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(54) Title: POURING MECHANISMS FOR CONTAINERS

(57) Abstract

This invention relates to fluid containers of the type which have an outlet in their upper part and out of which fluid can be poured by tipping the container towards the outlet. In particular, the invention relates to mechanisms for such containers including a helical baffle (14), a vent tube (10), a closure cap (6), and a movable discharge tube (7). When the container is tilted, fluid is momentarily diverted through the baffle at the initial dispensing.

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POURING MECHANISMS FOR CONTAINERS

This invention relates to fluid containers of the type which have an outlet in their upper part and out of which fluid can be poured by tipping the container towards the outlet. In particular, the invention relates to pouring mechanisms for such containers.

It is well known that pouring fluids from such containers is an inexact activity. Fluid often misses the intended receptacle when pouring starts, and fluid flow from containers is often unsteady, resulting in further spillage during pouring.

This problem may be expressed more exactly by considering in more detail the pouring of fluid from a standard container (e.g., a bottle or can having an opening near the top) into a receptacle. The first action is generally to move the opening in the container containing fluid to a position above an opening in a receptacle. This often requires a tipping motion and can be awkward in confined spaces such as around a vehicle engine. Often, the two openings cannot be brought into close proximity without fluid escaping from the container and the user must guess how and when the fluid will flow from the container opening. This process often results in unwanted spillage. Secondly, once liquid begins to flow the user must take great care to angle the container correctly such that liquid can escape from the container opening and air can enter through the same opening to replace the escaping fluid of the same rate. If this is not achieved (as is often the case), the fluid will not pour smoothly and "glugging" will ensue. Again, this causes unwanted spillage.

It is known to provide such containers with the outlet formed by an opening defined by a substantially cylindrical skirt provided with a removable cap for sealing across the

skirt and with a discharge tube which makes a sliding fit with the skirt and can be slid partly out through the skirt so as to provide an elongated discharge spout. Although this helps positioning of the discharge outlet, it does not solve the problems.

It is also known to provide the container with a very small outlet orifice. This reduces the volume of fluid which may be spilt, but makes discharge of the container unacceptably slow, even if there is an air bleed for bleeding air into the container.

It is also known to provide a discharge outlet which contains an intermediate chamber whereby this intermediate chamber has to be filled before fluid can be dispensed. Although this is useful for some containers in some environments, it is not satisfactory when it is desired to maintain a constant flow of fluid from the container after the flow has started in the correct position.

A container according to the invention comprises:

a body for containing fluid;

an outlet in the upper part of the body and out of which fluid can be poured by tipping the container; and

an air bleed for bleeding air into the lower part of the body when fluid is being poured out through the outlet.

The outlet comprises:

an opening in the body defined by a skirt;

a removable cap for sealing across the skirt;

a discharge tube for discharging fluid from within the body and out through the outlet and which either makes a fluid tight fit with the skirt or is integral with the skirt; and,

baffle means arranged along an elongated length of the discharge tube for impeding initial flow of fluid along the elongated length and for thereafter allowing continuous flow.

The skirt can extend down into the body in which event the cap may, for instance, make a pressure fit across the top of the skirt to close the opening. Usually, however, the skirt is an upstanding skirt and the cap usually fits over the top of it. Usually the skirt is externally threaded so as to allow the cap to be threaded down on to the skirt in order to close the opening.

The discharge tube can be integral with the skirt in that the skirt can serve also as the entire discharge tube or the tube may be otherwise integrally fixed (for instance by adhesive) with the skirt. Usually, however, the discharge tube makes a sliding fit with the skirt whereby it can be pushed into the container when the container is to be closed but can be slid partly out through the skirt to provide an elongated discharge spout when fluid is to be discharged from the container. In order to ensure that it only slides partly out through the skirt, there will normally be stop means for engaging the discharge tube with the container when the tube has slid sufficiently out through the skirt, or for otherwise restraining movement of the tube within the skirt.

The baffle means are arranged along an elongated length of the discharge tube, by which we mean that they extend over a length that is usually greater than the maximum width of the tube and is usually 1.5 to 3 times, or up to 5 times or more times, the maximum width of the tube. The tube and the skirt are usually substantially cylindrical and so the width is usually the diameter.

The baffle means are arranged along that elongated length so as to impede the initial flow of fluid along that length. Thus, on tipping the container, the fluid takes longer to reach the discharge end of the discharge tube than it would do in the absence of the baffle means. However the baffle means are such that, once the fluid starts,

continuous and substantially uniform flow past the baffle means will continue for as long as there is fluid to be poured out of the container.

The baffle means generally comprise elements that extend transversely across part or all of the width of the tube, along its elongated length, while still allowing a fluid flow path through the tube.

Instead of merely providing baffles that impede the flow and over which the fluid has to flow, the preferred baffle means comprise means for increasing the length of the fluid flow path along the elongated length of the discharge tube, and thus they are such as to cause the flow path through the tube to be longer than the elongated length, for instance being 1.5 or 2 times, and usually at least 3 or 4 times longer than the elongated length over which the baffles are arranged. The baffles can comprise, for instance, one or more coiled tubes and indeed the discharge tube can consist of such an assembly. Preferably the baffle means comprise a helix which extends along, and substantially prevents axial flow along, the elongated length of the discharge tube. Thus the tube may comprise a substantially cylindrical body into which the helix is fitted either permanently or slidably with a substantially fluid tight fit so as to substantially prevent flow in an axial direction, i.e., without following the helical channel defined by the helix.

The air bleed is preferably a vent tube which extends through the discharge tube into the lower part of the container body, and most conveniently it is an air bleed tube which extends coaxially with the discharge tube and the helix, whereby the helix extends around the bleed tube and substantially spans the distance between the outer walls of the bleed tube and the inner walls of the discharge tube.

The discharge tube preferably extends to near the bottom of the container and preferably it terminates in a one-way valve construction that allows the ingress of air into the container when fluid is being poured out of the container but which substantially prevents liquid entering the tube when the container is closed and full of liquid.

The invention includes also a discharge tube, as described above, for slidable fitting within an outlet skirt of a container. The pouring mechanism of the present invention solves the above mentioned problems. As a container having the pouring mechanism is inverted, there is a time delay, during which fluid flows around the helical path or otherwise along the baffle means, before fluid exits from the discharge tube. This time delay enables a user to position the outlet opening of the discharge tube in a position very close to the intended receptacle opening and thus prevents spillage as pouring starts. Furthermore, the mechanism induces a smooth flow as air enters the container separately, through the air channel, and this smooth flow reduces the chance of spillage during pouring.

The invention is of particular value when the fluid is relatively viscous, for instance having a Dynamic viscosity at 25°C of at least 50cPs. Usually the viscosity is at least 70cPs. However, if the viscosity is too high, it is difficult to pour the liquid out of the container and so usually the viscosity is not more than 550cPs, and preferably it is below 250cPs.

Suitable liquids are viscous chemically active liquids such as viscous liquid herbicides or other agricultural pesticides or bleach, liquid detergents or, especially mineral or synthetic oils, especially mineral or synthetic oils which are engine lubricating oils.

An example of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1A is a cross sectional view through the top section of a container having a pouring mechanism according to the invention.

Figure 1B is a perspective view of the container.

Figure 10 is a perspective view of the container with its cap in place.

Figure 2 is an exploded perspective view of a first example of the pouring mechanism.

Figure 3 is an exploded perspective view of a second example of the pouring mechanism.

Figure 4 is an exploded perspective view of a third example of the pouring mechanism.

Referring to Figure 1A, a container 1 has a body 2 with an opening 3 in the upper part of the body defined by an upstanding cylindrical skirt 4 provided with an external thread 5. A cap 6 can be threaded down over the top of the skirt so as to seal the opening.

A discharge tube 7 is slidably fitted within the skirt 4 so as to make a substantially fluid tight fit between the skirt and the tube. It is provided with stop means 8 at its lower end to prevent it being pulled up wholly through the skirt and stop means 9 at its upper end to prevent it sinking down into the body. These stop means are external protrusions which engage, respectively against the lower and upper edges of the skirt.

An air bleed tube 10 extends coaxially through the skirt and the discharge tube. The tube 10 extends to near the base of the body 2, where it terminates in a one-way valve 12. This valve is constructed to allow air to permeate outwardly from the tube 10 into the body 2 of the container but to prevent liquid flowing inwardly through the valve 12 into the tube 10.

Substantially the entire length of the discharge tube 7 is provided with baffle means, the tube 7 comprising a

substantially cylindrical outer housing 13 in which the baffle means and the tube 10 are fitted. In each of the illustrated embodiments, the baffle means comprise a helix 14 which extends around the tube 10 and within the cylindrical housing 13 so as to make a substantially fluid tight fit with the tube and the housing.

In the embodiment of Figure 2, the helix 14 is integral with a central tube portion 15 which fits into the upper end of the tube 10, and the helix 14 makes a sliding fit in the housing 13.

In the embodiment shown in Figure 3, the helix 14 and the upper tube portion 15 are permanently fixed in the housing 13.

In the embodiment shown in Figure 41 the upper tube portion 15 is permanently fixed in the cylindrical housing 13 and the helix 14 makes a slidable fit over it.

In all these embodiments$_1$ the tube 10 is shown as being formed by joining an upper tube member 15 with a lower tube member 10. However, if desired, the two parts may be integral.

In use, a filled container is opened by removing the cap 6 and pulling the discharge tube 7, and the air bleed tube 10, upwardly so that the lip B engages against the bottom of the skirt 4. The container is then tipped.

Before the fluid can exit from the upper outlet end of the discharge tube, the fluid must flow along the channel (or fluid path) defined by the helix 14. Depending upon the viscosity of the fluid it takes a certain amount of time for the fluid to flow along the channel, during which a user can ensure that the opening is correctly aligned with the receptacle. Thus, unnecessary spillages are avoided.

During pouring, air enters the container through the central tube 10 and valve 12 to replace the exiting fluid. Thus a smooth flow of fluid around the channel and out of

the container is ensured, further preventing spillage.

Different numbers of turns of the helix will cause different delay times and different inclines of the helix surface of the baffle 14 and different diameters of discharge tube 13 will cause fluid to flow at different rates. In particular, increasing the number of turns increases the delay. Generally, a shallow channel incline and/or a smaller channel will reduce the rate at which fluid flows and hence increase the time delay between inversion and fluid flow. Conversely, a channel having a greater incline and/or a larger channel will increase the rate of fluid flow and the time delay between container inversion and fluid exiting the container.

Thus, for a viscous fluid such as motor oil, a fairly wide and steep channel is suitable, whereas, for a less viscous chemical, a narrower and shallower channel is suitable.

The continuous rate of flow can also be constricted, if desired, by providing a constriction in the discharge tube, for instance by having one end of it partially closed by radial blocking segments 16.

The pouring mechanism of the invention has a number of applications. In particular spillages common to replacement of motor oil in vehicle engines may be limited by incorporating the pouring device of the invention in motor oil containers. Similarly, toxic or dangerous chemicals may be poured more safely by incorporating the pouring mechanism into containers through which they are supplied.

CLAIMS:

1. A container comprising a body for containing fluid, an outlet in the upper part of the body and out of which fluid can be poured by tipping the container, and an air bleed for bleeding air into the lower part of the body when fluid is being poured through the outlet, and in which the outlet comprises:

an opening in the body defined by a skirt;

a removable cap for sealing across the skirt;

a discharge tube for discharging fluid from within the body and out through the outlet and which either makes a fluid tight fit with the skirt or is integral with the skirt; and

baffle means arranged along an elongated length of the discharge tube for impeding initial flow of fluid along that elongated length and for thereafter allowing continuous flow.

2. A container according to claim 1 in which the discharge tube makes a sliding fit with the skirt and can be slid partly out through the skirt and includes stop means for restraining the movement of the tube within the skirt.

3. A container according to claim 1 or claim 2 in which the air bleed is a vent tube which extends through the discharge tube into the lower part of the container body.

4. A container according to any preceding claim in which the baffle means comprise means for increasing the fluid flow path length along the elongated length of the discharge tube.

5. A container according to any of claims 1 to 4 in which the baffle means comprise a helix which extends along, and substantially prevents axial flow along, the elongated length of the discharge tube.

6. A container according to claim 5 in which the air bleed tube extends coaxially with the tube and the helix, and the helix extends around the bleed tube and substantially spans the distance between the inner walls of the discharge tube and the outer walls of the bleed tube.

7. A container according to any preceding claim in which the air bleed terminates in a one-way valve which allows air to flow into the container but which substantially prevents fluid entering the tube.

8. A container according to any preceding claim containing fluid which has a Dynamic Viscosity of from 50 to 550cPs.

9. A container according to claim 8 in which the fluid is engine lubricating oil.

10. A discharge tube which can be slidably fitted within an outlet skirt in the upper part of a tippable fluid container and which comprises:

stop means for engaging with the container to prevent the tube being withdrawn from the container;

an air bleed tube extending substantially through the discharge tube for bleeding air into the lower part of the container; and

baffle means arranged an elongated length of the discharge tube for increasing the fluid flow path length along the elongated length of the discharge tube.

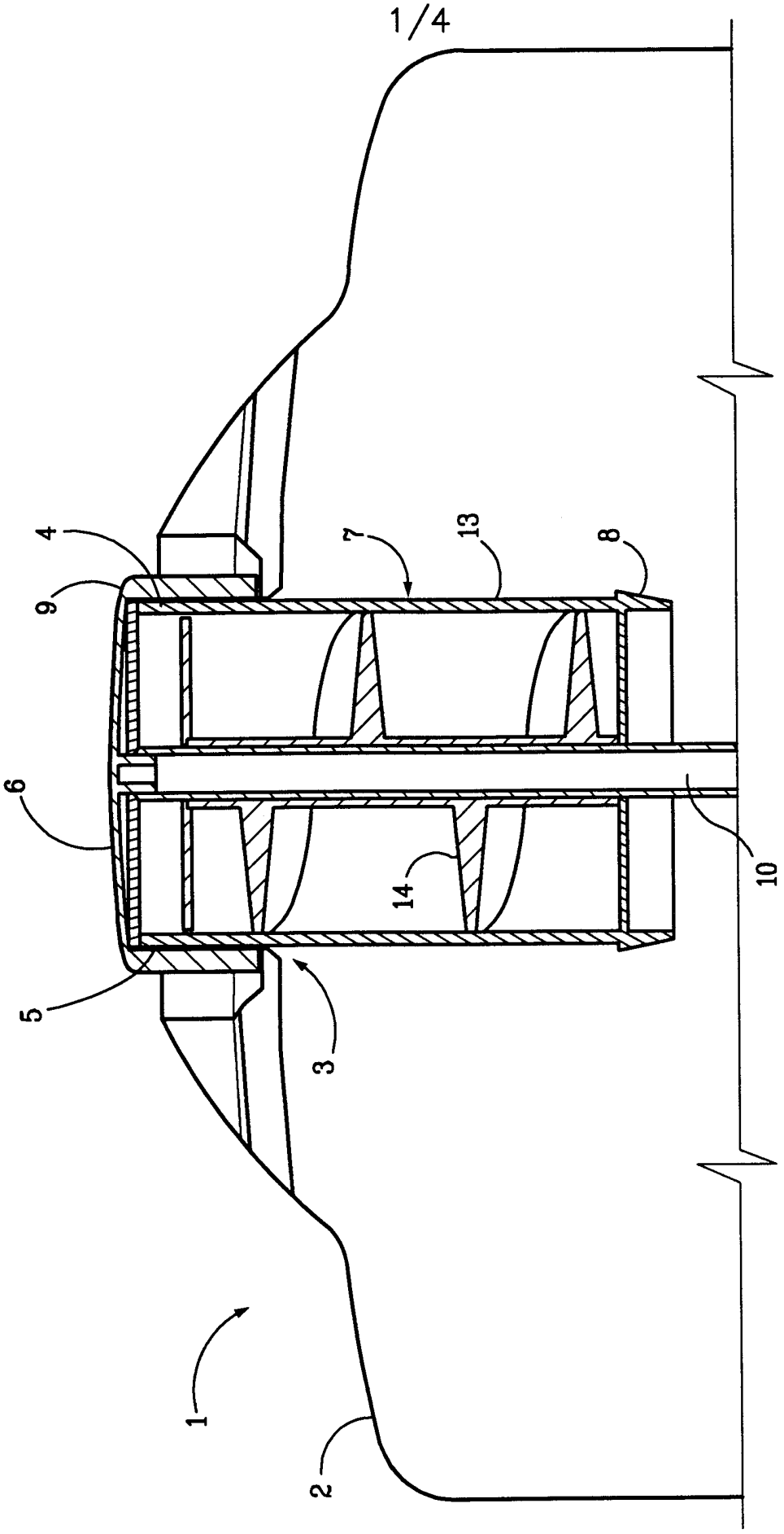


FIG. 1A

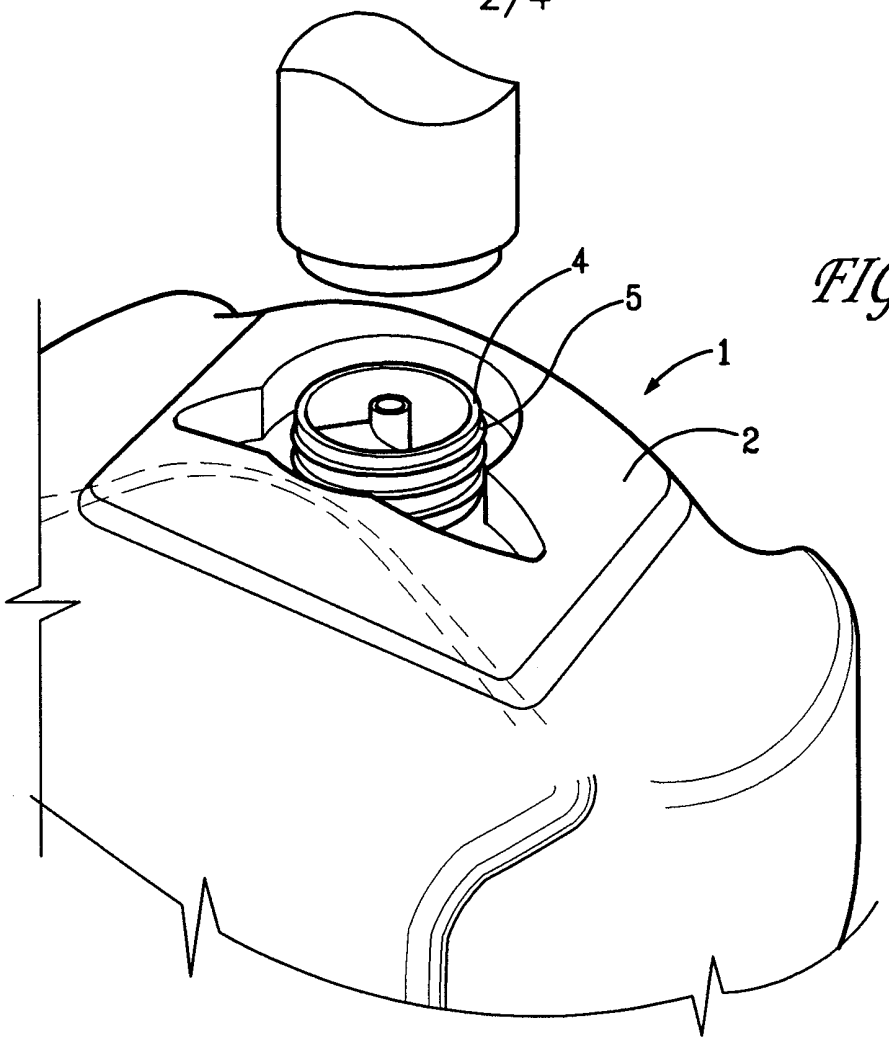


FIG. 1B

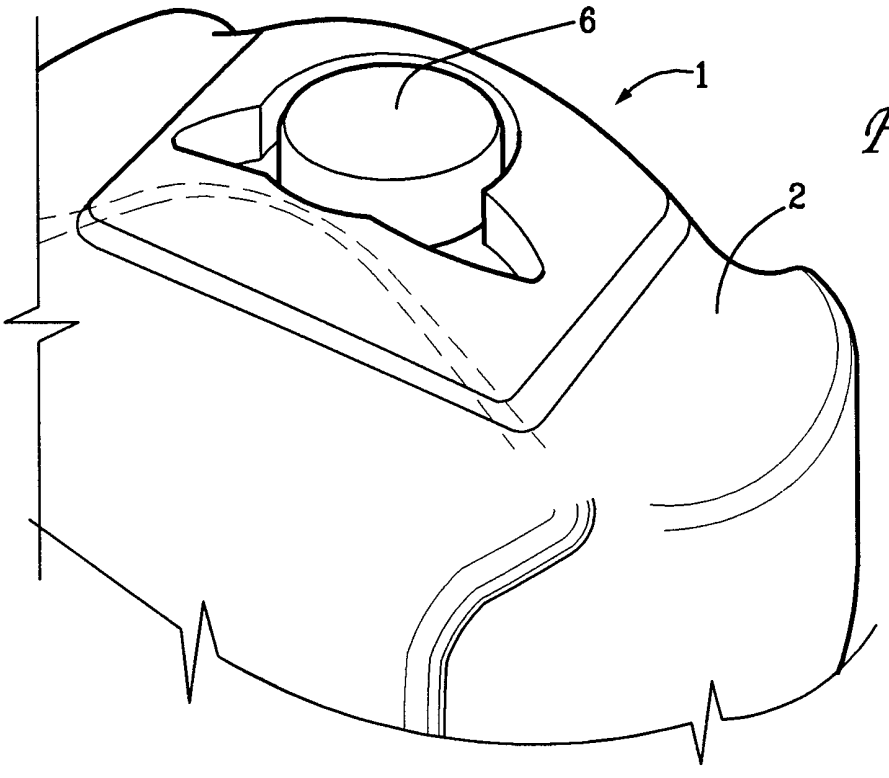


FIG. 1C

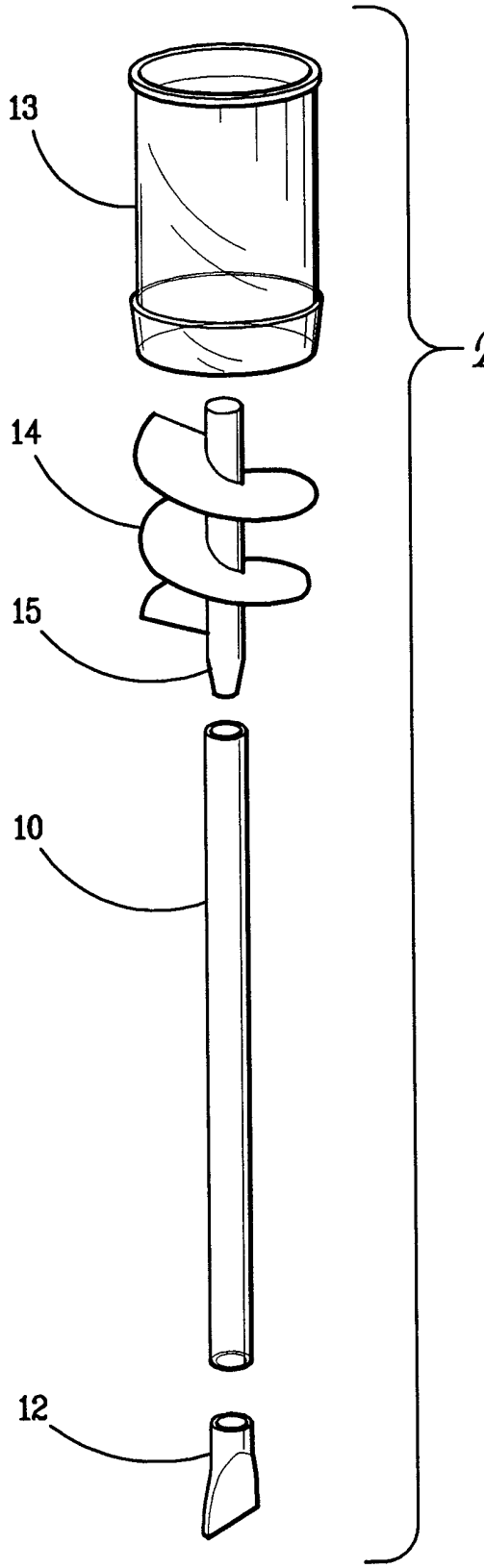


FIG. 2

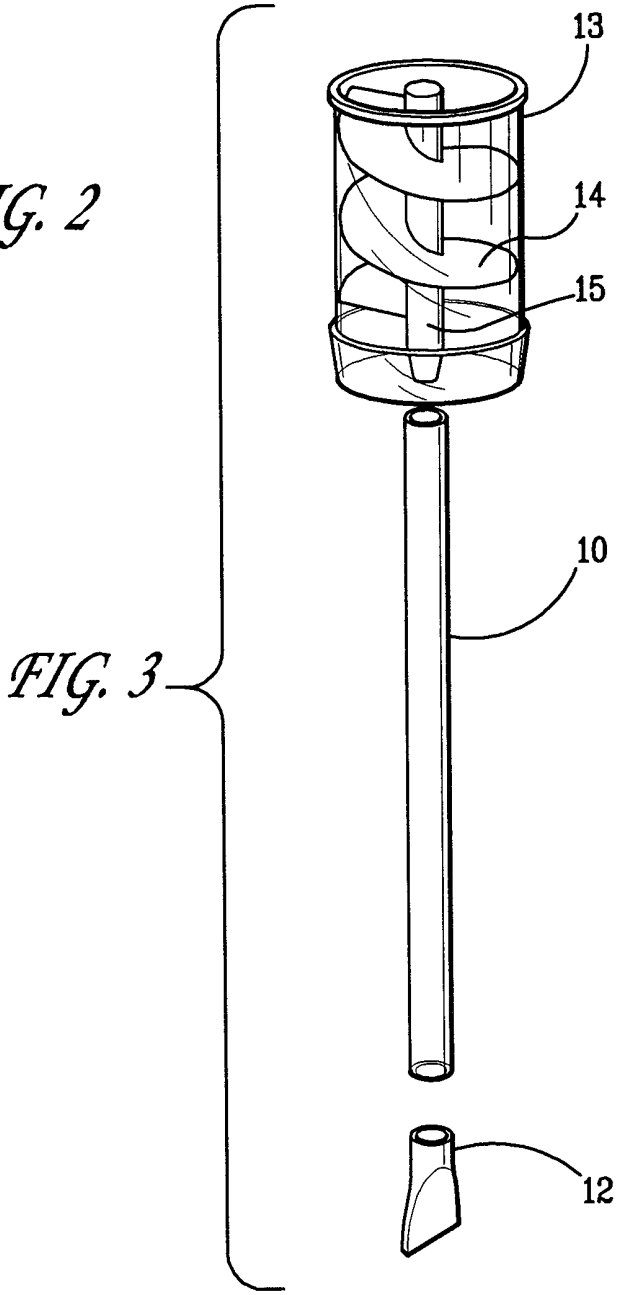
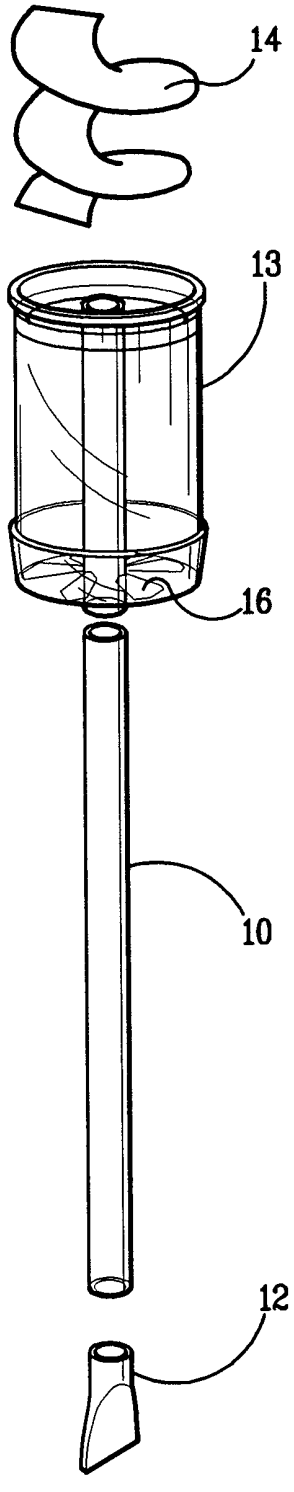


FIG. 3

FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/19609

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : B67D 1/14
US CL : 222/481.5, 525, 547
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. : 222/481.5, 525, 547, 523, 479, 459

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 ---- Y	US 3,091,373 A (KIRSCHENBAUM) 28 May 1963, see the entire document.	1 ------ 2, 3, 10
Y	US 4,650,096 A (THATCHER) 17 March 1987, see the entire document.	2, 10
Y	US 5,048,723 A (SEYMOUR) 17 September 1991, see the entire document.	10
Y	US 5,232,110 A (PURNELL) 03 August 1993, see the entire document.	3
A	US 5,458,262 A (KELLER) 17 October 1995, see the entire document.	1-3, 10
A	US 2,724,535 A (DAY et al) 22 November 1955, see the entire	1-3, 10

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

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"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search
12 NOVEMBER 1999

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/19609

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,807,785 A (PRITCHETT) 28 February 1989, see the entire document.	1-3, 10
A	US 4,881,666 A (TULLMAN et al) 21 November 1989, see the entire document.	1-3, 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/19609

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4-9
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.