

**(12) PATENT**  
**(19) AUSTRALIAN PATENT OFFICE**

**(11) Application No. AU 199892186 B2**  
**(10) Patent No. 763444**

(54) Title  
Liquid transfer system with flow control

(51)<sup>6</sup> International Patent Classification(s)  
B67D 001/04 F16L 037/28  
F16L 037/24

(21) Application No: 199892186 (22) Application Date: 1998 . 09 . 03

(87) WIPO No: WO99/67169

(30) Priority Data

(31) Number	(32) Date	(33) Country
09/102502	1998 . 06 . 22	US

(43) Publication Date : 2000 . 01 . 10  
(43) Publication Journal Date : 2000 . 03 . 23  
(44) Accepted Journal Date : 2003 . 07 . 24

(71) Applicant(s)  
Micro Matic U.S.A.

(72) Inventor(s)  
Henrik Rokkjaer

(74) Agent/Attorney  
DAVIES COLLISON CAVE,1 Little Collins Street,MELBOURNE VIC 3000

(56) Related Art  
US 4291821

92186/98



PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

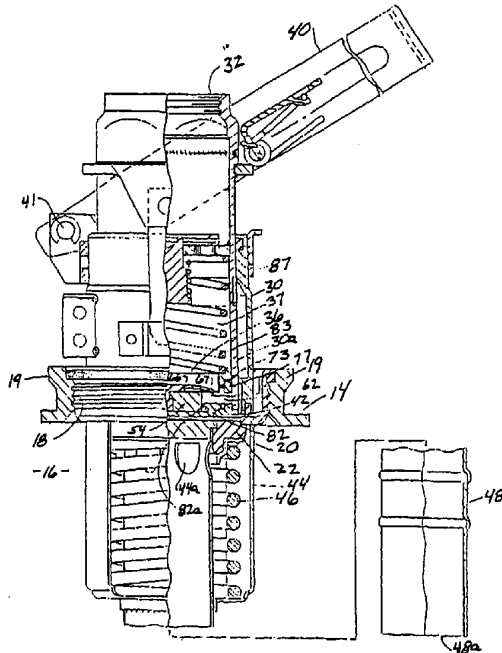
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>B67D 1/04, F16L 37/24, 37/28</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 99/67169</b> (43) International Publication Date: 29 December 1999 (29.12.99)</p>
<p>(21) International Application Number: PCT/US98/18324 (22) International Filing Date: 3 September 1998 (03.09.98) (30) Priority Data: 09/102,502 22 June 1998 (22.06.98) US (71) Applicant: MICRO MATIC, U.S.A. [US/US]; 19791 Bahama Street, Northridge, CA 91324-3397 (US). (72) Inventor: ROKKJAER, Henrik; 6275 Canoga Avenue #68, Northridge, CA 91364 (US). (74) Agent: ORUM, Keith, H.; Dvorak &amp; Orum, 53 West Jackson Boulevard, Chicago, IL 60604 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>	

(54) Title: LIQUID TRANSFER SYSTEM WITH FLOW CONTROL

(57) Abstract

A system for the filling, transport and emptying of liquid containers (16) which include a novel coupler mechanism (30, 30a, 54, 66) for interconnection with a coupler operated extractor valve (20) provided on the liquid container (16). The coupler mechanism (30, 30a, 54, 66) includes a novel coupler flow control assembly (54, 66) for preventing liquid trapped within the coupler body (30) from leaking back into the container (16) to which the coupler mechanism (30, 30a, 54, 66) is connected. More particularly, the coupler mechanism (30, 30a, 54, 66) includes a novel one-way valve mechanism which permits liquid to be pumped from the container (16) to which the coupler mechanism (30, 30a, 54, 66) is interconnected, but positively blocks the flow of liquid in the opposite direction toward the container (16).



**LIQUID TRANSFER SYSTEM WITH FLOW CONTROL****S P E C I F I C A T I O N****Field of the Invention**

The present invention relates generally to systems for the filling, transport, and emptying of liquid containers. More particularly, the invention concerns a novel, coupler for interconnection with a coupler operated extractor valve provided on the liquid container which coupler includes flow control means for preventing liquid trapped within the coupler body from leaking back into a container with which the coupler is interconnected.

**Discussion of the Prior Art**

A number of different types of reusable systems for the storage, shipment and transport of liquid formulations have been suggested. One of the most advanced of such systems was developed by and is presently commercially available from Micro Matic, Inc. of Northridge, California.

The Micro Matic system is basically a two-part system which comprises a coupler operated extractor valve which is interconnectable with a conventional drum via existing threaded connections and a cooperating coupler which is operably coupled with the extractor valve to allow drum emptying through the use of a separate pumping system. The extractor valve apparatus which can either remain with the drum after emptying, or can be removed for drum processing, includes a valve body and a down tube connected

to the valve body which extends to the bottom of the drum to permit the complete transfer of liquid from the drum.

The Micro Matic system, while representing the best of the current state of the art liquid transfer systems, has certain drawbacks which are sought to be overcome by the system of the present invention. More particularly, the coupler component of the prior art Micro Matic system is of a design which permits a small amount of fluids being pumped from the container to remain trapped within the coupler body. Accordingly, when the coupler is connected with a fresh container and the extractor valve thereof is opened, the trapped fluid can undesirably flow into the container and contaminate the contents thereof. In most cases this feature does not present a major problem. However, when certain types of liquids are being transferred, even a small amount of contamination of the liquid within the fresh container is most undesirable. As will be better understood from the discussion which follows, the present inventor recognized the problem and overcame it by providing an elegant, but relatively simple modified coupler which positively prevents the backflow of liquids trapped within the coupler body thereby making the modified coupler safe to use in the transfer of even the most contamination sensitive types of liquids.

#### **Summary of the Invention**

It is an object of the present invention to provide a system for the filling, transport and emptying of liquid containers which include a novel coupler mechanism for interconnection with a coupler operated extractor valve provided on the liquid con-

tainer, which coupler includes novel coupler flow control means for preventing liquid trapped within the coupler body from leaking back into the container to which the coupler is connected.

5 Another object of the invention is to provide a system of the aforementioned character in which the coupler mechanism can be used with a number of different containers without the danger of contaminating the contents of the containers.

10 Another object of the invention is to provide a system of the class described which is highly reliable in operation, is of a simple straight forward design and is quick and easy to use.

15 Another object of the invention is to provide a system of the character described in the preceding paragraphs which is in-expensive to produce and requires minimum maintenance.

20 According to the present invention there is provided a liquid transfer system that includes a liquid container having a reservoir, an access opening to the reservoir and an extractor valve assembly connected to the access opening, which the extractor valve assembly includes a valve member movable from a closed position blocking liquid flow through the extractor valve assembly to an open position permitting liquid flow therethrough the improvement comprising a  
25 coupler assembly removably interconnectable with the extractor valve assembly, said coupler assembly comprising:

(a) a coupler body having an inlet port and an outlet port;

30 (b) actuating means operably associated with said coupler body for moving the valve member of an extractor valve assembly to an open position, said actuating means comprising an actuating member movable

5 within said coupler body, said actuating member having an upper chamber and a lower chamber, said actuating means further including an actuating handle pivotally connected to said coupler body for moving said actuating member within said coupler body;

(c) coupler valve means disposed within said lower chamber of said actuating member for controlling liquid flow between said upper and lower chambers thereof, said coupler valve means comprising:

10 (i) an insert sealably mounted within said lower chamber of said actuating member, said insert having an internal chamber, at least one liquid passageway interconnecting said inlet port of said coupler body with said internal chamber and a valve seat;

15 (ii) a valve member connected to said insert, said valve member being movable from a first position in sealing engagement with said valve seat to a second, open position in response to liquid flowing through said liquid passageway so as to permit liquid flow toward said outlet port of said coupler body, said valve member blocking liquid flow toward said inlet port of said coupler body when said valve member is in said first position.

20  
25  
30 The invention also provides a liquid transfer system that includes a liquid container having a reservoir and an access opening to the reservoir; and further includes an extractor valve assembly connected to the liquid container proximate the access opening, the extractor valve assembly including a valve member movable from a closed position blocking liquid flow through the extractor valve assembly to

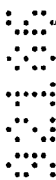
an open position permitting liquid flow therethrough; the improvement comprising a coupler assembly removably coupled with the extractor valve assembly, said coupler assembly comprising:

5 (a) a generally cylindrically shaped coupler body having an upper outlet port;

(b) actuating means interconnected with said coupler body for moving the valve member of the extractor valve assembly from a closed position to an open position, said actuating means comprising:

10 (i) an actuating sleeve slidably movable within said coupler body, said actuating sleeve having an upper chamber and a lower chamber having an inlet in communication with the reservoir of the liquid container; and

15 (ii) an actuating handle pivotally connected to said coupler body and associated with said actuating member for moving said actuating member from a first upper position to a second lower position;



20 (c) coupler valve means sealably disposed within said lower chamber of said actuating sleeve for controlling liquid flow between said upper and lower chambers thereof, said coupler valve means comprising:

25 (i) a generally ring shaped insert sealably mounted within said lower chamber of said actuating member, said insert comprising:



30 a. a skirt having a plurality of circumferentially spaced, liquid passageways communicating with said inlet port of said lower chamber of said actuating sleeve;

b. a base wall connected to said skirt

portion and defining in cooperation therewith  
an internal chamber, said base wall having a  
peripheral surface defining a valve seat; and  
(ii) a valve member connected to said insert,  
5 said valve member being movable in response to  
liquid flowing from a first position in sealing  
engagement with said valve seat to a second, open  
position permitting liquid flow toward said outlet  
portion of said coupler body, said valve member  
10 blocking liquid flow toward said inlet of said  
lower chamber of said actuating sleeve when said  
valve member is in said first position.

The invention also provides a liquid transferring  
system comprising:

15 (a) a liquid container having a liquid reservoir and  
an access opening communicating with said liquid reservoir;

(b) an extractor valve assembly connected to liquid  
container proximate said access opening, said extractor  
valve assembly including a valve member movable from a  
20 closed position blocking liquid flow through the extractor  
valve assembly to an open position permitting liquid flow  
therethrough;

(c) a coupler assembly removably connected to said  
extractor valve assembly, said coupler assembly comprising:

25 (i) a generally cylindrically shaped coupler body  
having an upper outlet port;

(ii) actuating means interconnected with said  
coupler body for moving the valve member of the  
extractor valve assembly from a closed position to an  
30 open position, said actuating means comprising:

a. an actuating sleeve telescopically  
movable within said coupler body, said actuating

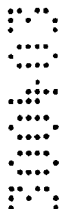
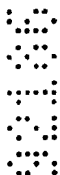
sleeve having an upper chamber and a lower chamber  
said lower chamber having an inlet in  
communication with said liquid reservoir of said  
liquid container;

5           b. an actuating handle pivotally connected  
to said coupler body for moving said actuating  
sleeve from a first upper location to a second  
lower location; and

10           (iii) coupler valve means disposed within said  
lower chamber of said actuating sleeve for controlling  
liquid flow between said upper and lower chambers  
thereof, said coupler valve means comprising:

15           a. a generally ring shaped insert sealably  
mounted within said lower chamber of said  
actuating member, said insert comprising a skirt-  
like portion, an apertured base wall connected to  
said skirt-like portion and defining in  
cooperation therewith an internal chamber, said  
20           base wall defining a valve seat, said skirt-like  
portion and said base wall being provided with a  
plurality of liquid passageways interconnecting  
said internal chamber with said inlet of said  
lower chamber of said actuating sleeve; and

25           b. a valve member connected to said insert,  
a peripheral portion of said valve member being  
movable in response to liquid flowing through said  
liquid passageways, said peripheral portion of  
said valve member being movable from a first  
position in sealing engagement with said valve  
30           seat to a second, open position permitting liquid  
flow toward said upper outlet port of said coupler  
body, said valve member blocking liquid flow



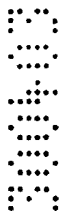
- 3E -

toward said inlet of said lower chamber of said actuating sleeve body when said valve member is in said first position.

**Brief Description of the Drawings**

5 Figure 1 is a generally perspective exploded view of a prior art liquid transfer system showing the fluid container drum broken away to reveal internal construction of the prior art extractor valve.

10 Figure 2 is a foreshortened, side-elevational, cross-sectional view of the prior art liquid transfer system shown in Figure 1 with the coupler mechanism of the apparatus connected



to with the extractor valve mechanism, which, in turn, is interconnected with the liquid container.

Figure 3 is a side-elevational, cross-sectional view of the prior art device shown in Figure 2, but shown in the configuration wherein the coupler mechanism is in a valve actuating configuration to permit liquid flow from the reservoir of the container through the extractor valve into the coupling mechanism and then outwardly through a liquid transfer line.

Figure 4 is an enlarged, fragmentary, side-elevational view, partly in cross section of a portion of the liquid transfer apparatus of the present invention showing the valve in a closed, non-actuated configuration.

Figure 4A is a generally perspective, fragmentary view of the connector neck portion of the container and a portion of the extractor valve assembly.

Figure 5 is a side-elevational, cross-sectional view similar to Figure 4, but showing the valve in an open configuration with liquid in the container flowing toward the coupler portion of the apparatus, but being momentarily blocked by the umbrella valve of the device.

Figure 6 is a view taken along lines 6-6 of Figure 5.

Figure 7 is a view taken along lines 7-7 of Figure 6.

Figure 8 is a side-elevational, cross-sectional view similar to Figure 5, but showing the umbrella device in an open configuration to permit liquid flow outwardly of the device through the open coupler valve and the body of the coupler apparatus.

Figure 9 is an enlarged, fragmentary, cross-sectional view similar to Figure 8 further illustrating the flow of fluid outwardly of the device.

Figure 10 is a generally perspective, exploded view of the form of the coupler valving mechanism of the apparatus of the invention.

Figure 11 is a side-elevational, cross-sectional view similar to Figure 5, but showing the portion of the components of the apparatus as they appear in a static, non-pumping configuration.

#### Description of the Invention

Referring to the drawings and particularly to Figures 1 through 4, a prior art fluid transfer system of the character manufactured and sold by Micro Matic U.S.A., Inc. of Northridge, California is there illustrated. This liquid transfer system comprises a fluid container or drum "D" of a conventional type having a threaded opening "O" provided in the top wall "T" of the container. In Figure 1, the Micro Matic coupler operated extractor valve assembly "V" is shown threadably interconnected with drum "D" with the valve body thereof extending through opening "O". As indicated in Figure 1, the extractor valve apparatus "V" includes a down tube "VT" which is connected to the valve body and extends downwardly to a location proximate the bottom of the drum to permit the complete extraction of liquids therefrom.

Referring to Figure 1, it can be seen that, in the prior art Micro Matic liquid transfer system, the coupler assembly "C" is removably interconnected with the valve assembly "V" by means

WO 99/67169

PCT/US98/18324

NOT TO BE TAKEN INTO  
CONSIDERATION FOR THE  
PURPOSES OF INTERNATIONAL  
PROCESSING

WO 99/67169

PCT/US98/18324

NOT TO BE TAKEN INTO  
CONSIDERATION FOR THE  
PURPOSES OF INTERNATIONAL  
PROCESSING

Figure 4 to an open position shown in Figure 5 wherein fluid is permitted to flow through the valve assembly 20 and outwardly of container 14. As will be discussed in greater detail hereinafter, the coupler assembly of the invention is interconnected with and operates the extractor valve assembly in much the same manner as does the prior art Micro Matic coupler.

As shown in Figure 4, the improved coupler assembly of the present invention is removably connected to the extractor valve assembly 20 so that a lower ring-like portion 42 of the coupler assembly sealably engages elastomeric gasket or member 22. Interconnection of the valve assembly with the extractor valve assembly is accomplished by inserting the outwardly extending pins "LP" (Figure 1) of the coupler assembly into circumferentially spaced slots 24 formed in the upper portion of the neck of the extractor valve assembly (Figure 4A). The coupler assembly is then rotated so that the locking pins slide along cam surfaces 26 formed in the neck portion of the extractor valve assembly thereby causing the ring-like portion 42 of the coupler valve assembly to move into secure sealing engagement with elastomeric member or gasket 22. With the improved coupler assembly thusly interconnected with the extractor valve assembly which has been previously interconnected with the liquid container 16, the liquid transfer process can be accomplished.

As best seen in Figure 4, the improved coupler assembly of the present form of the invention comprises a generally cylindrically shaped coupler body 30 having an outlet port 32. Telescopically movable within body 30 is a skirt-like actuator sleeve

30a which forms a part of the actuating means of the invention and which also defines the inlet port 34 of the coupler body (Figure 5). The actuating means of the invention functions to move the elastomeric valve member 22 of the extractor valve assembly from the closed position shown in Figure 4 to the open position shown in Figure 5. In the form of the invention shown in the drawings, the actuating means comprises, in addition to sleeve-like member 30a an actuating handle 40 which is pivotally connected to the coupler body. Handle 40 is pivotally movable about a pivot pin 41 from the first upper position shown in Figure 4 to the second actuating position shown in Figure 5. More particularly, as actuating handle 40 is pivoted downwardly about pivot pin 41 in the direction of the arrow in Figure 5, skirt-like member 30a, along with ring-like portion 42 which is connected thereto will be moved downwardly in a manner to cause ring-like portion 42 to engage valve member 22 move it downwardly within the generally cup-shaped upper portion 44 of the extractor valve assembly. As indicated in the drawings, biasing means here provided in the form of a coiled spring 46 resists downward movement of elastomeric member 22 and in a static condition continuously urges member 22 into the valve closed position shown in Figure 4.

When the extractor valve is in the open position shown in Figures 5 and 7, liquid contained within the liquid container is free to flow through the lower portion 48a of the downwardly extending downtube 48 which, as shown Figure 1, extends downwardly proximate the bottom of the liquid container. As indicated in

Figure 5 liquid flowing through the downtube 48 will flow upwardly in the direction of the arrows 50 of Figures 5 and 7 and toward the inlet 34 of the coupler assembly.

Forming an extremely important aspect of the improved coupler valve assembly of the present invention is valve coupler means which are disposed within a lower chamber 36 of actuating member sleeve 36a. This important coupler valve means functions to control liquid flow between lower chamber 36 of sleeve 30a and an upper chamber 37 of sleeve 30a. Referring to Figure 10, this important coupler valve means of the invention can be seen to comprise a generally ring-shaped insert 54 which is sealably mounted within the lower chamber 36 of actuating sleeve or member 36a. Ring-shaped insert 54 includes a downwardly depending skirt-like portion 56 which has an outer, circumferentially extending surface 56a. Provided internally of portion 56 is a base wall 58 which has a plurality of circumferentially spaced-apart flow apertures 60 formed therein. Base 58, in cooperation with the inner wall 56b of portion 56 defines an internal chamber into which fluid liquid can flow via inlet 34 of the coupler assembly. More particularly, as indicated in Figures 8 and 9, liquid flowing through inlet port 34 will flow through a plurality of circumferentially spaced liquid passageways 62 which are formed in skirt-like portion 56 of insert 54 and serve to interconnect inlet port 34 with internal chamber 64 of insert 54 which chamber is formed by base wall 58 and inner wall 56b of skirt-like portion 56.

Also forming an important part of the coupler valve means of the invention is a generally umbrella-shaped valve member 66

which is connected to insert 54. Valve member 66 comprises a yieldably deformable disk-like top wall 66a having a peripheral portion 67. A central stem 70 is integrally formed with the bottom surface of wall 66a and depends downwardly therefrom in a manner best seen in Figure 10. Stem 70 terminates in a generally cone shaped end portion 70a which is lockably receivable within a centrally disposed counterbore 72 formed in the bottom wall 58 of insert 56 (Figures 7 and 9). Also formed in base wall 58 of the insert is a centrally disposed bore 74 which is of a slightly smaller diameter than the diameter of counterbore 72. With this construction, valve member 66, which is formed of a yieldably deformable elastomeric material, can be snapped into position within bore 74 and counterbore 72 so as to securely position valve 66 within chamber 64 of insert 54. Circumscribing apertures 60 is a valve seat 73 (Figure 5) which is sealably engageable by the peripheral portion 67 of umbrella valve 66 when the valve is in the closed position shown in Figure 7.

As best seen by referring to Figures 7 and 10, the outer surface 56a of skirt-like portion 56 of the insert is provided with a circumferentially extending groove 75 which is adapted to receive an elastomeric O-ring 77 which sealably engages the inner surface of actuating sleeve 30 in the manner best seen in Figures 7 and 9.

As shown in Figure 7, the bottom of base wall 58 includes a central, downwardly extending, hub-like portion 80 which is closely received within a central cavity 82a of a dry seal closure member 82 (Figure 7). Seal 82 is preferably constructed of

a yieldably deformable elastomeric material such as a fluoroelastomer material manufactured and sold by duPont under the name and style "Viton". Seal 82 comprises a part of the sealing means of the invention and cooperates with the actuating means to close the lower portion of the coupler body. More particularly, as best seen in Figure 4, when the extractor valve assembly is in the valve-closed position, the peripheral portion of dry seal member 82 sealably engages the ring-like portion 42 of the actuating means. As also shown in Figure 4, a second biasing means shown here as a coil spring 83 is provided for yieldably urging insert 54 in a downward direction so that the peripheral portion of sealing member 82 is continuously urged into sealing engagement with ring-like portion 42. When the components of the apparatus are in the position shown in Figure 4, it is apparent that liquid cannot flow from reservoir 16 of the container into the coupler valve assembly. However, when the components are moved by the actuating means into the position shown in Figures 5 and 7 and elastomeric member 22 is moved away from dry seal member 82, liquid is free to flow inwardly of the coupler assembly via liquid inlet 34 and passageways 62 and apertures 60 of insert 54 where it will impinge on umbrella valve 66.

In using the apparatus of the invention, with the improved coupler assembly interconnected with the extractor valve assembly in the manner shown in Figure 4, downward force exerted on handle 40 in the manner shown by the arrow in Figure 5 will cause seal 22 of the extractor valve assembly to be moved downwardly into the valve open configuration shown in Figure 5. As indicated in

Figure 8, when the pump means of the invention for pumping fluid from the container, which is here shown as a conventional pump 85, is energized, fluid will flow from the reservoir of the container into the bottom opening 48a of the downtube 48, upwardly through the downtube and outwardly thereof through a plurality of circumferentially spaced outlets 44a formed in cup-like member 44. Next, the liquid will be drawn through inlet 34 and into radial passageways 62 of insert 54. Liquid will next flow through flow apertures 60 provided in base wall 58 of insert 54 where it will impinge upon the peripheral portion 67 of umbrella valve member 66. In response to this flow, of liquid under pressure, the peripheral portion of the umbrella valve member will deform from the closed position shown in Figures 4, 5, and 7 into the open position shown in Figures 8 and 9. As the umbrella valve moves into this open position, liquid will be free to flow into internal chamber 64 of insert 54, past umbrella valve 66 and into chamber 36a of central passageway 87 of coupler body 30. Continued pumping action by pump 85 will cause the liquid to flow outwardly of the outlet of the coupler body where it can be transferred to a remote location via an outlet tube such as outlet tube "OT" shown in Figure 1.

So long as pump 85 is operating, fluid will continue to flow outwardly of the apparatus in the direction of the arrow shown in Figure 8. However, when the pumping action is stopped, liquid flow through apertures 60 of insert 54 stops, and the yieldably deformable peripheral portion 67 of umbrella valve 66 will once again return to the valve closed position shown in Figure 11. It

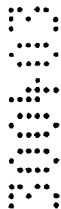
is apparent that when the umbrella valve moves into the closed position, liquid remaining within chamber 36a and the upper portion 87 of the coupler body will be trapped therewithin. This liquid will remain trapped within the upper portion of the coupler body by the closed umbrella valve 66 even when handle 40 is moved into the upraised position shown in Figure 11 and the coupler assembly is disengaged from the extractor tube valve assembly by counter-rotation of the coupler valve assembly relative thereto. Further, and most importantly, with this novel construction, when the coupler valve assembly is interconnected with a fresh, untapped container 14, the closed umbrella valve 66 will positively prevent the liquid "L" which is trapped within portion 87 (Figure 11) from flowing into the freshly tapped container. In this way contamination of the fresh contents of the new container is uniquely prevented. With the construction thus described, it is apparent that the trapped liquid "L" which is trapped within the coupler assembly will never flow into the fresh container and contaminate the contents thereof since, upon energizing pump 85, the trapped liquid "L" will be drawn out of chamber 87 and into the delivery line or outlet tube which is interconnected with the coupler assembly.

Having now described the invention in detail in accordance with the requirements of the patent statutes, those skilled in this art will have no difficulty in making changes and modifications to the individual parts or their relative assembly in order to meet specific requirement or conditions. Such changes and

modifications may be made without departing from the scope and spirit of the invention, as set forth in the following claims.

The reference to any prior art in this specification is  
5 not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

Throughout this specification and the claims which  
10 follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.



**I CLAIM**

1. In a liquid transfer system that includes a liquid container having a reservoir, an access opening to the reservoir and an extractor valve assembly connected to the access opening, which the extractor valve assembly includes a valve member movable from a closed position blocking liquid flow through the extractor valve assembly to an open position permitting liquid flow therethrough the improvement comprising a coupler assembly removably interconnectable with the extractor valve assembly, said coupler assembly comprising:

(a) a coupler body having an inlet port and an outlet port;

(b) actuating means operably associated with said coupler body for moving the valve member of the extractor valve assembly to an open position, said actuating means comprising an actuating member movable within said coupler body, said actuating member having an upper chamber and a lower chamber, said actuating means further including an actuating handle pivotally connected to said coupler body for moving said actuating member within said coupler body;

(c) coupler valve means disposed within said lower chamber of said actuating member for controlling liquid flow between said upper and lower chambers thereof, said coupler valve means comprising:

(i) an insert sealably mounted within said lower chamber of said actuating member, said insert having an internal chamber, at least one liquid passageway inter-

connecting said inlet port of said coupler body with said internal chamber and a valve seat;

(ii) a valve member connected to said insert, said valve member being movable from a first position in sealing engagement with said valve seat to a second, open position in response to liquid flowing through said liquid passageway so as to permit liquid flow toward said outlet port of said coupler body, said valve member blocking liquid flow toward said inlet port of said coupler body when said valve member is in said first position.

2. In a liquid transfer system as defined in Claim 1 in which said insert of said coupler valve means is generally ring shaped and includes a base wall and a downwardly depending skirt portion.

3. In a liquid transfer system as defined in Claim 2 in which said base wall of said insert includes a peripheral surface defining said valve seat.

4. In a liquid transfer system as defined in Claim 2 in which said skirt portion of said insert is provided with liquid passageways and includes an outer surface, said outer surface having a circumferentially extending groove.

5. In a liquid transfer system, as defined in Claim 4, in which said coupler valve means further includes an elastomeric O-ring disposed within said circumferentially extending groove of said outer surface of said skirt portion for sealable engagement with actuating member.

6. In a liquid transfer system that includes a liquid container having a reservoir and an access opening to the reservoir; and further includes an extractor valve assembly connected to the liquid container proximate the access opening, the extractor valve assembly including a valve member movable from a closed position blocking liquid flow through the extractor valve assembly to an open position permitting liquid flow therethrough; the improvement comprising a coupler assembly removably coupled with the extractor valve assembly, said coupler assembly comprising:

(a) a generally cylindrically shaped coupler body having an upper outlet port;

(b) actuating means interconnected with said coupler body for moving the valve member of the extractor valve assembly from a closed position to an open position, said actuating means comprising:

(i) an actuating sleeve slidably movable within said coupler body, said actuating sleeve having an upper chamber and a lower chamber having an inlet in communication with the reservoir of the liquid container; and

(ii) an actuating handle pivotally connected to said coupler body and associated with said actuating member for moving said actuating member from a first upper position to a second lower position;

(c) coupler valve means sealably disposed within said lower chamber of said actuating sleeve for controlling liq-

uid flow between said upper and lower chambers thereof, said coupler valve means comprising:

(i) a generally ring shaped insert sealably mounted within said lower chamber of said actuating member, said insert comprising:

a. a skirt having a plurality of circumferentially spaced, liquid passageways communicating with said inlet port of said lower chamber of said actuating sleeve;

b. a base wall connected to said skirt portion and defining in cooperation therewith an internal chamber, said base wall having a peripheral surface defining a valve seat; and

(ii) a valve member connected to said insert, said valve member being movable in response to liquid flowing from a first position in sealing engagement with said valve seat to a second, open position permitting liquid flow toward said outlet portion of said coupler body, said valve member blocking liquid flow toward said inlet of said lower chamber of said actuating sleeve when said valve member is in said first position.

7. In a liquid transfer system as defined in Claim 6 in which said base wall of said insert is provided with a central aperture and in which said valve member comprises:

(a) a generally disk shaped valve member having a yieldably deformable wall which includes a peripheral portion adapted to sealably engage said valve seat; and

(b) a central stem connected to said wall and depending therefrom, said central stem having a lower extremity lockably receivable within said central aperture of said base wall.

8. In a liquid transfer system as defined in Claim 6 in which said skirt portion of said insert includes an outer surface, said outer surface having a circumferentially extending groove and in which said coupler valve means further includes an elastomeric O-ring disposed within said groove for sealing engagement with said actuating sleeve of said actuating means.

9. In a liquid transfer system as defined in Claim 6 further including sealing means for closing said inlet of said lower chamber of said actuating sleeve, said sealing means comprising a dry break seal.

10. In a liquid transfer system as defined in Claim 9 further including biasing means disposed within said coupler body for urging said generally ring shaped insert toward said dry break seal.

11. A liquid transfer system comprising:

(a) a liquid container having a liquid reservoir and an access opening communicating with said liquid reservoir;

(b) an extractor valve assembly connected to liquid container proximate said access opening, said extractor valve assembly including a valve member movable from a

closed position blocking liquid flow through the extractor valve assembly to an open position permitting liquid flow therethrough;

(c) a coupler assembly removably connected to said extractor valve assembly, said coupler assembly comprising:

(i) a generally cylindrically shaped coupler body having an upper outlet port;

(ii) actuating means interconnected with said coupler body for moving the valve member of the extractor valve assembly from a closed position to an open position, said actuating means comprising:

a. an actuating sleeve telescopically movable within said coupler body, said actuating sleeve having an upper chamber and a lower chamber said lower chamber having an inlet in communication with said liquid reservoir of said liquid container;

b. an actuating handle pivotally connected to said coupler body for moving said actuating sleeve from a first upper location to a second lower location; and

(iii) coupler valve means disposed within said lower chamber of said actuating sleeve for controlling liquid flow between said upper and lower chambers thereof, said coupler valve means comprising:

a. a generally ring shaped insert sealably mounted within said lower chamber of said actuat-

ing member, said insert comprising a skirt-like portion, an apertured base wall connected to said skirt-like portion and defining in cooperation therewith an internal chamber, said base wall defining a valve seat, said skirt-like portion and said base wall being provided with a plurality of liquid passageways interconnecting said internal chamber with said inlet of said lower chamber of said actuating sleeve; and

b. a valve member connected to said insert, a peripheral portion of said valve member being movable in response to liquid flowing through said liquid passageways, said peripheral portion of said valve member being movable from a first position in sealing engagement with said valve seat to a second, open position permitting liquid flow toward said upper outlet port of said coupler body, said valve member blocking liquid flow toward said inlet of said lower chamber of said actuating sleeve body when said valve member is in said first position.

12. A liquid transfer system as defined in Claim 11 in which said base wall of said insert includes peripheral surface defining said valve seat.

13. A liquid transfer system as defined in Claim 11 in which said base wall of said insert is provided with a central aperture and in which said valve member comprises:

(a) a yieldably deformable top wall having a peripheral portion adapted to sealably engage said valve seat; and

(b) a central stem connected to said top wall and depending therefrom, said central stem having a lower extremity receivable within said central aperture of said base wall.

14. In a liquid transfer system as defined in Claim 13 in which said skirt portion of said insert includes an outer surface, said outer surface having a circumferentially extending groove and in which said coupler valve means further includes an elastomeric O-ring disposed within said groove for sealable engagement with said actuating sleeve of said actuating means.

15. In a liquid transfer system as defined in Claim 14 in which said coupler valve means further includes sealing means connected to said insert for cooperation with said actuating means to close said inlet of said lower chamber of said actuating sleeve, said sealing means comprising a dry break seal.

16. In a liquid transfer system as defined in Claim 15 further including biasing means disposed within said coupler body for urging said generally ring shaped insert into engagement with said dry break seal.

17. In a liquid transfer system as defined in Claim 16 in which said biasing means comprises a coil spring disposed within said coupler body.

- 23A -

18. A liquid transfer system substantially as hereinbefore described with reference to the accompanying drawings.

5

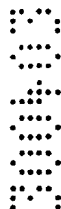
DATED this 28<sup>th</sup> day of April, 2003

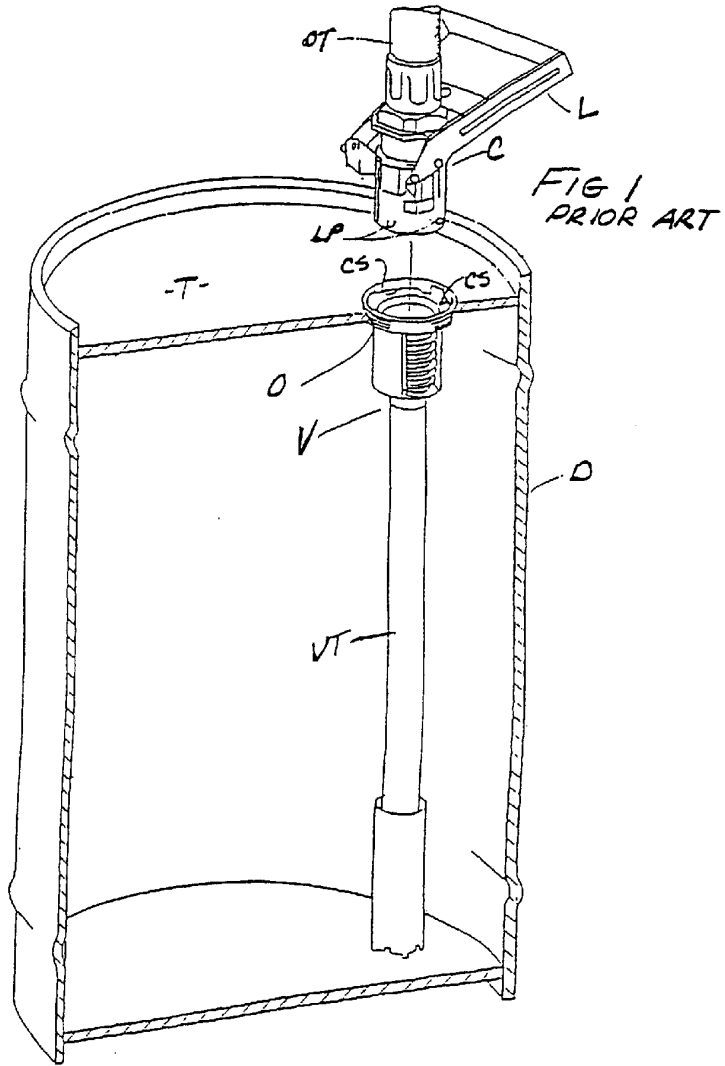
**MICRO MATIC U.S.A.**

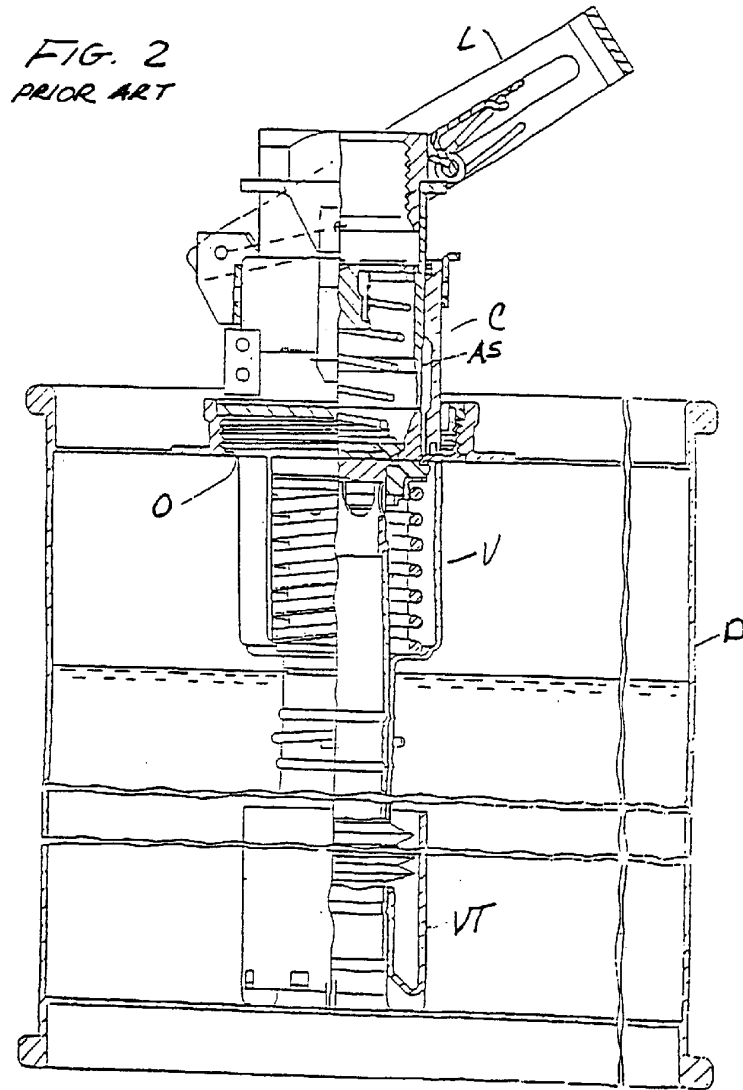
by its Patent Attorneys

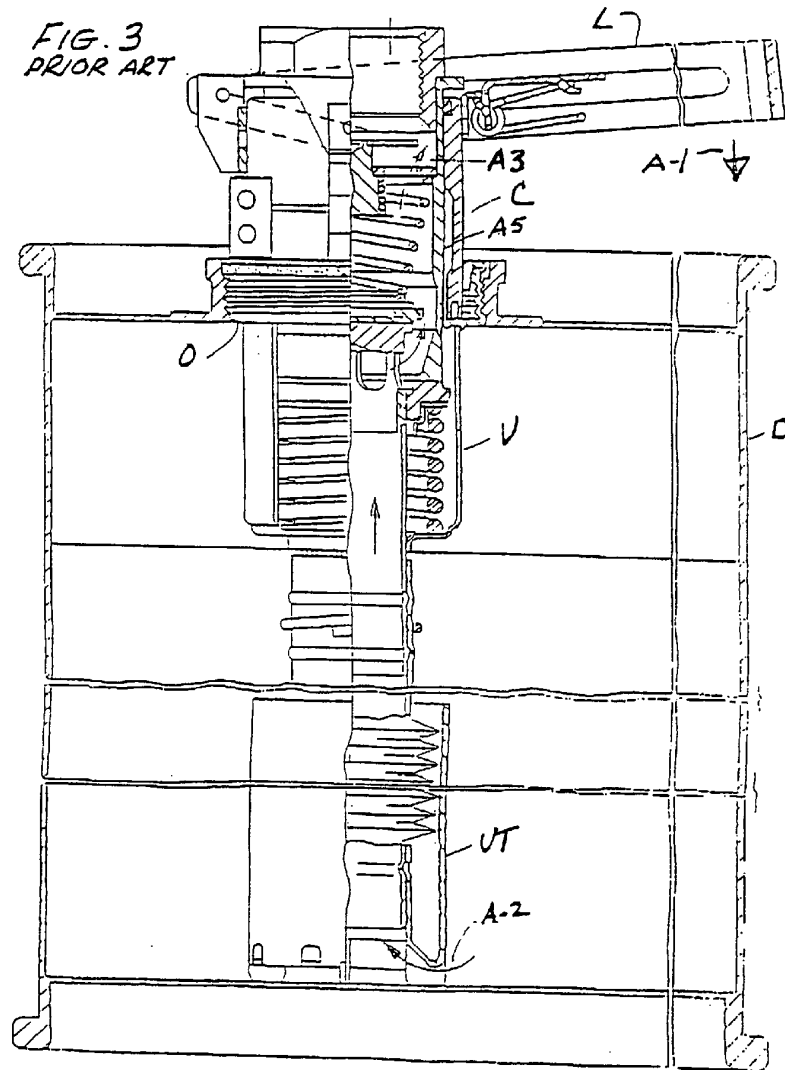
DAVIES COLLISON CAVE

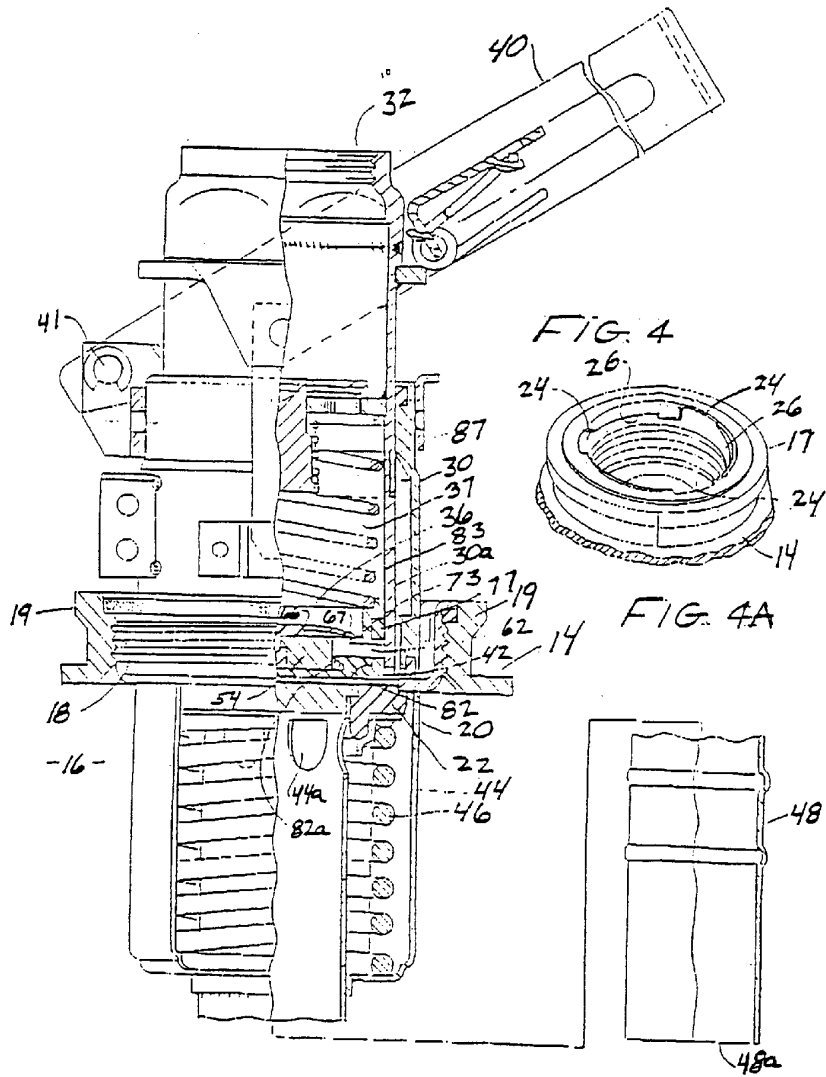
10

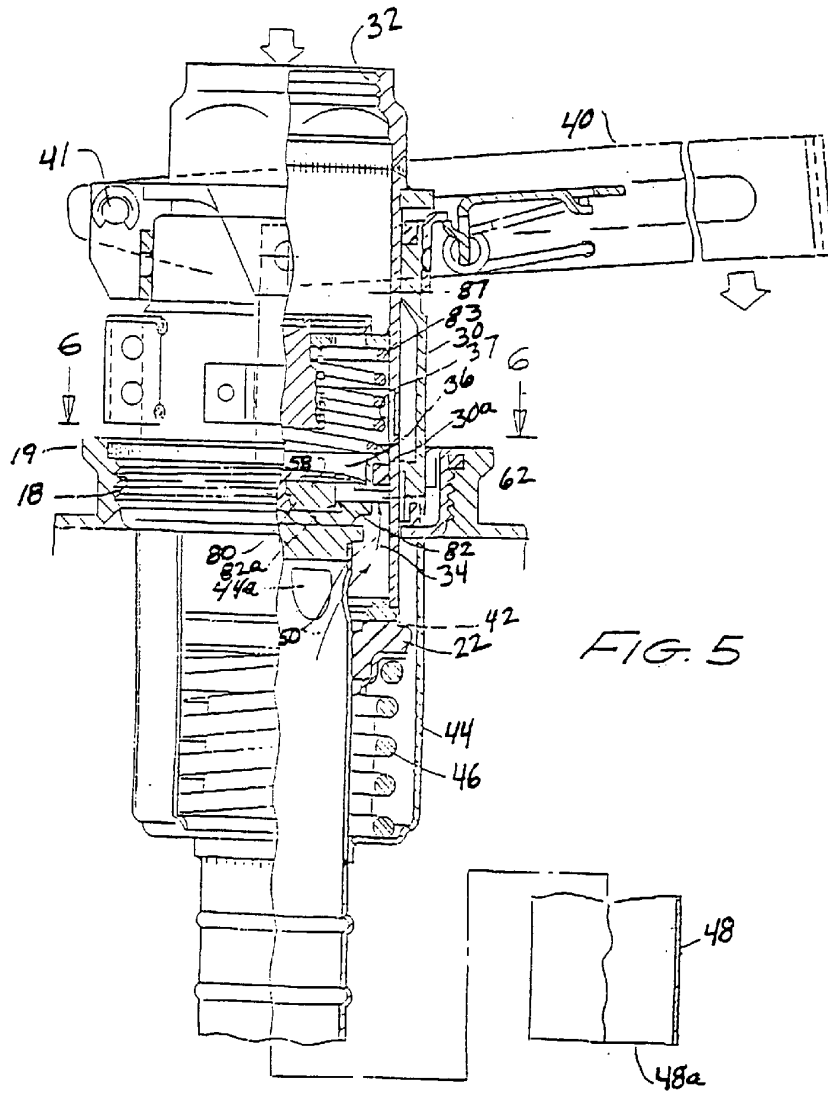


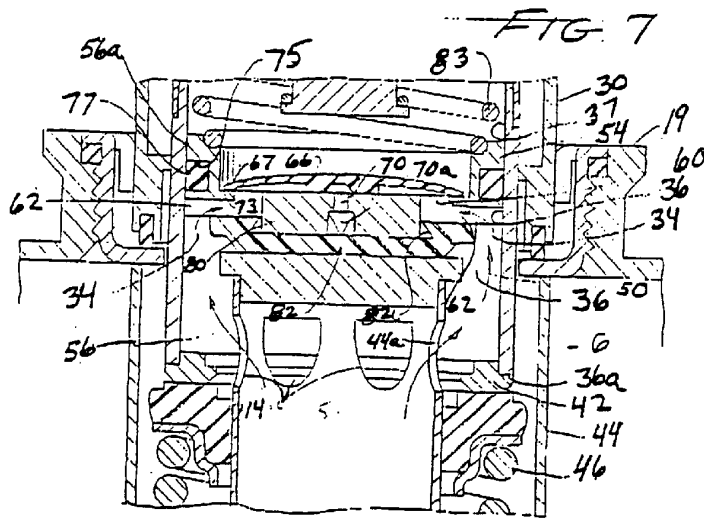
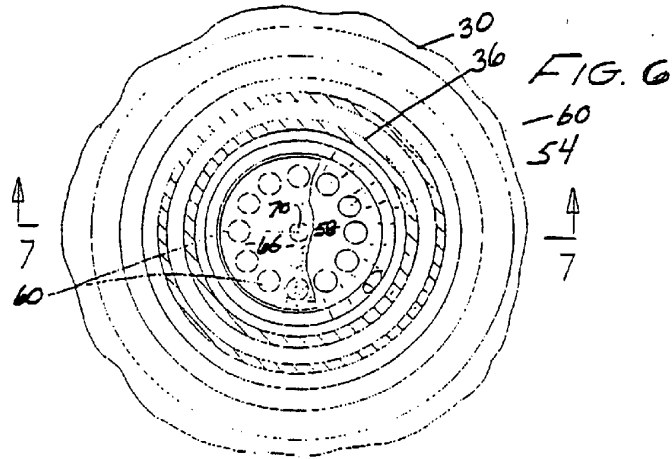














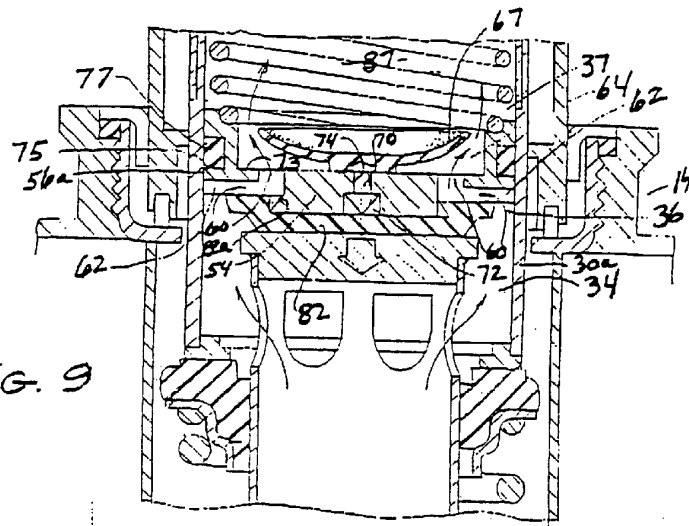


FIG. 9

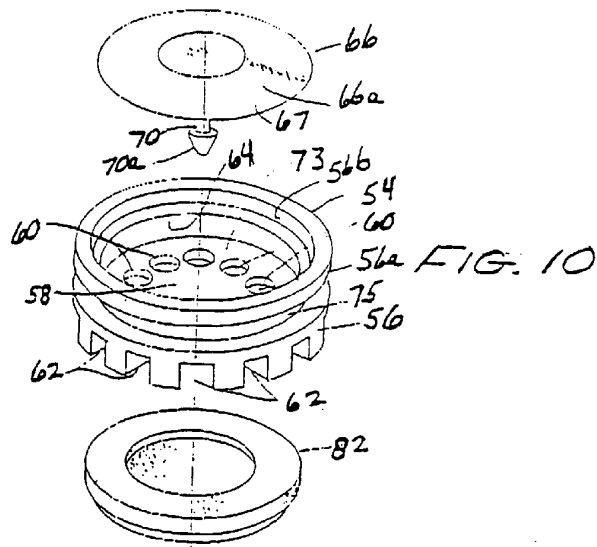


FIG. 10

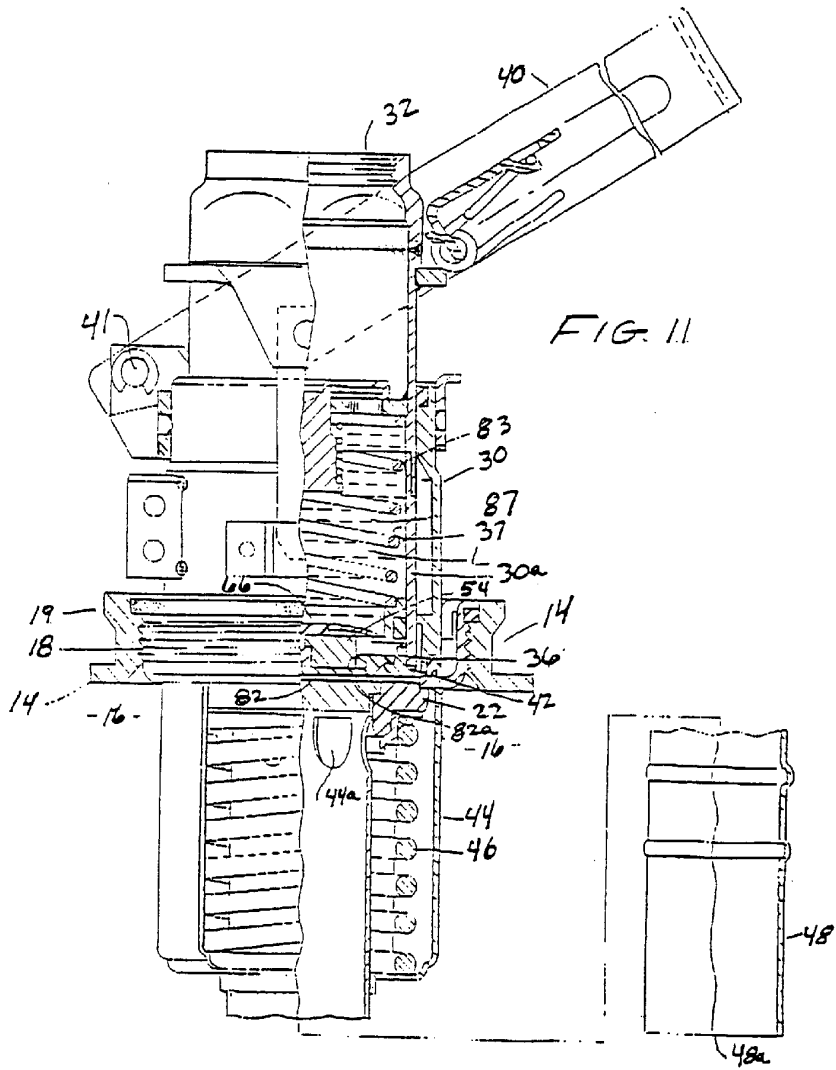


FIG. 11