(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 084 697**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **82300341.3**

(22) Date of filing: **22.01.82**

(51) Int. Cl.³: **B 05 B 11/00**

(43) Date of publication of application: **03.08.83**
Bulletin 83/31

(84) Designated Contracting States: **DE FR GB**

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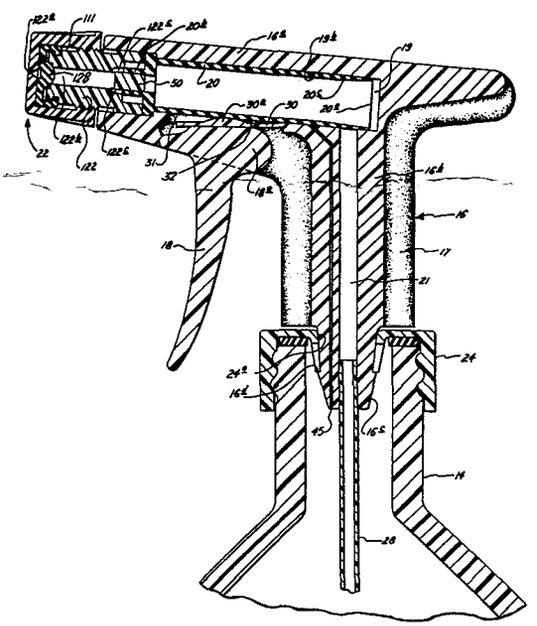
(54) Trigger actuated pump and combination thereof with a fluid container.

(57) A manually operable fluid dispensing pump (10) for attachment to a container (14) for a fluid to be dispensed, comprising an open flexible tubular bladder (20), a housing (16) which includes a cavity (11) intended to contain the tubular bladder, and a trigger (18) connected to the housing (16), such that it will depress the bladder (20).

The bladder has a downstream end (20b) provided with a one-way outlet valve comprising a cylinder with a cross-section smaller than the cross-section of the bladder, which interacts with post (50) on assembly with the nozzle (22), an upstream end (20a) open to permit fluid to flow into the bladder under control of a flap-valve formed by the bladder side wall.

The upstream flap-valve permits the flow of fluid from the container (14) via a channel (21, 28) to the pump when the bladder expands to regain its natural profile after depression. Venting means (45) are incorporated between container (14) and cavity (19), and the trigger (18) operates on the bladder (20) by means of a skid plate (30) having a raised profile (30A).



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TRIGGER ACTUATED PUMP AND COMBINATION THEREOF WITH A FLUID CONTAINER

This invention relates to a trigger actuated pump arrangement which can be connected to a fluid container for dispensing the fluid in the container.

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 Specification No. 3,749,290. 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 a nozzle. Additional trigger pumps which employ flexible tubular members are disclosed in U.S. Patent Specifications Nos. 4,101,057 and 4,199,083.

According to the present invention there is provided 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.

The invention encompasses a combination of the present pump arrangement and a fluid container.

The invention will now be illustrated and described in detail by reference to a preferred embodiment shown in the accompanying drawings, in which drawings:-

FIGURE 1 is a side elevational view of a pump in accordance with the invention mounted on a container;

FIGURE 2 is a front elevational view of the pump and container of Figure 1;

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 the flexible valve member employed in the pump of Figure 1;

FIGURE 8 is a side view of the liquid conduit employed in the pump of Figure 1;

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 the flexible bladder employed in the pump of Figure 1; and

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

Figures 1 and 2 show a pump mounted on a container 14. The pump 10 is held onto the container neck 12 by a 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 reference number 16, which housing is preferably one-piece and integrally molded and has, preferably, an integrally molded trigger 18. However, trigger 18 can be connected to the pump

assembly or housing 16 by any conventional means, for example, such as by pinning or bolting. 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 a bladder 20 and a 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 a 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, which is seen separately in Figures 12 and 13, is made of an elastic material such as rubber,

plastics material, or other flexible material, which can be depressed and relaxed and expanded to regain its natural profile. The bladder has a cylindrical end port 20b on its left hand end or downstream end which cooperates with a post 50 (see later) to function as a one-way nipple-type valve that allows fluids to pass outwardly only from the bladder. The upstream end or right hand end 20a of bladder 20 is tubular in shape and open at 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 Figure 6. The section 20c may be tapered to aid in assembly.

Located downstream from bladder 20 is a nozzle 22. Nozzle 22 can be any conventional type of nozzle and has an orifice 22a therein. A preferred nozzle is that disclosed in U.S. Patent Specification No. 4,257,561.

Nozzle 22 has a hollow cavity 111 therein for receipt of a 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 in 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 reference 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 upwards 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/or 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 Figures 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 thus-compressed fluid moves outwardly through end port 20b and orifice 22a of nozzle 22 as indicated in Figure 4.

When trigger 18 is released, the pressure inside bladder 20 decreases and the valve arrangement constituted by end port 20b and post 50 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 20 with fluids.

A vent 45 allows air to enter the container 14 when the pump is actuated. The path of the air flow is from the atmosphere through slots 33, 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 preferred 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 leakproof 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 preferred 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, if desired, be made entirely of plastics 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.

CLAIMS:

1. A manually operable fluid dispensing pump for attachment to a container for a fluid to be dispensed, which pump comprises, in combination:

(a) an open tubular bladder having a flexible wall which upon being allowed to relax after depression of the bladder returns to its natural profile, the bladder having a downstream end provided with a valve comprising a cylinder with a cross-section smaller than the cross-section of the bladder, which valve is a one-way valve that permits fluid to flow outwardly from the bladder and an upstream end open to permit fluid to flow into the bladder;

(b) a housing having a cavity therein containing the bladder and a channel communicating with and joining the cavity at a location substantially adjacent to the upstream end of the bladder and between the upstream end and the downstream end of the bladder, the upstream end portion of the bladder sealing the junction of the channel with the cavity so as to prevent fluid from entering the cavity from the channel when the bladder is depressed or is in its natural profile and permitting fluid to enter the bladder while it expands to its natural profile; and

(c) a trigger connected to the housing for

depressing the bladder so as to pump fluid therefrom.

2. A pump as claimed in claim 1, wherein a nozzle is located in the cavity downstream from the bladder.

3. A pump as claimed in claim 1 or claim 2, wherein the housing has a lower tapered end which is connectable to a fluid container closure.

4. A pump as claimed in any one of claims 1 to 3, wherein the bladder downstream end one-way valve is a nipple-type valve.

5. A pump as claimed in any one of claims 1 to 4, wherein the upstream end portion of the bladder has walls which are thinner towards the upstream end, which upstream end portion acts as a one-way valve to permit fluid to enter the upstream end of the bladder.

6. A pump as claimed in any one of claims 1 to 5, wherein the housing has a thin leaf-like strip molded therein adjacent to the cavity to provide a skid plate for the trigger when it is actuated.

7. A pump as claimed in claim 6, wherein the strip has a bump thereon which strikes the bladder when the trigger is actuated in order to increase the amount of fluid displaced thereby from the bladder.

8. A pump as claimed in any one of claims 1 to 7, wherein the trigger is integrally molded with the housing.

9. A pump as claimed in any one of claims 1 to 8,

wherein a cylindrical post is located in the downstream end of the cavity and is positioned inside the cylinder of the bladder downstream end one-way valve.

10. A pump as claimed in any one of claims 1 to 9, wherein the housing has a venting means therein for conveying air from the outside of the container to the inside of the container.

11. A pump as claimed in claim 10, wherein the venting means comprises a hollow channel molded into the housing.

12. A pump as claimed in any one of claims 1 to 11, wherein the cavity is disposed in a generally horizontal plane when the pump is in use on a container in an upright position and the channel is substantially axially aligned with the container.

13. A combination comprising a pump as claimed in any one of claims 1 to 12 attached to a container for fluid to be dispensed.

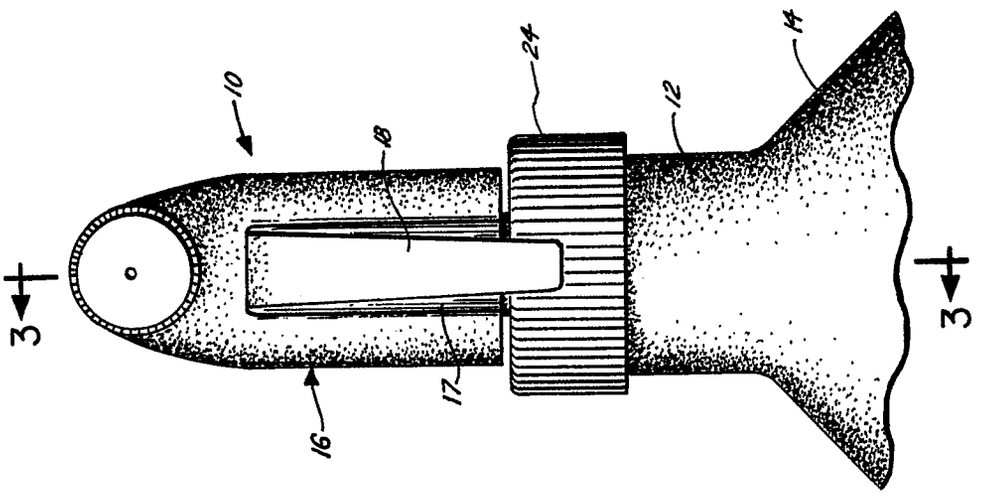


FIG. 2.

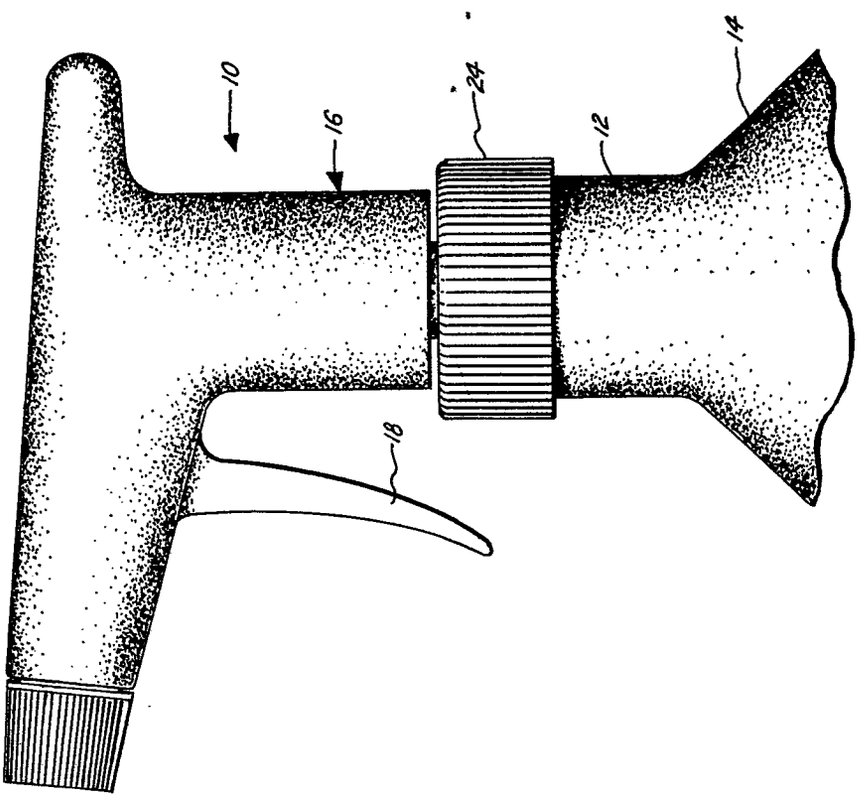
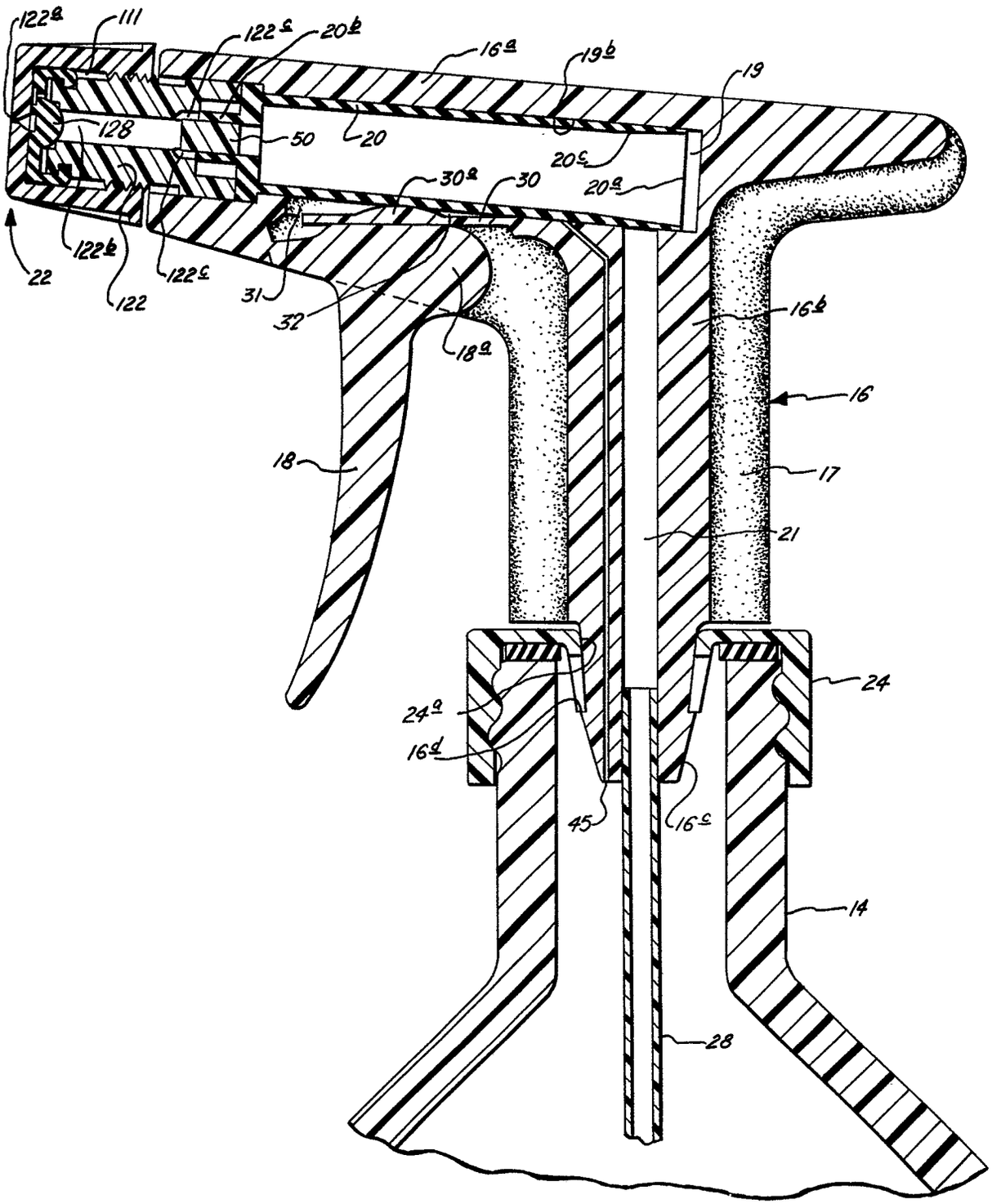


FIG. 1.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122c
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16a
19b
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128
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20c
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22
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122
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16d
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16c
14
28

FIG. 3.

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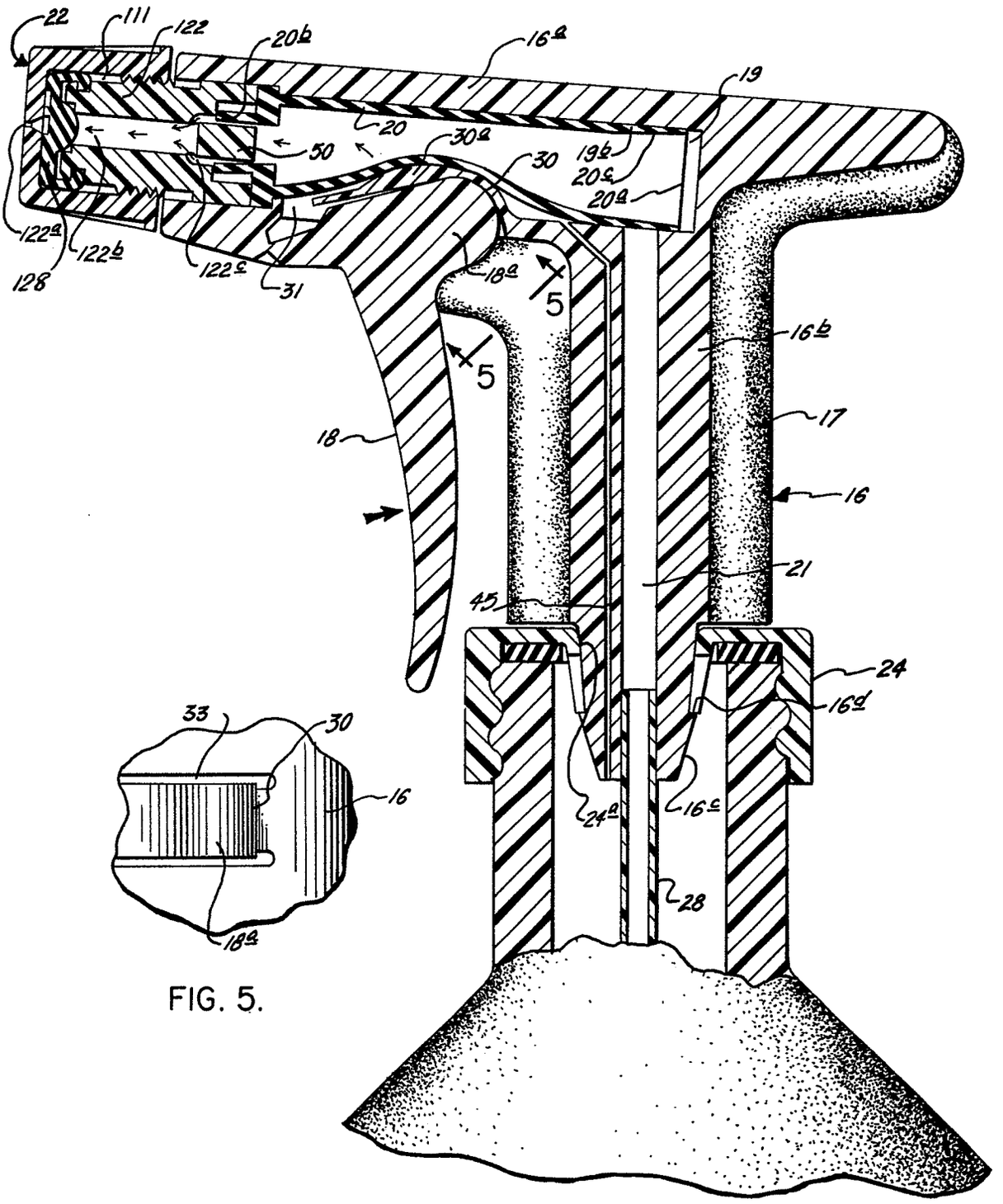
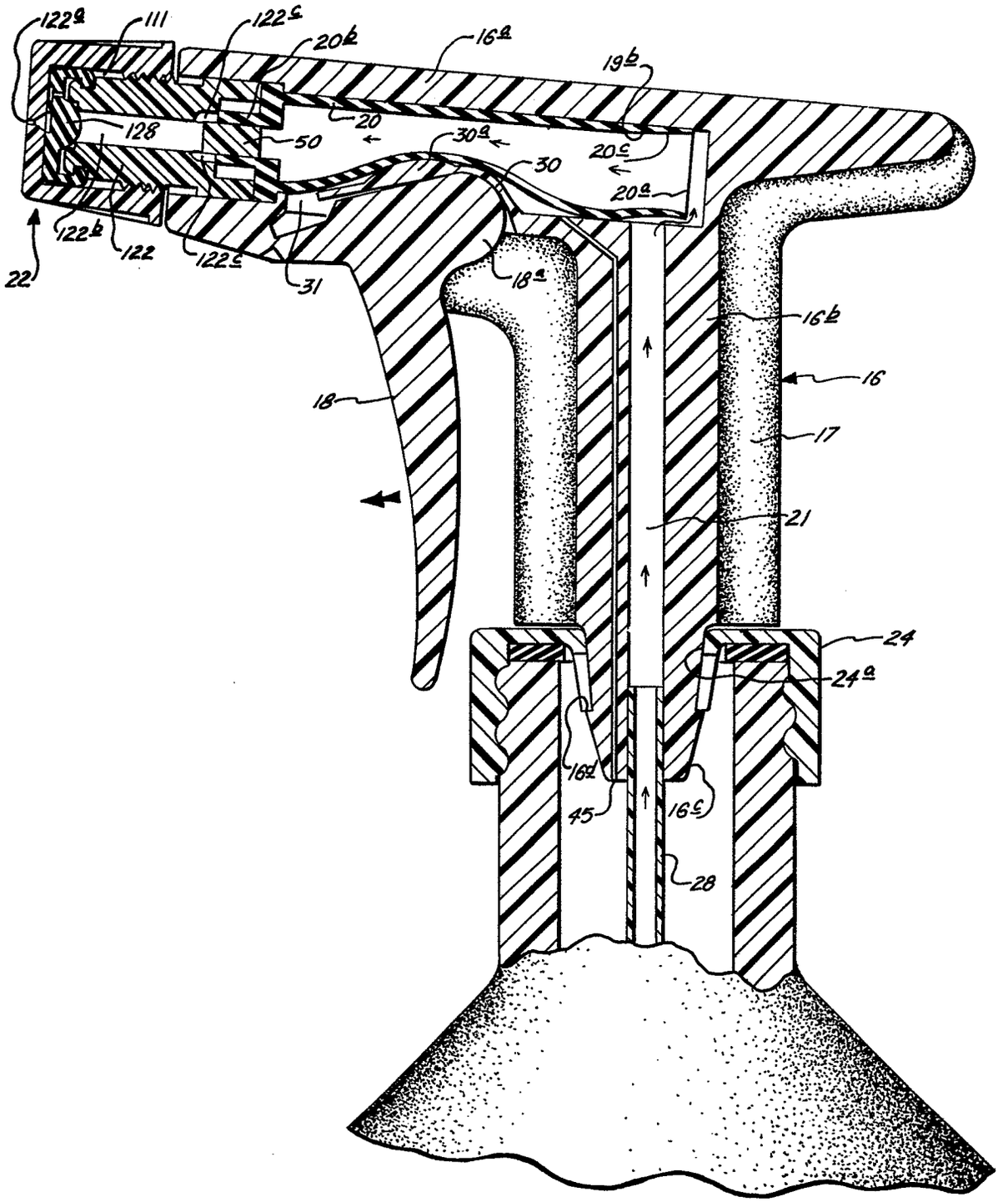


FIG. 5.

FIG. 4.


122a
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122c
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20a
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16b
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24
24a
16d
45
16c
28

FIG. 6.

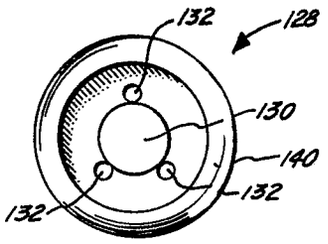

FIG. 7.

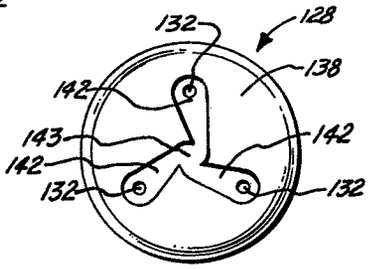

FIG. 10.

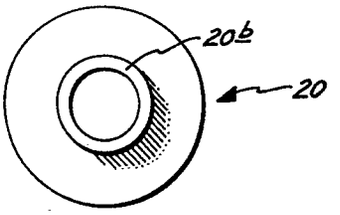

FIG. 12.

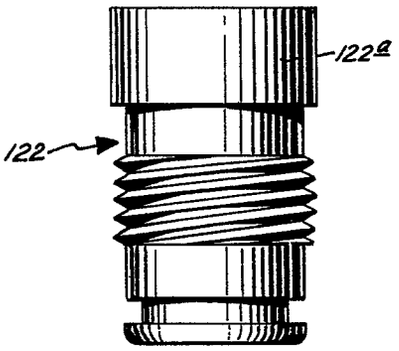

FIG. 8.

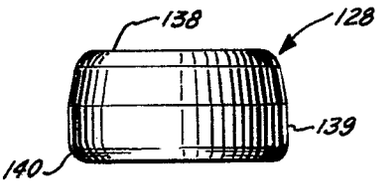

FIG. 11.

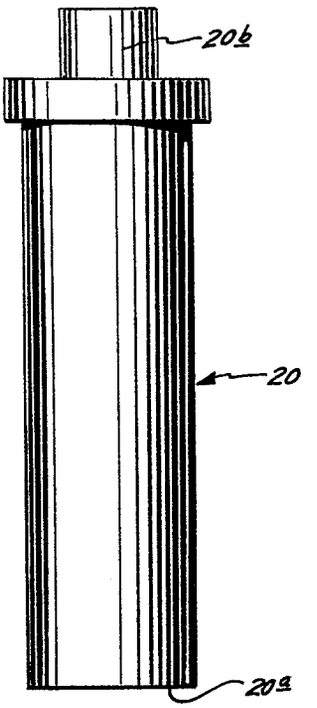

FIG. 13.

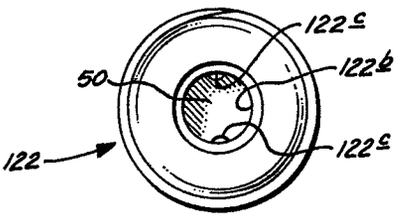

FIG. 9.

European Patent Office

EUROPEAN SEARCH REPORT

0084697
Application number

EP 82 30 0341

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
D,Y	US-A-4 199 083 (L.C.LoMAGLIO) *The whole document*	1-6,8-13	B 05 B 11/00
Y	US-A-1 392 600 (W.H.ROSE) *Figure 4; page 2, lines 54-87*	1-6,8-13	
A	FR-A-2 002 077 (LEEDS & MICALLEF) *Page 9, line 34 - page 10, line 10; page 10, line 35 - page 11, line 4; figure 3* & US - A - 3 452 905	1,4,9	
A	US-A-2 527 614 (J.W.ARPIN) *Page 1, column 2, lines 28-53; figure 3*	7	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	GB-A- 647 604 (J.SCHNEIDER) *Page 1, lines 44-64; figure 1*	7	B 05 B B 67 D F 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-10-1982	MOSEDALE T.W.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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