



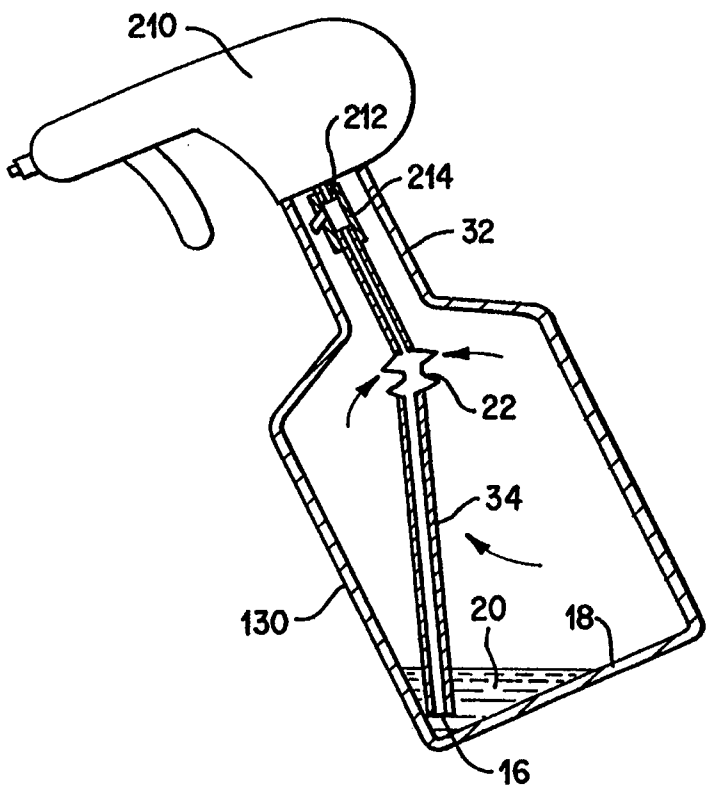
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>B67D 5/40</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 98/52863</b> (43) International Publication Date: 26 November 1998 (26.11.98)</p>
<p>(21) International Application Number: PCT/US98/10372 (22) International Filing Date: 21 May 1998 (21.05.98) (30) Priority Data: 08/861,029 21 May 1997 (21.05.97) US (71) Applicant: FLEIT, Lois [US/US]; 520 Brickell Key Drive #A201, Miami, FL 33131 (US). (71)(72) Applicant and Inventor: HELM, James, Dudley [US/US]; P.O. Box 245, Brasstown, NC 28902 (US). (74) Agents: FLEIT, PA, Martin et al.; Evenson, McKeown, Edwards &amp; Lenahan, PLLC, Suite 700, 1200 G Street, N.W., Washington, DC 20005-3814 (US).</p>	<p>(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, GW, HU, ID, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UZ, VN, YU, 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, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: NOVEL LIQUID DISPENSING DEVICE AND METHOD OF MAKING SAME

(57) Abstract

A liquid dispensing device consisting of a liquid container (12) having an opening and a bottom with a dispensing unit connected to the container at its opening. A pickup tube (14) having a preselected wall thickness is connected via a coupling (214) to the dispensing unit and extends into the container. The pickup tube has a distal end and is arranged so that the distal end moves in close proximity to the bottom of said container to accommodate tilt of the device during operation and enable substantial or complete evacuation of liquid stored in the liquid container. The pickup tube is characterized by a section (22) having a wall thickness substantially less than the preselected wall thickness of the remainder of the tube to provide flexing of the pickup tube in response to tilting of the dispensing unit during operation. The coupling has a branch tube (218) in which is mounted a one-way valve to enable the dispensing device to be inverted and operated through 360 degrees.



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## NOVEL LIQUID DISPENSING DEVICE AND METHOD OF MAKING SAME

## BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to novel liquid dispensing devices including spray bottles having pump actuators and aerosol liquid dispensers, and , more particularly, to a liquid dispensing device having a novel pickup tube, and methods of making same.

Description of the prior art

The prior art has recognized the need for a siphon, pickup or dip tube in a dispensing device of the type noted to be capable of tilting to as great an angle as possible, e.g. about 90 degrees. That is, when the dispensing device is tilted, the low free end of the pickup tube tracks a low point in the liquid within the reservoir of the device, which low point migrates about the bottom of the device. Also, the art has recognized the need for a liquid dispensing device capable of 360 degree movement in use. Such dispensing devices are used for a variety of purposes as are well known in the art. Prior art efforts to meet the need for 90 degree operation are exemplified by U. S. Patent No. 5,381,961 which shows two proposals, one being to insert a flexible connection between the pickup tube and the spray head, and the other being to weight the end of a flexible tube forming the siphon or pickup. These proposals suffer the disadvantage that extra parts are required increasing the cost. Also, extra labor is required to make such dispensing devices according to these proposals further exacerbating the cost problem concerning these proposals. Consequently, a strong need still exists in the art for a workable, cost and labor effective solution.

## SUMMARY OF THE INVENTION

Accordingly, the present invention meets the above described need by providing an inventive liquid dispensing device that has a novel pickup tube that is easy to fabricate, has low material cost, does not unduly increase labor cost and most important works effectively. The inventive liquid dispensing device functions in a highly efficacious and efficient manner. This and other objects of the present invention will become readily

apparent from the following detailed description when taken in conjunction with the appended drawings.

#### DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view in section showing an embodiment of the invention.

Fig. 2 is a side view in section showing another embodiment of the invention.

Fig. 3 is a side view in section showing still another embodiment of the invention.

Fig. 4 is a side view partly in section of a spray head usable with the invention.

Fig. 5 is a side view partly in section of another spray head usable with the invention.

Fig. 6 is a side view broken away showing the novel pickup tube of the present invention.

Fig. 7 is a view like Fig. 2 showing the invention arranged for 360 degree operational movement.

Fig. 8 is a detail of Fig. 7

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, a liquid dispensing device is shown consisting of a known sprayer 10, a container 12 and a semi-rigid to rigid pickup tube 14 which is coupled to the sprayer 10 in any conventional manner, and which extends into the container 12 with its free end 16 terminating adjacent the bottom 18 of the container. Tube 14 may be any known tube for this purpose, may be composed of any suitable material, preferably plastic, such as, polyethylene or polypropylene, and also, may be flexible with a degree of stiffness. As shown, a liquid 20 is contained in the reservoir defined by the container 12, with the free end 16 of the tube 14 immersed in the liquid 20. A tube deformation, generally indicated by the reference numeral 22, is formed in the pickup tube and enables the tube 14 to migrate over the bottom 18 of the container 12 under the influence of gravity. Tube deformation 22 will be described in detail in conjunction with Fig. 6.

Referring to Fig. 2, a liquid dispensing device is shown consisting of a known

sprayer 10, a container 30 having a long neck 32, and a pickup tube 34 having a tube deformation 22 located below the neck 32 in the top of the reservoir of the container 30. Referring to Fig. 3, another dispensing device is shown consisting of a sprayer 40, a container 42 and a pickup tube 44. The tube deformation 22 is hidden beneath the screw cap 46 that holds the sprayer 40 on the container 42. Similarly, the sprayers of Fig. 1 and Fig. 2 use screw caps to hold the sprayers on the containers.

Referring to Fig. 4 and Fig. 5, there is shown known sprayers. In Fig. 4, the sprayer consists of a sprayhead 60, a rigid connector 68, a suction chamber 62 in a housing 66, and a check valve 64. A semi-rigid pickup tube 70 is connected to the rigid connector 68. In Fig. 5, the sprayhead 80 includes housing 82, suction chamber 84, downtube 86, gasket 88, tube 70, screw cap 90, bottle neck 92, and mating threads 94.

Referring to Fig. 6, the deformation 22 will now be described. As shown, the pickup tube (14, 34, 44, 70) is provided with a deformation 22 intermediate its ends, preferably nearer to and adjacent its top end. Deformation 22 consists of a pair of corrugation-like bulges or protrusions coupled with an intermediate tube section 100. Each bulge consists of a top cylindrical shape in the form of a frustum of a cone 102, a bottom inverted cylindrical shape in the form of a frustum of a cone 104 and an interconnecting section 106. The small bases 108 and 110 of the top 102 and the bottom 104 are formed as integral continuations of the tube. Also, all parts are integral continuations of the next preceding and next succeeding parts, that is, the bulges are formed out of the original tube. The wall thickness of pickup tubes varies from about .015 to about .050 inches. In the preferred embodiment described, the wall thickness is about .025 inches. The bulges are formed from the original tube by any suitable method, but it is preferred that the bulges be formed by vacuum or blow molding either as a separate operation or as part of the extrusion operation that is used to form the tube. The vacuum or blow molding can be incorporated in the extrusion process of the tube, that is while extruding the tube by the use of a corrugation extrusion machine. The thickness of the walls of the top and bottom 102 and 104 gradually decreases as the top and bottom expand and is an average of about .017 inches, but may vary from about .010 to about .040 inches, and preferably from about .015 to about .020 inches.

The wall thickness of the intermediate section 100 in the preferred embodiment is the original tube wall thickness, namely, about .025 inches. The wall thickness of the interconnecting section 106, which is integrally connected to the large bases 112 and 114 of the top and bottom 102 and 104, is from about .001 to about .007 inches, and preferably, is from about .003 to about .005 inches. In the preferred embodiment described the wall thickness is about .005 inches

The dimensions of the original tube vary and for example the tube may have an internal diameter of from about .05 to about .25 inches, and preferably, an internal diameter of about .120 inches, but this depends upon the viscosity and other properties of the liquid being sprayed or dispensed. Also, an important consideration is the volume that need to be propelled by different kinds of sprayers. The diameter of the large bases 112 and 114 of the top and bottom 102 and 104 vary from about 2 to about 4 times the diameter of the tube, with about 3 times being preferred or whatever expansion is required to produce the thin interconnecting section 106. Also, as a result of the vacuum or blow molding or extrusion process of creating the bulges or corrugations, the wall thickness of the top and bottom 102 and 104 will vary and decrease as it progresses toward the the interconnecting section 106. The axial length of the top and bottom 102 and 104 is about .10 to about .30 inches. The axial length of the intermediate section 100 is from about .02 to about .10 inches or more, and in the preferred embodiment is .055 inches. The axial length of the interconnecting section 106 is from about .02 to about .1 inches and in the preferred embodiment is .040 inches. The axial distance between the bulges from inconnecting part to interconnecting part is from about .22 to about .70 inches and in the preferred embodiment is .270 inches.

The deformation 22 provides a flexible joint that allows the tube to flex at the point of the deformation rather easily. The mechanism, as understood, is that the tube will bend and flex around a pivot established by the interconnecting part 106 of the deformation by the bottom part 104 tucking into the top part 102 on one side while expanding or moving laterally on the other side without any locking, crimping or excessive resistance. Although two bulges are described as the preferred embodiment, only one may be used.

Referring to Figs. 7 and 8, a container 130 is shown provided with a sprayhead 210 that is mounted on the container or bottle 130 by conventional means, such as by screw

threads not shown. The head 210 has a short tube 212 which is inserted into the bottle. A special coupling 214 at its top end is press fitted onto the lower end of the tube 212. The bottom end of the coupling 214 is press fitted onto the top end of the dispensing tube 34 which is provided with the corrugations 22 as previously described. The coupling 214 is shown in greater detail in Fig. 8 and consists of a main down tube 216 having a branch tube 218 projecting radially outwardly at an acute angle downwardly when the bottle 130 is in the upright position. This angle may vary from about 30 degrees to about 60 degrees with 45 degrees being preferred. Press fitted in the open end of the branch tube 218 is a duckbill one-way valve 220. The dispensing assembly as described will function at 360 degrees of operation and the dispensing tube with the inventive corrugations will be exceptionally effective up to 90 degrees.

The invention has been described in terms of a preferred embodiment, nevertheless, changes and modifications are possible and will be evident to those skilled in the art which do not depart from the spirit scope and teachings herein. Such changes and modifications are deemed to come within the purview of the invention.

## I CLAIM:

1. A liquid dispensing device, comprising:
  - a.) a liquid container having an opening and a bottom;
  - b.) a dispensing unit connected to said container at said opening;
  - c.) a coupling connected to the dispensing unit and lying within the opening of the container, said coupling having a branch tube projecting therefrom with a one-way valve mounted in the branch tube;
  - d.) a pickup tube having a preselected wall thickness connected to said coupling and extending into said container, said pickup tube having a distal end and arranged so that the distal end moves in close proximity to said bottom of said container to accommodate tilt of the device during operation and enable substantial or complete evacuation of liquid stored in said liquid container;
  - e.) said pickup tube being characterized by a section thereof having a wall thickness substantially less than the preselected wall thickness of the remainder of the tube to provide flexing of said pickup tube in response to tilting of said dispensing unit during operation.
2. A liquid dispensing device as in claim 1 wherein the said section is located nearer to the connection to the dispensing unit.
3. A liquid dispensing device as in claim 1 wherein the said section is formed as a protrusion.
4. A liquid dispensing device as in claim 1 wherein said section is formed as a corrugation.
5. A liquid dispensing device as in claim 1 wherein said section is expanded and comprises a first frusto-conical part formed integral with said tube, a second inverted



frusto-conical part facing and axially spaced from the first part formed integral with the tube, and an interconnecting part integrally formed with the first and second parts.

6. A liquid dispensing device as in claim 1 wherein the thickness of the section is from about 1 mil to about 7 mils thick.

7. A liquid dispensing device as in claim 5 wherein two such expanded sections are present and are separated by a short axial length of tube.

8. A liquid dispensing device as in claim 7 wherein the interconnecting parts extend axially for from about 20 mils to about 100 mils.

9. A liquid dispensing device as in claim 7 wherein the short axial length of tube extends for greater than about 20 mils.

10. A liquid dispensing device as in claim 8 wherein the interconnecting parts extend for about 40 mils.

11. A liquid dispensing device as in claim 9 wherein the short axial length of tube extends for about 55 mils.

12. The combination of a coupling having a branch tube in which is mounted a one-way valve and a pickup tube mounted to the coupling for use in a liquid dispensing device including a liquid container having an opening and a bottom, and a dispensing unit connected to the container at the opening, wherein the coupling is intended to be connected to the dispensing unit and the pickup tube is intended to extend into the container such that the distal end of the pickup tube is arranged to move in close proximity to the bottom of the container to accommodate tilt of the device during operation and enable substantial or complete evacuation of liquid stored in the liquid container;

said pickup tube comprising a length of tube having a preselected wall thickness, a section of said tube being characterized by a wall thickness substantially less than the preselected wall thickness of the remainder of the tube to provide flexing of said pickup tube when positioned in the dispensing device, said flexing being in response to tilting of the dispensing unit during operation.

13. The combination as in claim 12 wherein the said section is located nearer to one end of the pickup tube.

14. The combination as in claim 12 wherein the said section is formed as a protrusion.

15. The combination as in claim 12 wherein said section is formed as a corrugation.

16. The combination as in claim 12 wherein said section is expanded and comprises a first frusto-conical part formed integral with said tube, a second inverted frusto-conical part facing and axially spaced from the first part formed integral with the tube, and an interconnecting part integrally formed with the first and second parts.

17. The combination as in claim 12 wherein the thickness of the section is from about 1 mil to about 7 mils thick.

18. The combination as in claim 16 wherein two such expanded section are present and are separated by a short axial length of tube.

19. The combination as in claim 16 wherein the interconnecting parts extend axially for from about 20 mils to about 100 mils.

20. The combination tube as in claim 18 wherein the short axial length of tube extends for greater than about 20 mils.

21. A coupling for use in a dispensing device comprising a tube having a branch tube projecting therefrom and terminating in an open free end, and a one-way valve mounted in the open end free end of the branch tube.

22. The coupling of claim 21 wherein the branch projects at an acute angle.

23. The combination of a dispensing container, a sprayhead mounted on the

container in through which liquid in the container is dispensed, a dispensing tube extending into the container, and a coupling comprising a tube having a branch tube projecting therefrom and terminating an open free end, and a one-way valve mounted in the open end free end of the branch tube .

24. The combination of claim 23 wherein the branch tube projects at an acute angle.

25.. A method for making a dispensing tube to be connected to a dispensing unit used with a container containing liquid comprising, deforming a selected section of a preselected length of plastic tube having a substantially uniform wall thickness to produce opposed expanded parts interconnected by a web having a thickness less than the wall thickness of the tube to impart substantial flexibility to the selected section as the tube experiences the force of gravity, and connecting one end of the tube to a coupling comprising a main tubular part having a branch tube radially projecting therefrom and terminating in a free end into which is mounted a one-way valve.

26. A method as in claim 25 wherein the interconnecting web of the tube has a thickness from about one-half to about one-fiftieth the thickness of the wall thickness of the tube.

27. A method as in claim 25 wherein the inconnecting web has a thickness from about 1 mil to about 7 mils.

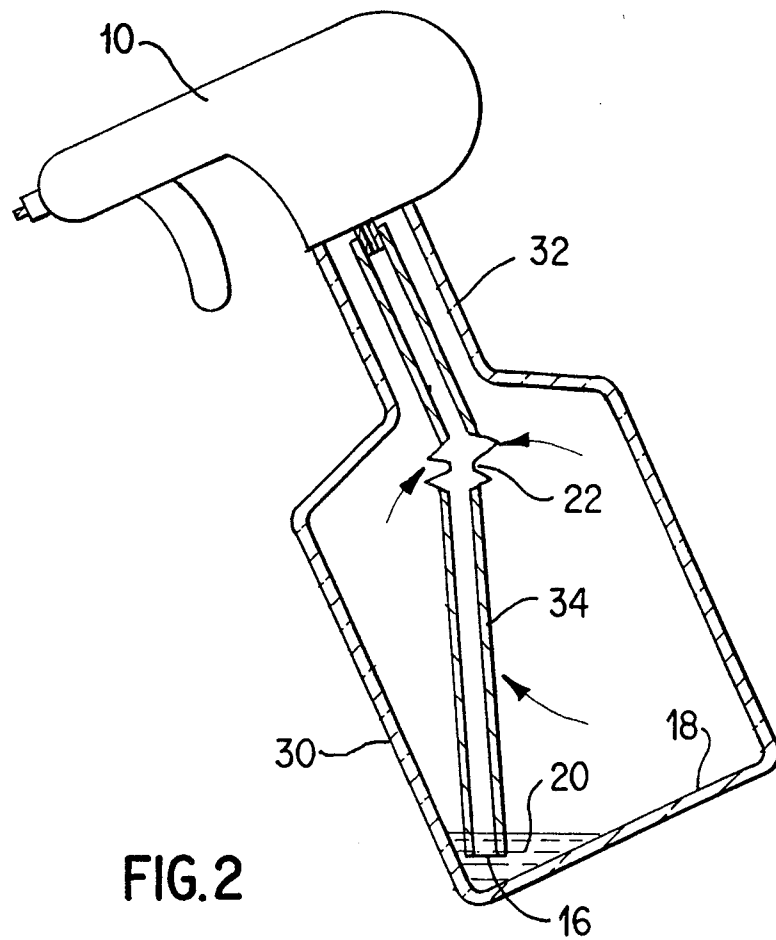
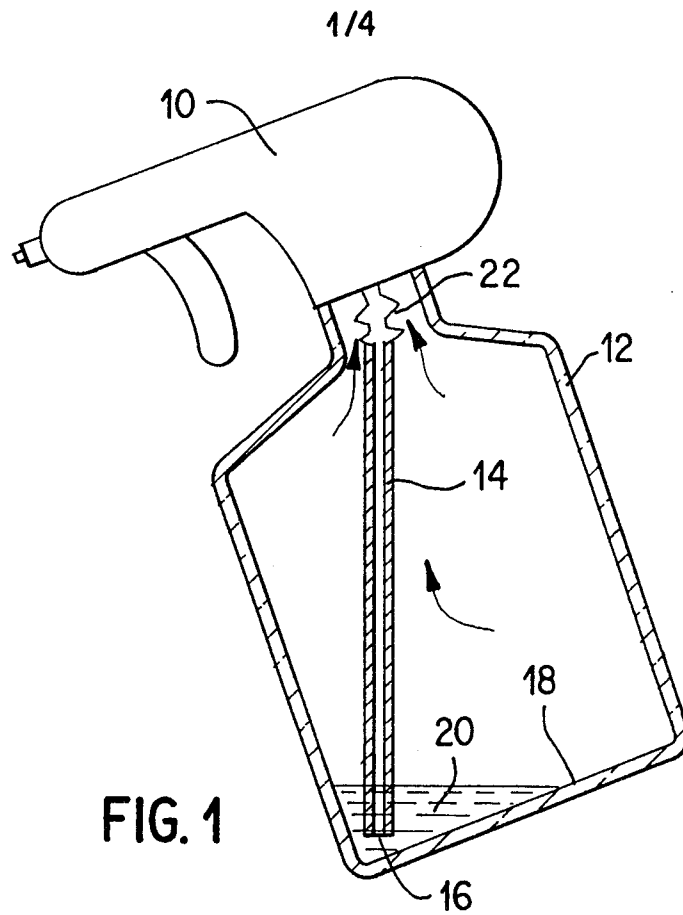
28. The method of claim 25 including the further step of providing a supply of preselected lengths of plastic tube.

29. The method of claim 28 wherein the step of providing a supply of preselected lengths is effected by cutting lengths of plastic tube from a continuous length of plastic tube.

30. The method of claim 29 wherein the continuous length is produced by extrusion.

31. The method of claim 25 wherein the step of deforming is carried out by molding.

32. The method of claim 31 wherein the molding is vacuum molding.
33. The method of claim 31 wherein the molding is blow molding.
34. The method of claim 25 wherein the expanded parts are frusto-conical in shape having small bases integral with the tube and large bases integral with the inconnecting web.
35. The method of claim 25 wherein two adjacent selected sections are deformed.
36. The method of claim 35 wherein the two selected sections are separated by a short section of the tube.
37. The method of claim 25 wherein the coupling is prepared with the branch tube lying at an acute angle to the main tubular part directed toward the preselected length of plastic tube.
38. The method of claim 36 where in the inconnecting webs of the two selected sections extend axially for from about 20 to about 100 mils, and the short section extends for about greater than 20 mils.
39. The method of claim 25 including the further step of connecting the coupling to a dispensing head before deforming the selected section of the plastic tube.



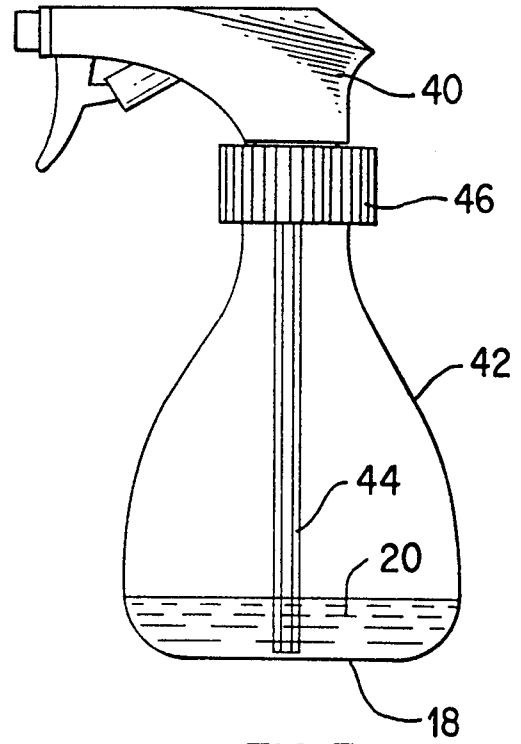


FIG. 3

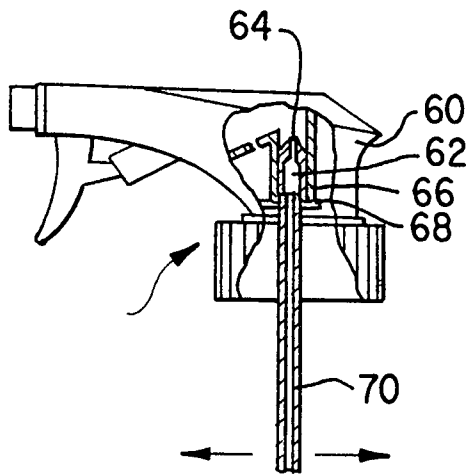


FIG. 4

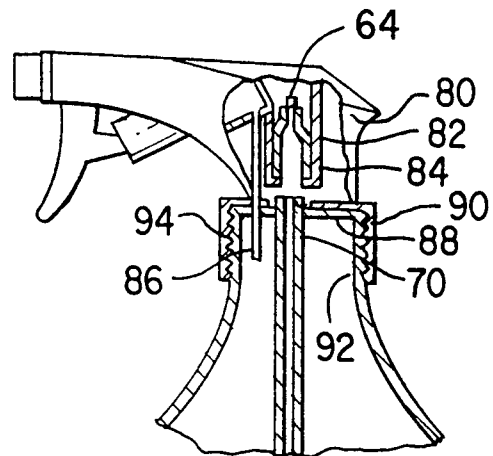


FIG. 5

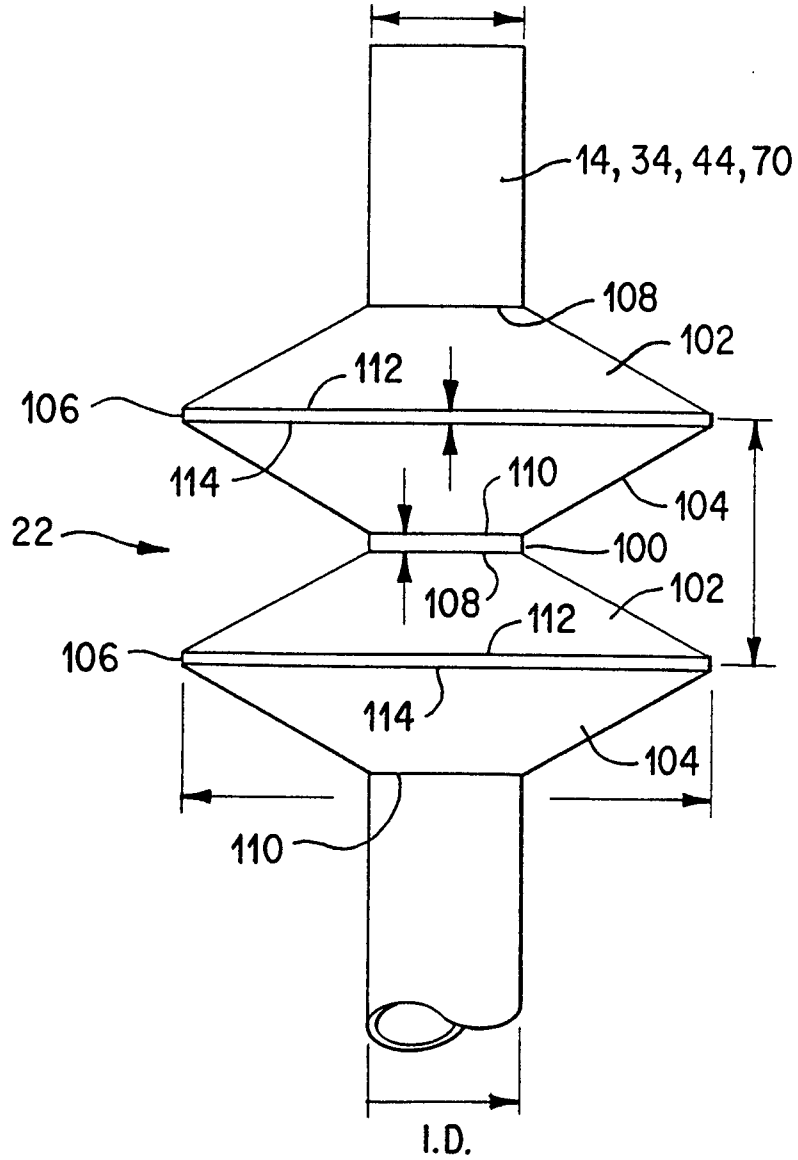


FIG.6

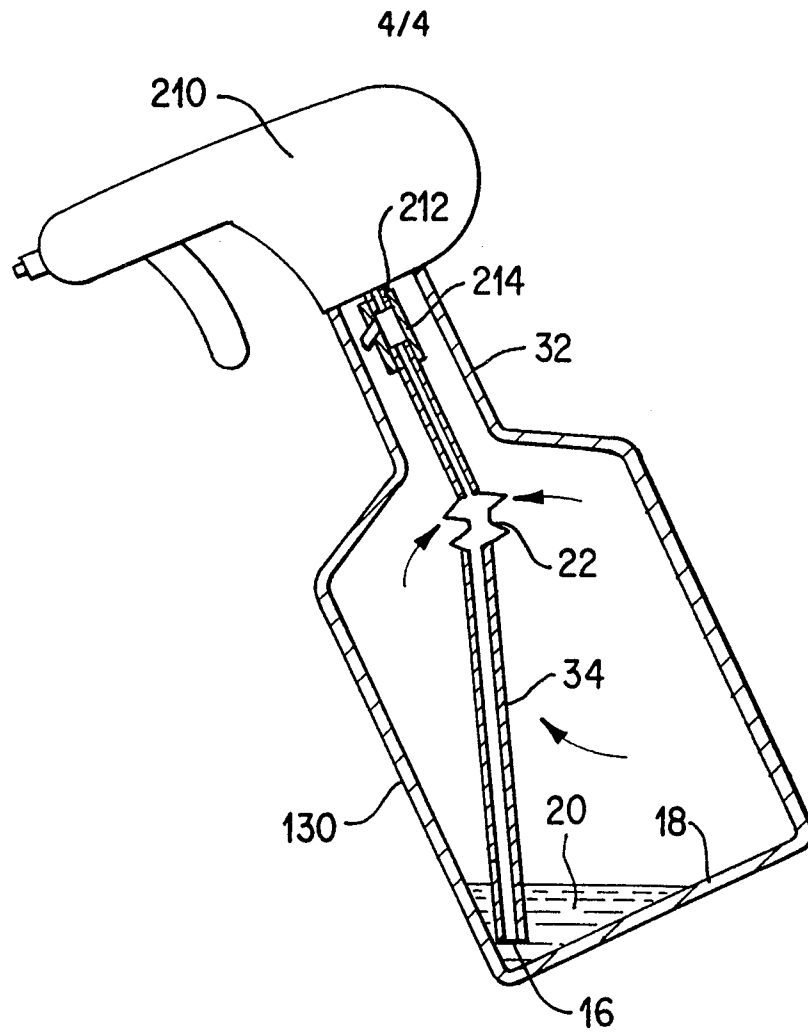


FIG. 7

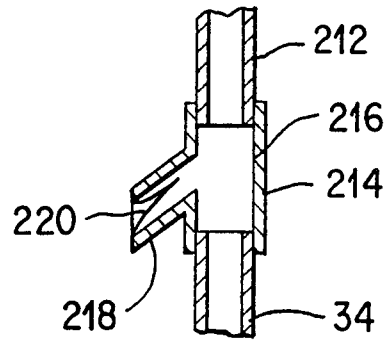


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/10372

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B67D 5/40  
US CL :Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 222/376, 382, 464.1-464.4, 383.1, 402.19, 211

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,572,406 A (PRATT et al) 25 February 1986, figure 2.	21-24
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Y		1-4, 6, 12-15, 17, 25-33 and 35-39
Y	US 4,830,235 A (MILLER) 16 May 1989, column 3, lines 45-49.	1-4, 6, 12-15, 17, 25-33 and 35-39
A	US 5,381,961 A (EVANS et al) 17 January 1995, figure 1.	1
A	US 5,462,209 A (FOSTER et al) 31 October 1995, figure 1.	1

Further documents are listed in the continuation of Box C.  See patent family annex.

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Date of the actual completion of the international search

29 JULY 1998

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US98/10372

A. CLASSIFICATION OF SUBJECT MATTER:

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222.376. 382. 464.3