the invention are shown in Figures 4, 7-9 and embodiments of the valve holder and assembly of the invention are shown in Figures 15-17. As shown in Figure 4, instead of the valve retainer shown in Figure 3, a detachable snap fit valve retainer 81 can alternatively be provided. Or, as shown in Figure 7, valve retainer 94 can be provided as well. Valve retainers 81 and 94 serve the same function as valve retainers 37b and 39(b), holding and securing the valve within the valve assembly. It is preferred that the valve retainer, whichever embodiment is utilized, be sonic welded on, to ensure that the valve cannot be dislodged or removed from the holder.

**[0047]** Thus, in accordance with the invention, a system is provided for maintaining a tight seal against fluid flow when the cup is not in use. An extremely secure seal is provided, such that excessive or vigorous shaking is ineffective to force fluid out of the cup. Significantly, the valve construction disclosed results in a much tighter seal

than that observed in the no-spill cup assemblies of the prior art. In accordance with the invention, unless the user sucks through the spout, no liquid will flow through the valve.

**[0048]** In the preferred embodiment, subunits 37 and 39 are preferably identical in all respects excepts for the size of the orifice or slit in valve 42 and the orifice or slit in valve 45. It is preferred that one valve be provided with a larger opening than the other valve, such as a longer slit or larger orifice in one valve than the other. In one embodiment, one valve is provided with an opening in the form of a slit of approximately two hundred thousandths (200/1000) of an inch in length, while the second valve is provided with a slit of approximately fifty thousandths (50/1000) of an inch. Alternatively, other lengths or sizes may, of course, be used as well in accordance with the invention.

**[0049]** By varying the size and/or shape of the opening in the valve, the present inventor has further provided a novel dual acting flow system for regulating fluid flow. In this system, the level of flow of liquid out of the cup during use can be easily regulated. Regulation is accomplished by a simple rotation of the valve assembly which converts the cup between a faster or higher liquid flow, and a slower or lower flow system.

**[0050]** As shown in Figure 5, valve holder 31 can be inserted into cap 11 in either of two configurations. In a first configuration, valve 45, having a larger opening or orifice or slit, is placed into hole 18, the hole in communication with spout 14. In this configuration, a first, higher, flow level of liquid through the valve is established when the user sucks liquid through the spout, due to the use of the valve having the larger opening therein. By removing the valve holder 31 from holes 16 and 18, and flipping the valve holder 31 one hundred eighty degrees (180°), the other valve 42, having the smaller opening, can be inserted into hole 18. This valve 42 provides a second, lower flow state, in which liquid can still flow out of the spout, but at a lower flow rate than flow through the first valve. In this way, the rate of flow of liquid out of the cup can be regulated by a parent. Although a two level flow system is disclosed, greater or fewer flow levels can be provided by varying the number of attached subunits having valves therein, or by providing replacement valve holders having different sized openings 70 therein. In all configurations, however, liquid only flows through the valve when the user sucks through the spout, as disclosed above.

**[0051]** Any form of desired opening suitable for passage of a desired level of liquid can be utilized in the valve. The opening 70 can be, for example, a slit, a slot, an orifice (including any form of hole), or so forth. Likewise, by the term opening, it is contemplated that multiple openings of these or any other types can be provided as well.

**[0052]** In one example, the opening 70 is an "X" shaped slot 78, as shown in Figure 7. In another example, the opening is a "T" shaped slot 76, as also shown in Figure

7. Use of the X-shaped slot 78 shown in Figure 7, will provide a higher flow rate than the T-shaped slot 76 shown therein. The flow rate, of course, depends on the total length of the slots, or in general, on the size of the opening. Accordingly, both the X-shaped slot and the T-shaped slot can be used in a single valve assembly, each placed in its respective subunit. In this example, a two level flow system is provided, as previously discussed.

**[0053]** In a further example, both openings are X-shaped, with one opening larger than the other. A 7mm opening (the length from end to end of each crossbar of the "X") can be used for the fast side, and a 6mm opening for the slow side.

**[0054]** In a preferred embodiment of the invention, the valve includes a valve member 126 and a center stop or seal off with a protruding member. The preferred configurations and dimensions for the valve are shown in Figures 15-17.

**[0055]** As shown in Figure 17(a), valve member 126 includes an opening such as orifice or hole 118, and is preferably a membrane or flexible portion of material. The valve member and, likewise the protruding member, can each be made of a suitable flexible or plastic material, such as silicone, kraton, latex or ABS (Acrylonitrile-Butadiene-Styrene).

**[0056]** Valve member 126 is preferably encapsulated within an valve assembly subunit 114, 116 or 130, the valve assembly subunit being shown in Figures 15(a) and 16. Valve assembly subunit 130 is provided with openings therethrough, for passage of liquid through one side of the subunit, then through the valve, when the valve is in the open position, and then through the other side of the subunit, allowing a user to drink when negative pressure or suction is applied to the valve. The valve subunit or another suitable anti-inversion member or flow bridge placed in proximity to the valve member can further serve to block excessive inversion of the valve member. In accordance with this embodiment, the side of the valve subunit or the anti-inversion member is placed at a sufficiently close distance to the valve member such that upon the application of negative pressure or suction to the valve member, the valve member will hit the side of the subunit before fully inverting.

**[0057]** In the preferred embodiment, center stop or sealing member 101 is provided with a protruding member 108 which extends off of a base 104, as shown in Figure 15 (b) and Figures 15(e) - (f). Protruding member 108 is a male sealing or protruding member, which in the closed valve state extends through orifice 118. Preferably, a circular or approximately circular orifice is used, although any shaped orifice can be used consistent with the invention.

**[0058]** Further preferably, male sealing or protruding member 108 is a post or pin, such as a frustoconical or conical post, or a finger-like shaped member. Male sealing or protruding member 108 extends off of the base 104 as a protrusion or projection toward the orifice 118. Preferably, sealing or protruding member 108 is tapered.

Specifically, in the preferred embodiment, the protruding member 108 has a greater diameter at its bottom portion (near the base 104 of the center seal-off), than its diameter at the top. In the preferred embodiment, base 104 is substantially flat.

**[0059]** In accordance with the preferred embodiment of the invention, protruding member 108 is provided opposite female orifice 118, with the protruding member 108 and the orifice 118 in the center seal off forming a male to female mating relationship. In the relaxed state, with no negative pressure applied, center seal off 101 presses against orifice 118, with protruding member 108 tightly extending through the orifice and forming a seal against the flow of fluid through the valve. Due to the mating between the sealing member and the orifice, and due to the tapering of the sealing member with the larger diameter provided at the protruding member's base, the orifice sits snugly against the wider diameter bottom portion of protruding member 108 to form a very tight seal against fluid flow. In addition, in the preferred embodiment, the protruding member 108 extends past the orifice 118, i.e., in the closed valve state, the top of the protruding or sealing member 108 extends both through and past the orifice 118, to further ensure a tight barrier against fluid flow through the valve and to prevent the orifice from overtravelling and moving off of the protruding member. In accordance with the invention, even if the cup with the valve is shaken vigorously no fluid flows therethrough. In fact, shaking the cup can further wedge the protruding member 108 into the orifice 118, further tightening the seal between the protruding member and the edges of the orifice.

**[0060]** In this preferred embodiment, when the child or user tilts back the cup to drink therefrom and sucks at the top of the valve, the negative pressure he or she is applying to the top of the valve will open the valve by pulling the valve member containing the opening up and off of the valve and away from the protruding member. Accordingly, with the opening or orifice pulled off of the protruding member, the opening or orifice is unblocked and liquid can flow through the opening into the user's mouth.

**[0061]** In accordance with the preferred embodiment of the invention, a variable flow valve is provided, such that the harder the user sucks on the spout the greater the flow of liquid that comes out through the valve. Since the valve member preferably rests on a tapered protruding member, such as cone or frusto-conical member, the higher the negative pressure on the top of the valve member, i.e. the more the user sucks on the spout, the more the valve member is pulled off of the cone. As the valve member is further pulled off the base of the protruding member 108 and up its height (e.g. up the height of a cone), the opening or orifice in the valve member becomes progressively less blocked by the tapered protruding member 108, revealing a progressively greater cross-sectional area for fluid to flow therethrough.

**[0062]** Further in accordance with the embodiments

shown in Figures 15-17, the application of negative pressure to the top of the valve causes the valve to partially invert, raising the valve off of the protruding member, but preferably not inverting totally. As the valve begins to invert, the orifice is raised off of the protruding member, partially unblocking the orifice, which results in fluid flow therethrough as disclosed above.

**[0063]** In the preferred embodiment, the orifice in valve member 124 is circular and approximately 3/32 of an inch in diameter for the slow valve side +/- 1/16 of an inch, and is approximately 1/8 of an inch in diameter for the fast flow valve, also +/- 1/16 of an inch. Preferably, the protruding member is provided with a diameter of slightly over an 1/8" at its base, and a diameter of approximately 1/16 of an inch at its top on the fast flow valve, and a diameter of over 3/32 of an inch at its base and approximately 1/32 of an inch at its top on the slower flow valve. The opening or hole in the valve member 124 is also preferably radiused on the face, as shown in Figures 17 (b) and in the detailed, enlarged view of the orifice in Figure 17(d), to enable the valve member 124 to more easily move up and down the protruding member, and so that it does not stick on the protruding member during operation. In the preferred embodiment, the radius is 0.0100 inches.

**[0064]** In one embodiment, the valve is part of one or more subunits 114 and/or 116 of a valve assembly 120 for attachment to a no-spill drinking cup, or the cap thereof. In an alternative embodiment of the invention, the valve is an integral part of the cap or cover of the drinking cup. In a preferred version of this embodiment, the valve holder is molded to the cup cap or cover, or the cover is molded with the valve inserted therein. In a further preferred version of this embodiment, only a single valve is used, this valve having a protruding member with an approximately seven (7) degree taper.

**[0065]** In one embodiment of the invention, two valves are provided, one on each side of the lid or cap of the cup. In this embodiment, the protruding member on the fast flow side has a taper of approximately seven (7) degrees, and the protruding member on the slow flow side has a taper of approximately nine (9) degrees. In a further preferred embodiment of the invention, a single valve is used, this valve having a protruding member with an approximately seven (7) degree taper.

**[0066]** In the various embodiments of the invention, it is further preferred that the valve holder be marked to indicate which subunit is suitable for higher flow, and which for lower flow of liquid therethrough. Accordingly, the valve holders can be explicitly marked "Fast" and "Slow" as shown in Figures 7 and 9, respectively. Alternatively, or additionally, the subunits or the valve holders can be marked with a hare or rabbit, signifying fast flow, and a tortoise or turtle, signifying slow flow, as respectively also shown in Figures 7 and 9. The subunit connected to the spout is, of course, the subunit which controls the liquid flow rate. The valve holder can be marked, for example, on the subunit itself, or on the bridge in an

area directly adjacent to the subunit, as shown in the figures. In one embodiment, the valve holder is marked on the top and bottom (i.e. the sides facing the spout and the cup, respectively), such that the symbols and/or words can be seen from the top when the valve holder is being inserted, and from the bottom, once it has already been inserted, to determine which speed valve is in place in the spout. In an alternate embodiment, the words and/or symbols are only on the bottom of the valve, so that the user can see them from the bottom when inserting the valve holder, and can also view the valve holder from the bottom, once inserted.

**[0067]** Having described this invention with regard to specific embodiments, it is to be understood that the description is not meant as a limitation since further modifications may suggest themselves, or may be apparent to those in the art. It is intended that the present application cover all such modifications and improvements thereon.

## Claims

1. A no spill drinking apparatus (7), comprising:

a cap (11) and a cup (22), said cap (11) being removably attachable to and detachable from said cup (22), said cap (11) comprising a soft spout (14, 130, 140);  
a valve, said valve comprising a flexible material (126) having an opening (118), said valve further comprising a protruding member (108), said protruding member (108) extending into said opening (118), said valve having a resting position and an open position, wherein in said resting position liquid is blocked from passing through said opening (118) and through said spout (14, 130, 140);  
a valve holder (31) which holds said flexible material, said valve holder (31) being attachable to said cap (11) and separable from said cap (11); and  
an air vent,

wherein the apparatus is configured such that application of negative pressure through said spout (14, 130, 140) causes said flexible material (126) to move, with said opening (118) of said flexible material (126) moving along said protruding member (108) toward said spout (14, 130, 140), such that liquid passes through said opening (118) and out of said spout (14, 130, 140) and further such that air passes into said apparatus through said vent.

2. An apparatus according to claim 1, wherein said air vent comprises an opening and the opening of said air vent is smaller than the opening (118) of said flexible material (126) of said valve.

3. An apparatus according to any preceding claim, wherein said soft spout (14, 130, 140) is connected to a hard section of said cap (11).
4. An apparatus according to any preceding claim, wherein said flexible material (126) comprises the shape of a bowl, said bowl having a rim and a bottom, said bottom moving both toward said rim and toward said spout (14, 130, 140) upon application of negative pressure through said spout (14, 130, 140).
5. An apparatus according to any preceding claim, wherein said opening of said air vent is closed before drinking, and opens during drinking of liquid through said spout (14, 130, 140).
6. An apparatus according to any preceding claim, wherein said opening (118) is a hole.
7. An apparatus according to any preceding claim, wherein said flexible material (126) is provided with a greater thickness of material on the central area of said flexible material.
8. An apparatus according to any preceding claim, wherein said opening of said air vent is an opening in a flexible material.
9. An apparatus according to any preceding claim, wherein said opening of said air vent is closed when said opening of said flexible material is blocked, and wherein said air vent opens upon application of negative pressure through said spout (14, 130, 140).
10. An apparatus according to any preceding claim, wherein said opening of said air vent is an opening in a flexible material, said opening of said air vent being in a separate flexible material (126) from said flexible material through which passes liquid.
11. An apparatus according to any preceding claim, wherein said apparatus comprises a flow bridge (84), said flow bridge providing a shield preventing the flexible material from damage.
12. An apparatus according to any preceding claim, wherein said valve holder (31) and said cap (11) are dimensioned such that said valve holder (31) fits snugly into said cap (11).
13. An apparatus according to any preceding claim, wherein said protruding member (108) has a greater diameter at its bottom than at its top.
14. An apparatus according to any preceding claim, wherein said protruding member (108) extends tightly through said opening (118).
15. An apparatus according to any preceding claim, wherein cups (22) of different sizes are configured for interchangeable attachment to said cap (11).
16. An apparatus according to any preceding claim, wherein said cap (11) is provided with screw threads, such that said cap (11) can be screwed onto and off of the cup (22).
17. An apparatus according to any preceding claim, wherein said cup (22) is a hard cup.
18. An apparatus according to claim 16, wherein said cap (11) is further provided with finger grips on the outside of said cap (11) to facilitate screwing of said cap on and off of said cup (22).
19. An apparatus according to any preceding claim, wherein liquid passes through said valve holder (31) when a user drinks from said spout (14, 130, 140).
20. An apparatus according to claim 9, wherein application of negative pressure causes a flexible material to move to open said air vent.
21. An apparatus according to any of claims 1-3 or 5-20, wherein said flexible material begins to invert upon said application of negative pressure.
22. An apparatus according to any of the preceding claims, wherein said apparatus comprises a flow bridge (84), said flow bridge being placed in proximity to the flexible material to block excessive inversion of the flexible material.
23. Use of the apparatus of any of claims 1 to 20, as a no-spill drinking cup.
24. Use of the apparatus of any of claims 1 to 20, as a no-spill drinking cup for a child.
25. A method of dispensing a liquid using a no spill drinking apparatus (7), the apparatus comprising:
  - a cap (11) and a cup (22), said cap (11) being removably attachable to and detachable from said cup (22), said cap (11) comprising a soft spout (14, 130, 140);
  - a valve, said valve comprising a flexible material (126) having an opening (118), said valve further comprising a protruding member (108), said protruding member (108) extending into said opening (118), said valve having a resting position and an open position, wherein in said resting position liquid is blocked from passing through said opening (118) and through said spout (14, 130, 140);
  - a valve holder (31) which holds said flexible ma-

terial (126), said valve holder being attachable to said cap (11) and separable from said cap (11); and  
an air vent,  
said method comprising:

applying negative pressure through said spout (14, 130, 140) such that said flexible material (126) moves with said opening (118) of said flexible material (126) moving along said protruding member (108) toward said spout (14, 130, 140) to allow liquid to pass through said opening (108) and out of said spout (14, 130, 140) and further to allow air to pass into said apparatus (7) through said vent.

### Patentansprüche

1. Auslaufgeschützte Trinkvorrichtung (7), die folgendes umfaßt:

eine Kappe (11) und einen Becher (22), wobei die Kappe (11) abnehmbar an dem Becher (22) befestigt und von demselben gelöst werden kann, wobei die Kappe (11) eine weiche Tülle (14, 130, 140) umfaßt,  
ein Ventil, wobei das Ventil ein flexibles Material (126) umfaßt, das eine Öffnung (118) hat, wobei das Ventil ferner ein vorspringendes Element (108) umfaßt, wobei sich das vorspringende Element (108) in die Öffnung (118) erstreckt, wobei das Ventil eine Ruheposition und eine offene Position hat, wobei in der Ruheposition eine Flüssigkeit daran gehindert wird, durch die Öffnung (118) und durch die Tülle (14, 130, 140) hindurchzugehen,  
einen Ventilhafter (31), der das flexible Material hält, wobei der Ventilhafter (31) an der Kappe (11) befestigt und von der Kappe (11) getrennt werden kann, und  
eine Lüftung,

wobei die Vorrichtung derart konfiguriert ist, daß das Ausüben eines Unterdrucks durch die Tülle (14, 130, 140) bewirkt, daß sich das flexible Material (126) bewegt, wobei sich die Öffnung (118) des flexiblen Materials (126) längs des vorspringenden Elements (108) zu der Tülle (14, 130, 140) hin bewegt derart, daß Flüssigkeit durch die Öffnung (118) und aus der Tülle (14, 130, 140) hindurchgeht, und ferner derart, daß durch die Lüftung Luft in die Vorrichtung hindurchgeht.

2. Vorrichtung nach Anspruch 1, wobei die Lüftung eine Öffnung umfaßt und die Öffnung der Lüftung kleiner ist als die Öffnung (118) des flexiblen Materials (126)

des Ventils.

3. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die weiche Tülle (14, 130, 140) mit einem harten Abschnitt der Kappe (11) verbunden ist.
4. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das flexible Material (126) die Form einer Schale umfaßt, wobei die Schale einen Rand und einen Boden hat, wobei sich der Boden beim Ausüben eines Unterdrucks durch die Tülle (14, 130, 140) sowohl zu dem Rand hin als auch zu der Tülle (14, 130, 140) hin bewegt.
5. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Öffnung der Lüftung vor dem Trinken verschlossen ist und sich während des Trinkens einer Flüssigkeit durch die Tülle (14, 130, 140) öffnet.
6. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Öffnung (118) ein Loch ist.
7. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das flexible Material (126) am Mittelbereich des flexiblen Materials mit einer größeren Materialdicke versehen ist.
8. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Öffnung der Lüftung eine Öffnung in einem flexiblen Material ist.
9. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Öffnung der Lüftung geschlossen ist, wenn die Öffnung des flexiblen Materials gesperrt ist, und wobei sich die Lüftung beim Ausüben eines Unterdrucks durch die Tülle (14, 130, 140) öffnet.
10. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Öffnung der Lüftung eine Öffnung in einem flexiblen Material ist, wobei sich die Öffnung der Lüftung in einem von dem flexiblen Material, durch das Flüssigkeit hindurchgeht, gesonderten flexiblen Material (126) befindet.
11. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Vorrichtung eine Strömungsbrücke (84) umfaßt, wobei die Strömungsbrücke einen Schutz bereitstellt, der eine Beschädigung des flexiblen Materials verhindert.
12. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei der Ventilhafter (31) und die Kappe (11) derart bemessen sind, daß der Ventilhafter (31) satt in die Kappe (11) paßt.
13. Vorrichtung nach einem der vorhergehenden An-

sprüche, wobei das vorspringende Element (108) an seiner Unterseite einen größeren Durchmesser hat als an seiner Oberseite.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei sich das vorspringende Element (108) festsitzend durch die Öffnung (118) erstreckt. 5
15. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei Becher (22) unterschiedlicher Größen für eine austauschbare Befestigung an der Kappe (11) konfiguriert sind. 10
16. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Kappe (11) mit Schraubgewindengängen versehen ist derart, daß die Kappe (11) an den Becher (22) geschraubt und von demselben abgeschraubt werden kann. 15
17. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei der Becher (22) ein harter Becher ist. 20
18. Vorrichtung nach Anspruch 16, wobei die Kappe (11) ferner mit Fingergriffen an der Außenseite der Kappe (11) versehen ist, um ein Schrauben der Kappe an den Becher (22) und von demselben zu erleichtern. 25
19. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei eine Flüssigkeit durch den Ventilhalter (31) hindurchgeht, wenn ein Benutzer aus der Tülle (14, 130, 140) trinkt. 30
20. Vorrichtung nach Anspruch 9, wobei ein Ausüben eines Unterdrucks bewirkt, daß sich ein flexibles Material bewegt, um die Lüftung zu öffnen. 35
21. Vorrichtung nach einem der Ansprüche 1 bis 3 oder 5 bis 20, wobei das flexible Material beginnt, sich beim Ausüben eines Unterdrucks umzukehren. 40
22. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Vorrichtung eine Strömungsbrücke (84) umfaßt, wobei die Strömungsbrücke in der Nähe des flexiblen Materials angeordnet ist, um ein übermäßiges Umkehren des flexiblen Materials zu sperren. 45
23. Verwendung der Vorrichtung nach einem der Ansprüche 1 bis 20 als auslaufgeschützten Trinkbecher. 50
24. Verwendung der Vorrichtung nach einem der Ansprüche 1 bis 20 als auslaufgeschützten Trinkbecher für ein Kind. 55
25. Verfahren zum Ausgeben einer Flüssigkeit unter Verwendung einer auslaufgeschützten Trinkvorrichtung (7), wobei die Vorrichtung folgendes umfaßt:

eine Kappe (11) und einen Becher (22), wobei die Kappe (11) abnehmbar an dem Becher (22) befestigt und von demselben gelöst werden kann, wobei die Kappe (11) eine weiche Tülle (14, 130, 140) umfaßt, ein Ventil, wobei das Ventil ein flexibles Material (126) umfaßt, das eine Öffnung (118) hat, wobei das Ventil ferner ein vorspringendes Element (108) umfaßt, wobei sich das vorspringende Element (108) in die Öffnung (118) erstreckt, wobei das Ventil eine Ruheposition und eine offene Position hat, wobei in der Ruheposition eine Flüssigkeit daran gehindert wird, durch die Öffnung (118) und durch die Tülle (14, 130, 140) hindurchzugehen, einen Ventilhalter (31), der das flexible Material (126) hält, wobei der Ventilhalter an der Kappe (11) befestigt und von der Kappe (11) getrennt werden kann, und eine Lüftung,

wobei das Verfahren folgendes umfaßt:

Ausüben eines Unterdrucks durch die Tülle (14, 130, 140) derart, daß sich das flexible Material (126) bewegt, wobei sich die Öffnung (118) des flexiblen Materials (126) längs des vorspringenden Elements (108) zu der Tülle (14, 130, 140) hin bewegt, um zu ermöglichen, daß Flüssigkeit durch die Öffnung (118) und aus der Tülle (14, 130, 140) hindurchgeht, und um ferner zu ermöglichen, daß durch die Lüftung Luft in die Vorrichtung (7) hindurchgeht.

## Revendications

### 1. Dispositif à boire anti-fuite (7), comprenant:

une capsule (11) et un gobelet (22), ladite capsule (11) pouvant être fixée de manière amovible sur ledit gobelet (22) et en être détachée, ladite capsule (11) comprenant un bec souple (14, 130, 140) ;  
une soupape, ladite soupape comprenant un matériau flexible (126) comportant une ouverture (118), ladite soupape comprenant en outre un élément en saillie (108), ledit élément en saillie (108) s'étendant dans ladite ouverture (118), ladite soupape comportant une position de repos et une position ouverte, un passage du liquide à travers ladite ouverture (118) et à travers ledit bec (14, 130, 140) étant empêché dans ladite position de repos ;  
un élément de support de la soupape (31), retenant ledit matériau flexible, ledit élément de support de la soupape (31) pouvant être fixé sur ladite capsule (11) et séparé de ladite capsule

- (11) ; et  
un événement d'air,  
le dispositif étant configuré de sorte que l'appli-  
cation d'une pression négative à travers ledit  
bec (14, 130, 140) entraîne le déplacement dudit  
matériau flexible (126), ladite ouverture (118)  
dudit matériau flexible (126) se déplaçant le long  
dudit élément en saillie (108) en direction dudit  
bec (14, 130, 140), de sorte que le liquide passe  
à travers ladite ouverture (118) et hors dudit bec  
(14, 130, 140), l'air rentrant dans ledit dispositif  
à travers ledit événement.
2. Dispositif selon la revendication 1, dans lequel ledit  
événement d'air comprend une ouverture, l'ouverture dudit  
événement d'air étant plus petite que l'ouverture (118)  
dudit matériau flexible (126) de ladite soupape.
3. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit bec souple (14, 130,  
140) est connecté à une section dure de ladite cap-  
sule (11).
4. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit matériau flexible  
(126) a la forme d'un bol, ledit bol comportant un  
rebord et un fond, ledit fond se déplaçant vers ledit  
rebord et vers ledit bec (14, 130, 140) lors de l'ap-  
plication d'une pression négative à travers ledit bec  
(14, 130, 140).
5. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite ouverture dudit  
événement d'air est fermée avant la consommation et est  
ouverte au cours de la consommation de liquide à  
travers ledit bec (14, 130, 140).
6. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite ouverture (118) est  
constituée par un trou.
7. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit matériau flexible  
(126) a une épaisseur de matériau accrue sur la zone  
centrale dudit matériau flexible.
8. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite ouverture dudit  
événement d'air est constituée par une ouverture dans un  
matériau flexible.
9. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite ouverture dudit  
événement d'air est fermée lorsque ladite ouverture dudit  
matériau flexible est bloquée, ledit événement d'air étant  
ouvert lors de l'application d'une pression négative  
à travers ledit bec (14, 130, 140).
10. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite ouverture dudit  
événement d'air est constituée par une ouverture dans un  
matériau flexible, ladite ouverture dudit événement d'air  
étant formée dans un matériau flexible (126) séparé  
dudit matériau flexible que traverse le liquide.
11. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit dispositif comprend  
un pont d'écoulement (84), ledit pont d'écoulement  
établissant une protection empêchant un endomma-  
gement dudit matériau flexible.
12. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit élément de support  
de la soupape (31) et ladite capsule (11) sont dimen-  
sionnés de sorte que ledit élément de support de la  
soupape (31) est bien ajusté dans ladite capsule  
(11).
13. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit élément en saillie  
(108) a un diamètre supérieur au niveau de sa partie  
inférieure qu'au niveau de sa partie supérieure.
14. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit élément en saillie  
(108) s'étend légèrement à travers ladite ouverture  
(118).
15. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel des gobelets de taille dif-  
férente sont configurés en vue d'une fixation inter-  
changeable sur ladite capsule (11).
16. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ladite capsule (11) com-  
porte des filetages de vis, ladite capsule (11) pouvant  
ainsi être vissée sur le gobelet (22) et dévissée de  
celui-ci.
17. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel ledit gobelet (22) est un  
gobelet dur.
18. Dispositif selon la revendication 16, dans lequel la-  
dite capsule (11) comporte en outre des éléments  
de préhension pour les doigts sur l'extérieur de ladite  
capsule (11) pour faciliter le vissage de ladite cap-  
sule sur ledit gobelet (22) et le dévissage correspon-  
dant.
19. Dispositif selon l'une quelconque des revendications  
précédentes, dans lequel le liquide passe à travers  
ledit élément de support de la soupape (31) lorsqu'un  
utilisateur boit en se servant dudit bec (14, 130, 140).
20. Dispositif selon la revendication 9, dans lequel l'ap-

plication d'une pression négative entraîne le déplacement d'un matériau flexible afin d'ouvrir ledit évent.

21. Dispositif selon l'une quelconque des revendications 1 à 3 ou 5 à 20, dans lequel ledit matériau flexible commence à se retourner lors de ladite application d'une pression négative. 5
22. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif comprend un pont d'écoulement (84), ledit pont d'écoulement étant agencé à proximité du matériau flexible pour empêcher un retournement excessif du matériau flexible. 10  
15
23. Utilisation du dispositif selon l'une quelconque des revendications 1 à 20, sous forme d'un gobelet à boire anti-fuite. 20
24. Utilisation du dispositif selon les revendications 1 à 20, sous forme d'un gobelet à boire anti-fuite pour un enfant.
25. Procédé de distribution d'un liquide en utilisant un dispositif à boire anti-fuite (7), le dispositif comprenant : 25
  - une capsule (11) et un gobelet (22), ladite capsule (11) pouvant être fixée de manière amovible sur ledit gobelet (22) et en être détachée, ladite capsule (11) comprenant un bec souple (14, 130, 140) ; 30
  - une soupape, ladite soupape comprenant un matériau flexible (126) comportant une ouverture (118), ladite soupape comprenant en outre un élément en saillie (108), ledit élément en saillie (108) s'étendant dans ladite ouverture (118), ladite soupape comportant une position de repos et une position ouverte, un passage du liquide à travers ladite ouverture (118) et à travers ledit bec (14, 130, 140) étant empêché dans ladite position de repos ; 35
  - un élément de support de la soupape (31), retenant ledit matériau flexible, ledit élément de support de la soupape (31) pouvant être fixé sur ladite capsule (11) et séparé de ladite capsule (11) ; 40
  - ledit procédé comprenant les étapes ci-dessous : 45  
50
    - application d'une pression négative à travers ledit bec (14, 130, 140), de sorte que ledit matériau flexible (126) se déplace avec ladite ouverture (118) dudit matériau flexible (126), le long dudit élément en saillie (108), vers ledit bec (14, 130, 140), pour permettre le passage du liquide à travers 55

ladite ouverture (108) et hors dudit bec (14, 130, 140) et pour permettre le passage de l'air dans ledit dispositif (7) à travers ledit évent.

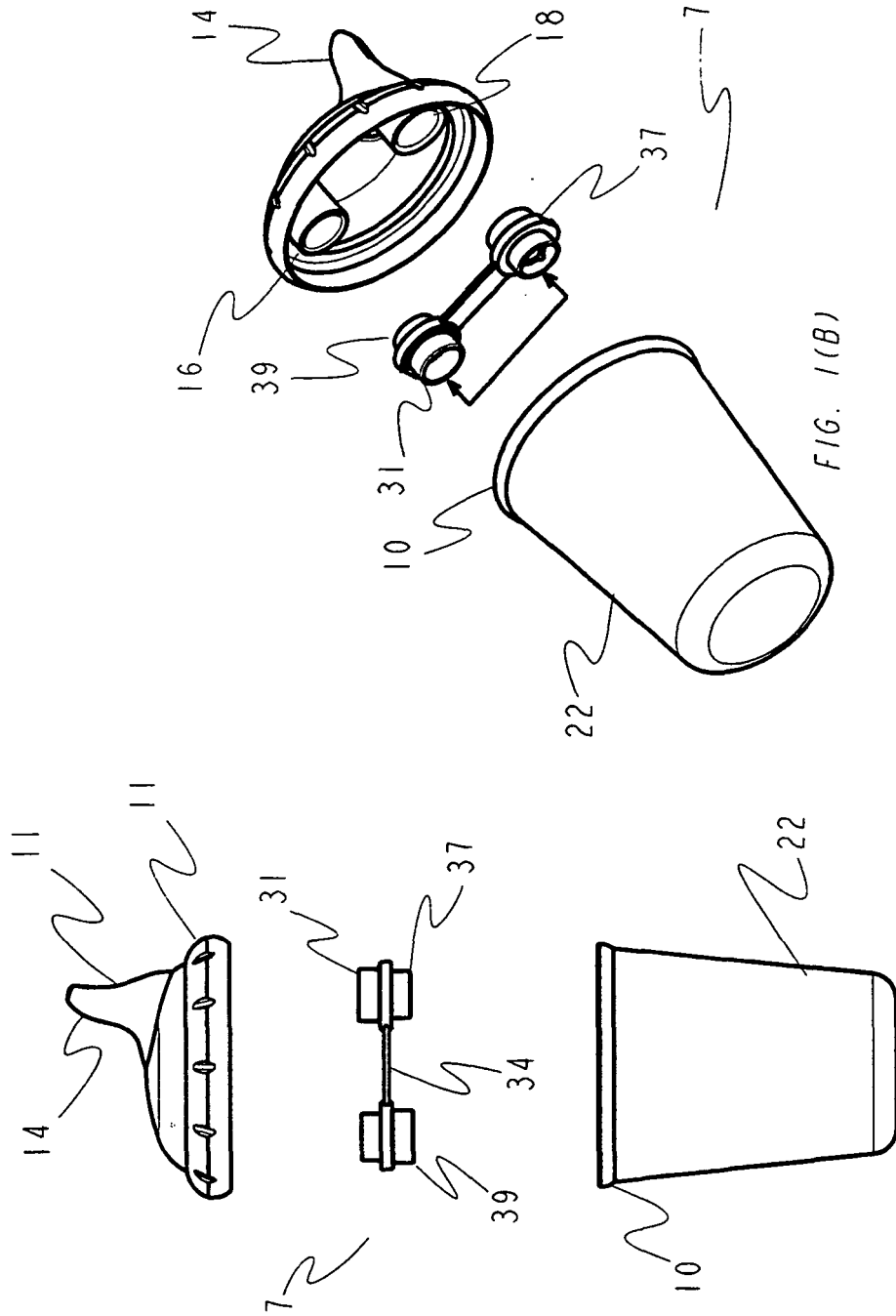
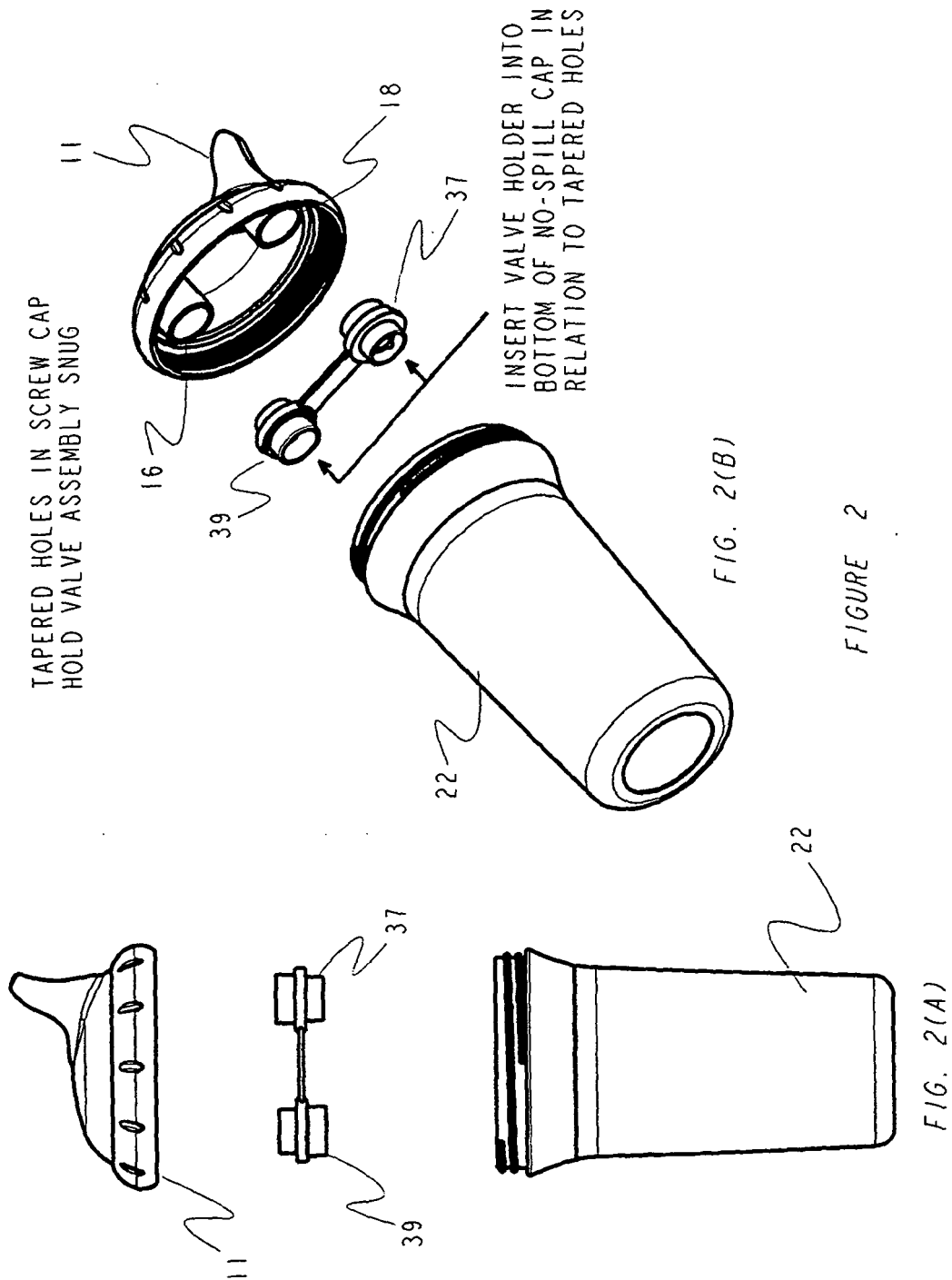


FIGURE 1

FIG. 1(A)

FIG. 1(B)



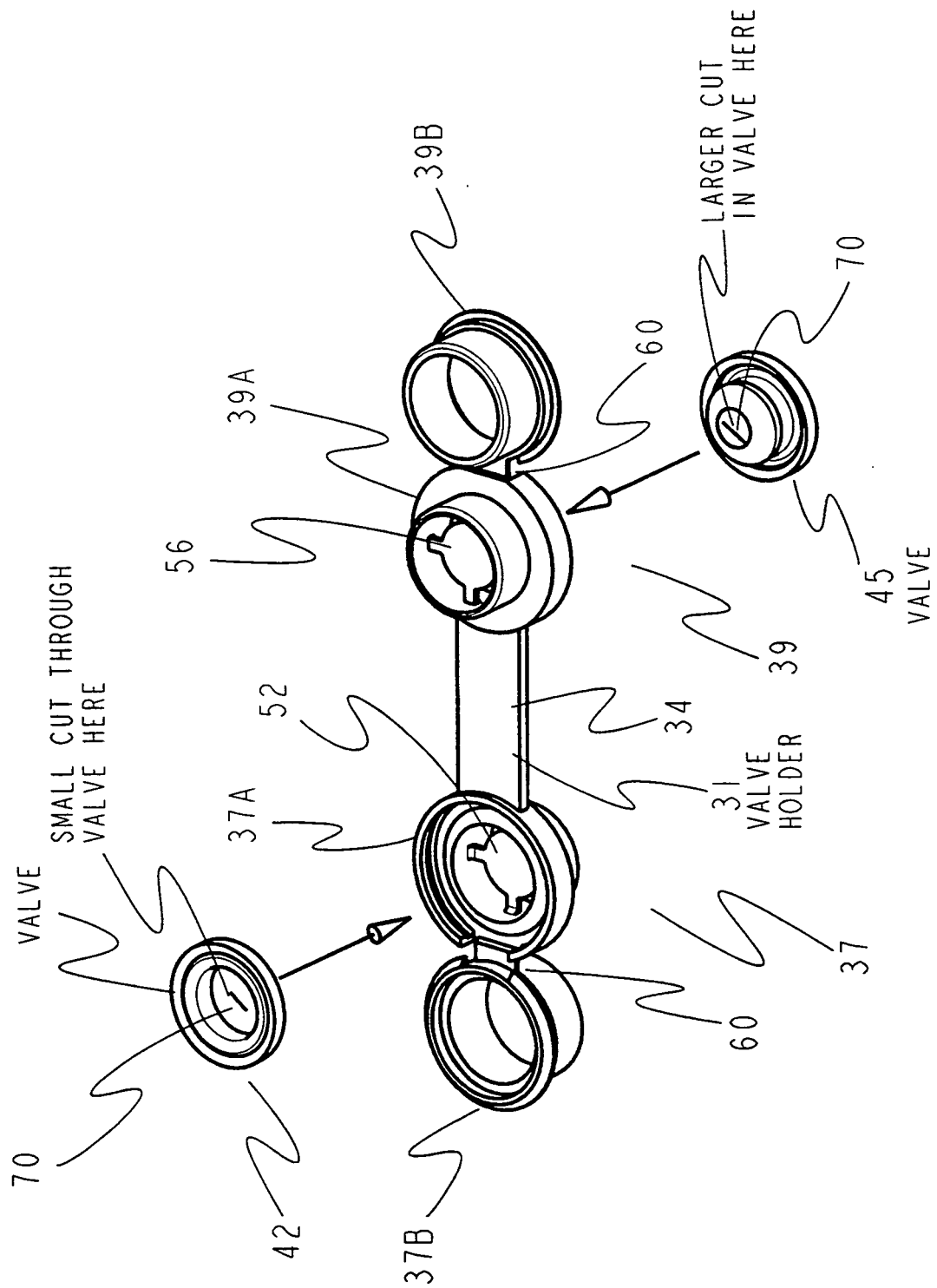
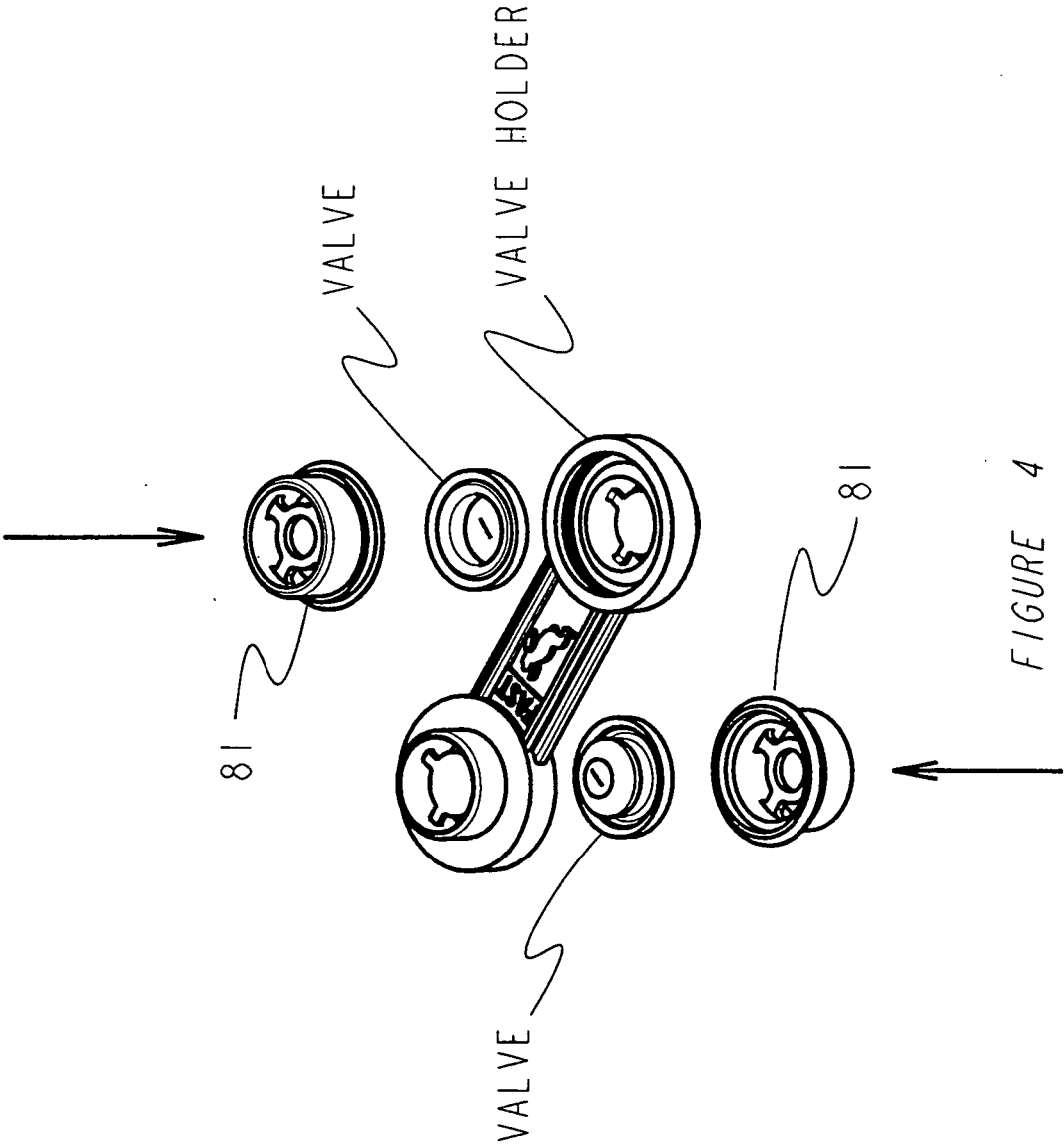
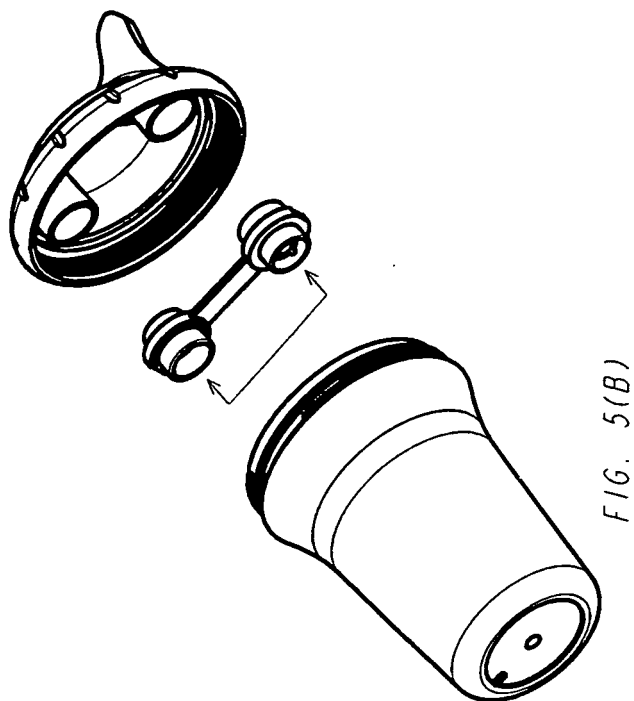
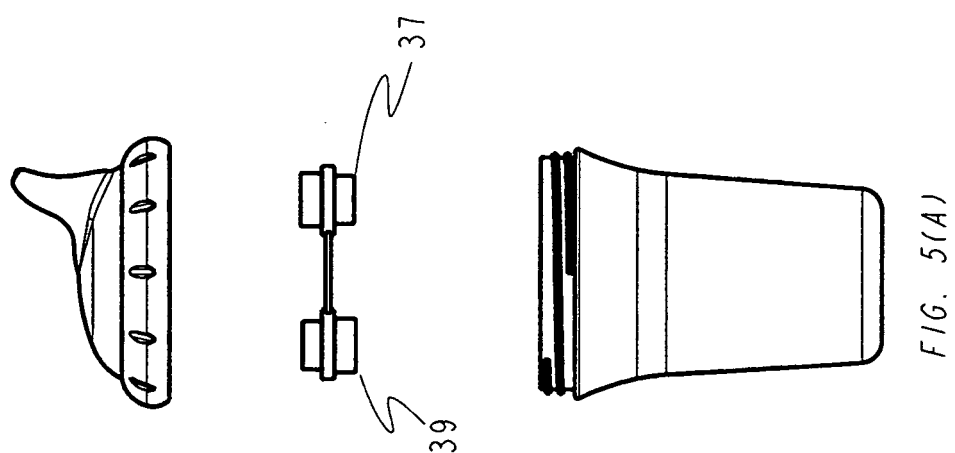


FIGURE 3





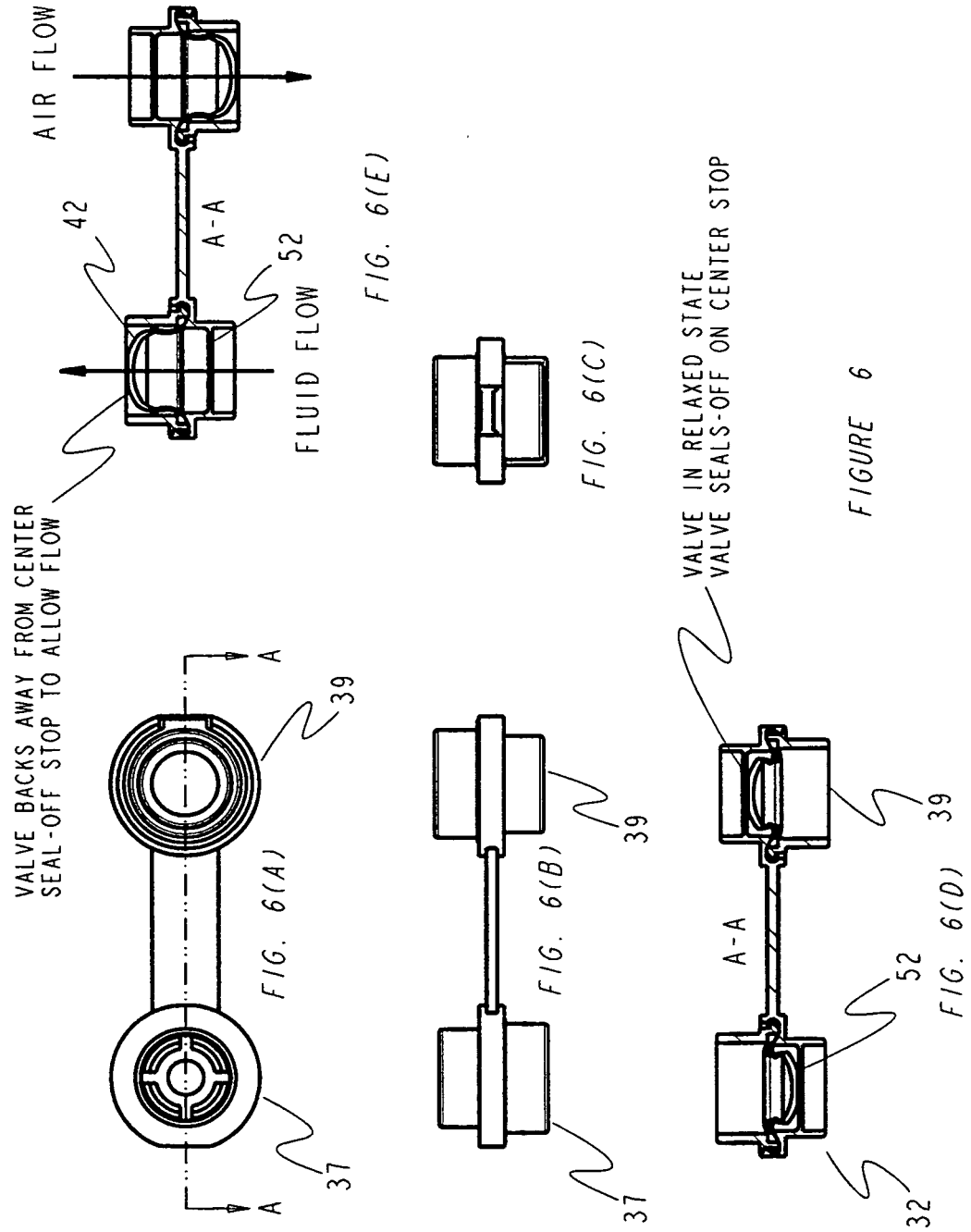


FIGURE 6

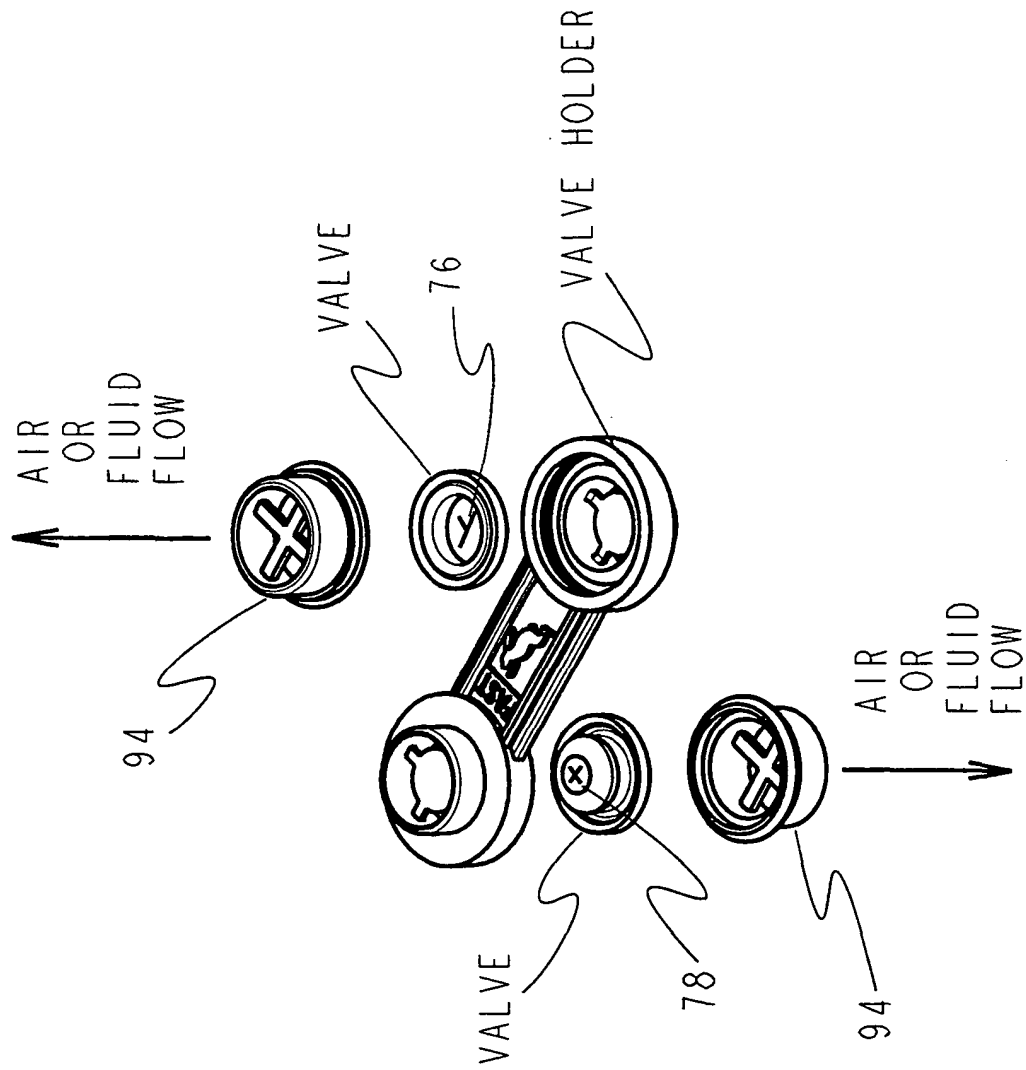
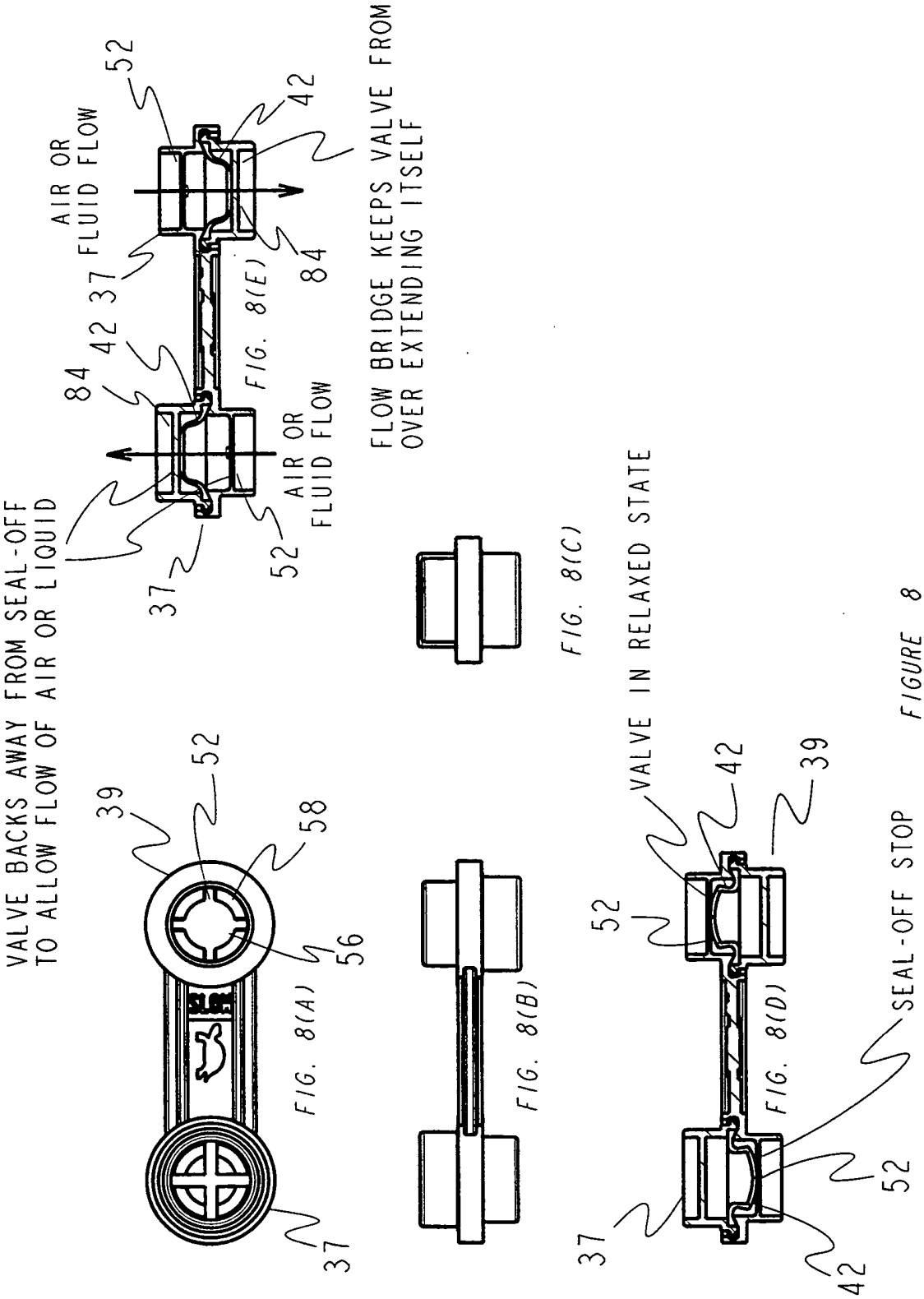
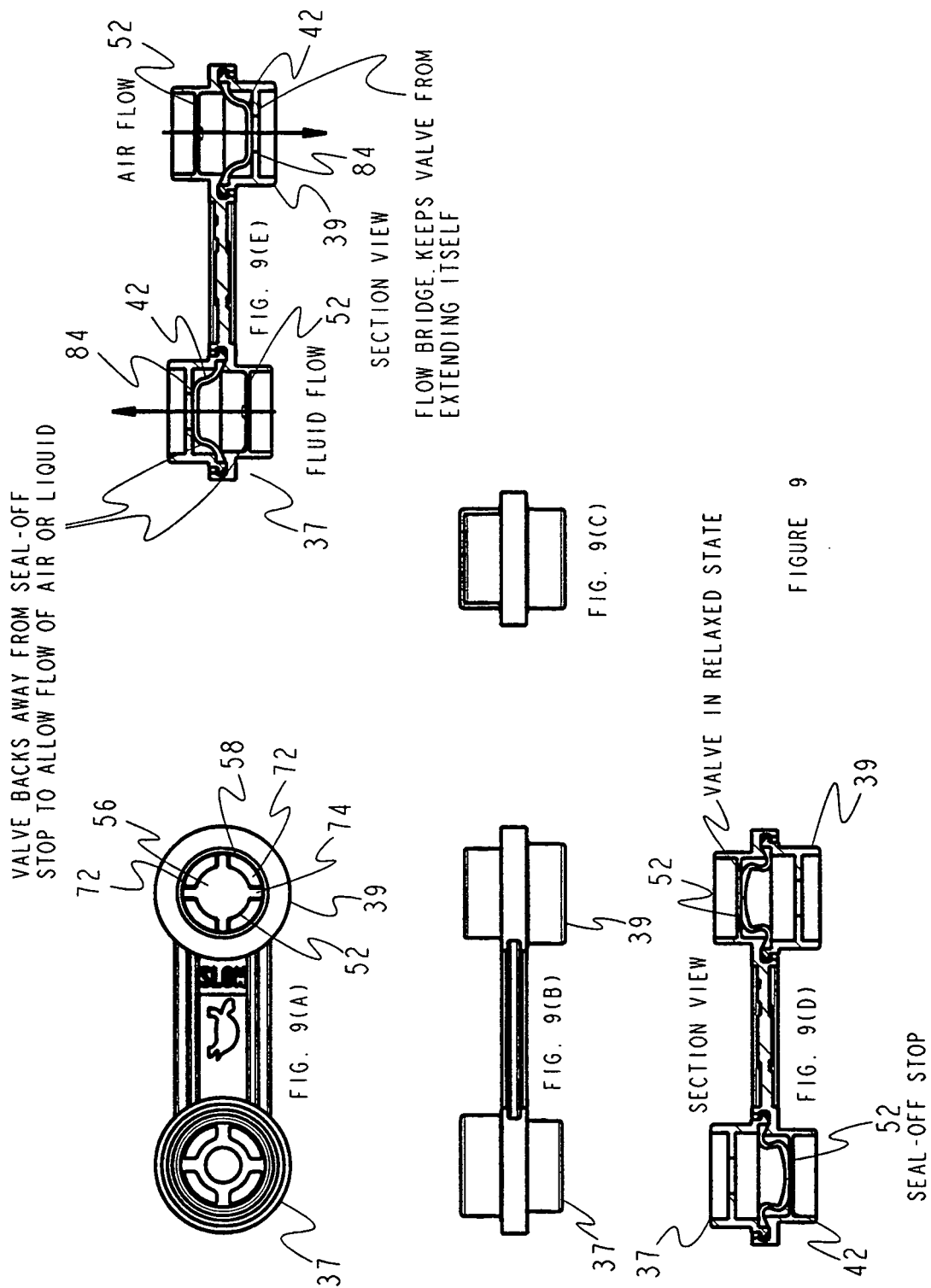


FIGURE 7





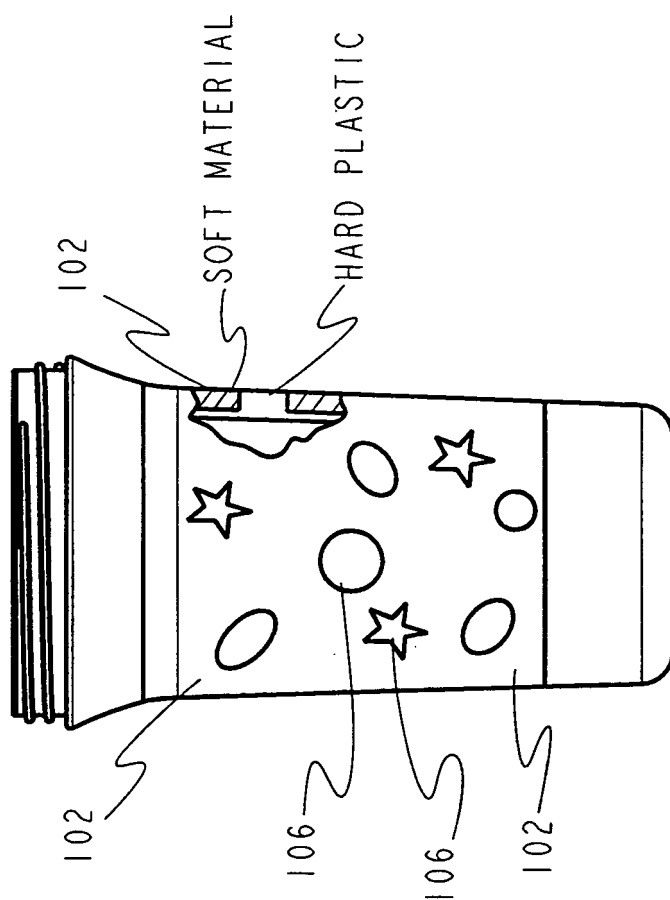
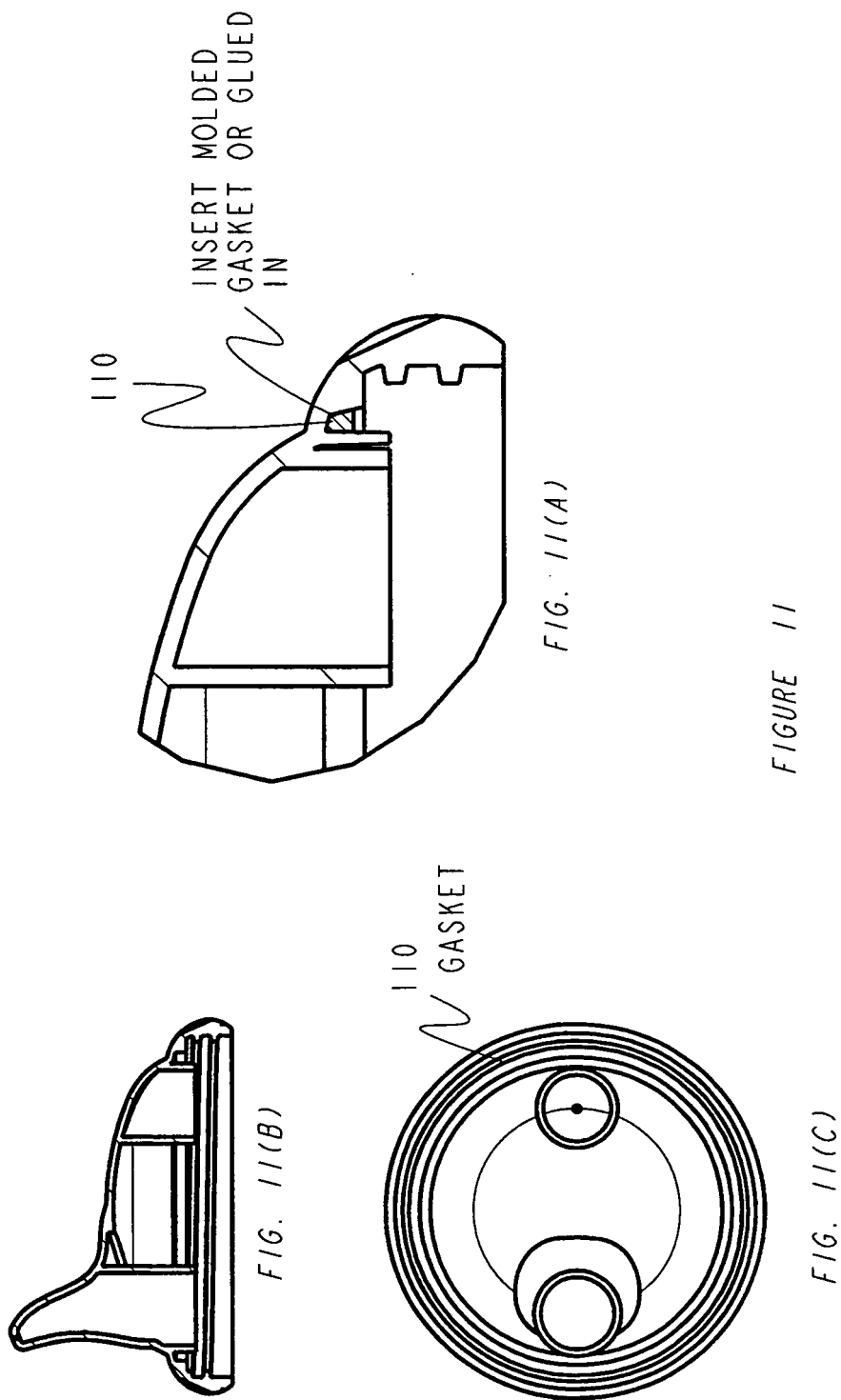
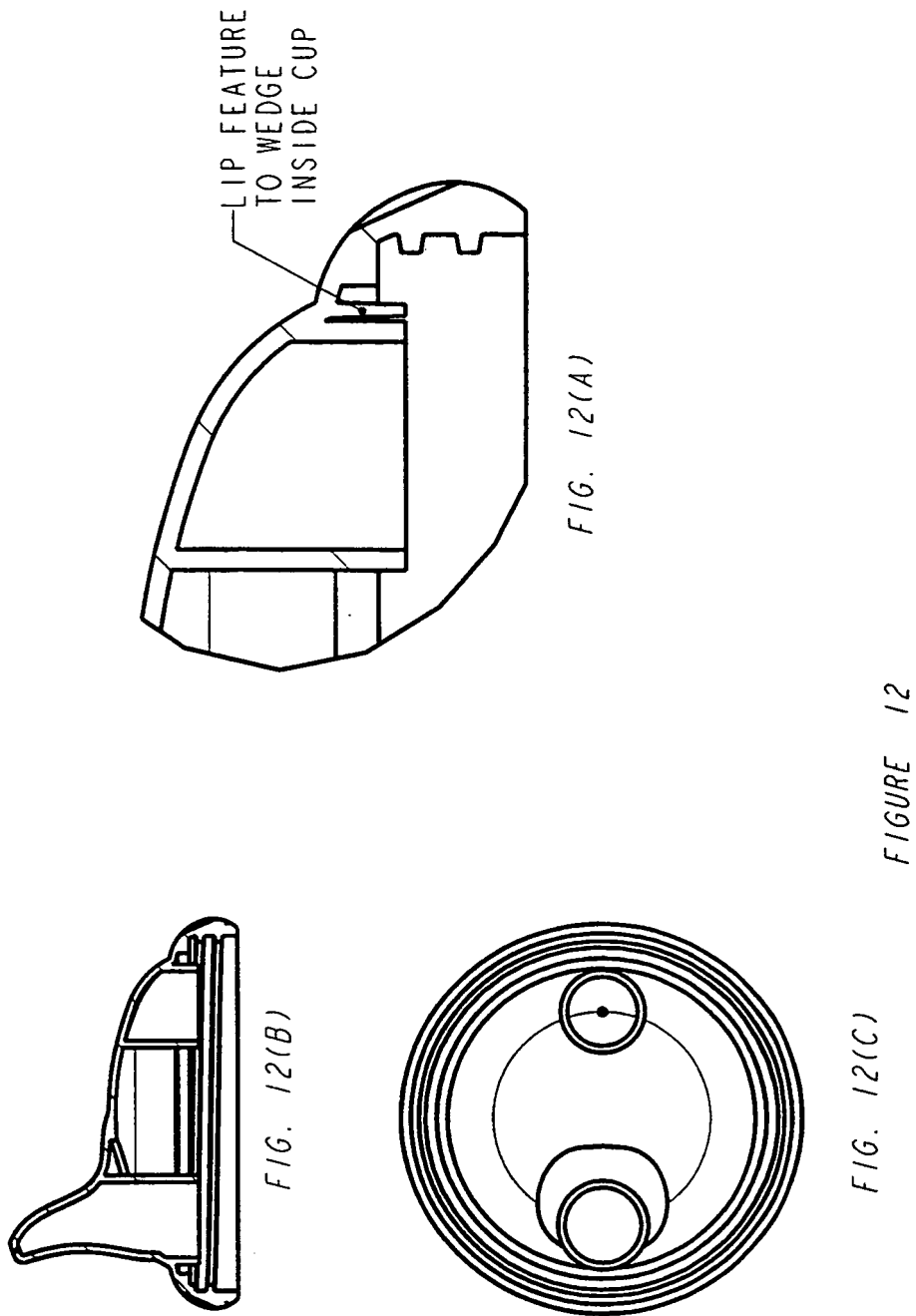


FIGURE 10





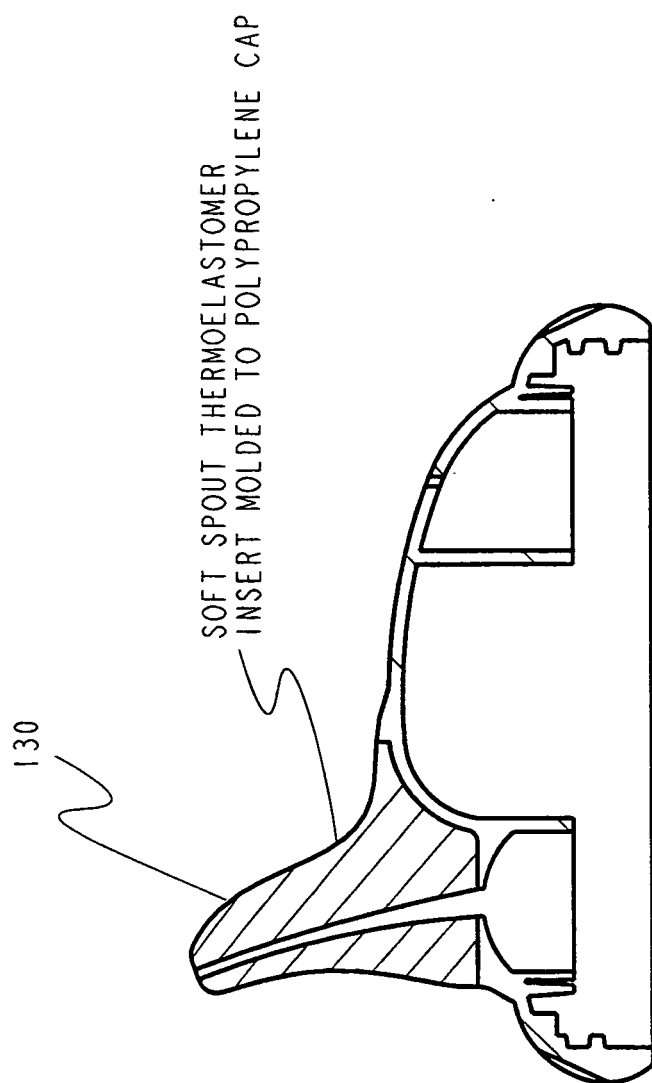


FIGURE 13

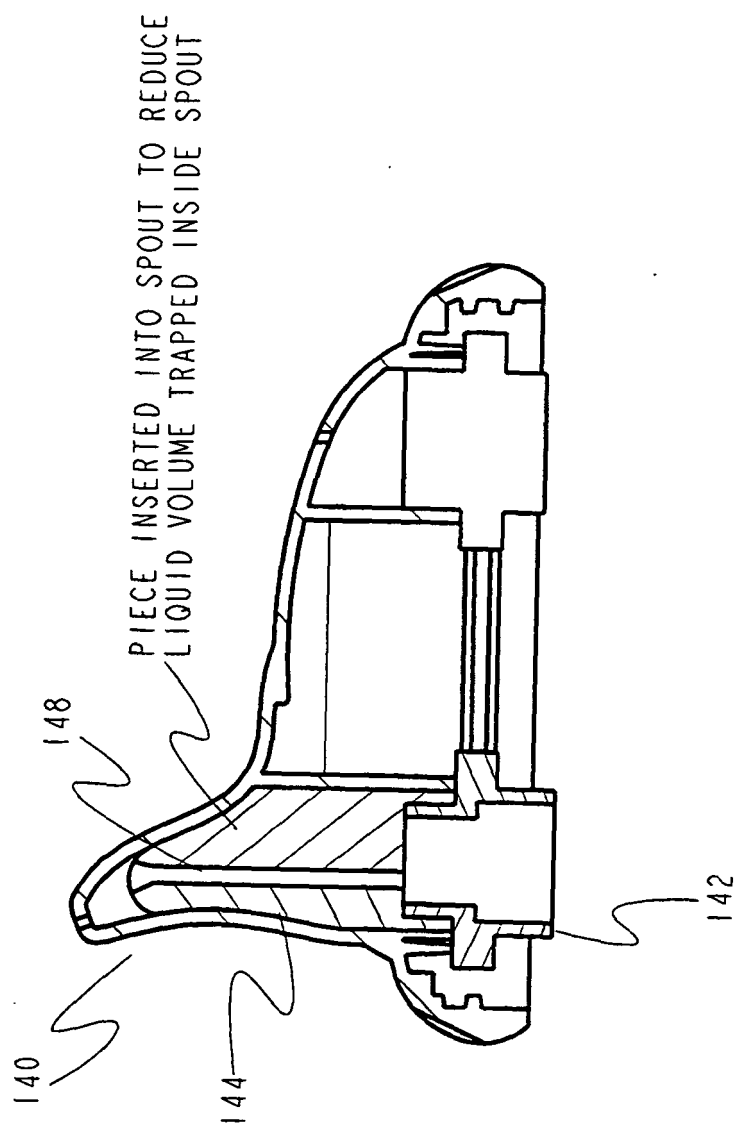


FIGURE 14

Fig.15(a)

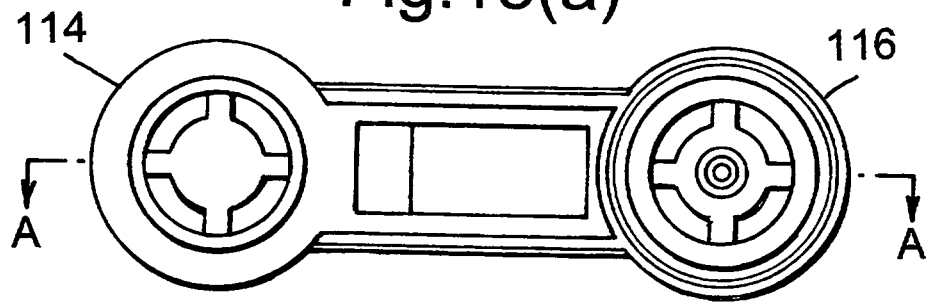


Fig.15(b)

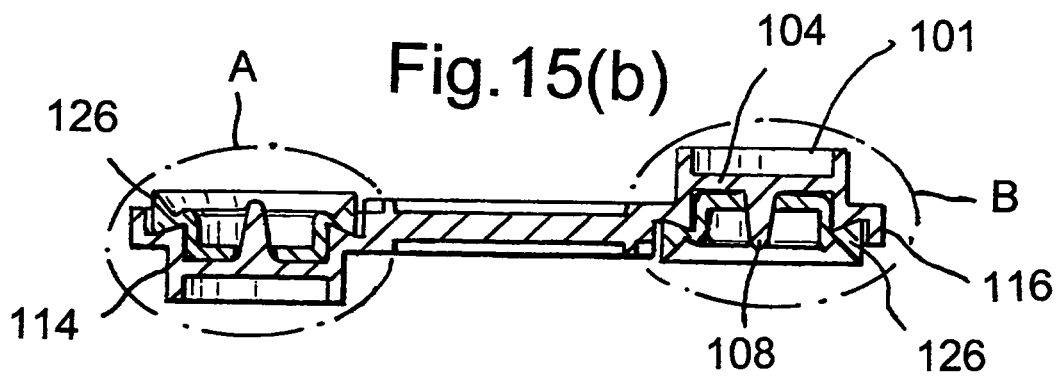


Fig.15(c)

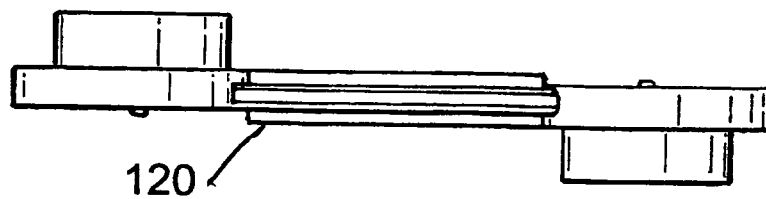


Fig.15(d)

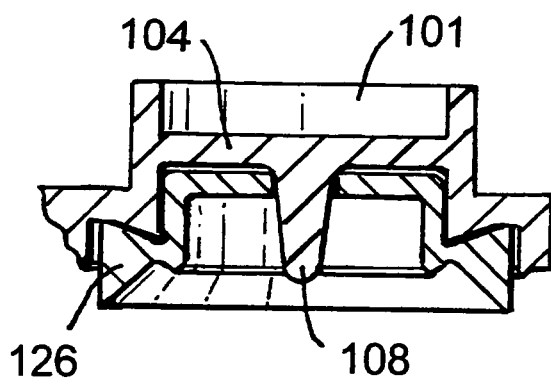


Fig.15(e)

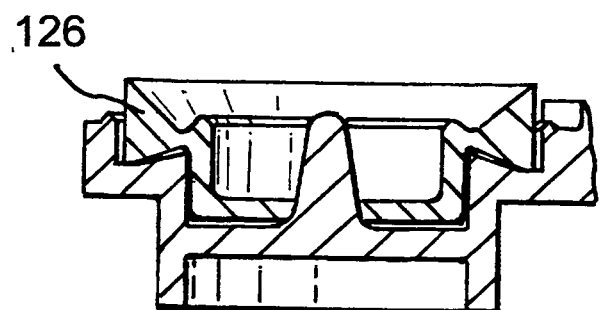


Fig.16(a)

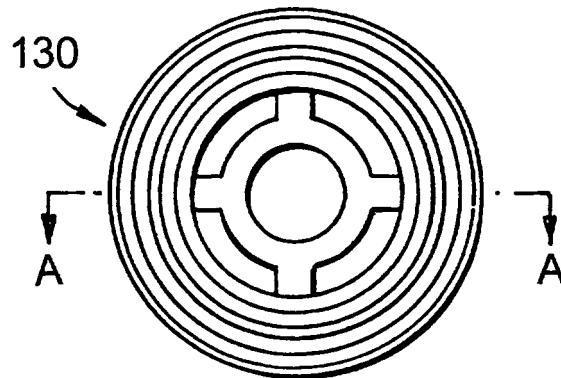


Fig.16(b)

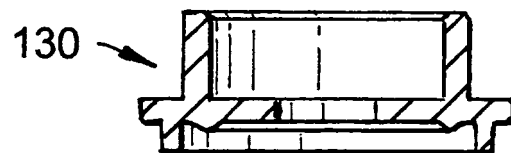


Fig.16(c)

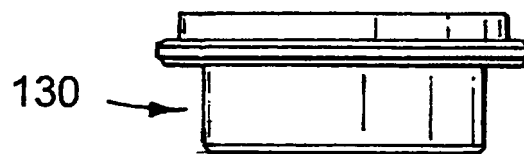


Fig.16(d)

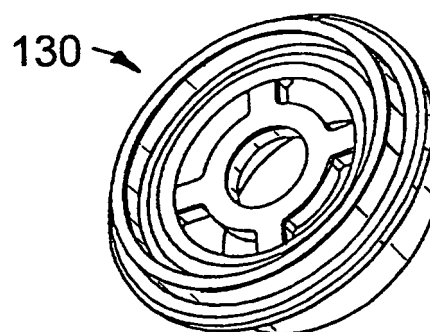


Fig.17(a)

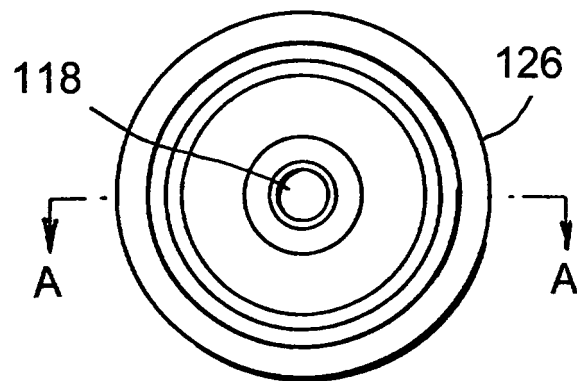


Fig.17(b)

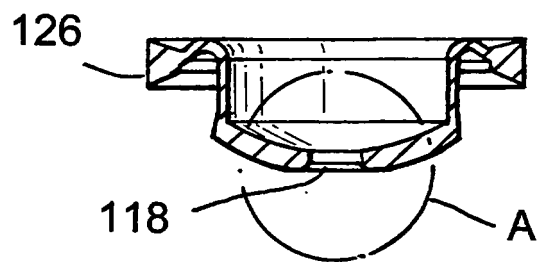


Fig.17(c)

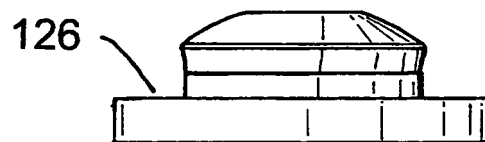


Fig.17(d)

