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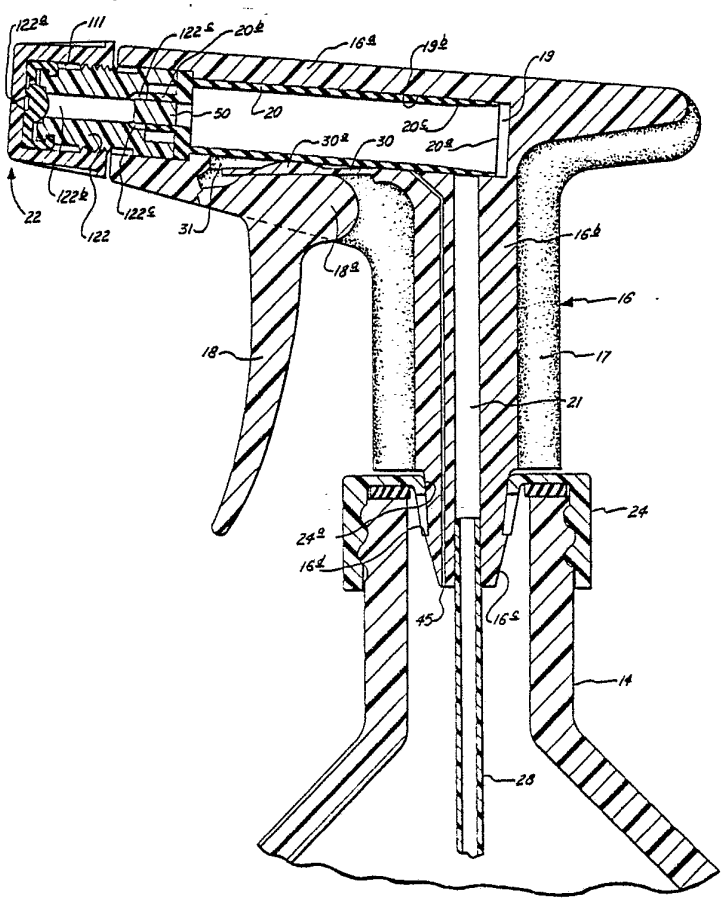
(57) Abstract

The invention pertains to manually operated trigger actuated dispenser pumps. A problem in the art has been the lack of an easily assembled dispenser pump. The invention solves the problem by providing a complete pump assembly comprising a relatively small number of component parts including a one piece housing (16), a bladder (20) inserted into a cavity (19) of the housing and a trigger (18) which is integral with the housing. Fluids are dispensed from a nozzle (22) by depressing the trigger (18) which strikes a strip (30) which in turn strikes the bladder (20) and forces fluids therefrom outwardly through the nozzle (22).



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TRIGGER ACTUATED PUMP

Manually operated trigger actuated dispenser pumps for liquid containers have been proposed in the past. One having wide commercial application is disclosed in U.S. Patent No. 3,749,290 granted July 31, 1973. Such a pump employs a flexible tubular member having a ball check valve therein which is depressed or collapsed by depressing the trigger to spray liquids from the nozzle.

Additional trigger pumps which employ flexible tubular members are disclosed in U.S. Patents 4,101,057 and 4,199,083.

The pump of the present invention is a manually operated trigger actuated dispenser pump including a main housing with a trigger connected thereto, a tubular bladder which fits into the housing, and a nozzle connected to the housing. Fluids are dispensed from the nozzle by depressing the trigger which strikes a strip which in turn strikes the bladder and forces fluids therefrom outwardly through the nozzle.

In the drawings:

Figure 1 is a side elevational view of the pump mounted on a container.

Figure 2 is a front elevational view of the pump mounted on a container.

Figure 3 is a cross-sectional view taken along lines 3-3 of Figure 2.

Figure 4 is a cross-sectional view taken along lines 3-3 of Figure 2 in which the trigger is being depressed.

Figure 5 is an enlarged, cut-away view taken along lines 5-5 of Figure 4.

Figure 6 is a cross-sectional view taken along lines 3-3 of Figure 2 in which the trigger is being released.

Figure 7 is a rear plan view of a flexible valve member.

Figure 8 is a side view of a liquid conduit.

Figure 9 is a front end view of the conduit of Figure 8.

Figure 10 is a front plan view of the flexible valve member of Figure 7.

Figure 11 is a side view of the flexible valve member of Figure 7.

Figure 12 is a front end view of a flexible bladder.

Figure 13 is a side elevational view of the bladder of Figure 12.

Referring now to the drawings, in Figures 1 and 2 pump 10 can be seen to be mounted on container 14. The pump 10 is held onto the container neck 12 by screw cap 24. If desired, screw cap 24 could be replaced with any conventional closure, such as a snap-on closure.

As can best be seen in Figure 3, the pump 10 includes a housing, generally indicated by the number 16, having, preferably, an integrally molded trigger 18. However, trigger 18 can be connected to the pump assembly or housing 16 by any conventional means, such as pinning, bolting, or the like. Housing 16 has a generally horizontal portion 16a and a generally vertical portion 16b. Horizontal portion 16a forms an approximate right angle with vertical portion 16b. Thus, when container 14 is in the upright or vertical position, horizontal portion 16a is approximately horizontal and vertical portion 16b is vertical.

Horizontal portion 16a has a generally horizontal cavity 19 therein for receipt of bladder 20 and nozzle 22. Preferably, cavity 19 has a tapered upstream end 19b for

receipt of the tapered end 20a of bladder 20. A vertical channel 21 in vertical portion 16b connects suction tube 28 with cavity 19. The end 20a of bladder 20 covers the upper end of channel 21.

Suction tube 28 is connected to the lower end 16c of vertical portion 16b. The lower end 16c of vertical portion 16b can be tapered so that it may be easily inserted in the top of cap 24 and may be provided with a shoulder 16d for force fitting into hole 24a in cap 24. The lower end 16c of vertical portion 16b could also be threaded to screw into a conventional closure, or formed in any other conventional manner.

Bladder 20 is made of an elastic material such as rubber, plastic, or other flexible materials, which can be depressed and relaxed and expanded to its natural profile. The bladder has a cylindrical end port 20b on its left end or downstream end which cooperates with post 50 to function as a one-way nipple-type valve that allows fluids to pass outwardly only from the bladder. The upstream end or right end 20a of bladder 20 is tubular in shape and open on the end. Preferably, bladder 20 has a relatively thin wall thickness as can be seen in Figure 3 at 20c so that the end 20a of bladder 20 can act as a flapper valve as shown in Fig 6. The section 20c may be tapered to aid in assembly.

Located downstream from bladder 20 is nozzle 22. Nozzle 22 can be any conventional type nozzle which has an orifice 22a therein.

A preferred nozzle is that disclosed in U.S. Patent No. 4,257,561, issued March 24, 1981. As can be seen in the drawings, the nozzle is generally indicated by the numeral 22.

As can be seen in the drawings, nozzle 22 has a hollow cavity 111 therein for receipt of conduit 122. Conduit 122 is shown in detail in Figures 8 and 9. Conduit 122 has an upstream end 122a which can be glued or force fitted into the downstream end of housing 16. Conduit 122

has a hollow channel 122b therein through which liquids flow when trigger 18 is depressed. Conduit 122 has a solid post 50 at the upstream end thereof. Two channels 122c-122c are formed in the upstream end for liquids to enter channel 122b.

Mounted on the end of conduit 122 is a flexible valve member, generally indicated by the numeral 128, and shown in Figures 3, 4, 6, 7, 10 and 11. Flexible valve member 128 has a central, generally hemispherical portion 130 surrounded by apertures 132. The apertures 132 provide fluid flow passages between the outlet conduit 122 and the aperture 22a in nozzle 22 when flexible outlet valve 128 is open. Valve 128 is opened and closed by screwing nozzle 22 outwardly and inwardly, respectively.

The main housing 16 has a thin leaf-like strip 30, as shown in Figure 3, molded into the open area 31 into which the upper portion 18a of trigger 18 rests in the normal, undepressed position. The leaf-like strip 30 acts as a skid plate for upper portion 18a and easily deforms upward when trigger 18 is depressed as indicated in Figure 4. Strip 30 can include a bump or raised portion 30a to increase the volume of liquid displaced from bladder 20. However, if desired, the thin leaf-like strip 30 can be omitted to permit the upper portion 18a of trigger 18 to contact bladder 20 directly and a bump may be incorporated on the upper portion 18a of trigger 18 to increase the volume of liquid displaced.

Housing 16 can be seen to have a recess 17 therein. Recess 17 is a hollow portion in housing 16 which is provided for the purposes of saving material and decreasing cost of the housing. The front portion of recess 17 can best be seen in Figure 1 to lie directly behind the trigger. A similar recess 17 is provided on the back part of housing 16.

The operation of the pump of the present invention is depicted in drawings 4 and 6. When trigger 18 is depressed in the direction of the arrow indicated in Figure

4, the upper portion 18a thereof forces the lower end of bladder 20 upward, thereby compressing the fluid contained within bladder 20. The fluid is compressed and moves outwardly through valve 20b and orifice 22a of nozzle 22 as indicated in Figure 4.

When trigger 18 is released, the pressure inside bladder 20 decreases and valve 20b closes. Due to the lower pressure within bladder 20 fluids are drawn upwardly through suction tube 28 and channel 21 around the end 20a of bladder 20, thus filling the bladder with fluids.

Vent 45 allows air to enter the container when the pump is actuated. The path of the air flow is from the atmosphere through slots 31, shown in Figure 5, into the space 32, shown in Figure 1, which is immediately behind thin leaf-like strip 30, and downwards through vent 45. Such a means for venting is desirable when the pump has an air-tight seal with the container.

It can thus be seen that the complete pump assembly includes a relatively small number of component parts, i.e., a main housing with an integrally formed trigger, a nozzle, a bladder, a screw cap, a gasket, and a dip tube. The main housing snap fits into the screw cap and incorporates a leak-proof seal. The screw cap preferably has integrally molded score marks (not shown) on the underside which allow air to enter the container between the gasket and cap to displace fluid discharge by the pump.

The pump of the present invention can thus be seen to be easily assembled. To assemble the pump, one merely inserts the bladder 20 into cavity 19 and then inserts conduit 122, valve 128, and nozzle 22 into cavity 19 downstream from the bladder 20. Dipper tube 28 may then be forced upwardly into channel 21.

The entire pump may be made entirely of plastic material as is well known in the art. The bladder, of course, should be made of a flexible material which will return to its natural profile after being deformed and

depressed.

Although the preferred embodiments of the present invention have been disclosed and described in detail above, it should be understood that the invention is in no sense limited thereby and its scope is to be determined by that of the following claims.

C L A I M S

1. A manually operable liquid dispensing pump for use and incorporation on a container for a liquid to be dispensed comprising, in combination:

a. tubular bladder means having flexible walls which expand to their natural profile when depressed and relaxed, said bladder means having an upstream end and a downstream end, said downstream end having an integrally molded one-way valve means that permits fluid to flow outwardly from said bladder means, said one-way valve means comprising a cylinder in said downstream end of said bladder having a diameter smaller than that of said bladder, said upstream end of said bladder means being open to permit fluid to flow into said bladder means;

b. a one-piece, integrally molded housing means having:

i. cavity means for receiving and containing said bladder means,

ii. channel means communicating with said cavity means, said channel means being located substantially adjacent to said upstream end of said bladder means and between said upstream end and said downstream end of said bladder means when said bladder means is received in said cavity means, said upstream end of said bladder means sealing one end of said channel means to prevent fluids from entering said cavity means from said channel means when said bladder means is in a depressed position or in its natural profile and permitting fluids to enter said bladder means while said bladder means is expanding to its natural profile; and,

c. trigger means connected to said housing means for depressing said bladder means to pump fluids therefrom.

2. The pump of claim 1, wherein nozzle means is located in said cavity means downstream from said bladder means.

3. The pump of claim 1, wherein said housing means has a lower tapered end means which is connectable to closure means.

4. The pump of claim 1, wherein said valve means is a nipple-type valve.

5. The pump of claim 1, wherein said upstream end of said bladder means has walls which are thinner in thickness toward said upstream end, and said upstream end acts as a one-way valve to permit fluids to enter said upstream end of said bladder means.

6. The pump of claim 2, wherein said housing means has a thin leaf-like strip molded therein adjacent to said cavity means to provide a skid plate for said trigger means when said trigger means is depressed.

7. The pump of claim 6, wherein said strip has a bump thereon which strikes said bladder when said trigger is depressed for increasing the amount of liquids displaced from said bladder.

8. The pump of claim 1, wherein said trigger means is integrally molded with said housing means.

9. The pump of claim 1, wherein cylindrical post means is located in the downstream end of said cavity means and positioned inside said cylinder of said one-way valve.

10. The pump of claim 1, wherein said housing has vent means for conveying air from the outside of said container to the inside of said container.

11. The pump of claim 10, wherein said vent means comprises a hollow channel molded into said housing means.

12. The pump of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11, wherein said cavity means is disposed in a generally horizontal plane when said container is in an upright position, and said channel means is substantially axially aligned with said container.

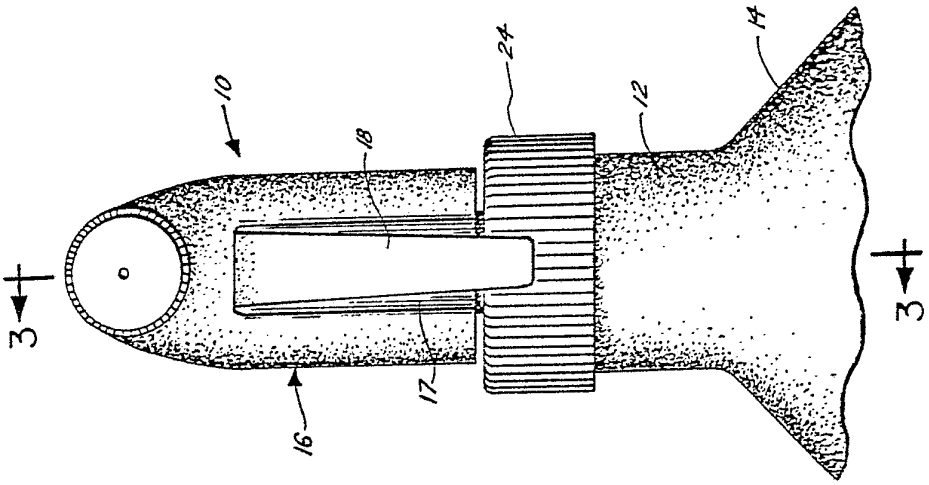

FIG. 2.

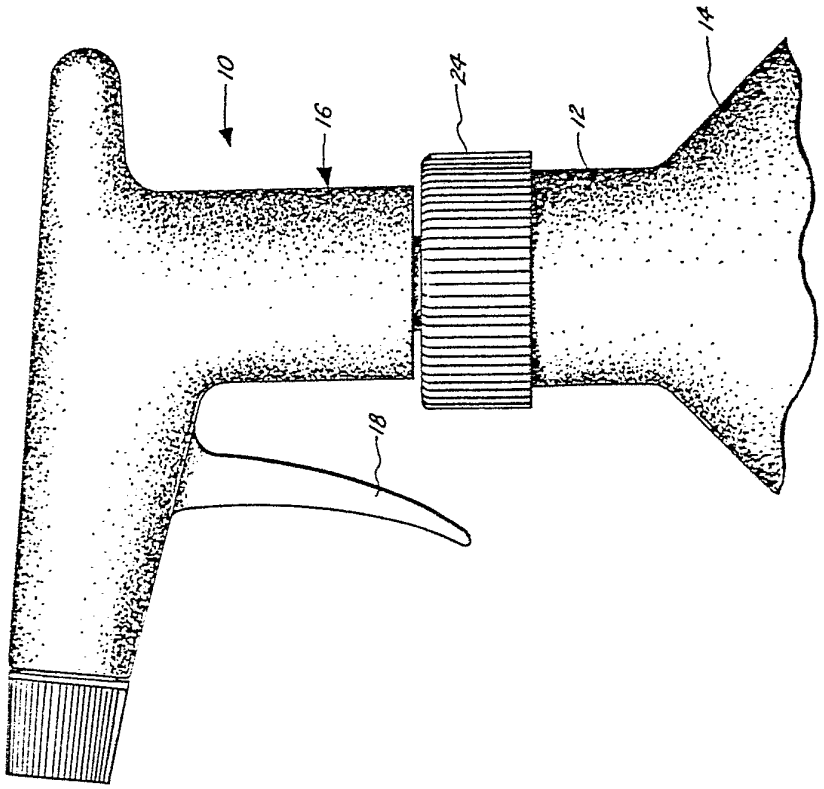

FIG. 1.

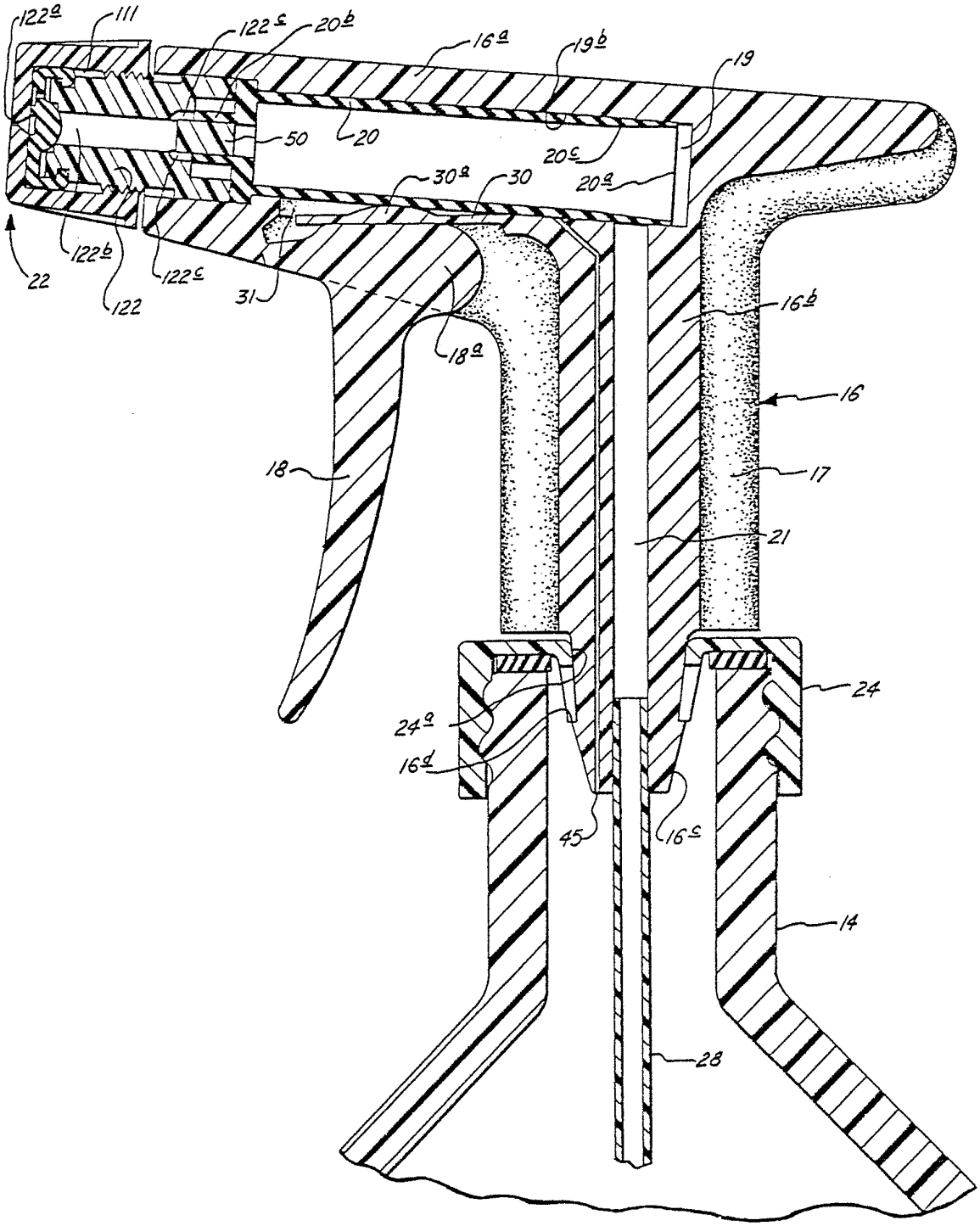

FIG. 3.

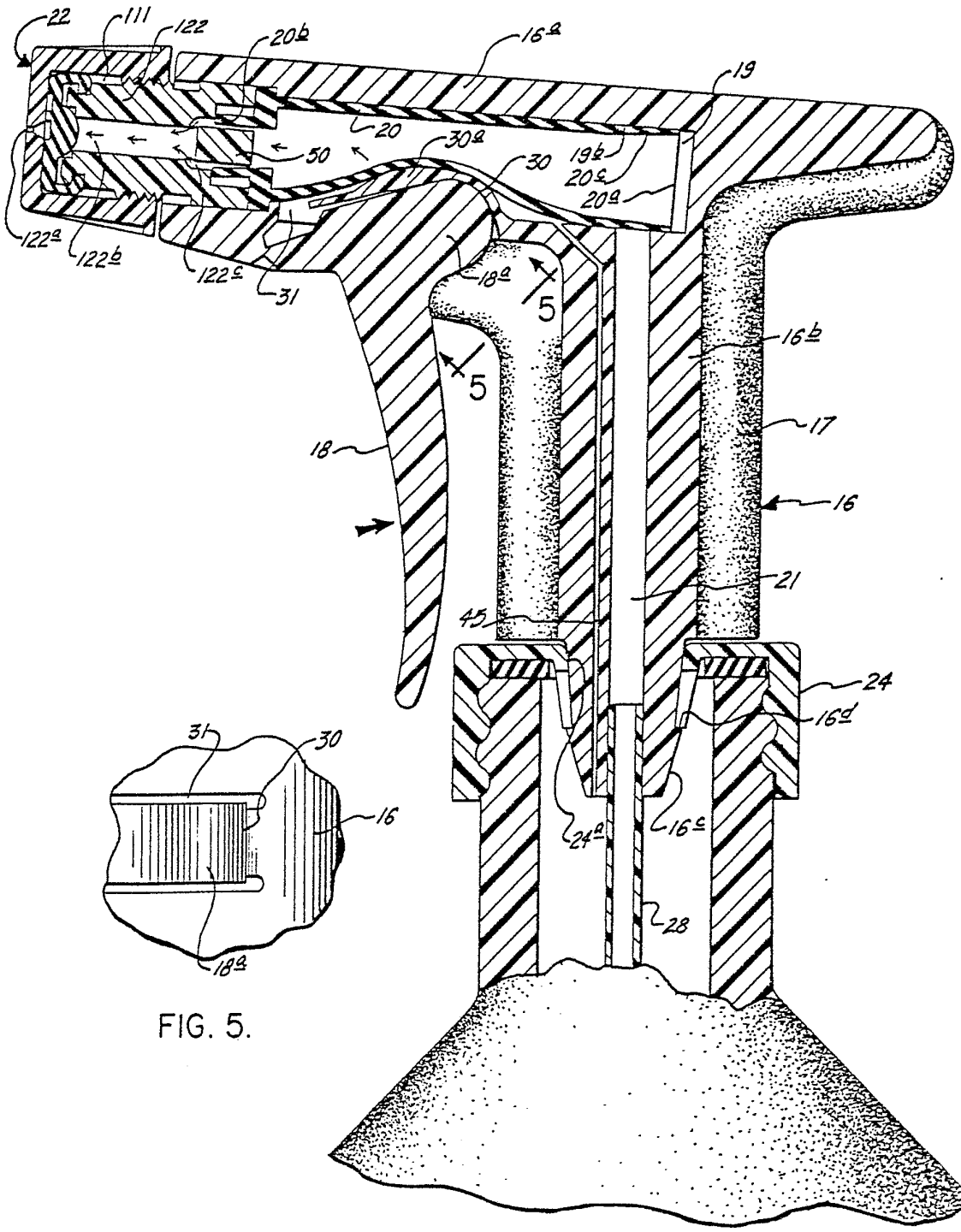

FIG. 5.

FIG. 4.

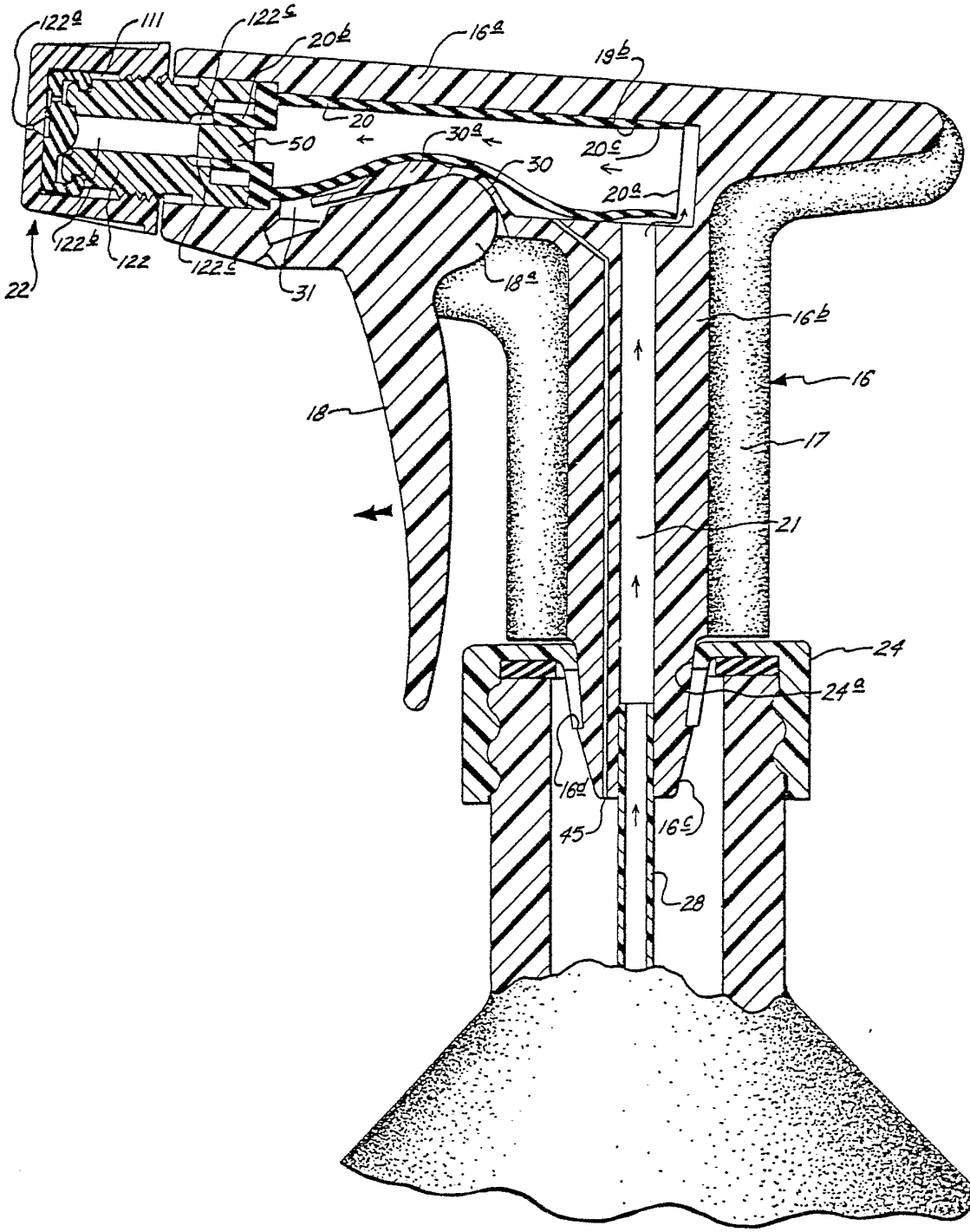

FIG. 6.

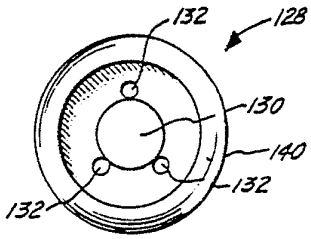

FIG. 7.

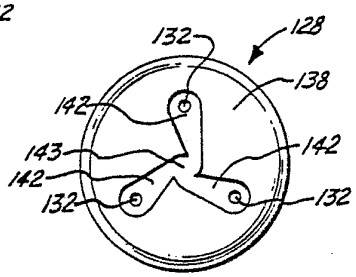

FIG. 10.

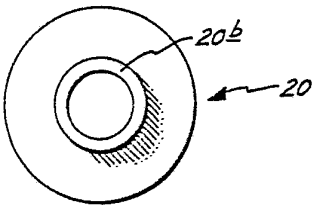

FIG. 12.

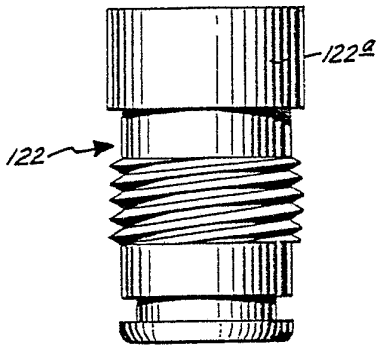

FIG. 8.

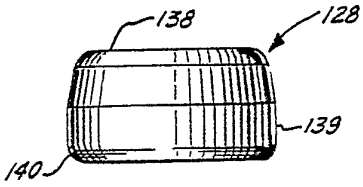

FIG. 11.

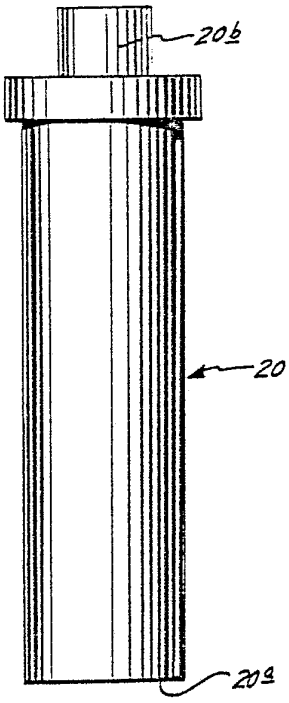

FIG. 13.

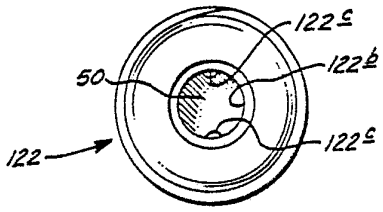

FIG. 9.

INTERNATIONAL SEARCH REPORT

International Application No PCT/US81/01772

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[3] B65D 37/00

U.S. Cl. 222/207

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	222/207,211-214,383,494 239/333 417/478-480

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [6]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A, 4,101,057, Published 18 July 1978, LoMaglio.	1-6,8,12
Y	US, A, 4,182,465, Published 08 January 1980, Bennett.	7,12
Y	US, A, 2,698,703, Published 04 January 1955, Harvey.	9,12
X	US, A, 4,199,083, Published 22 April 1980, LoMaglio.	10-12
Y	US, A, 3,995,774, Published 07 December 1976, Cooprider Et. Al..	10-12

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
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International Searching Authority [1]	Signature of Authorized Officer [20]
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