



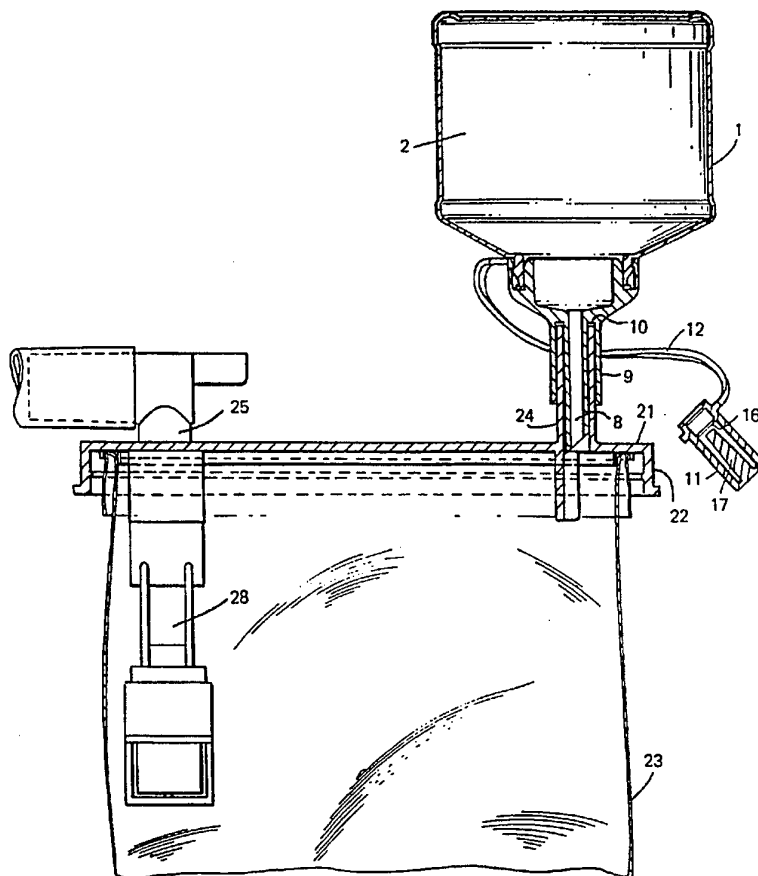
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : A61M 1/00, 37/00	A1	(11) International Publication Number: WO 95/01191 (43) International Publication Date: 12 January 1995 (12.01.95)
(21) International Application Number: PCT/US94/06794 (22) International Filing Date: 15 June 1994 (15.06.94) (30) Priority Data: 930493 1 July 1993 (01.07.93) IE (71) Applicant: ABBOTT LABORATORIES [US/US]; CHAD 0377/AP6D-2, One Abbott Park Road, Abbott Park, IL 60064-3500 (US). (72) Inventors: MAHER, Pascal, James; Drimark, Donegal, County Donegal (IE). FILAN, Finbarr, John; Castle Street, Sligo, County Sligo (IE). SHAW, Christian; 13 Cedarwood Drive, Loughboy, Kilkenny (IE). (74) Agents: TRAUSCH, A., Nicholas et al.; Abbott Laboratories, CHAD 0377/AP6D-2, One Abbott Park Road, Abbott Park, IL 60064-3500 (US).		(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: GELLING TREATMENT FOR SUCTION DRAINAGE SYSTEM

(57) Abstract

A gelling system for treating waste, such as bodily fluids, comprises a sealed receptacle (20) including a lid (21) and a chamber (23) within the receptacle for receiving the waste, a waste inlet port (24) in the lid connected to the interior of the chamber (23), an outlet port (25) in the lid (21) for connection to a suction source; and a container (1) for storing waste-treating material (e.g. a gelling agent), and for dispensing the waste-treating material into the chamber (23). When the suction system is in use, the container (1) is unattached to the receptacle (20) but, when it is desired to treat waste within the chamber (23), the container (1) is freely attachable to the receptacle (20) by means of an elongate dispensing nozzle (8) on the container which connects with the waste inlet port (24) to dispense the waste-treating material into the chamber. The container (1) has a removable cap (11) which in one position fits over the nozzle (8) of the container to form a fluid-tight seal on the nozzle (8), and which, in a second position, when removed from the nozzle (8), is used to seal the outlet port (25).



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

GELLING TREATMENT FOR SUCTION DRAINAGE SYSTEM**TECHNICAL FIELD**

Suction drainage systems having a connection from a rigid container or a flexible liner to the body of a patient and a connection from the container or liner to a suction source have been widely utilized in hospitals.

5 These systems collect waste, in the form of body fluids, from surgical and other patients in a disposable container or flexible liner having an integral lid or cover. The aspirated waste often is highly infectious and often subject to exposure caused by spills or a

10 failure of the suction drainage system.

BACKGROUND ART

Our European Patent Application Nos. O 391 219 and

15 O 390 095 disclose a suction drainage control system that reduces an operator's exposure to infectious waste by permitting waste-treating material to be dispersed into a sealed chamber in which the infectious waste is contained. The sealed chamber includes a cover with a

20 flexible liner sealed to and suspended therefrom. A freely movable reservoir is provided inside the chamber for storing the waste-treating material, which reservoir is opened by manipulating the flexible liner to open the reservoir.

25 Our European Patent Application No. O 390 094 discloses a system in which a normally closed reservoir is provided on an underside of the cover of the chamber for storing the waste-treating material therewithin as long as the reservoir remains closed. An externally

30 operated actuator is provided on the cover for opening the reservoir to release the waste-treating material into the sealed chamber having a flexible liner.

Our European Patent Application No. O 394 687 discloses a suction drainage system having absorbent and/or germicide to treat waste and/or locking connections and/or valves to minimize the possibility of escaping waste. A transfer system is also provided to facilitate the use of multiple containers in a single system.

United States Patent No. 5,156,823 discloses a device for use in treating waste body fluids comprising a waste container for storing body fluids and body fluid solutions, an aspiration port at an upper portion of the waste container for aspirating the body fluids and body fluid solutions, a discharge port at an upper portion of the waste container, means for holding a chemical agent in an inner upper portion of the waste container, and a chemical agent comprising a coagulant for coagulating body fluids and body fluid solutions in the waste container.

In the prior art apparatus the container containing the gelling agent is permanently attached to the suction drainage system, which provides a limitation on its freedom of use. Furthermore, in systems where the gelling agent is introduced to the suction drainage system through the inlet port, as is the case in the apparatus of Figure 1 of USP 5,156,823, difficulties are encountered in passing the gelling agent, which is usually in powder or granular form, through the port, which is relatively narrow. This is particularly so because the particles of the gelling agent tend to expand when they come into contact with moisture, which is usually present on the inside walls of the inlet port. The swollen particles then block the port preventing or restricting the entry of the remainder of the gelling agent.

OBJECT OF THE INVENTION

It is an object of the invention to provide a simple and safe suction drainage infection control system.

It is a further object of the invention to provide a suction drainage system incorporating a gelling agent, or absorbent, and/or a germicide which is contained in a container normally separate from the system but which is freely attachable to the system when it is desired to introduce the gelling agent, or absorbent, and/or germicide into the system.

It is yet a further object of the invention to overcome the problems inherent in the prior art apparatus, as discussed above.

SUMMARY OF THE INVENTION

The present invention is directed to an improved gelling treatment for a suction drainage infection control system.

More particularly, the present invention is directed to a suction drainage infection control system wherein a gelling agent, or an absorbent, and/or a germicide, (hereinafter referred to as a "waste-treating material") is released or dispensed into a disposable rigid container or flexible liner. The waste-treating material is located in an enclosed container having a nozzle which fits into an inlet port in the lid of the rigid container or flexible liner to release the waste-treating material into the container or liner.

In accordance with one aspect the invention provides a suction system for draining waste from a source, comprising a sealed receptacle including a lid and, optionally, a flexible liner defining a chamber within the receptacle for receiving the waste, a waste

inlet port in said lid connected to the interior of the chamber, an outlet port in said lid for connection to a suction source; a reservoir for storing waste-treating material, and for dispensing said waste-treating material into the chamber; characterized in that the reservoir comprises a container which when the suction system is in use is unattached to the receptacle but which, when it is desired to treat waste within the chamber, is freely attachable to the receptacle by means of an elongate dispensing nozzle on the container which connects with the waste inlet port to dispense the waste-treating material into the chamber.

The container has a removable cap which in one position fits over the nozzle of the container to form a fluid-tight seal on the nozzle, and which, in a second position, when removed from the nozzle, is adapted to seal the outlet port.

In accordance with a second aspect the invention provides a container for use with the suction system, the container comprising an enclosed chamber for containing a waste-treating material, an outlet from said chamber including a dispensing nozzle which is adapted to form a fluid tight connection with the waste inlet port of the fluid receptacle so as to dispense waste-treating material from the container into the waste inlet port. The nozzle on the container forms a fluid tight fit with the waste inlet port, and provides a dry channel through which the waste-treating material may be dispensed into the chamber.

Thus, the invention provides a closed and sealed system comprising the sealed receptacle and the waste-treating material container, which when the waste fluid within the receptacle has been treated, may be disposed of as a unitary sealed system. Each suction drainage receptacle may be used alone or in series with one or more additional receptacles.

The suction drainage infection control system of the present invention minimizes the risk of exposure for hospital personnel to infectious waste by decreasing the risk of infection and spills caused by failure to cap off
5 full or partially full waste containers, accidental cap disconnection and liner breakage.

The suction drainage infection control system of the present invention promotes the safe handling of potentially infectious suction waste by converting the
10 waste into a solid or semi-solid state, and/or exposing the collected waste to an effective germicidal agent that is capable of killing many types of bacteria and viruses at room temperature. The germicide is effective against
15 HIV, hepatitis B, herpes simplex 1, polio, adeno virus, and many other potentially infectious materials, and thus dramatically reduces the potential of cross-contamination between patients and minimizes the associated risk to health care workers.

Other advantages and features of the present
20 invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

25

Figure 1 is a front elevation of a container for containing waste-treating material in accordance with one aspect of the invention;

Figure 2 is a vertical sectional view of the
30 container of Figure 1;

Figure 3 is a vertical sectional view of the container of Figure 1 in a closed state;

Figure 4 is a front elevation of one embodiment of the invention showing the container of Figure 1 about to
35 be connected to a waste receptacle;

Figure 5 is a front elevation showing the container of Figure connected to the waste receptacle; and

Figure 6 is a fragmentary vertical section of a detail of Figure 5.

5

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the present invention is susceptible of embodiment in many forms, there is shown in the drawings
10 and will hereinafter be described one presently preferred embodiment with the understanding that the present specification is to be considered as an exemplification of the invention, which is not intended to limit the invention to the specific embodiment illustrated.

15 Referring to the drawings, Figure 1 is a front elevation of a container 1 for containing waste-treating material for use in the system of the invention. Preferably, the container 1 is molded from a plastics material.

20 The container 1 comprises an enclosed chamber 2 for containing the waste-treating material. The container 1 has a snap-on closure 3. As shown more clearly in Figure 2, the closure 3 has a downwardly-open annular recess 4 which fits over and accommodates an annular peripheral
25 edge-portion 5, which defines an opening to the compartment 2. The edge portion 5 is formed with a rebate 6, which engages with a complementary recess 7 of the closure 3. When the closure 3 is fitted over the edge portion 5 of the container 1, the resilience in the
30 material permits the rebate 6 to override the edge portion 5, such that the rebate snaps into the recess 7 to lock the closure 3 onto the container 1.

The closure 3 is formed with a dispensing nozzle 8 which is in communication with the interior of the
35 chamber 2. The lower portion of the nozzle 8 is surrounded by a tubular sleeve 9 which defines an annular

space 10 between the nozzle 8 and the sleeve 9. The free outer end of the nozzle 8 is not square, but is cut at an acute angle, preferably between 45 to 50°.

The container 1 is provided with a cap 11 for closing the container. The cap 11 is attached to the container 1 by means of a tag 12. As shown more clearly in Figure 3, the cap 11 is hollow and fits over the free end of the nozzle 8. An annular end portion 13 of the cap 11 is adapted to fit into the annular space 10 between the nozzle 8 and the sleeve 9. Optionally, the inner wall of the cap 11 is provided with annular ribs 16 which provide for an interference fit between the cap 11 and the nozzle 8. An annular collar 14 on the cap abuts the top edge portion 15 of the sleeve 9. An integral plug 17, which is of frusto-conical shape, is disposed axially within the cap 11, and is adapted, when the cap 11 is placed over the end of the nozzle 8, to fit tightly within the nozzle as shown in Figure 3. In this way a very secure and fluid-tight seal is obtained between the cap 11 and the nozzle 8.

An embodiment of the complete suction drainage container infection control system of the present invention is illustrated in the Figures 4 to 6.

In addition to the container 1, described above, the system includes a cylindrical receptacle 20 that can be constructed of a relatively rigid plastics material. The receptacle 20 is open at the top and closed at the bottom. The receptacle 20 is not contacted by the waste so it may be repeatedly used. In the unlikely event of it becoming contaminated, it may be autoclaved at a temperature of about 121°C, or may be chemically sterilized. The receptacle 20 is mounted on a metal cradle (not shown). Cradles of varying heights may be used, and may accommodate a plurality of receptacles 20.

The receptacle 20 is adapted to receive a unitary structure comprising a receptacle lid 21 having a

depending flange 22 for fluid tight engagement with the upper open end of the receptacle 20. A flexible liner 23 which is fused, e.g. by RF welding, or otherwise secured, to the underside of the lid 21 in a completely fluid tight manner. The liner 23 is in the form of a fluid-tight bag which is adapted to receive and contain the waste liquid. Preferably, the liner is a strong flexible unitary container. It may be blow-molded from a plastics material, such as polyvinyl chloride, so as to eliminate weak areas, such as seams.

The lid 21 includes an inlet port 24 and an outlet port 25, both of which open into the interior of the liner 23. The inlet port 24 is comprised of an upwardly extending tubular portion on the outside of the lid 21, and a downwardly extending tubular portion on the underside of the lid 21. The upper end of the inlet port 24 is adapted for connection to an inlet tube or line (not shown) and is connected to the source from which fluid is to be drained. For example, it may be connected to a patient by means of a catheter.

The other end of the inlet port 24 depends beneath the lid 21 and in is communication with the interior of the liner 23. Though not shown in the drawings, a valve may be provided in series with the depending inner portion of the inlet port 24. The valve allows for one-way flow of waste from the source to be drained to the interior of the sealed liner 23. Suitable valves are disclosed in European Patent Applications Nos. 0 390 094, 0 394 687, and 0 390 095, the contents of which are incorporated herein by way of reference. Other suitable valves are disclosed in U.S. Patents Nos. 3,822,720 and 3,901,272 the contents of which are also incorporated herein by way of reference.

The outlet port 25 is also provided with an upstanding tubular portion on the exterior of the lid 21, which connects by means of an elbow junction 26 to an

outlet tube 27. The outlet tube 27 connects the interior of the liner 23 to a negative pressure or vacuum source (not shown) which causes the waste to be drawn into the liner 23 through the inlet port 24.

5 The outlet port 25 has a tubular portion which depends downwardly beneath the lid 21 into the interior of the liner 23. This tubular portion of the outlet port contains a valve 28 which prevents overflow of waste liquid into the outlet tube 27. The valve 28 may be a
10 mechanical valve which prevents flow of waste material through the outlet tube when the liner 23 is full, comprising a float in a housing which rises with the fluid level to block the outlet port 25 and to shut-off the vacuum. Alternatively, the valve 28 may be a non-
15 mechanical valve comprising a housing that contains a polyethylene foam containing swellable moisture-sensitive beads made of polymers or other suitable materials. The beads swell instantly on contact with liquid to seal the outlet port 25. They also provide a highly efficient
20 aerosol filter which prevents the suction equipment from contamination by aerosol-borne bacteria and viruses. A suitable non-mechanical valve is disclosed, for example in published PCT Application No. W087/00439.

 The operation of the system of the invention is now
25 described with reference to Figures 4 to 6. On the completion of aspiration of waste material, such as body fluid, or when the liner 23 is almost full of fluid, the inlet tube is disconnected from the patient, or other waste source, and the vacuum source is disconnected.
30 Preferably, the inlet tube is flushed with a suitable germicide, and the flushed material is collected in the liner 23. The inlet tube is then disconnected from the inlet port 24.

 The cap 11 is removed from the nozzle 8 of the
35 container 1. As shown in Figure 4, the free end of the nozzle 8 is inserted into the open end of the inlet port

24 to dispense the waste-treating material from the container 1 into the liner 23. The waste-treating material acts within minutes to gel or solidify the waste liquid within the liner 23. The position of the container 1 when the nozzle 8 is fully inserted in the port 24 is illustrated in Figure 5, and is shown in more detail in Figure 6. As shown in Figure 6, the nozzle 8 fits tightly within a tubular portion of the inlet port 24. The sleeve 9 of the container 1 fits over the outer wall of the inlet port 24 so that the top tubular portion of the inlet port 24 forms a friction fit within the annular space 10 between the nozzle 8 and the sleeve 9. In this way a very secure liquid-tight seal is obtained between the container 1 and the receptacle 20.

The provision of the nozzle 8, and its configuration, is of importance in ensuring that the waste-treating material, which usually is in granular form, flows freely through the inlet port 24, which is relatively narrow. Further, the inside wall of the inlet port 24 is usually wet and, where the waste-treating material is a gelling agent, the gel particles on coming into contact with moisture on the inside wall of the inlet port would swell and block the inlet. The nozzle 8 assists in keeping the gel particles out of contact with the inner wall of the inlet port 24. The angled configuration of the free end of the nozzle 8 is of importance. If the end nozzle was square it would tend to collect moisture from the inner wall of the inlet port 24 when the nozzle is pushed into the port. However, this is avoided by the angled configuration which avoids or minimizes the collection of moisture, and if any moisture is collected it is localized on the tip of the nozzle 8.

The nozzle 8 has a relatively small bore which controls the flow of granular or particulate waste-treating material to a near optimum rate, to provide even

and consistent gelling of the waste liquid as quickly as possible given the constrained aperture size of the inlet port 25.

As shown in Figure 5, the outlet tube 27 is
5 disconnected from the vacuum source by disconnecting a connector 29 which is positioned on the end of the tube.

As shown in Figures 5 and 6 the cap 11, the exterior wall of which is of cylindrical shape, is then fitted within a complementary portion of the connector
10 29. The cap 11 forms a tight friction fit within the connector 29 to provide fluid-tight seal. In this way the system is tightly closed and sealed to prevent exit of contaminated material. The seal system can be disposed of as a complete unit in standard disposal
15 boxes, or other bulk disposal containers.

The waste-treating material used in the invention may comprise a gelling agent, such as sodium acrylate copolymer, which swells in the presence of water to form an absorbent gel. It may be in the form of a powder
20 having a particle size of 100 microns to 800 microns, and a density of 0.60 to 0.70 gm/cm³ at 20° C. Other suitable absorbents include cellulose fibers, cross-linked polymeric salts, diatomaceous earth, dried clay, expanded silicate particulates, ground corncobs, perlite,
25 silica gel, shredded polypropylene microfibers, sodium/calcium borosilicate glass, starch grafted sodium polyacrylate, thermally reticulated polyether polyurethane and vermiculite.

The waste-treating material may include a
30 germicide. Suitable germicides include calcium hypochlorite, chlorinated trisodium phosphate, N-chlorosuccinimide, 1,3-dichloro-5,5-dimethylhydantoin, potassium dichloro-s-triazinetriene, sodium benzene-sulfonchloramide, sodium hypochlorite, sodium p-toluene-sulfonchloramide, sodium dichloroisocyanurate dihydrate,
35 sodium dichlor-s-triazinetriene, p-sulfondichlor-

amidobenzoic acid, p-toluenesulfondichloramide, trichloro-isocyanuric acid, trichloromelamine, alcohols, formaldehyde, glutaredehyde, hydrogen peroxide, iodine, quaternary ammonium compounds, paraacetic acid, 5 paraformaldehyde and phenols. Preferred germicides include 1,3-dichloro-5,5-dimethylhydantoin, potassium dichloro-s-triazinetriene, N-chlorosuccinimide, and sodium dichloroisocyanurate dihydrate.

Although the embodiment illustrated herein is 10 directed to a suction drainage infection control system having a flexible liner, the present invention is equally applicable to a rigid container used without a liner. Thus, as used herein, the term "receptacle" is intended to include both disposable rigid containers, and 15 canisters having disposable flexible liners.

From the foregoing, it will be apparent that numerous modifications and variations can be effected without departing from the true spirit and scope of the novel concept of the present invention. It will be 20 appreciated that the present disclosure is intended to set forth samples of the invention which are not intended to limit the invention to the specific embodiments illustrated. The disclosure is intended to cover by the appended claims all such modifications as fall within the 25 scope of the claims.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such 30 reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

CLAIMS

1. A system for treating waste from a source, comprising: a sealed receptacle including a lid and a chamber within the receptacle for receiving the waste, a waste inlet port in said lid connected to the interior of the chamber, an outlet port in said lid for connection to a suction source; a reservoir for storing waste-treating material, and for dispensing said waste-treating material into the chamber characterized in that the reservoir comprises a container (1) which when the suction system is in use is unattached to the receptacle (20) but which, when it is desired to treat waste within the chamber (23), is freely attachable to the receptacle (20) by means of an elongate dispensing nozzle (8) on the container which connects with the waste inlet port (24) to dispense the waste-treating material into the chamber.

2. A system as claimed in claim 1, characterized in that the container (1) has a removable cap (11) which in one position fits over the nozzle (8) of the container to form a fluid-tight seal on the nozzle (8), and which, in a second position, when removed from the nozzle (8), is adapted to seal the outlet port (25).

3. A system as claimed in claim 2, characterized in that the nozzle (8) is adapted to form a fluid-tight fit with the waste inlet port (24).

4. A system as claimed in claim 3, characterized in that the nozzle (8) is freely insertable into the waste inlet port (24).

5. A system as claimed in claim 4, characterized in that a tubular wall portion of the inlet (24) forms a friction fit in an annular space (10) between the nozzle (8) and a sleeve (9) surrounding the nozzle (8).

5

6. A system as claimed in claim 4, characterized in that a free end of the nozzle (8) defines an acute angle to the longitudinal axis of the nozzle (8).

10

7. A suction system as claimed in claim 6, characterized in that the waste-receiving chamber is defined by a flexible liner (23).

8. A container for use with a system as claimed in claim 7, characterized in that it comprises an enclosed chamber (2) for containing a waste-treating material, an outlet from said chamber (2) including a dispensing nozzle (8) which is adapted to form a fluid tight connection with the waste inlet port (24) of the fluid receptacle (20) so as to dispense waste-treating material from the container into the waste inlet port (24).

9. A container as claimed in claim 8, characterized in that it includes a removable cap (11) which in one position fits over the nozzle (8) of the container to form a fluid-tight seal on the nozzle (8), and which, in a second position, when removed from the nozzle (8), is adapted to seal the outlet port (25).

30

10. A container as claimed in claim 8, characterized in that the nozzle (8) is surrounded by a tubular sleeve (9) which defines an annular space (10) between the nozzle (8) and the sleeve (9).

15

11. A container as claimed in claim 10, characterized in that a free end of the nozzle (8) defines an acute angle to the longitudinal axis of the nozzle (8).

5

12. A method of treating waste collected in a suction system comprising a sealed receptacle including a lid and a chamber within the receptacle for receiving the waste, a waste inlet port in said lid connected to the interior of the chamber, an outlet port in said lid for connection to a suction source, characterized in that a nozzle (8) of a container (1) characterized in that the reservoir comprises a container (1) which when the suction system is in use is unattached to the receptacle (20) but which, when it is desired to treat waste within the chamber (23), is freely attachable to the receptacle (20) by means of an elongate dispensing nozzle (8) on the container which connects with the waste inlet port (24) to dispense the waste-treating material into the chamber, as claimed in any of claims 8 to 11 is inserted into the waste inlet port (24) of the receptacle, and waste-treating material contained in the container (1) is dispensed through the nozzle (8) into the chamber.

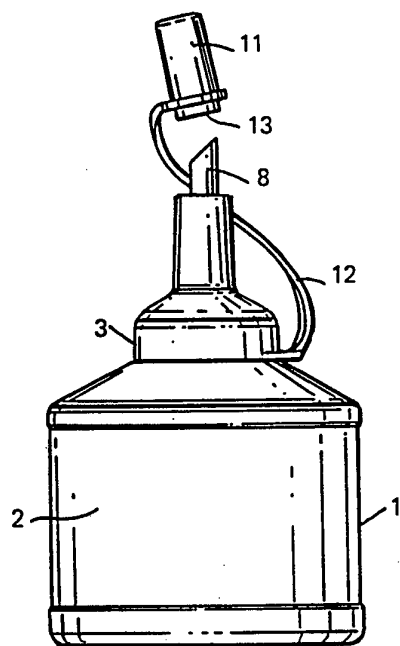


FIG. 1

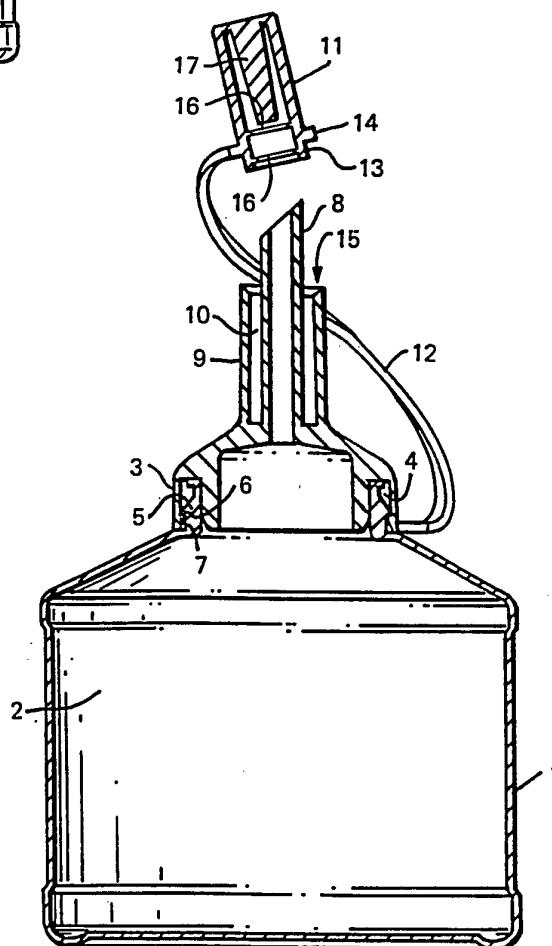
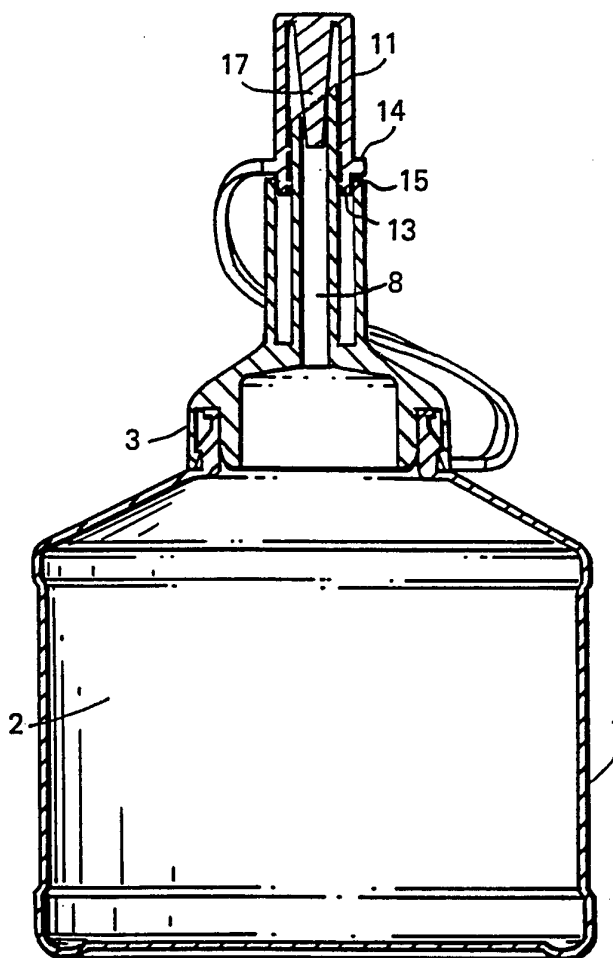


FIG. 2

**FIG. 3**

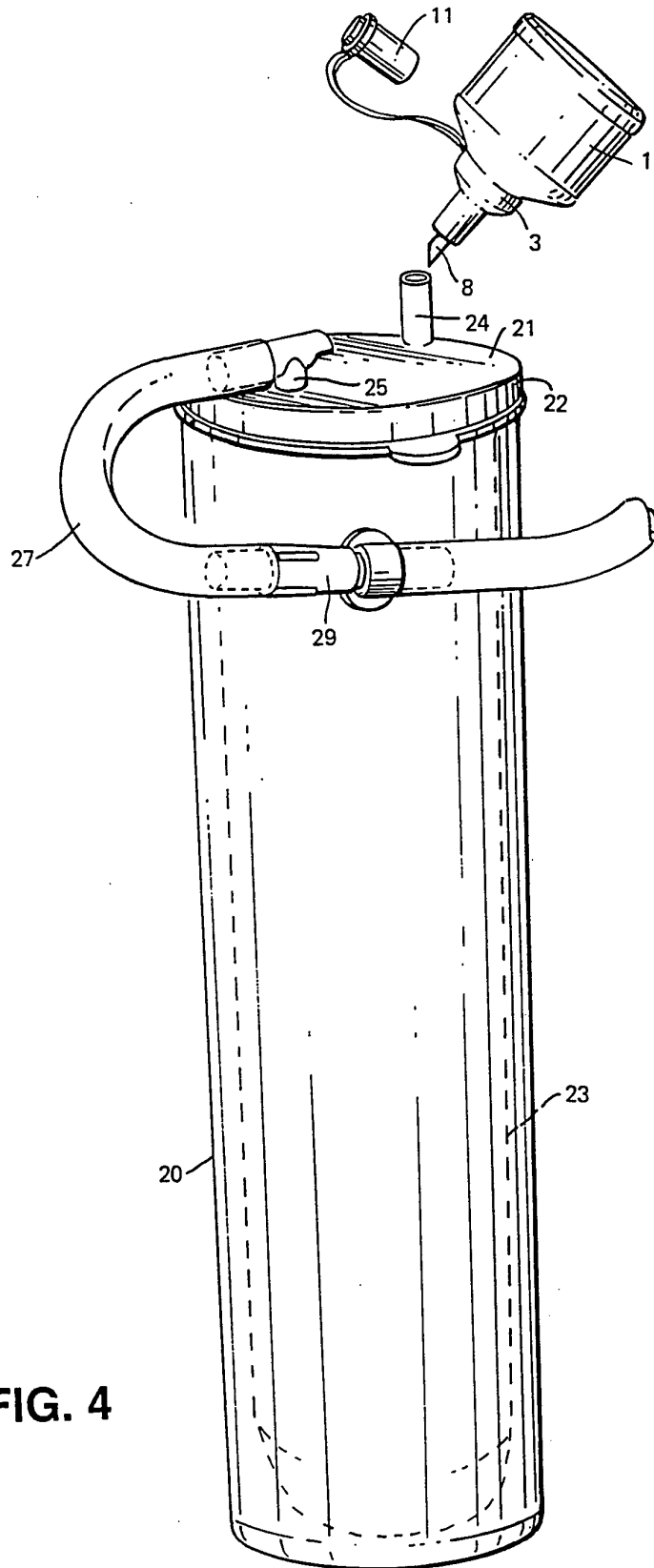


FIG. 4

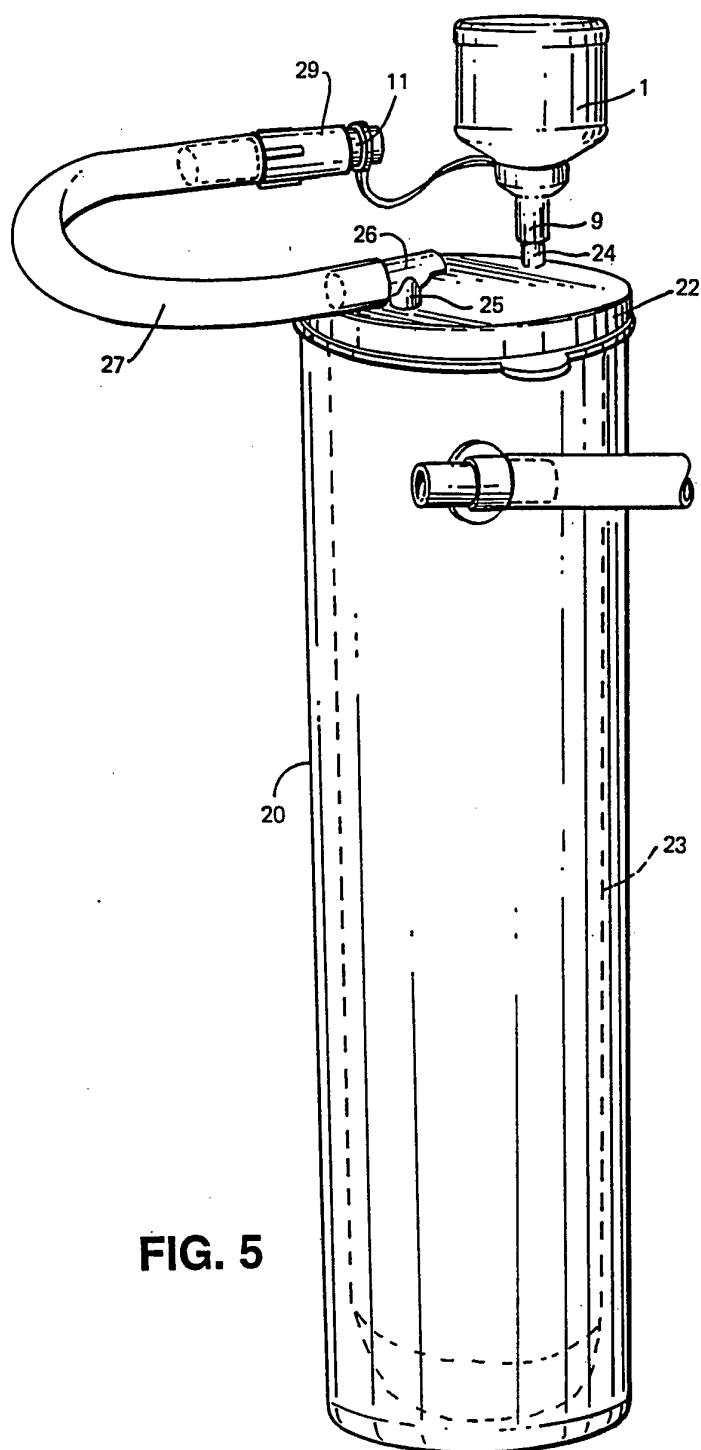


FIG. 5

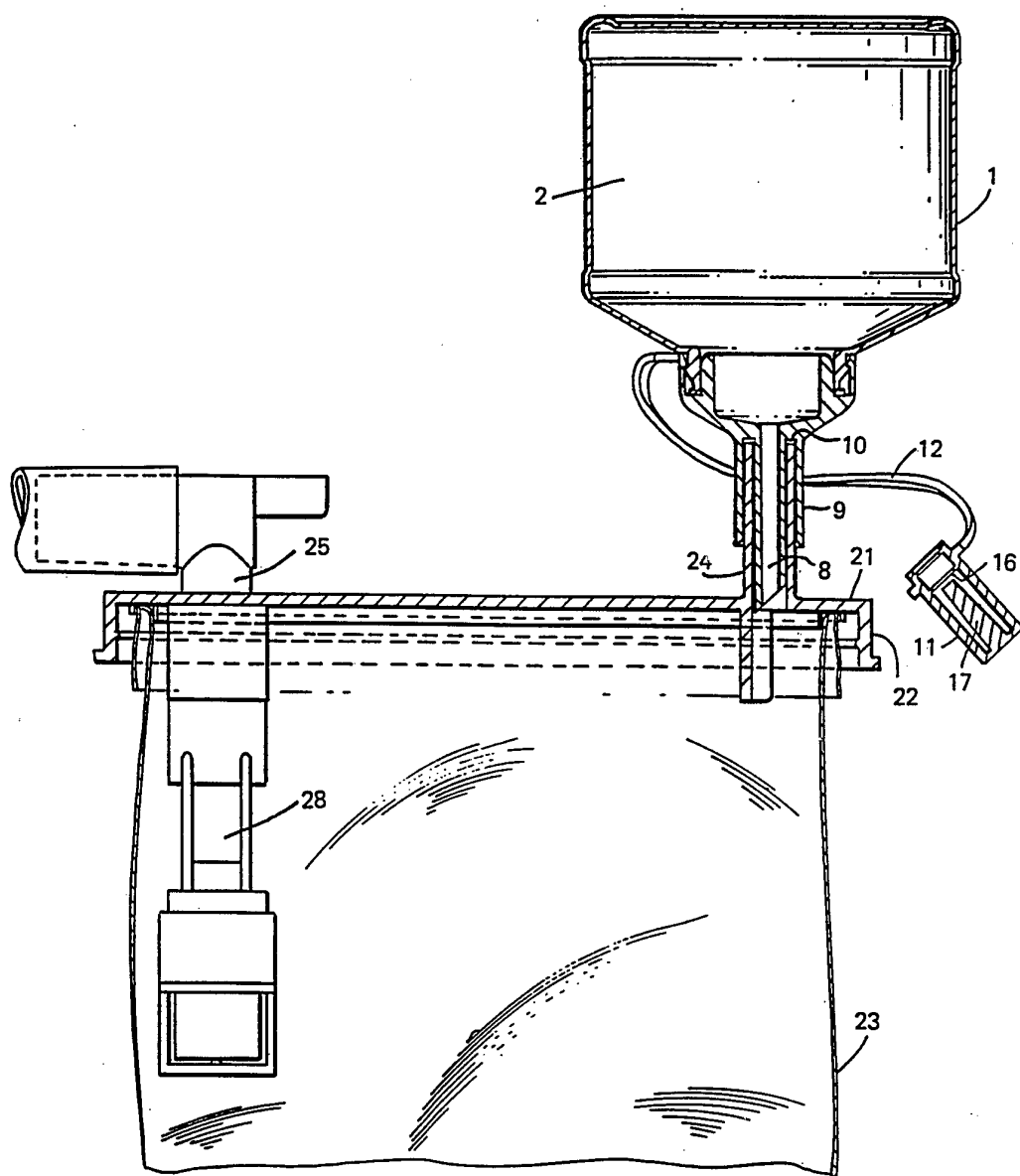


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/06794

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : A61M 1/00, 37/00

US CL : 604/88, 317

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. : 604/82-88, 317, 318-323

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,185,007, (MIDDAUGH ET AL.), 09 February 1993. See entire document.	1-12
Y	US, A, 4,606,734, (LARKIN ET AL.), 19 August 1986. See entire document.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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
E earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
I document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

17 SEPTEMBER 1994

Date of mailing of the international search report

OCT 19 1994

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ROBERT CLARKE

Telephone No. (703) 308-2908