



US 20090249533A1

(19) **United States**

(12) **Patent Application Publication**
Sawalski et al.

(10) **Pub. No.: US 2009/0249533 A1**

(43) **Pub. Date: Oct. 8, 2009**

(54) **TOILET BOWL CLEANING AND/OR DEODORIZING DEVICE**

Publication Classification

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(51) **Int. Cl.**
E03D 9/02 (2006.01)
(52) **U.S. Cl.** **4/223**

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RACINE, WI 53403-2236 (US)

(57) **ABSTRACT**

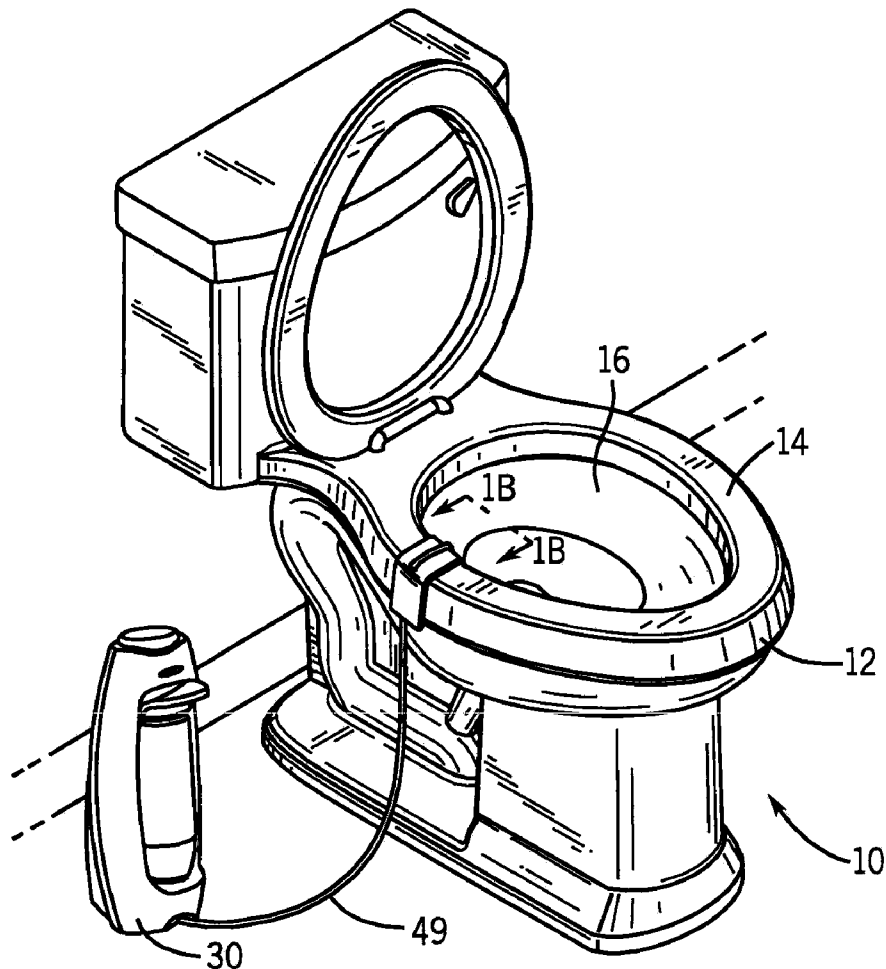
A device for spraying an inner surface of a toilet bowl with a cleaning and/or deodorizing chemical is disclosed. The device includes a container for the chemical, a spray nozzle through which the chemical can be sprayed laterally around a perimeter of the nozzle, a conduit in fluid communication with the container and the spray nozzle, fluid delivery means for delivering chemical from the container through the conduit and to the spray nozzle, and means for attaching the spray nozzle near a rim of the toilet bowl. The spray nozzle of the automatic or manual toilet bowl cleaning device can operate such that the chemical is applied to the entire circumference of the inner surface of the toilet bowl whereby the entire toilet bowl is cleaned around the inner circumference of the toilet bowl.

(21) Appl. No.: **12/479,149**

(22) Filed: **Jun. 5, 2009**

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/312,281, filed on Dec. 20, 2005.



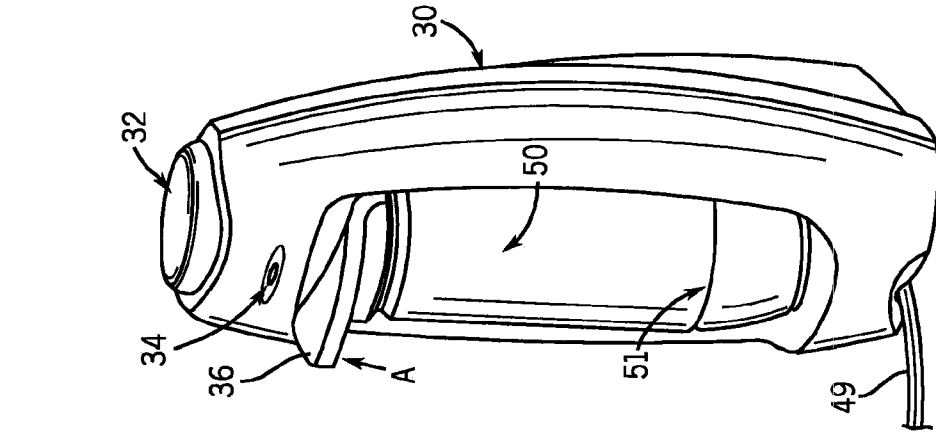


FIG. 1C

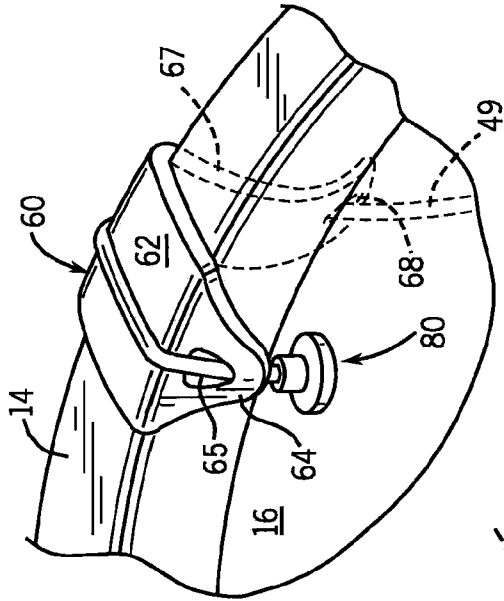


FIG. 1B

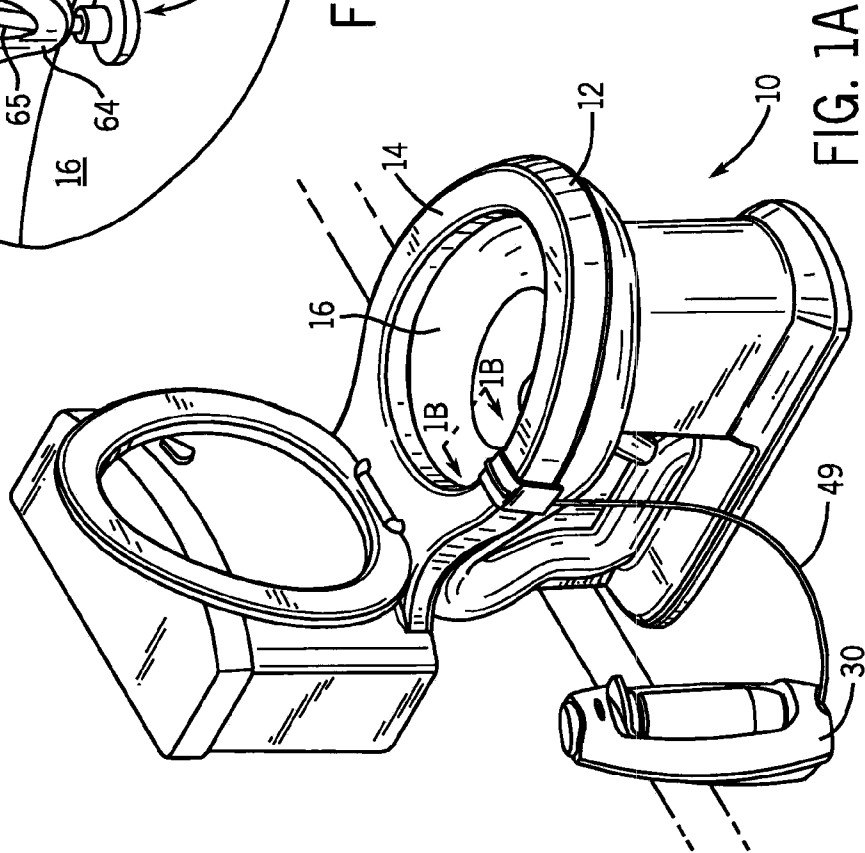


FIG. 1A

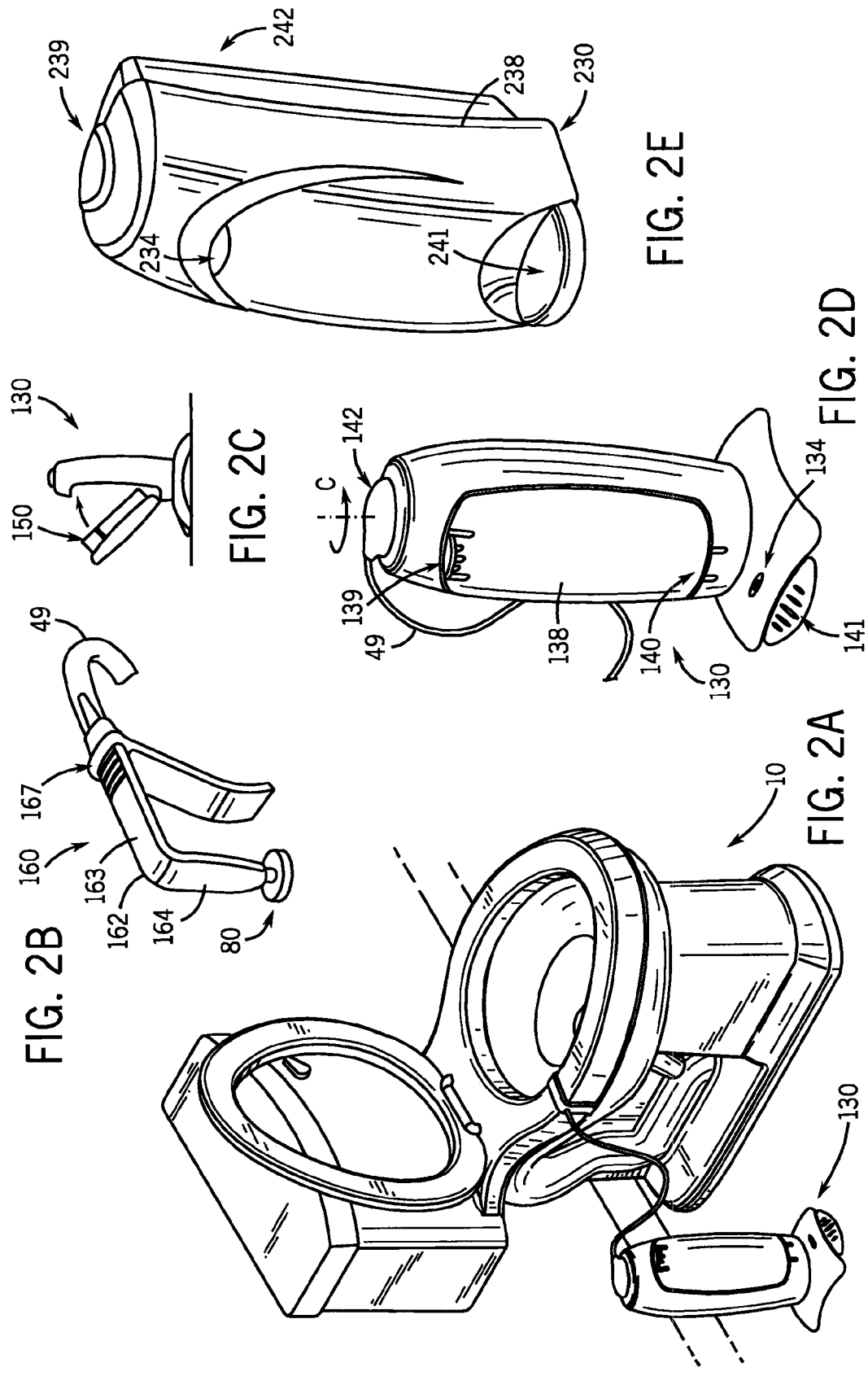


FIG. 2B

FIG. 2C

FIG. 2A

FIG. 2D

FIG. 2E

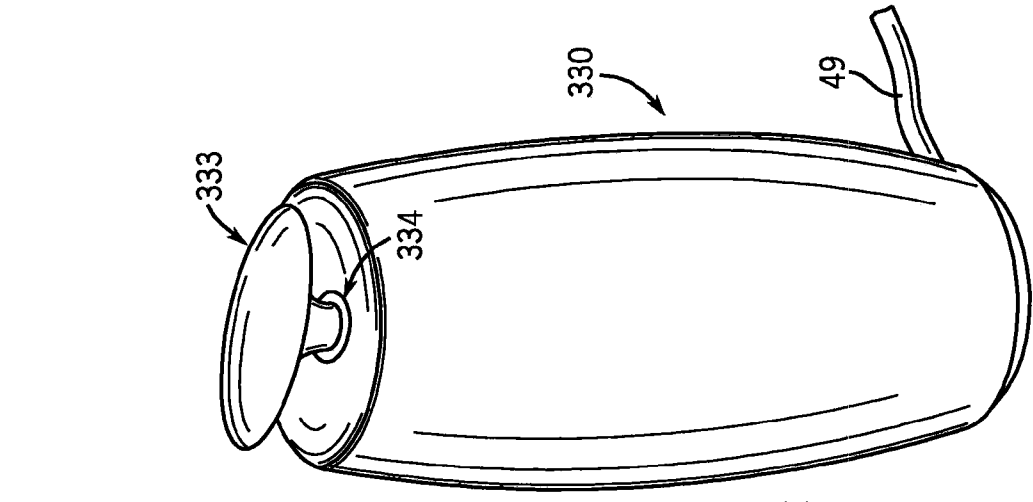


FIG. 3C

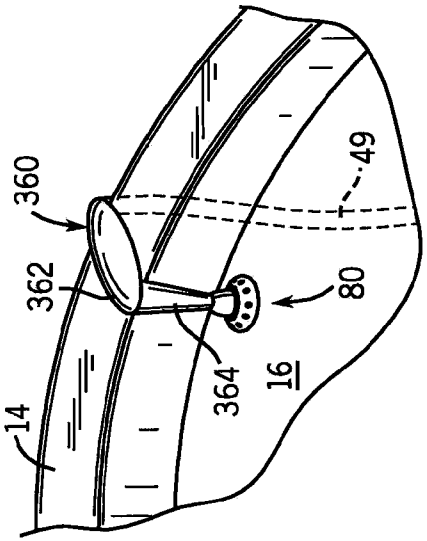


FIG. 3B

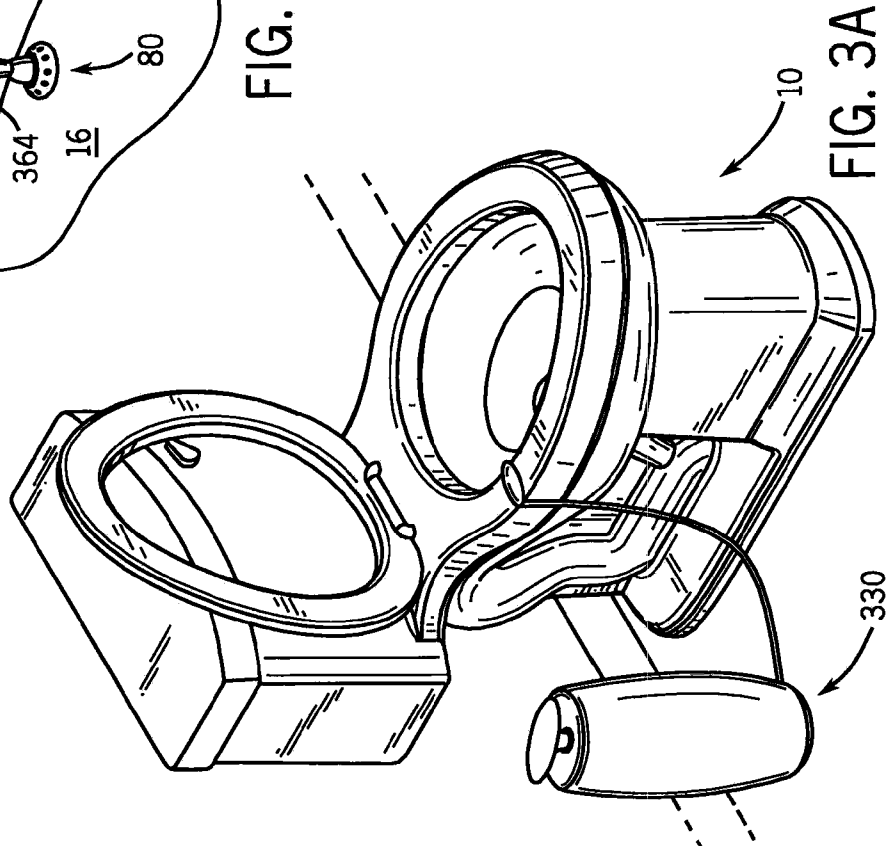


FIG. 3A

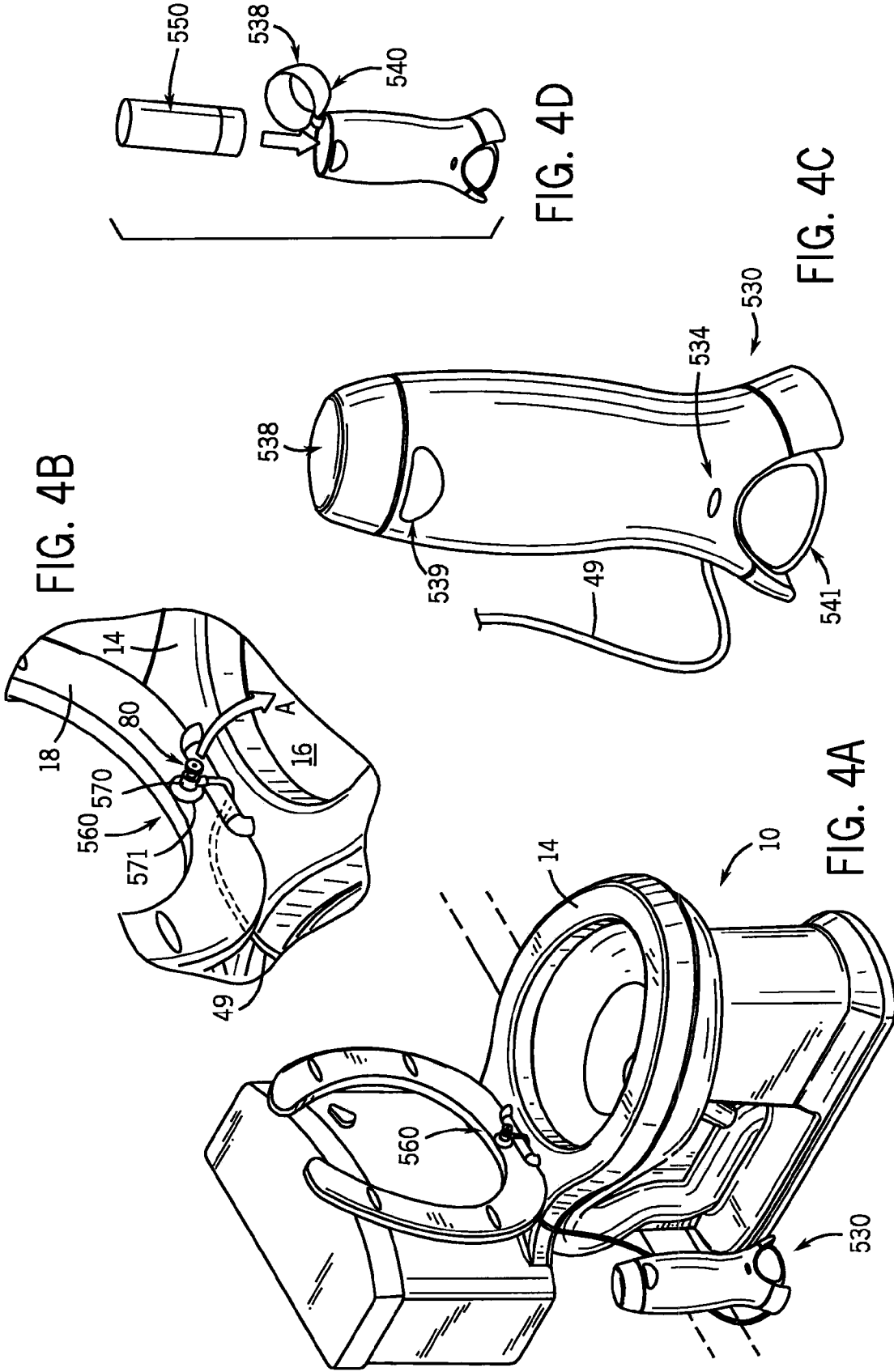
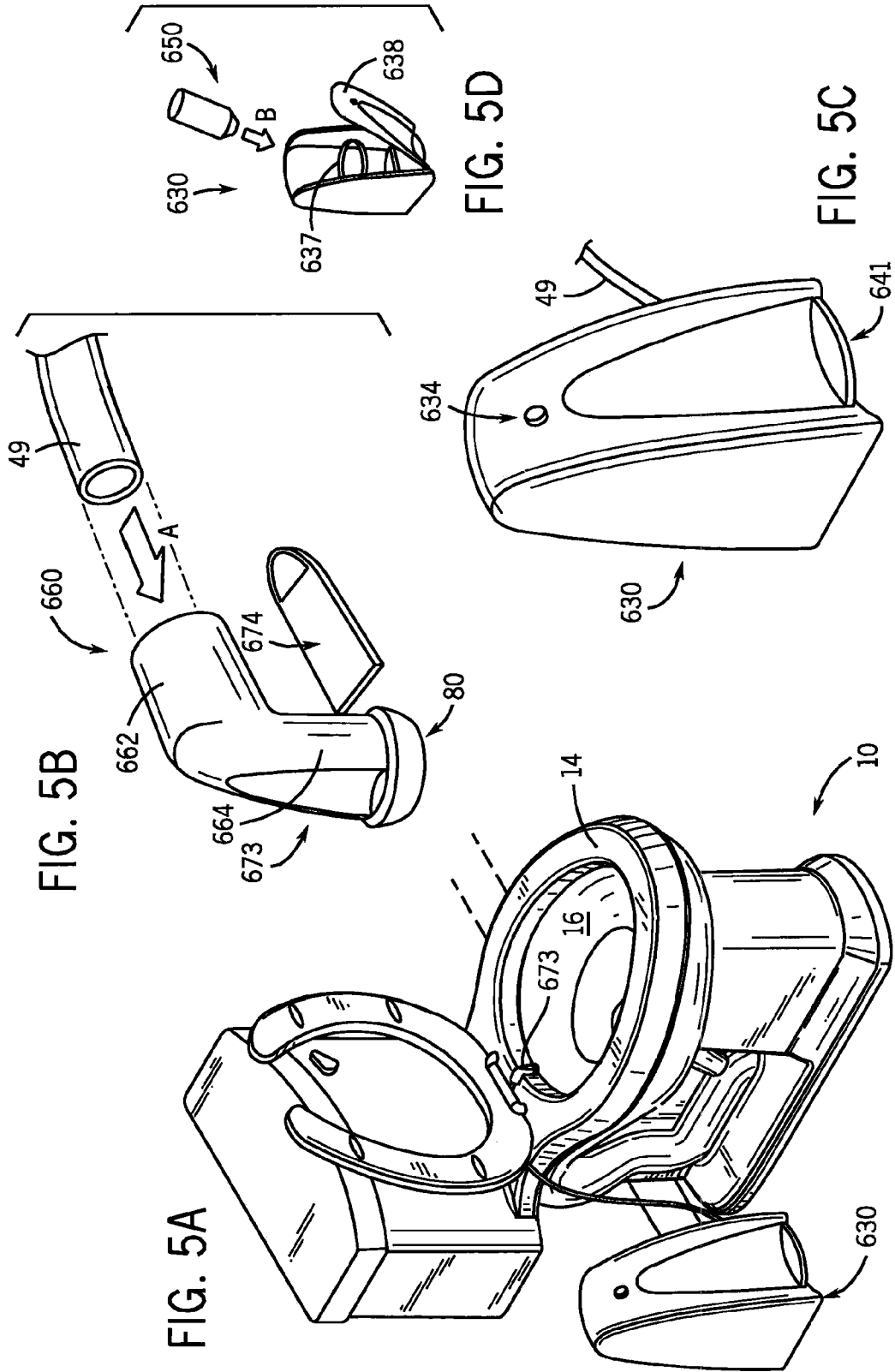


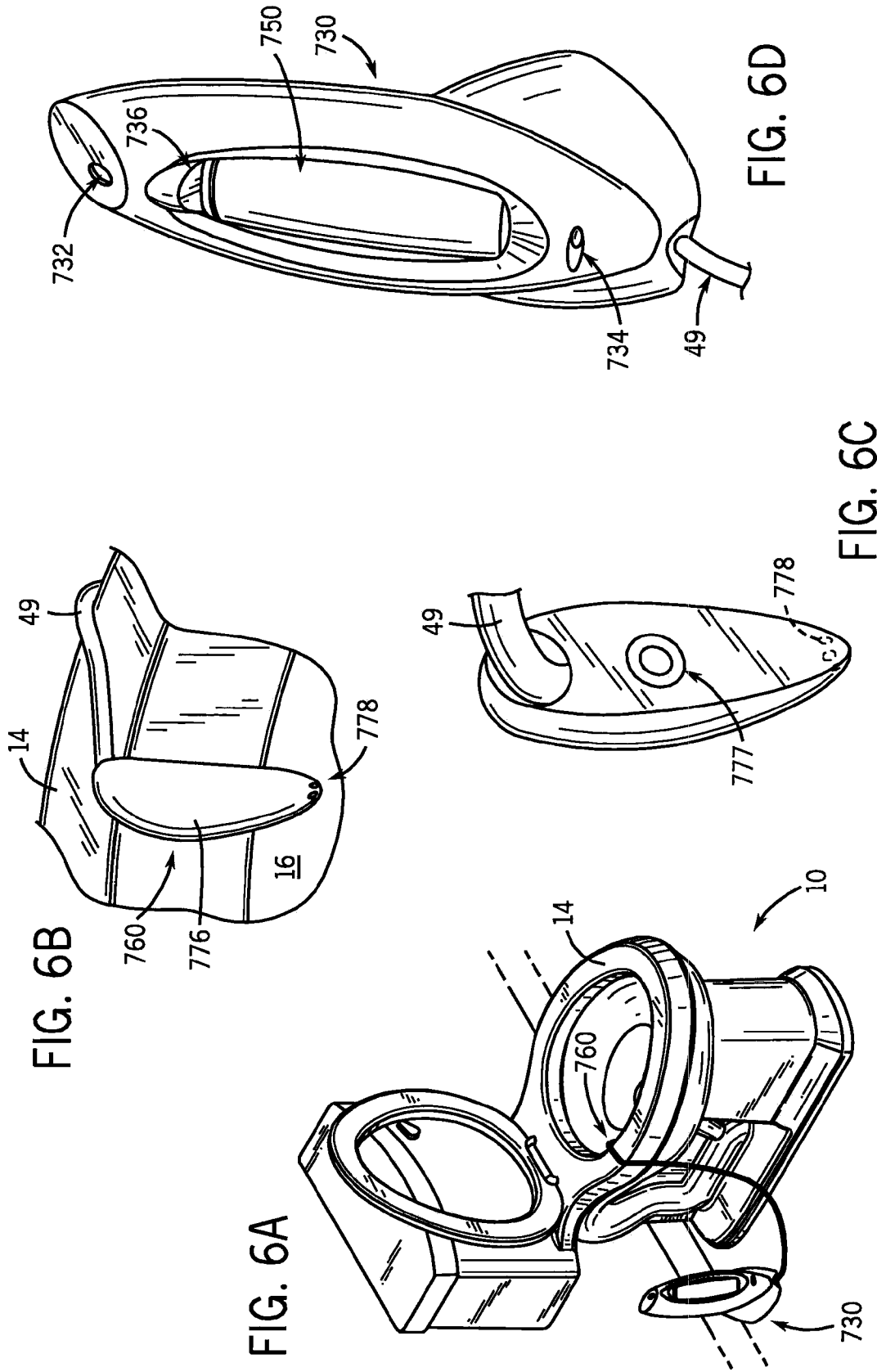
FIG. 4B

FIG. 4D

FIG. 4C

FIG. 4A





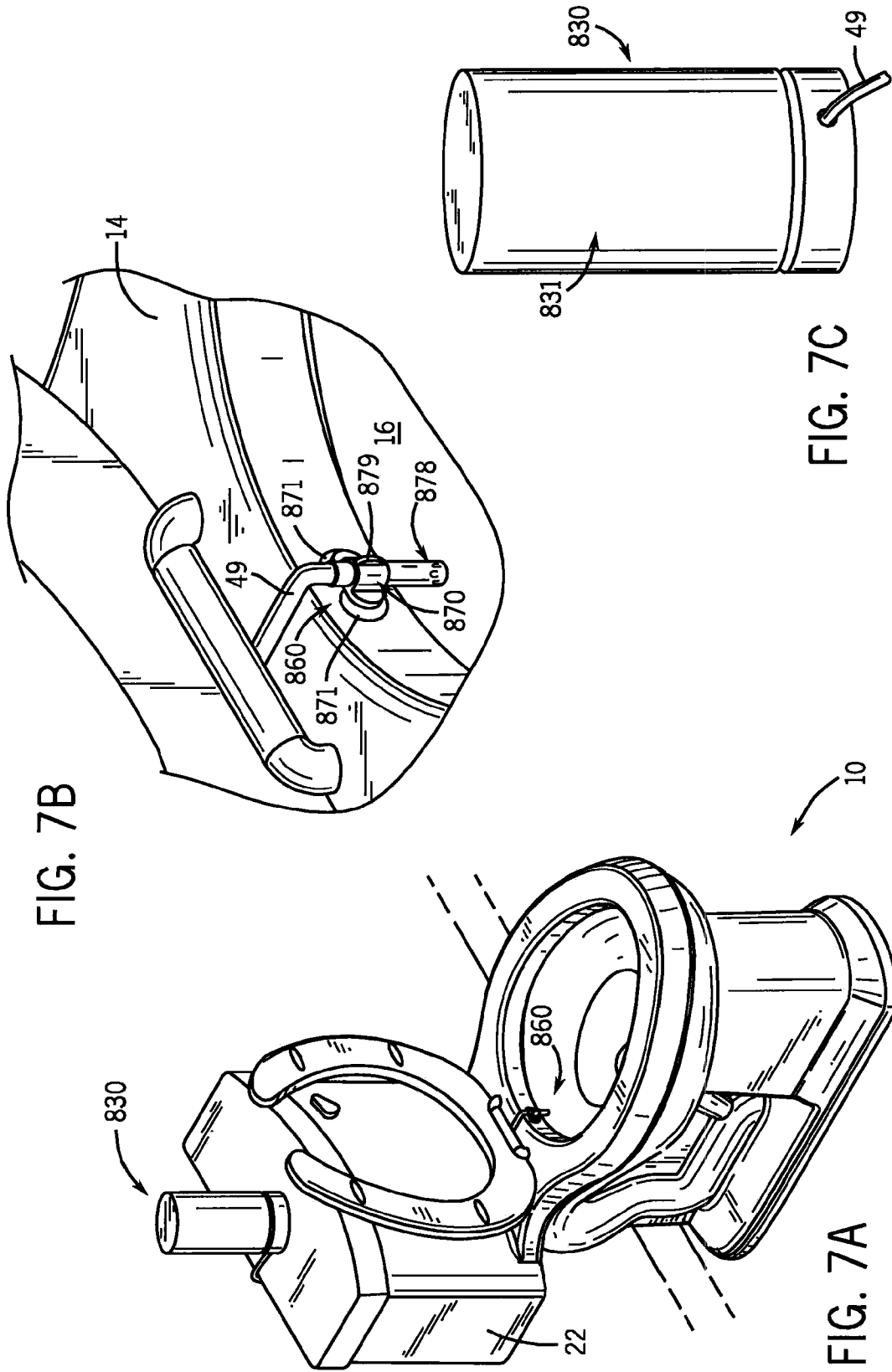
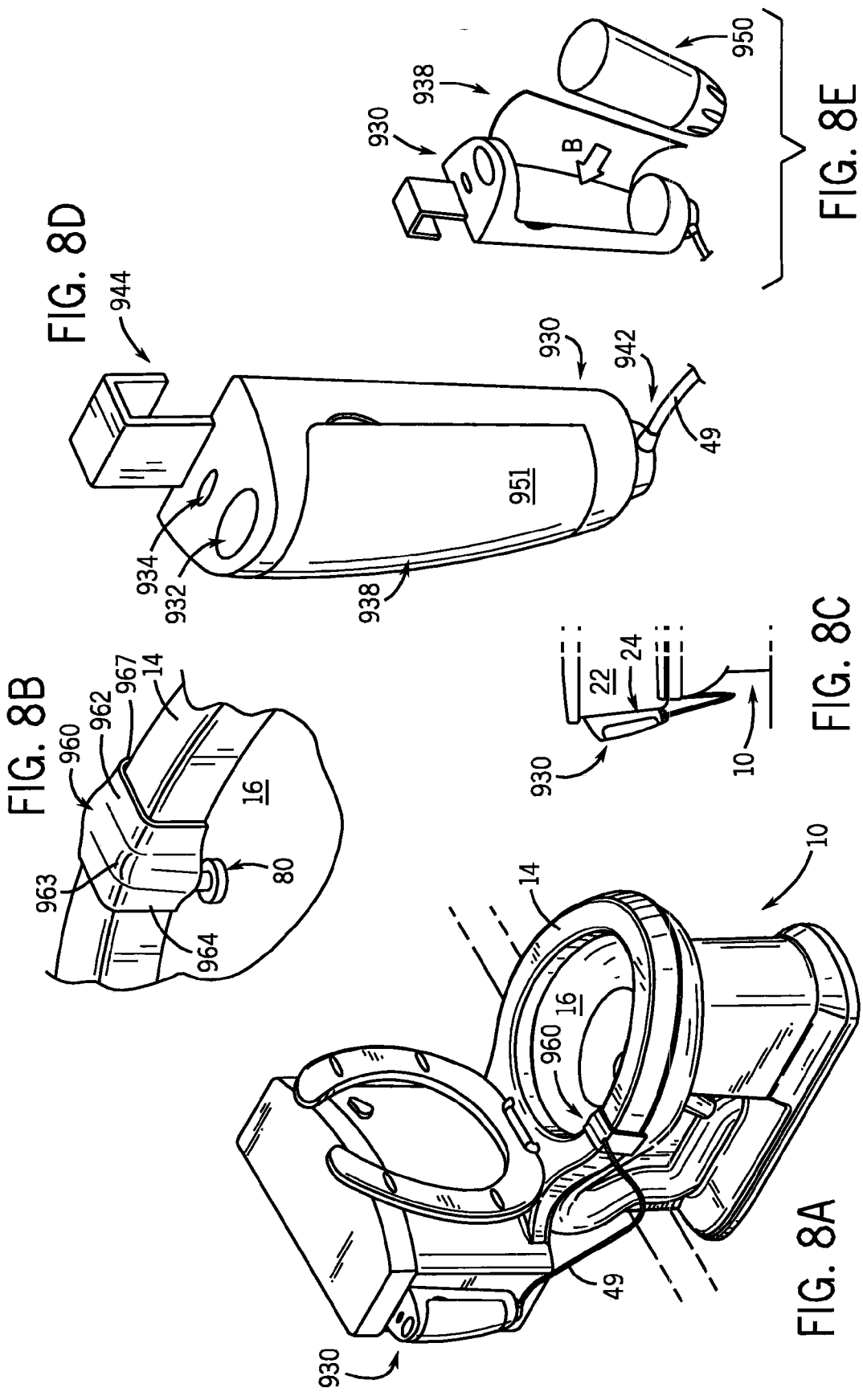


FIG. 7B

FIG. 7C

FIG. 7A



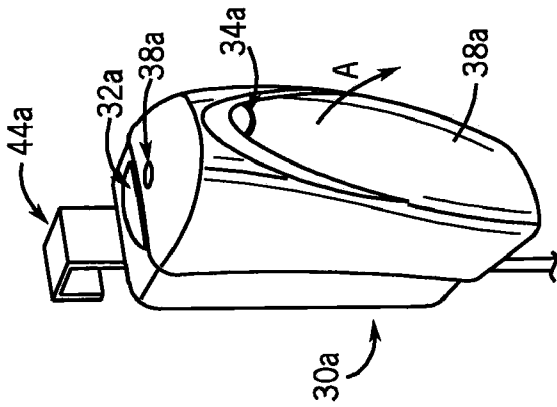


FIG. 9B

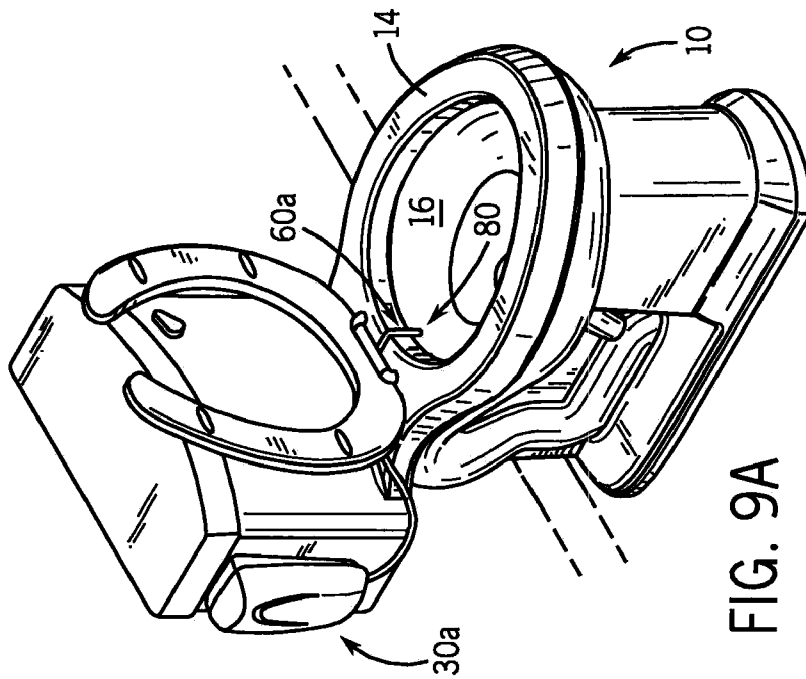


FIG. 9A

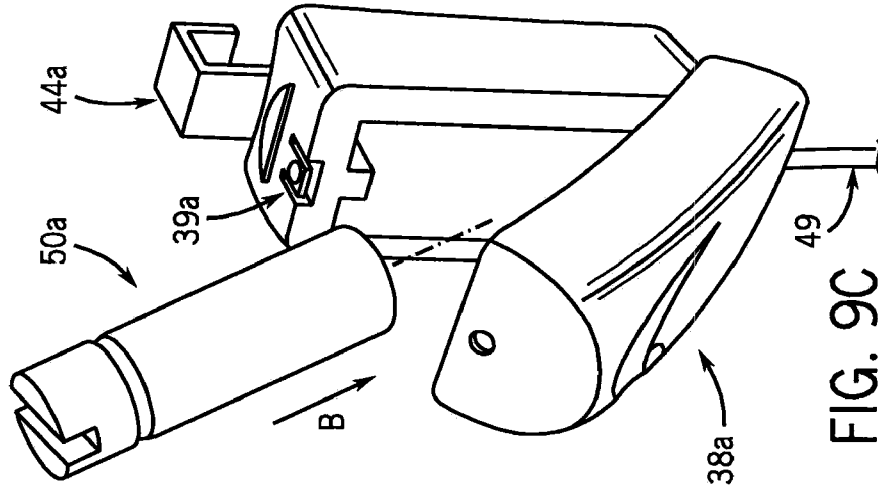


FIG. 9C

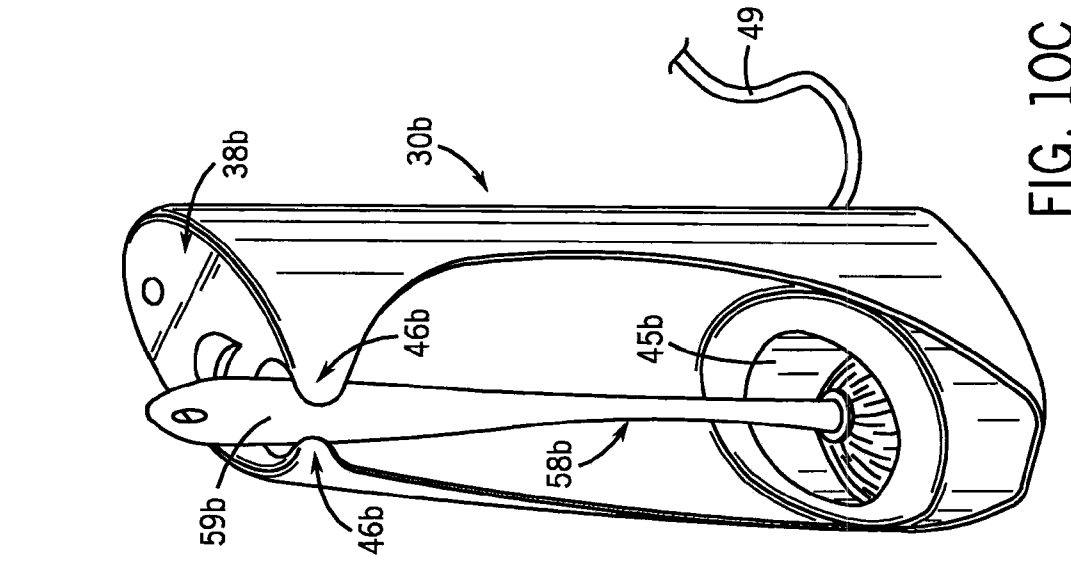


FIG. 10C

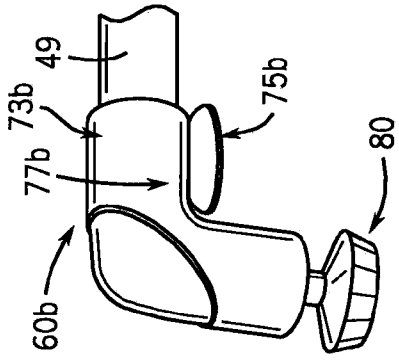


FIG. 10B

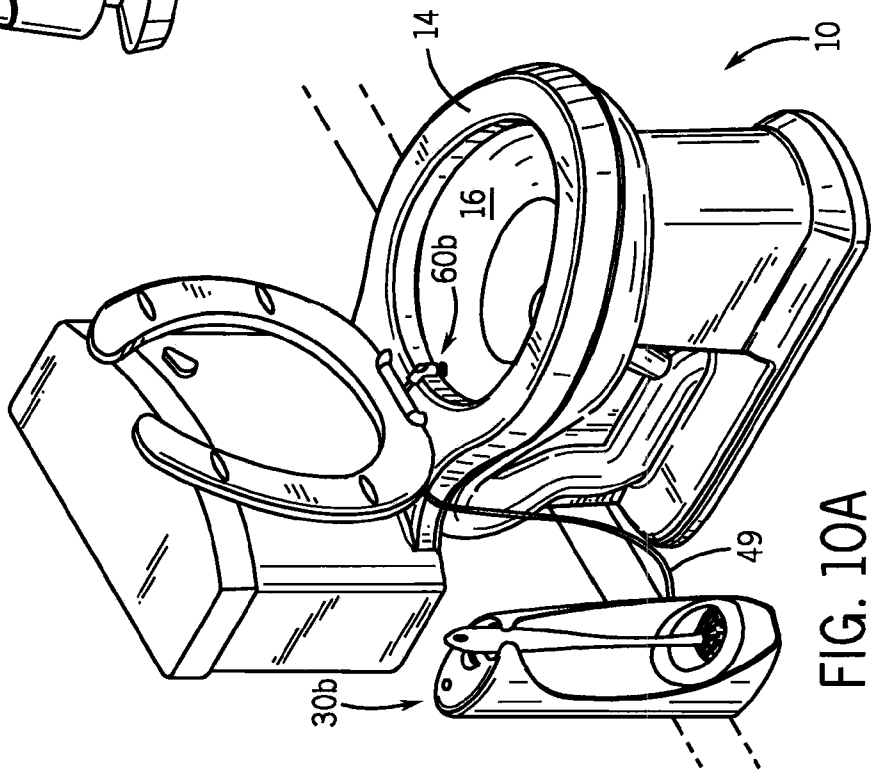
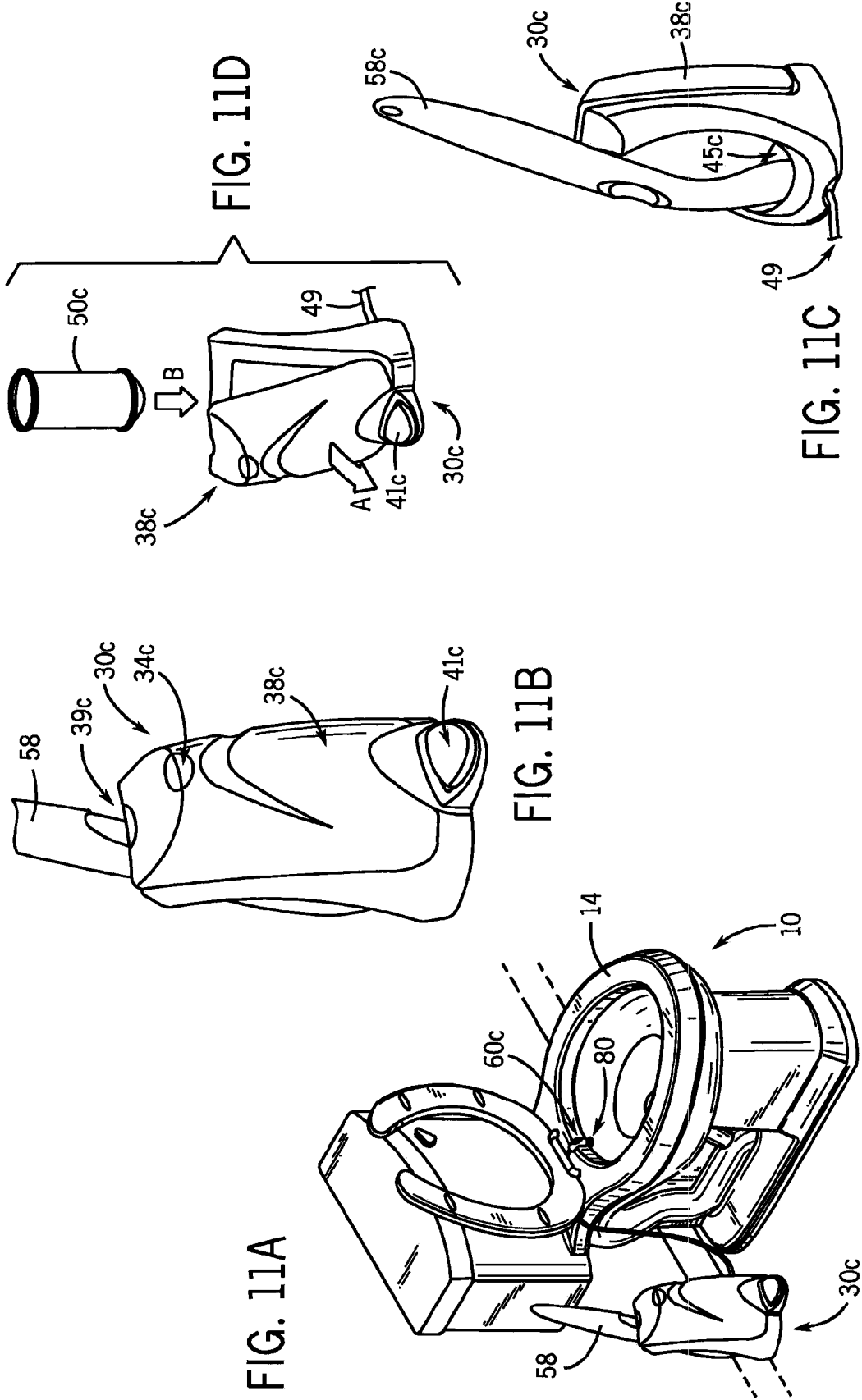


FIG. 10A



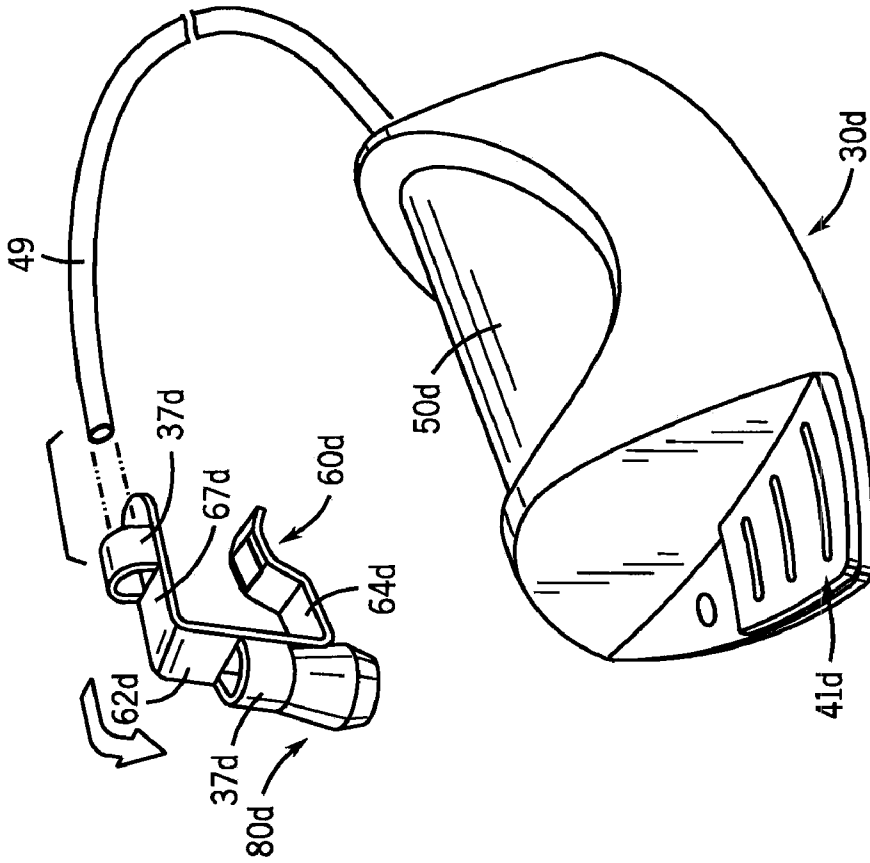


FIG. 12B

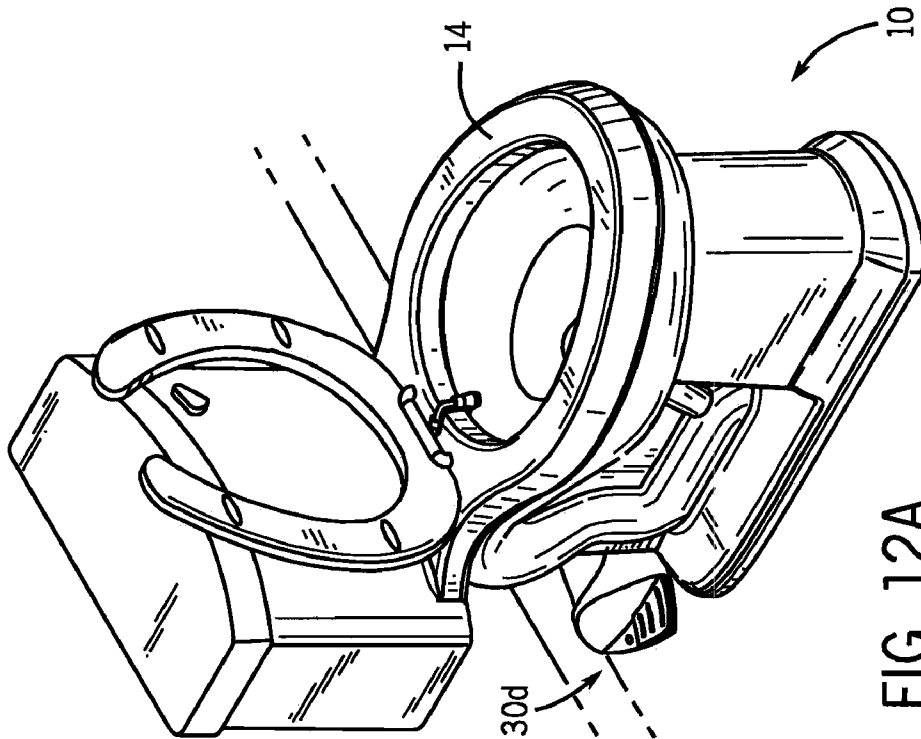


FIG. 12A

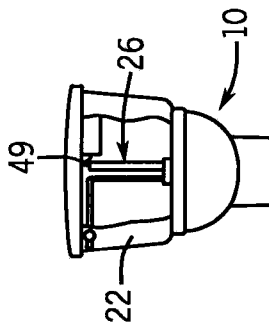


FIG. 13E

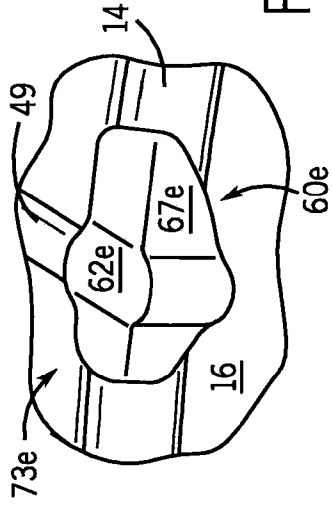


FIG. 13B

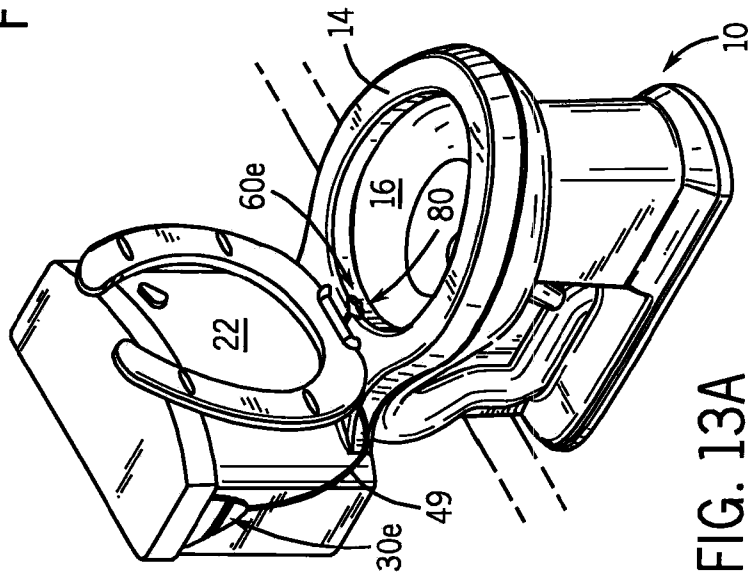


FIG. 13A

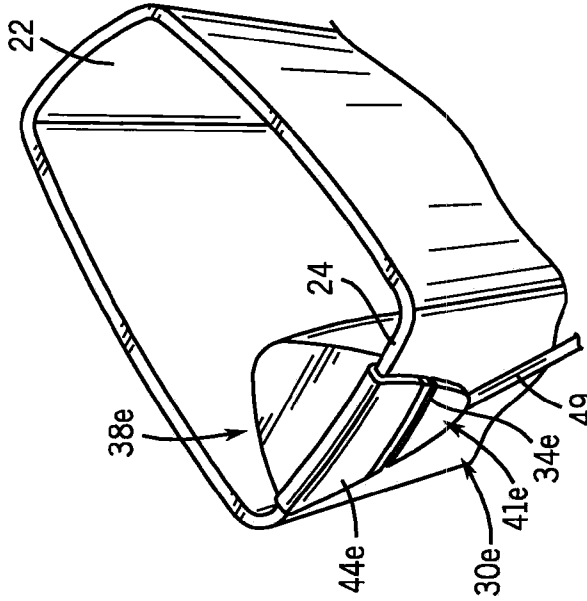


FIG. 13C

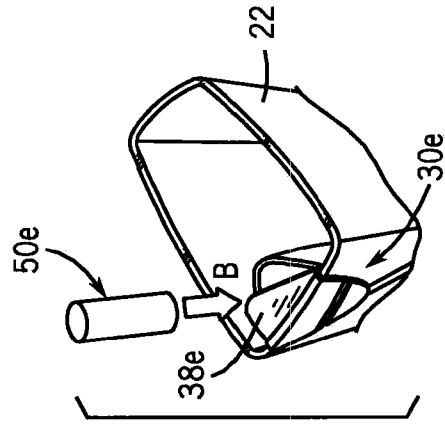
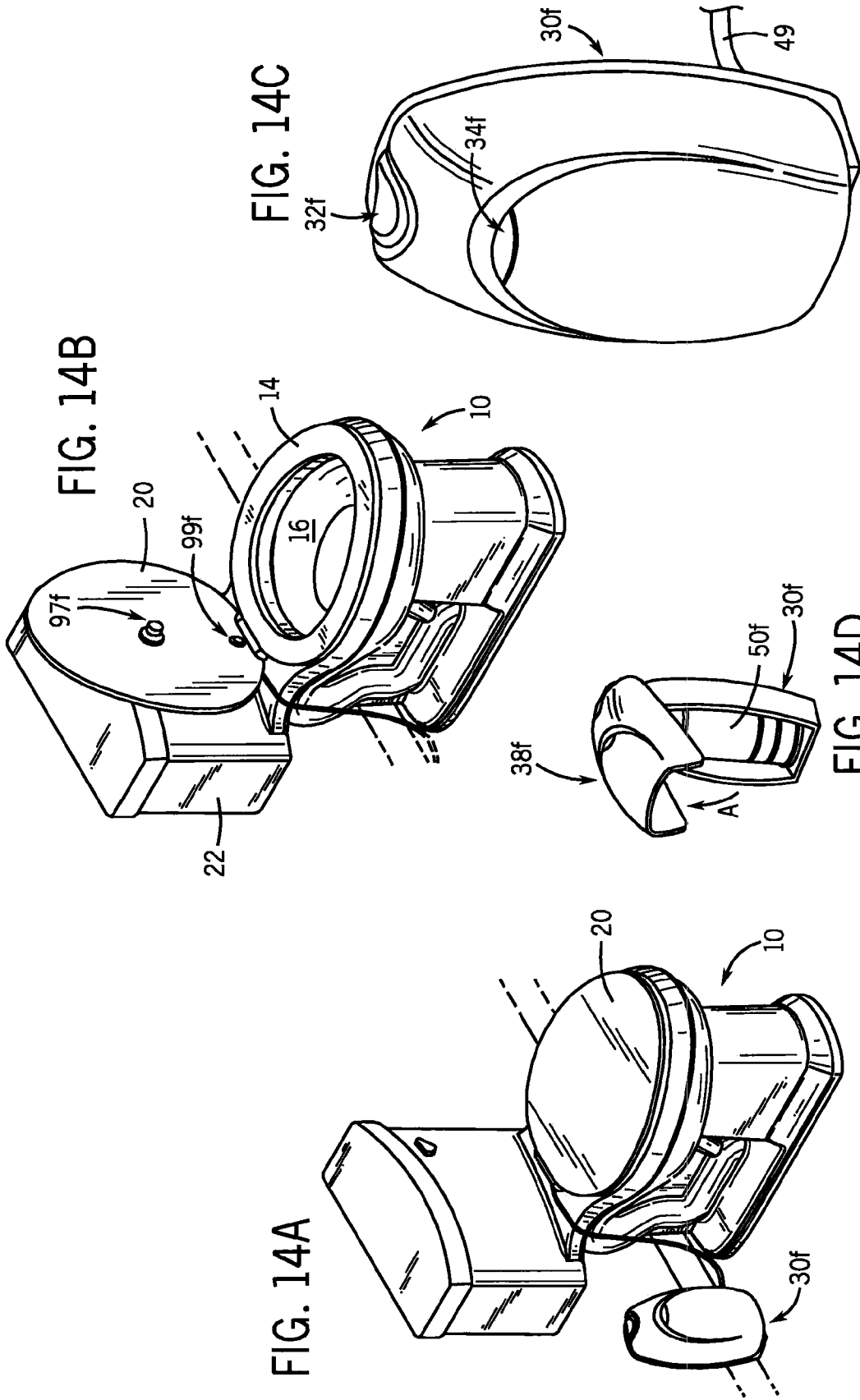


FIG. 13D



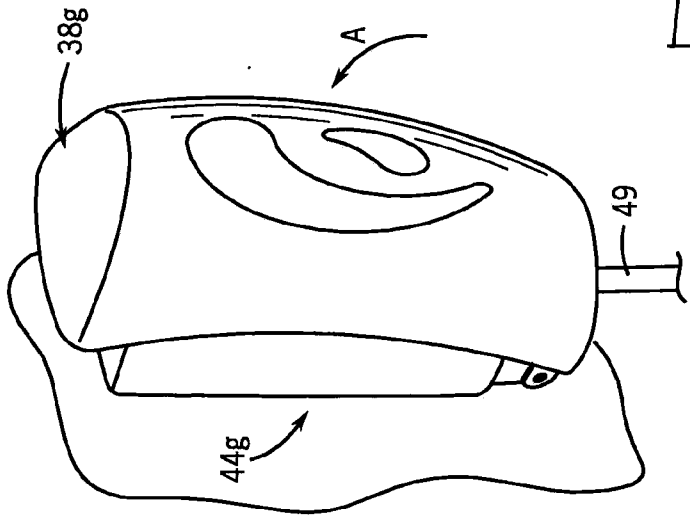


FIG. 15C

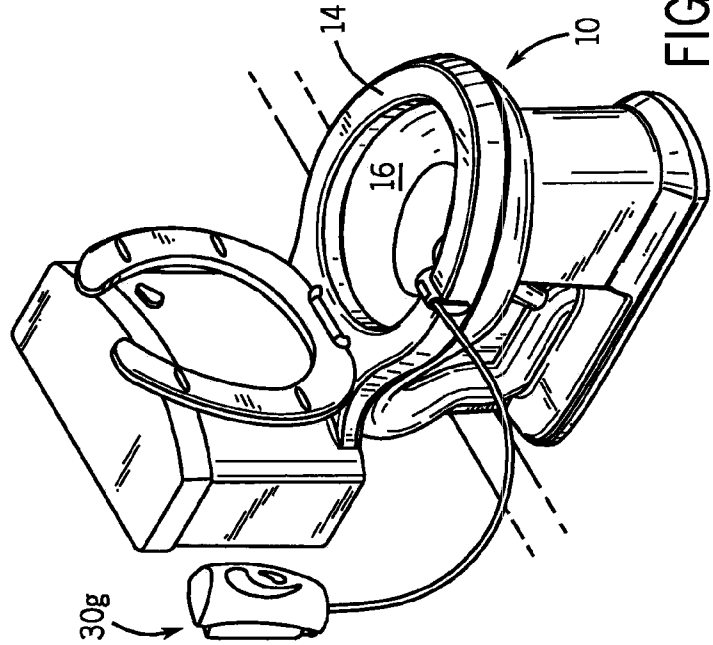


FIG. 15A

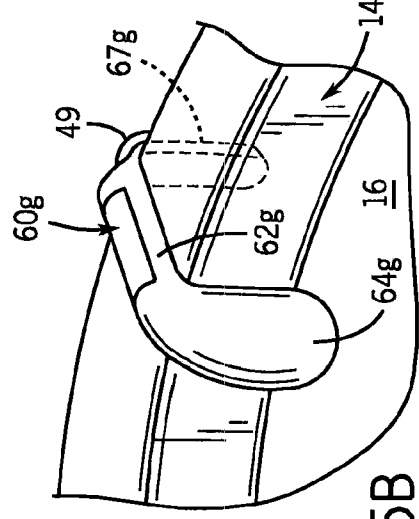


FIG. 15B

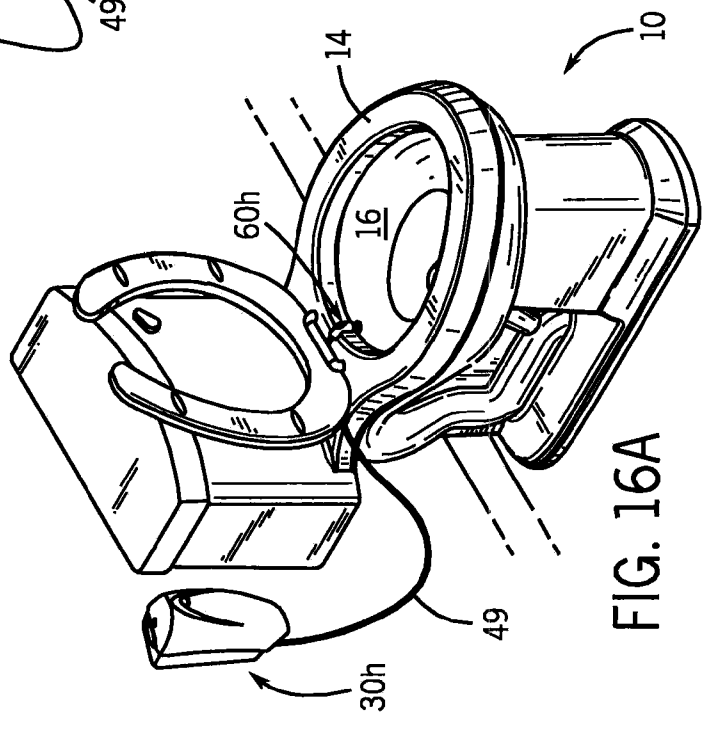
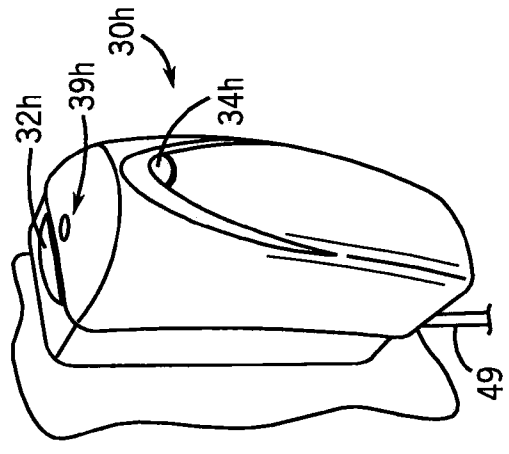
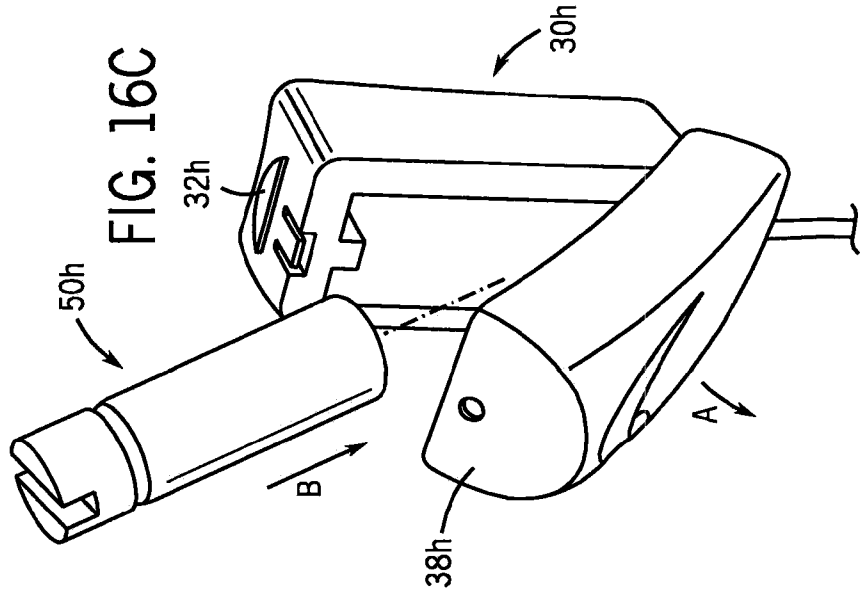


FIG. 16C

FIG. 16B

FIG. 16A

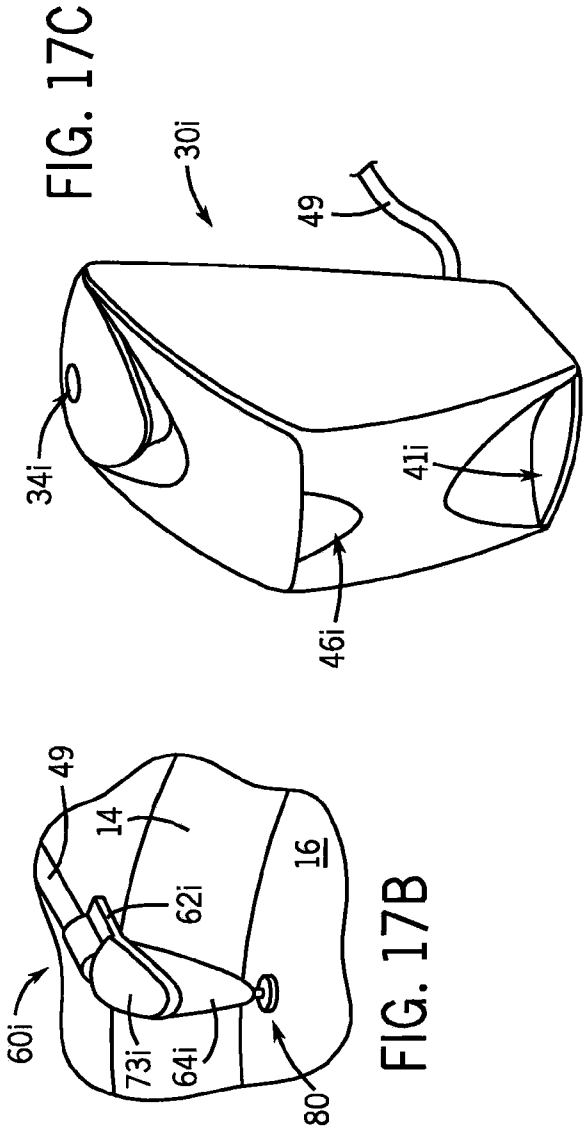


FIG. 17A

FIG. 17B

FIG. 17C

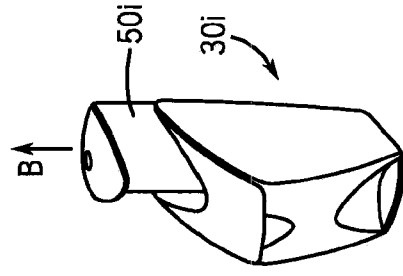


FIG. 17E

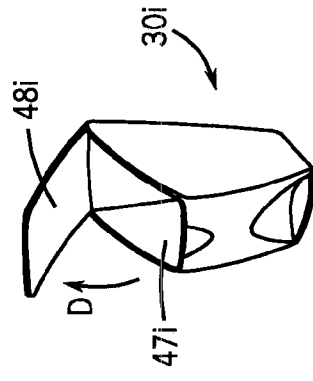


FIG. 17D

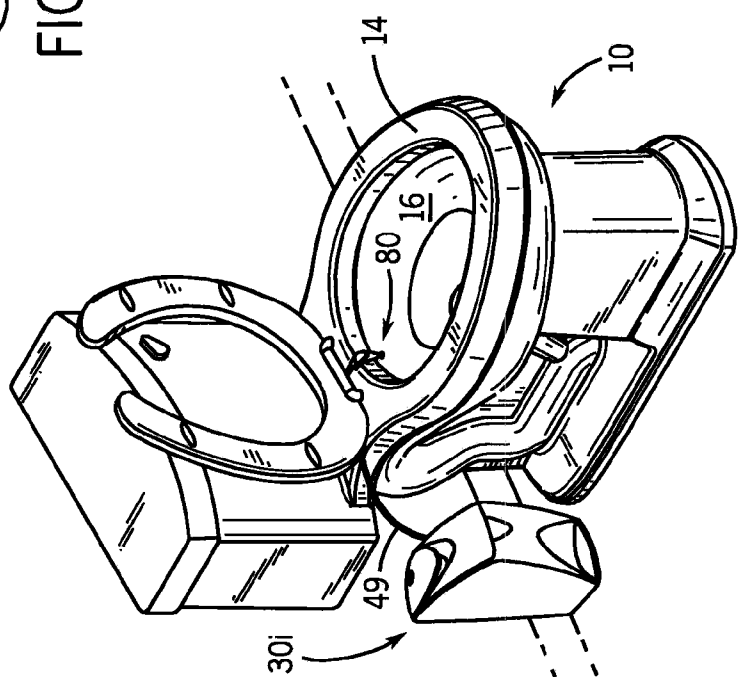


FIG. 17A

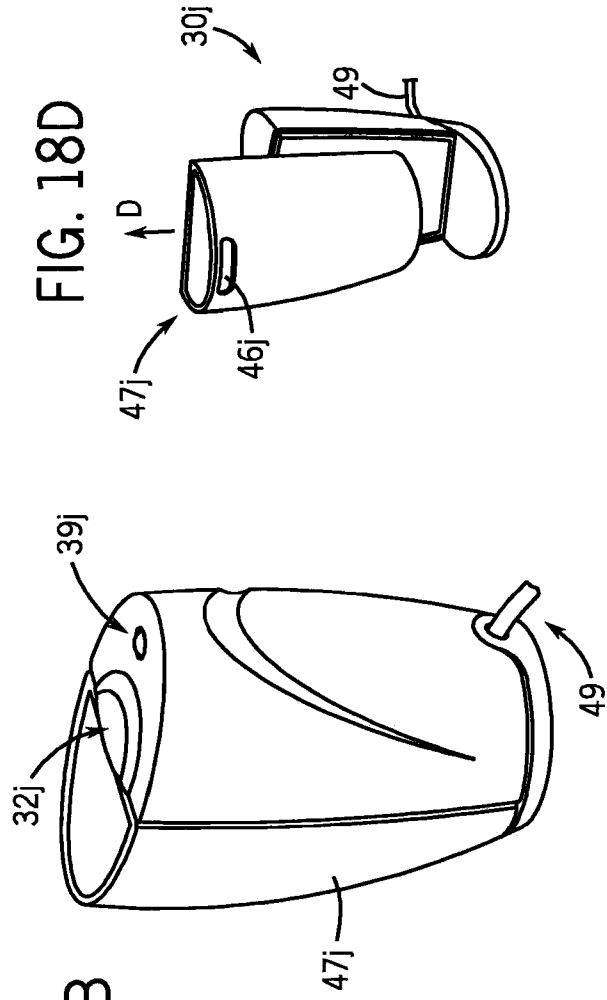


FIG. 18D

FIG. 18B

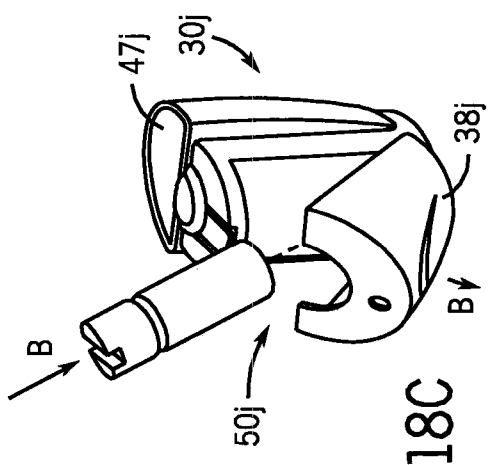


FIG. 18C

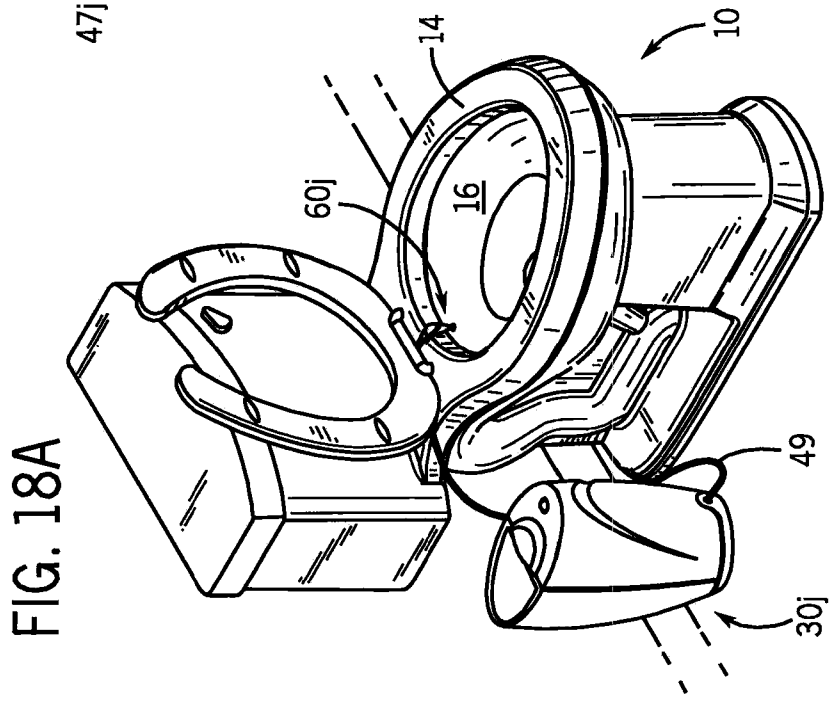


FIG. 18A

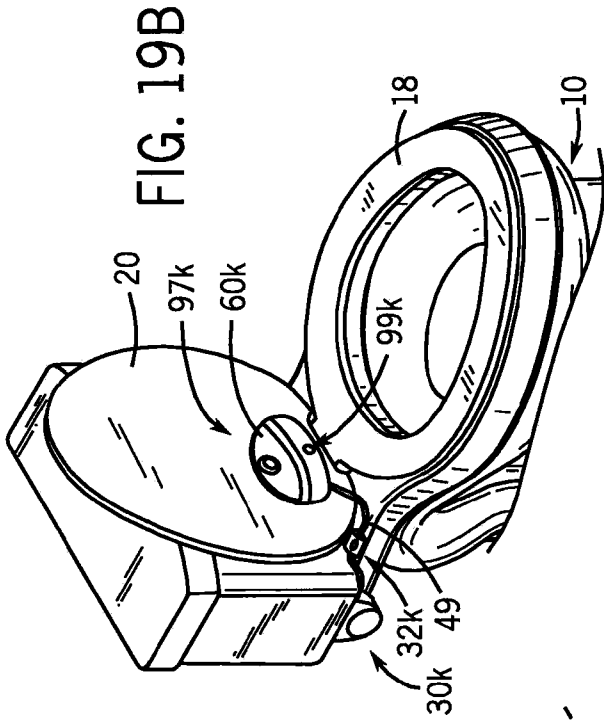


FIG. 19B

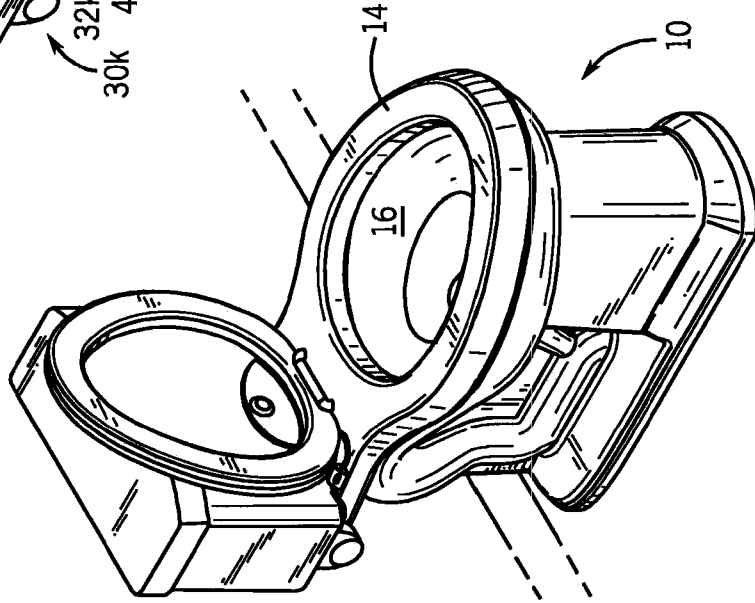


FIG. 19A

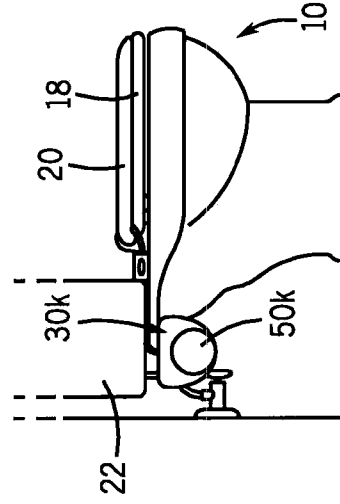


FIG. 19C

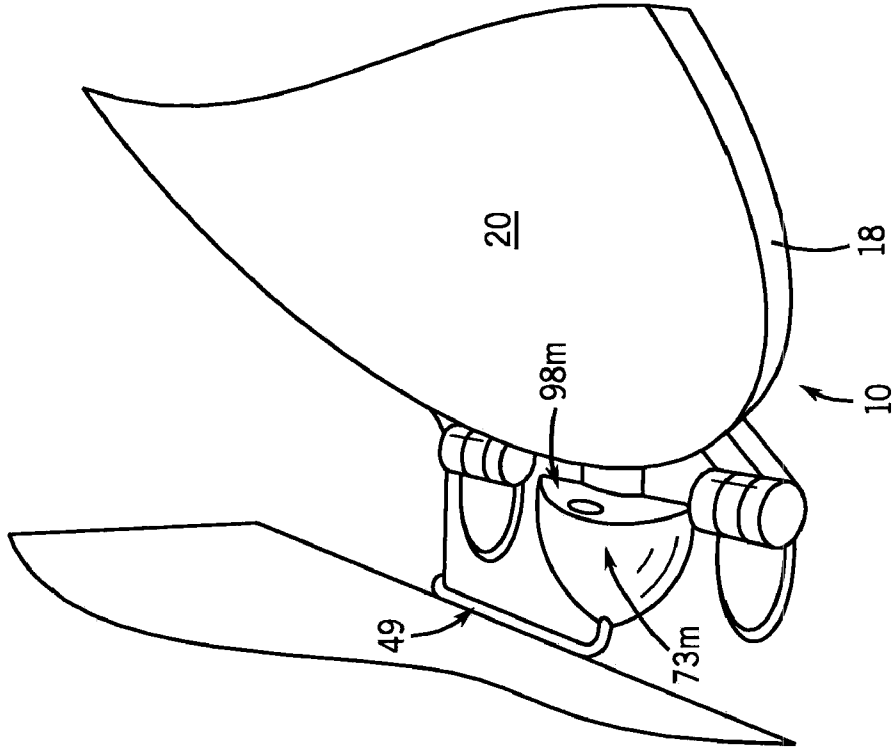


FIG. 20B

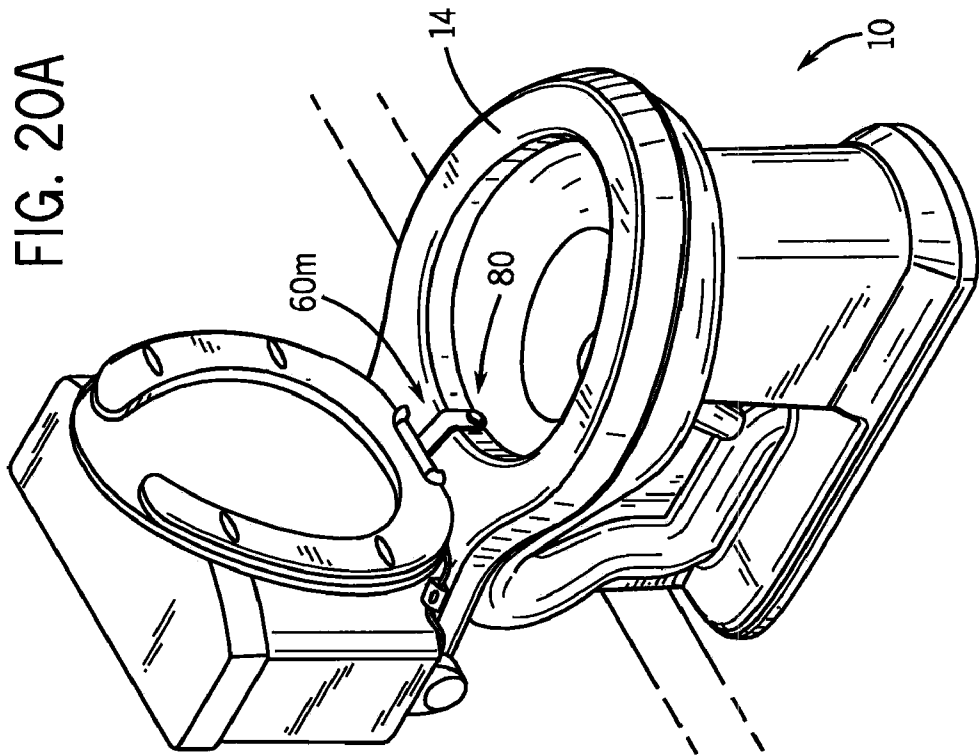


FIG. 20A

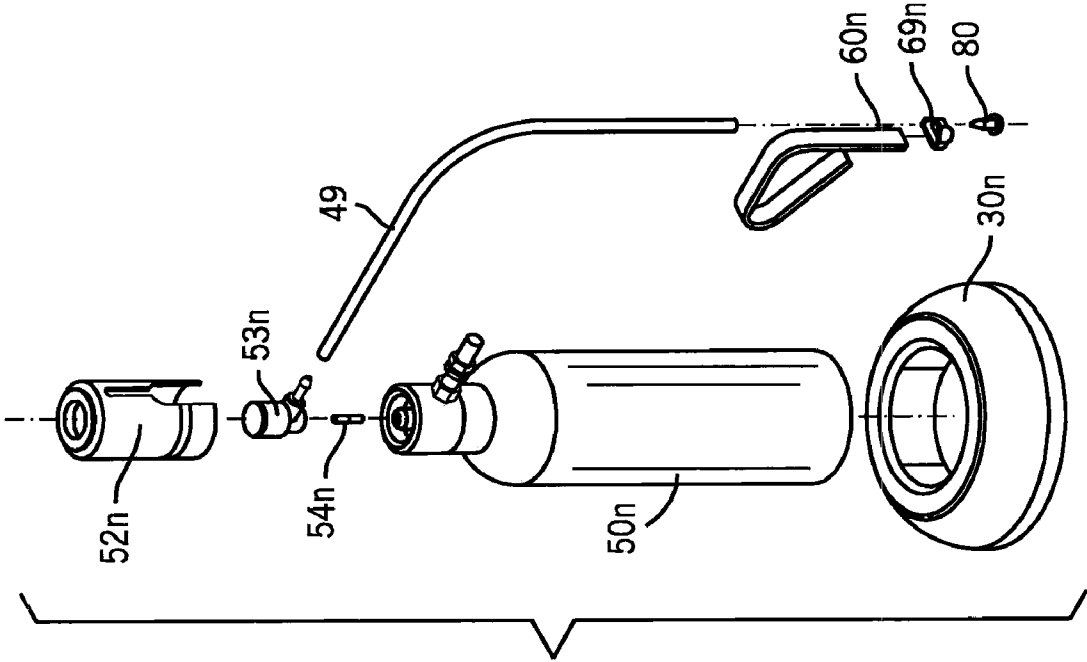


FIG. 21B

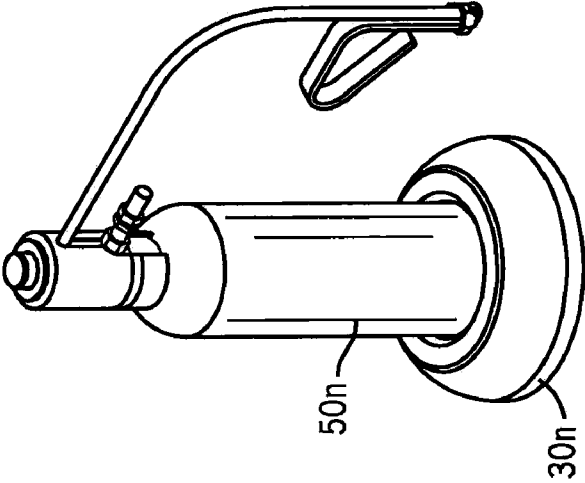


FIG. 21A

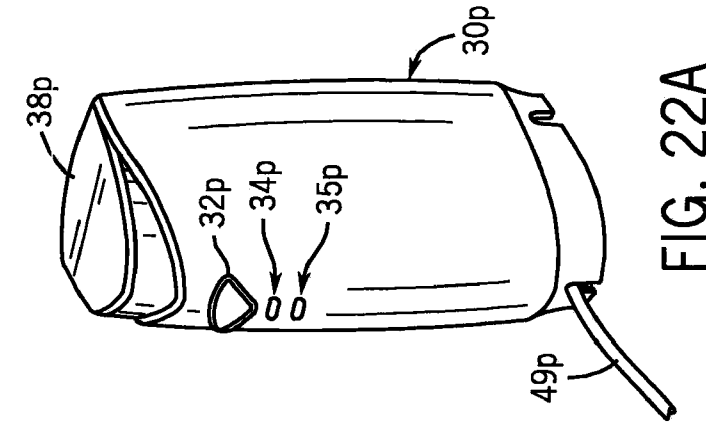


FIG. 22A

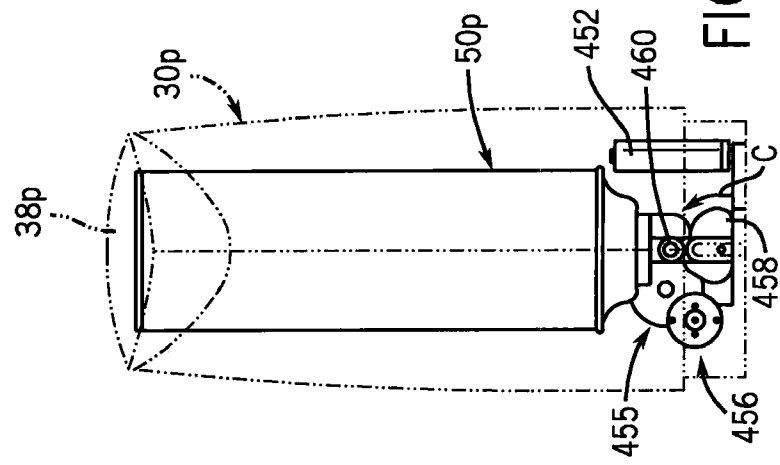


FIG. 22B

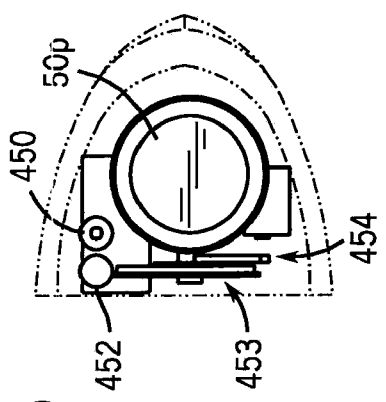


FIG. 22D

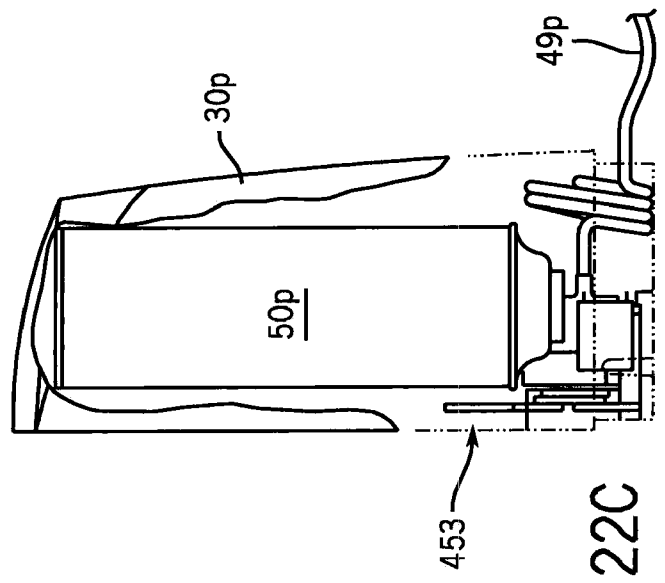


FIG. 22C

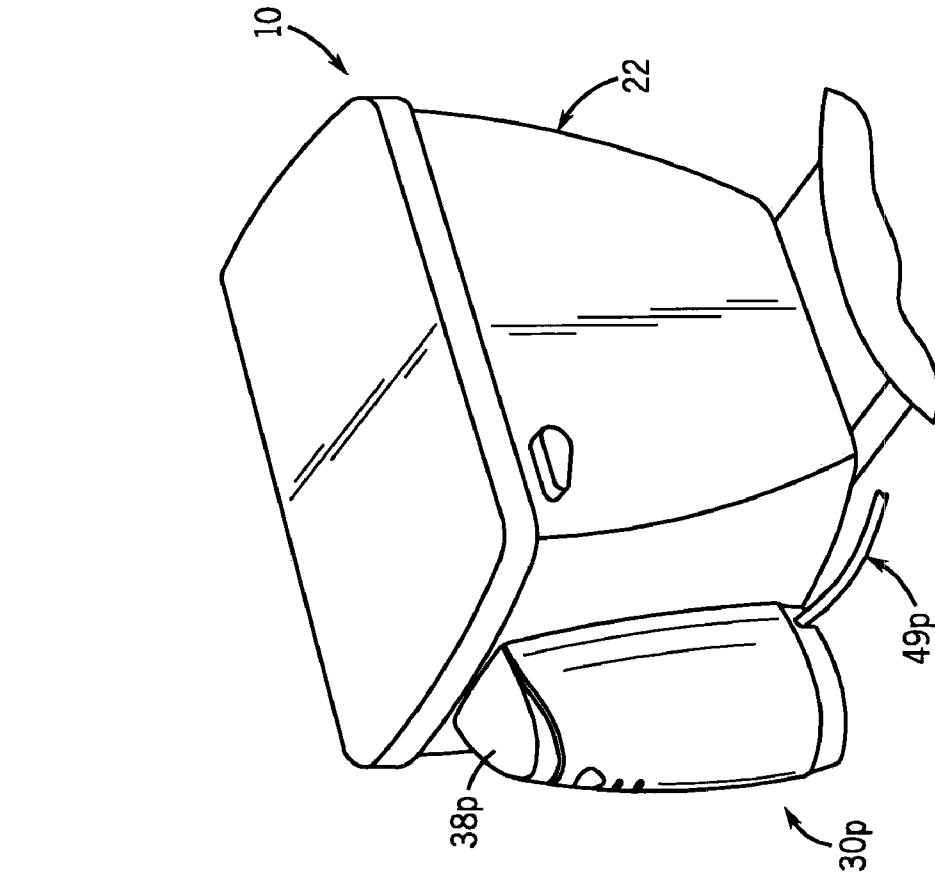


FIG. 22E

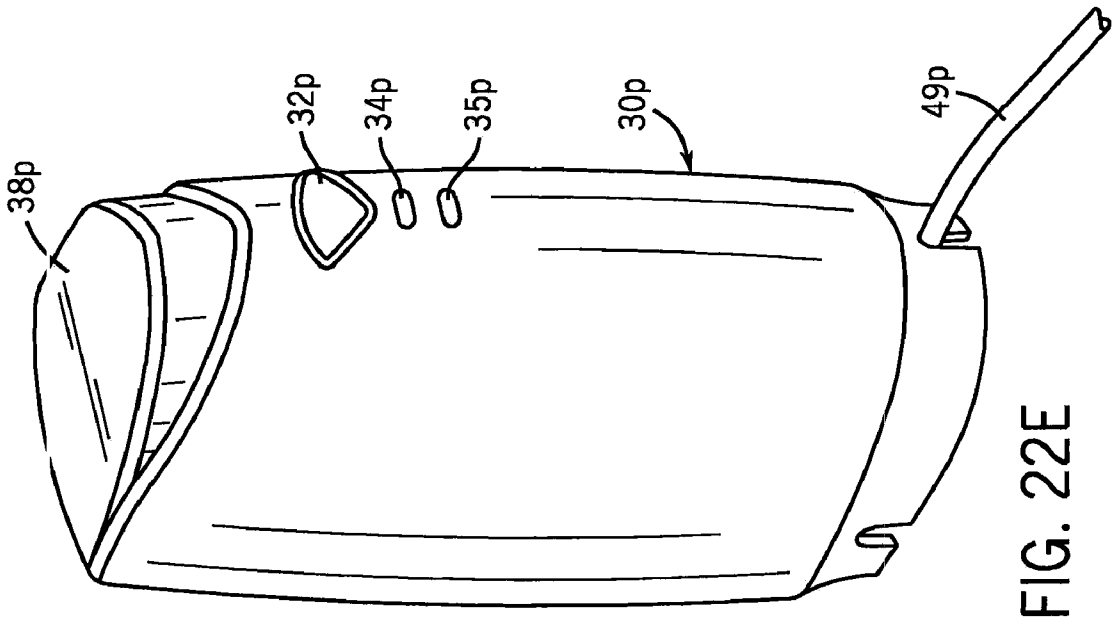


FIG. 22F

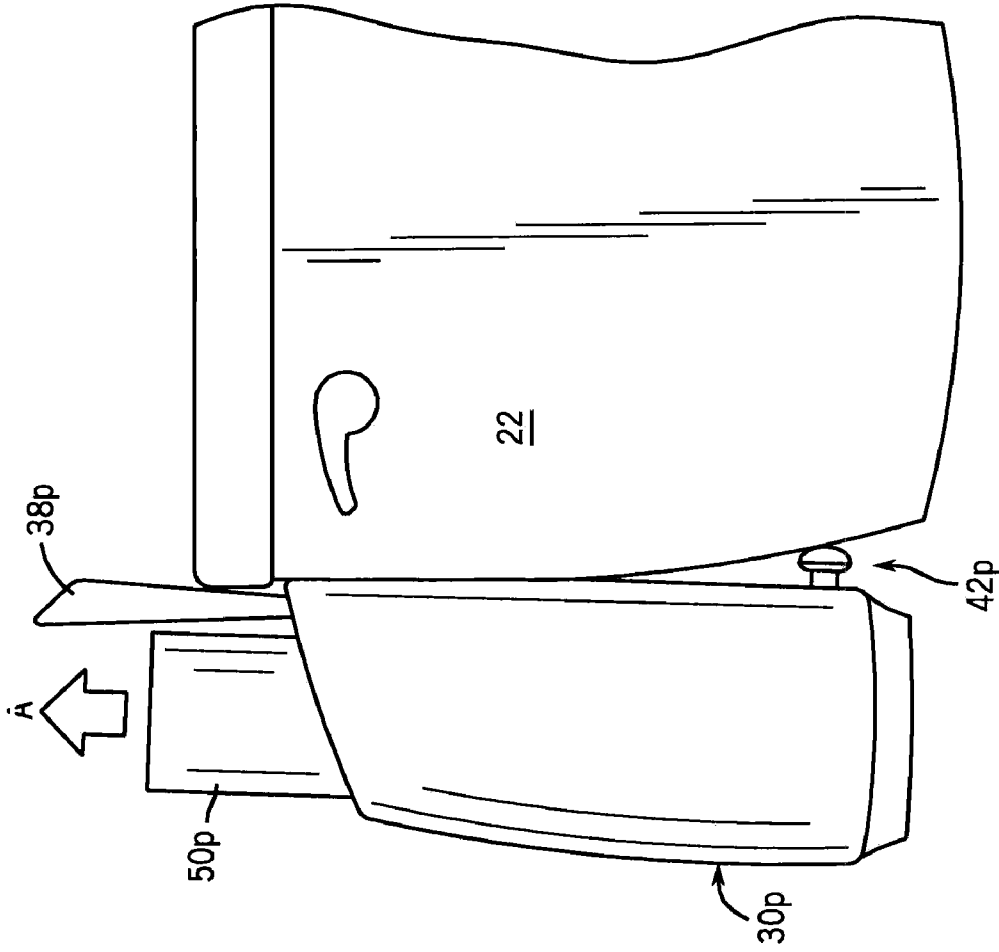


FIG. 22H

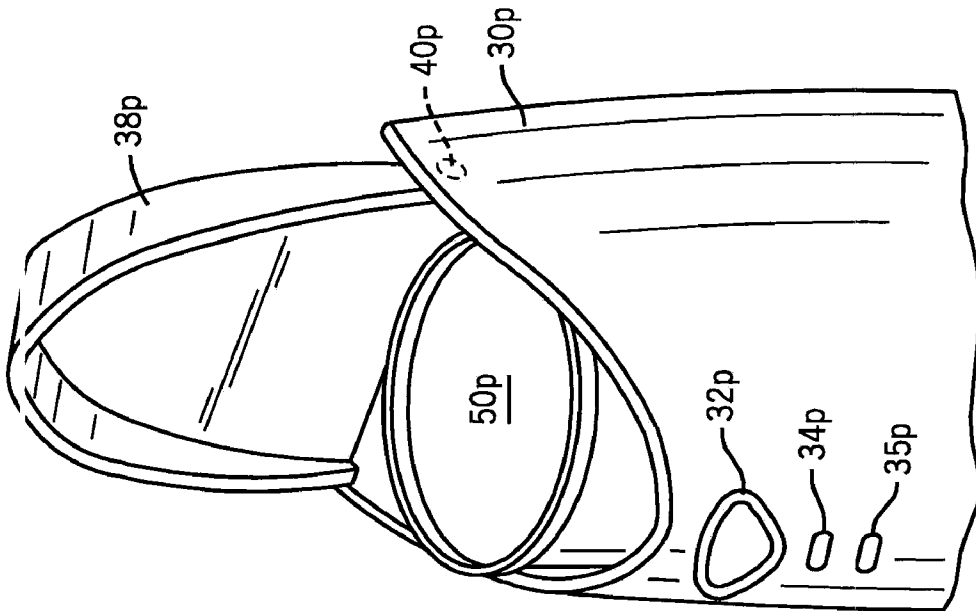


FIG. 22G

FIG. 22J

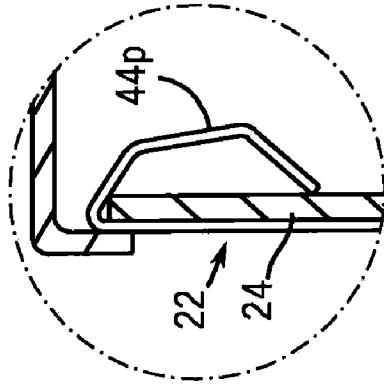


FIG. 22K

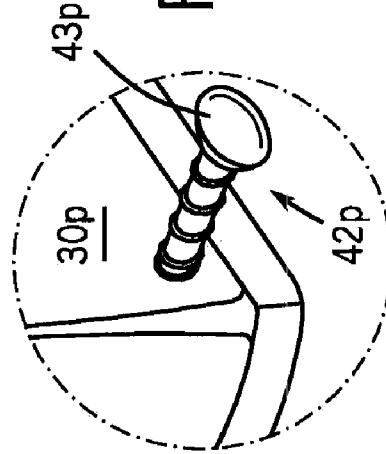
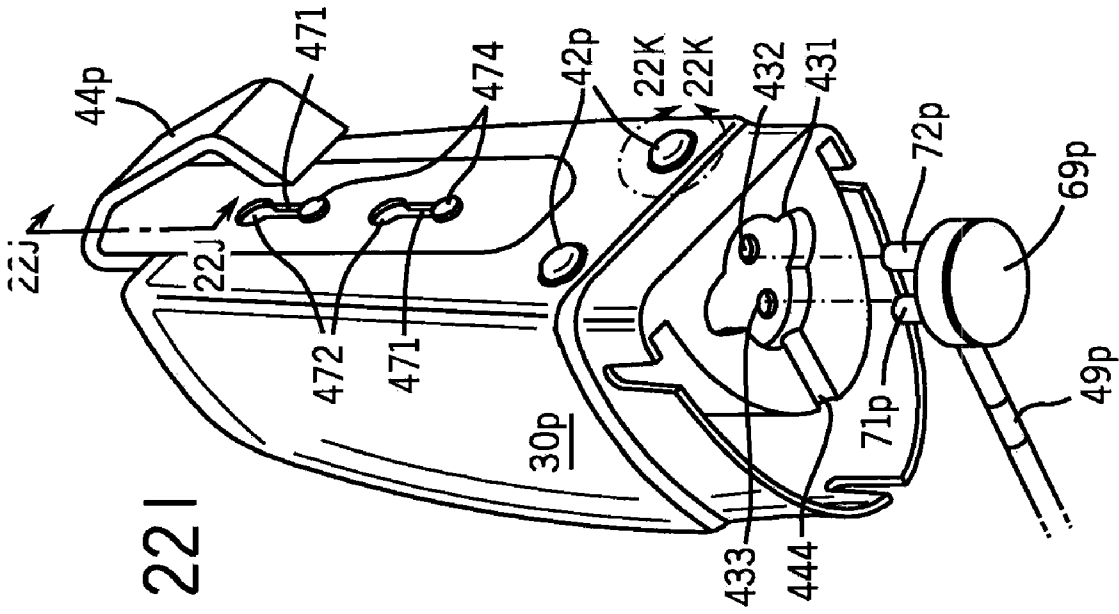


FIG. 22I



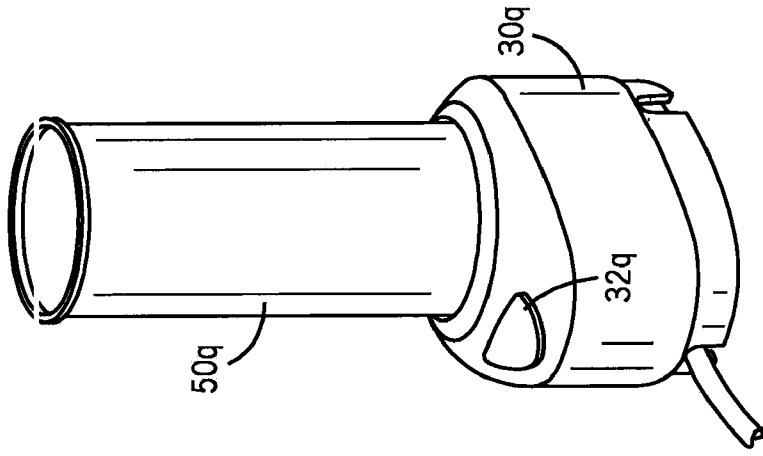


FIG. 23A

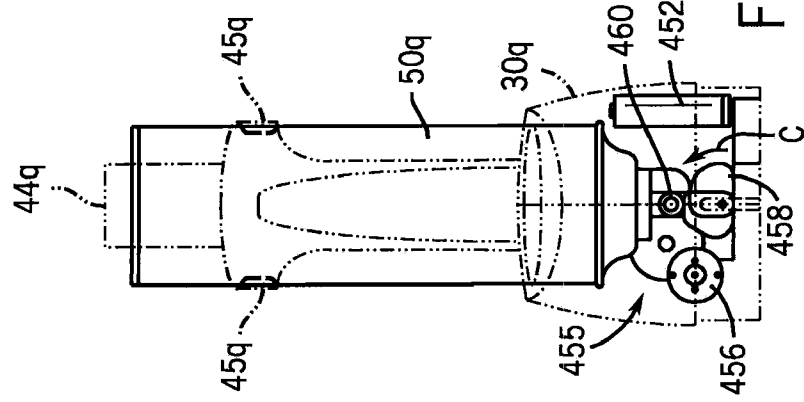


FIG. 23B

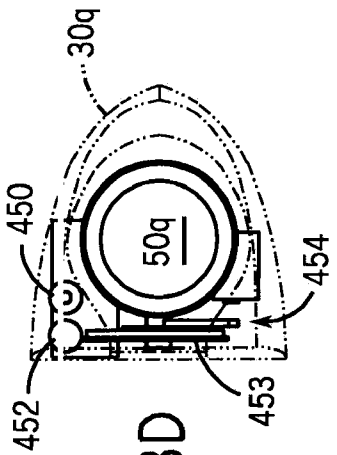


FIG. 23D

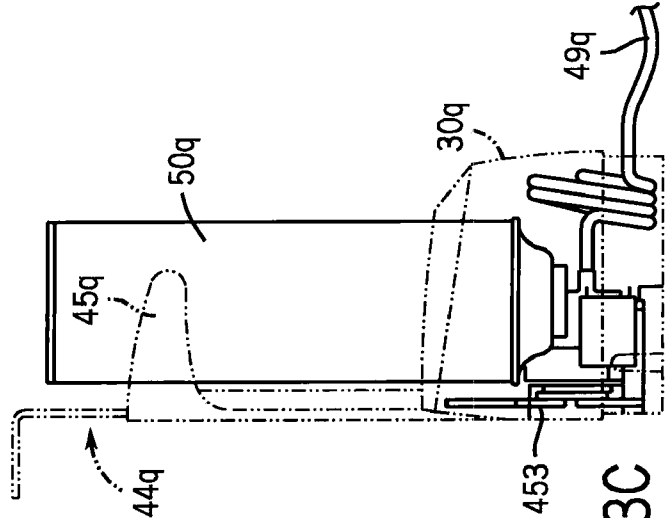


FIG. 23C

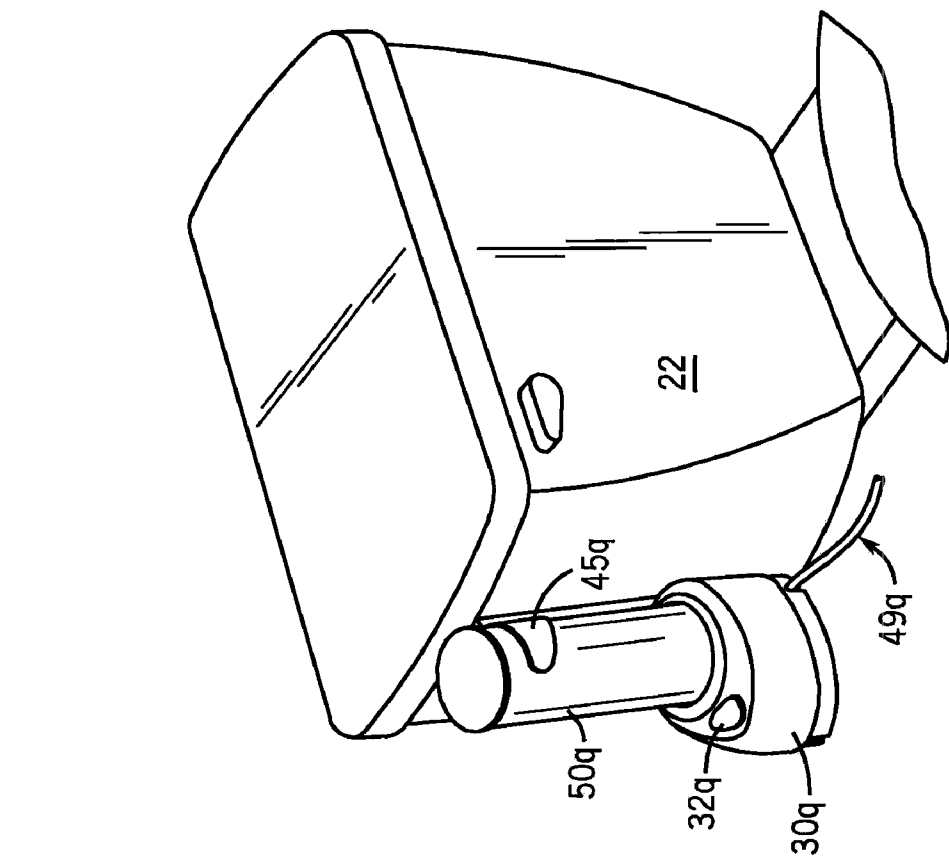


FIG. 23F

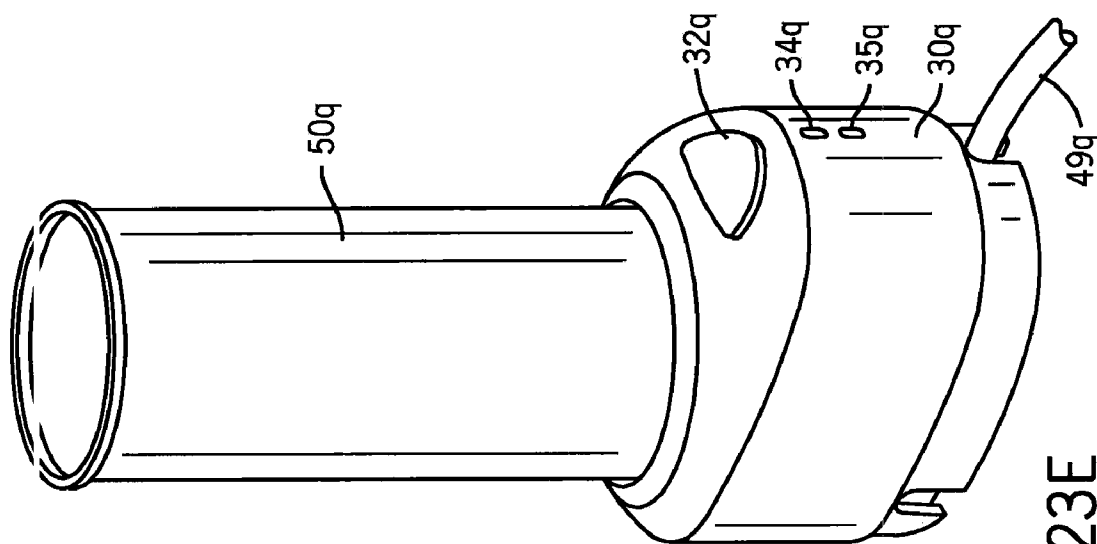


FIG. 23E

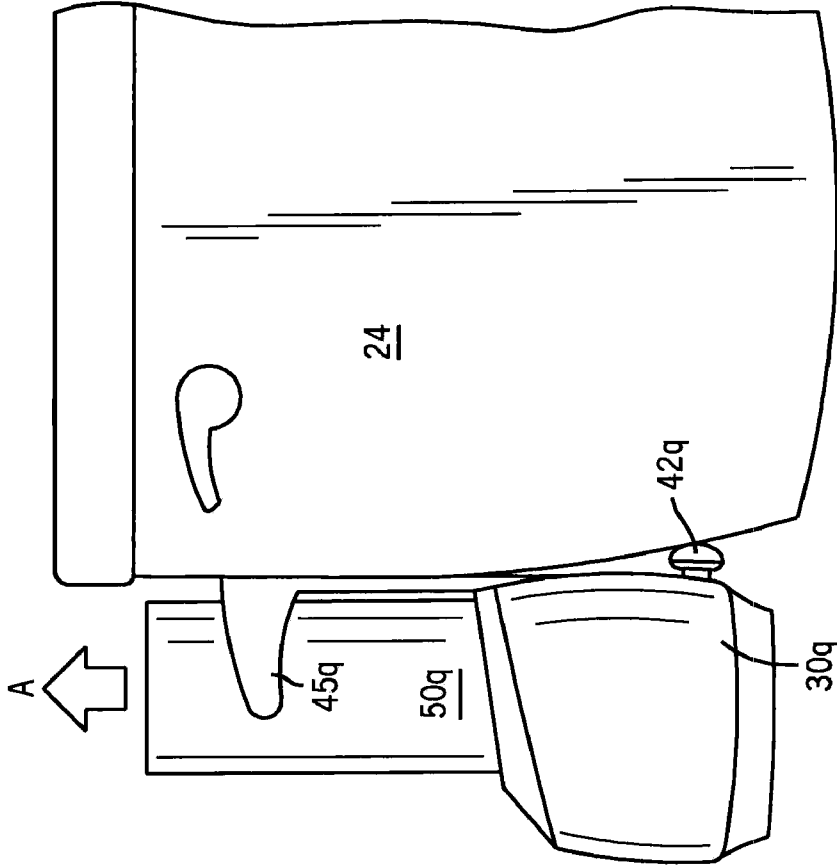


FIG. 23H

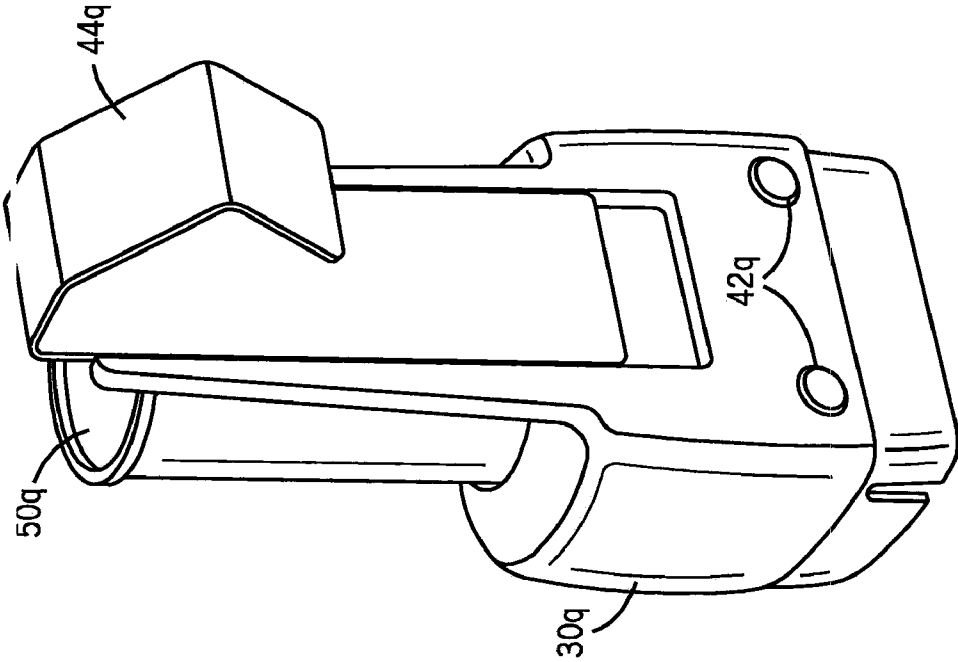


FIG. 23G

FIG. 23 J

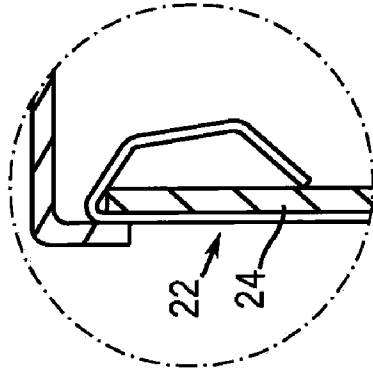


FIG. 23 K

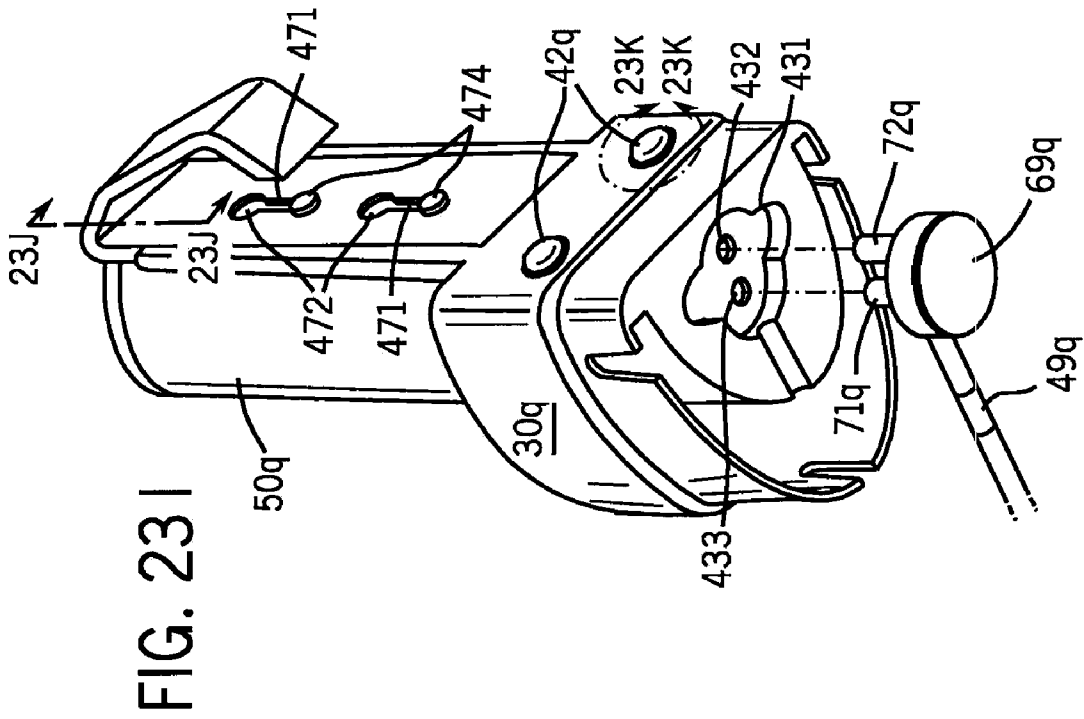
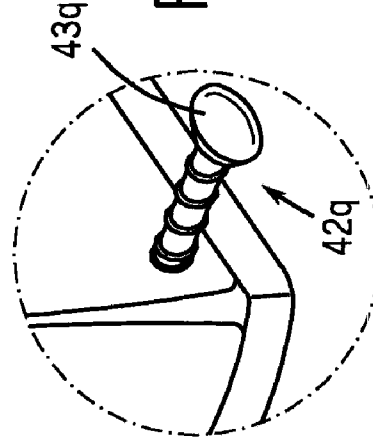


FIG. 23 I

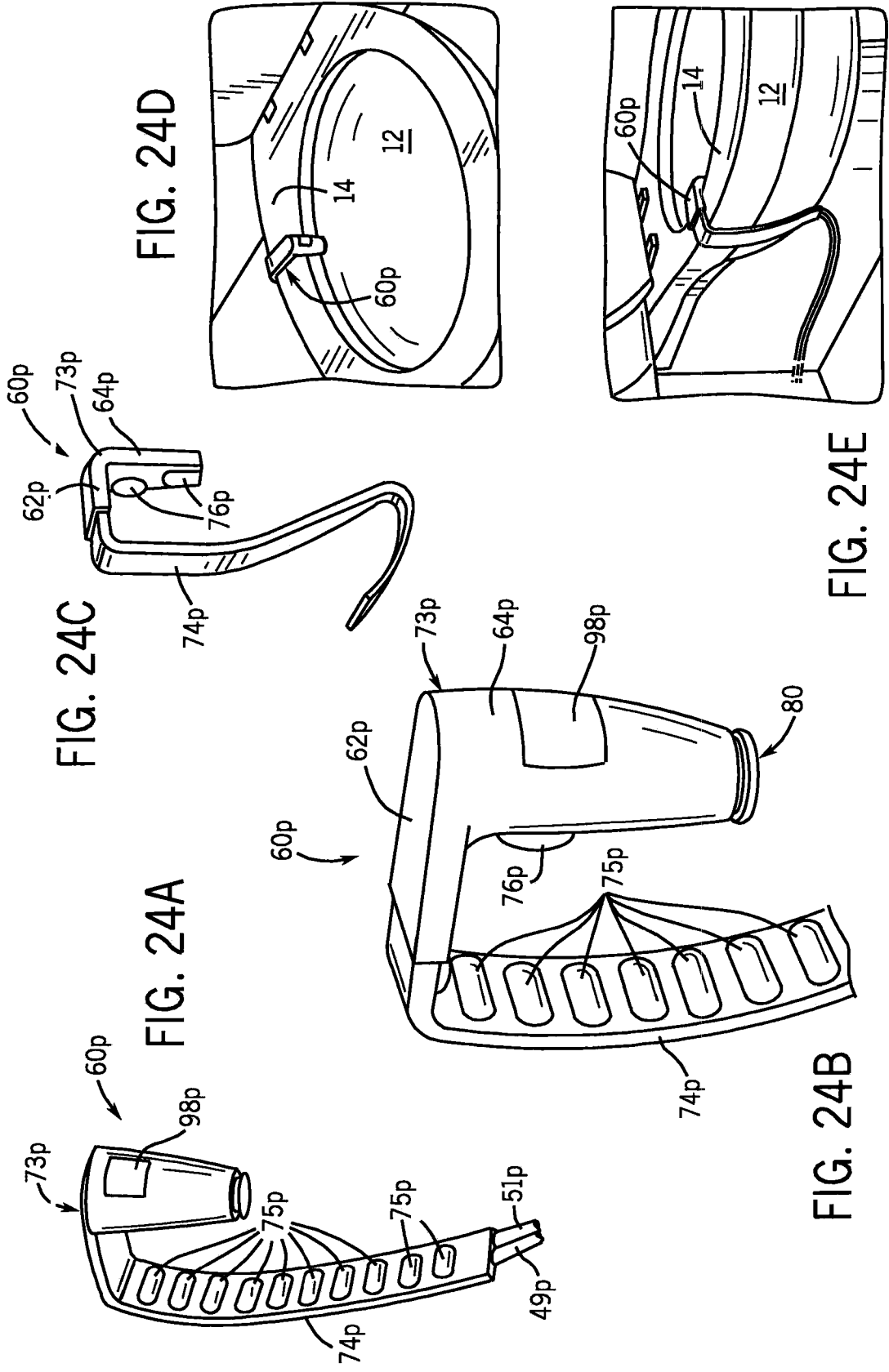


FIG. 24C

FIG. 24A

FIG. 24D

FIG. 24B

FIG. 24E

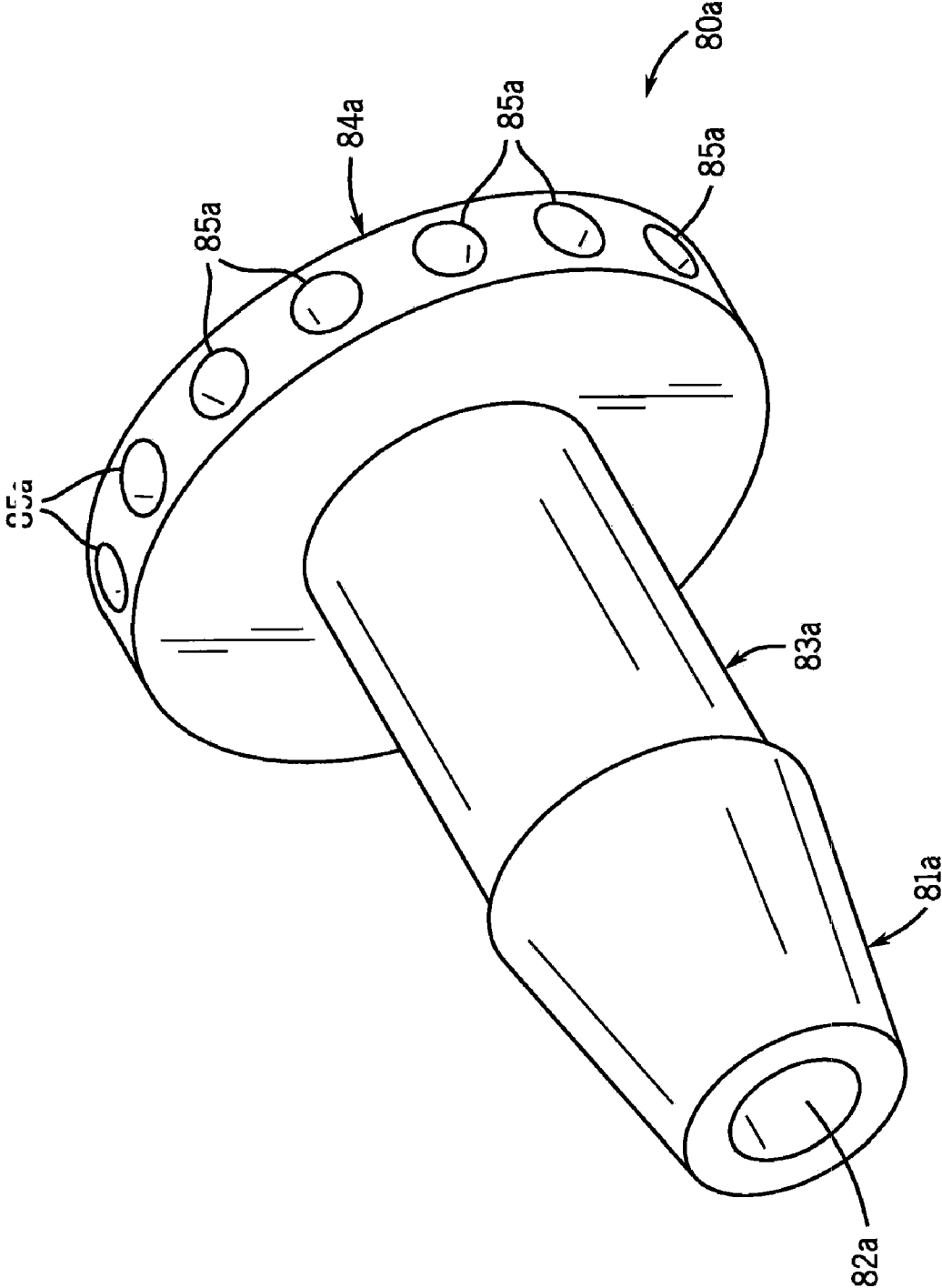
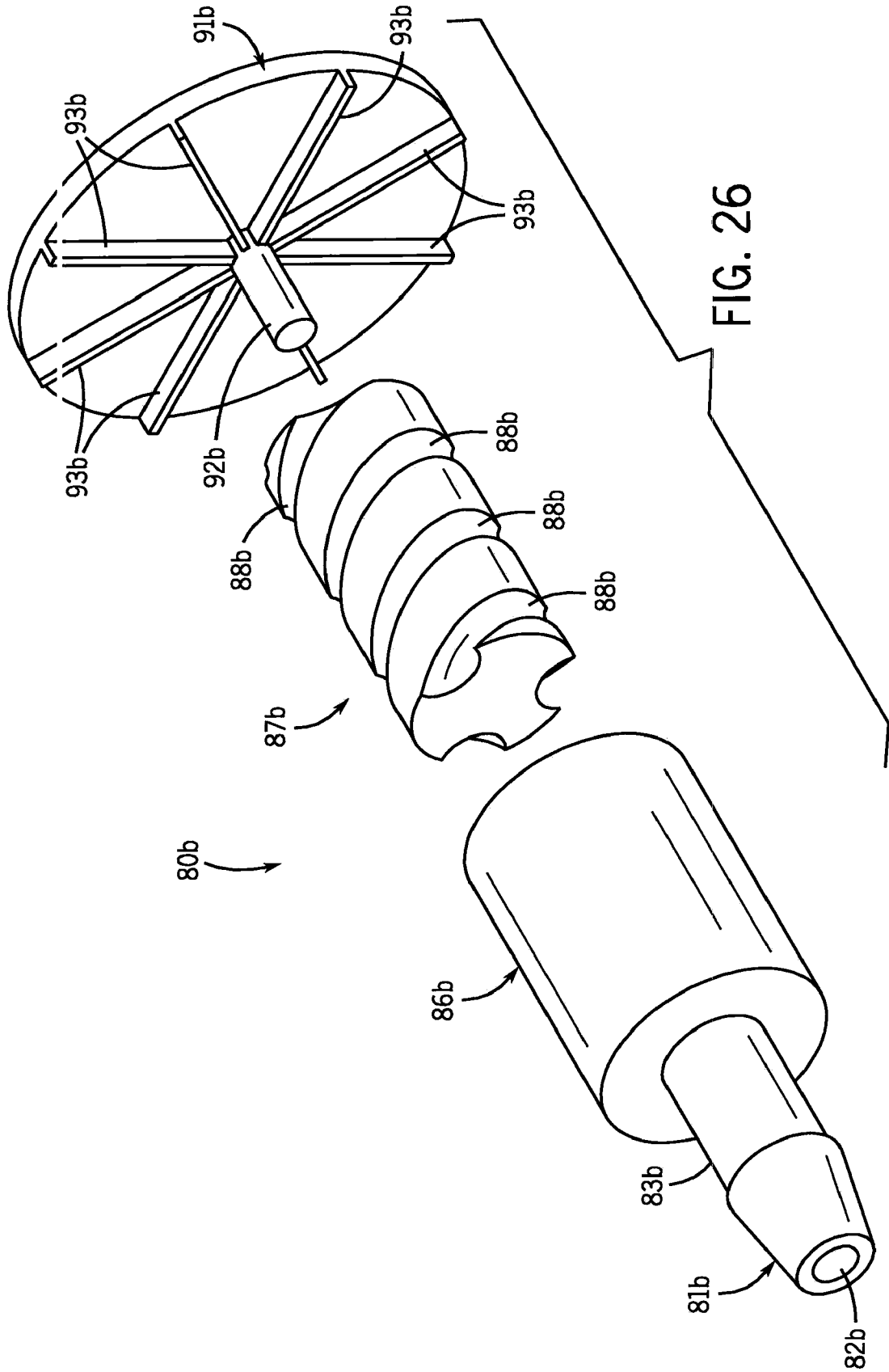


FIG. 25



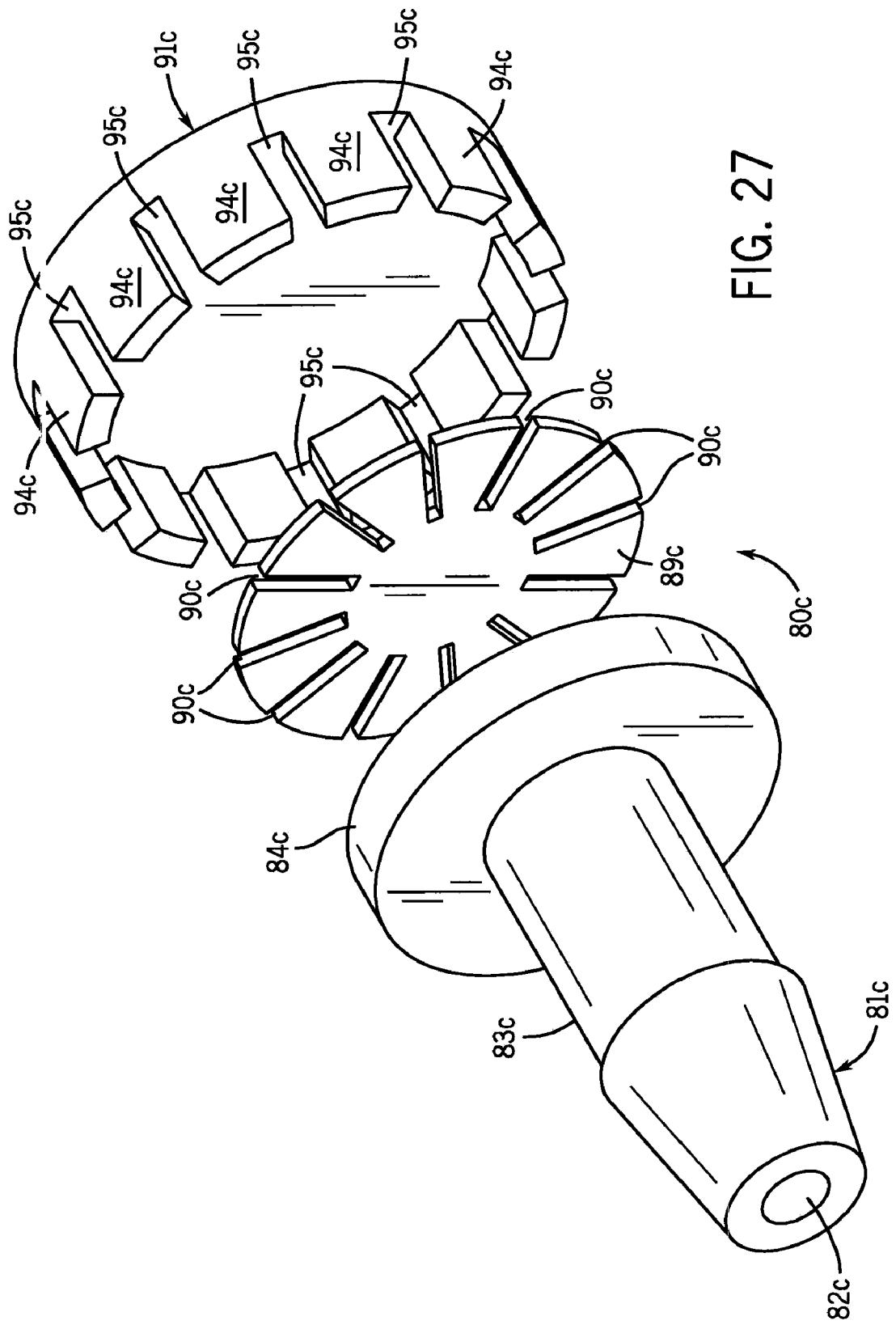


FIG. 27

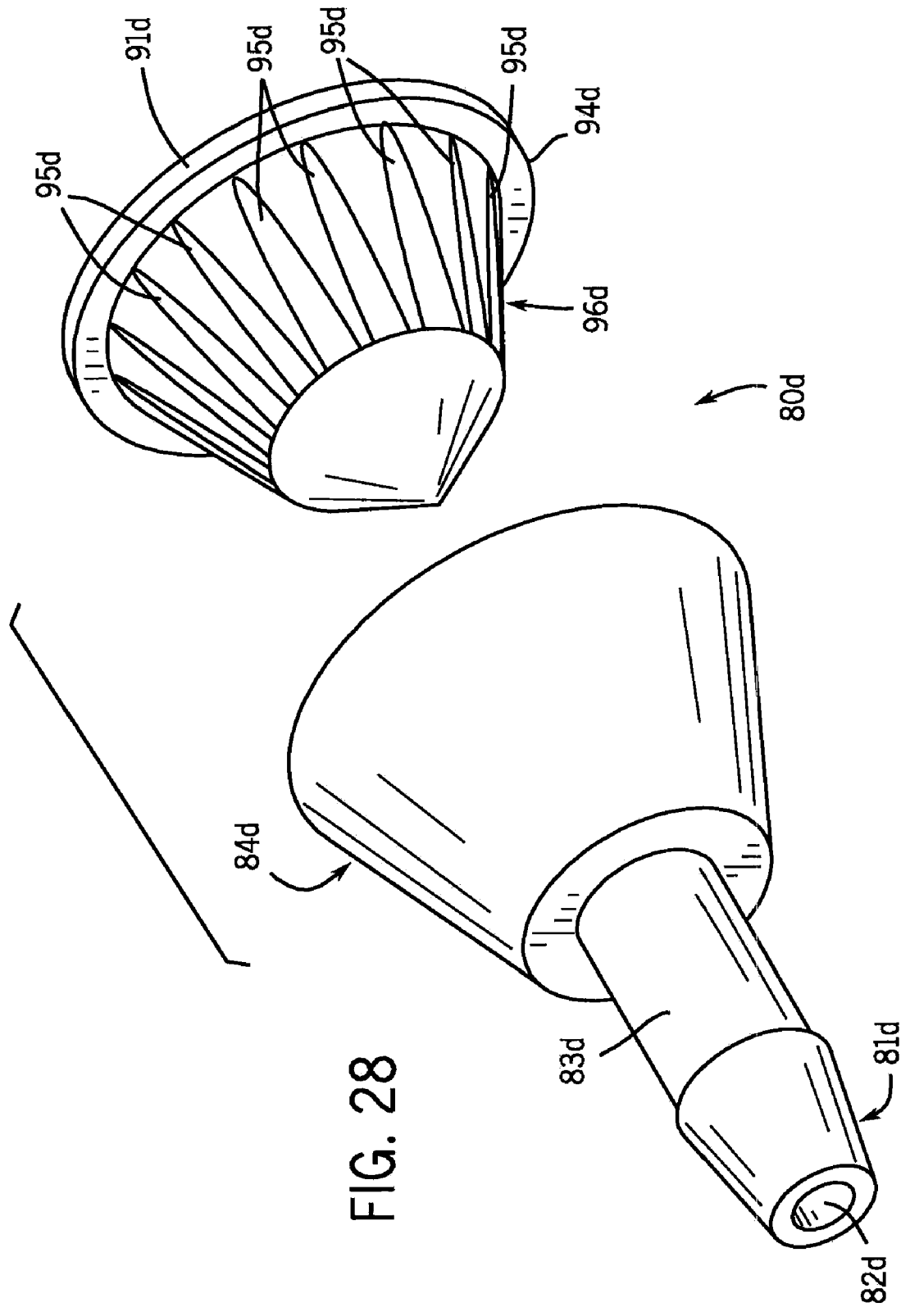


FIG. 28

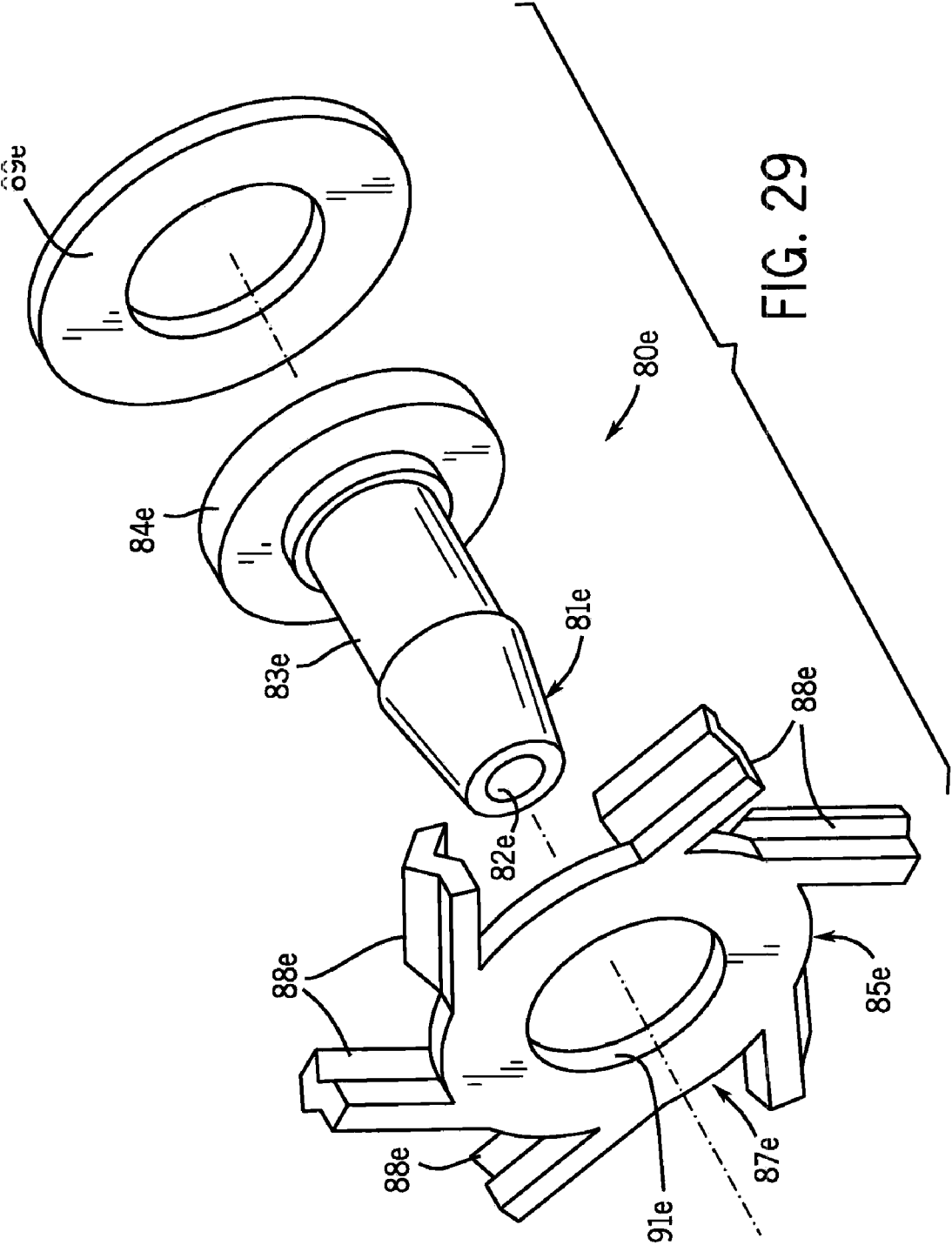


FIG. 29

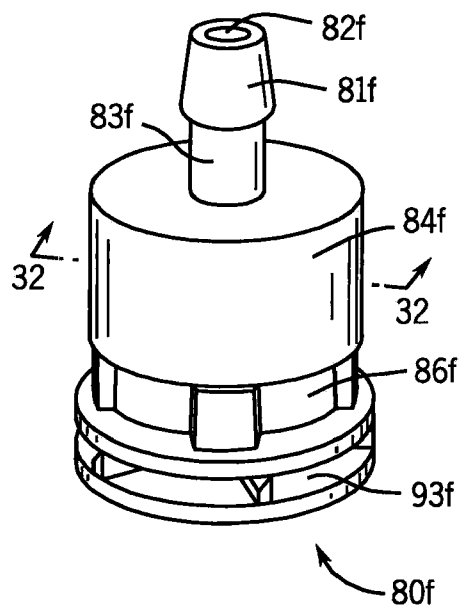


FIG. 30

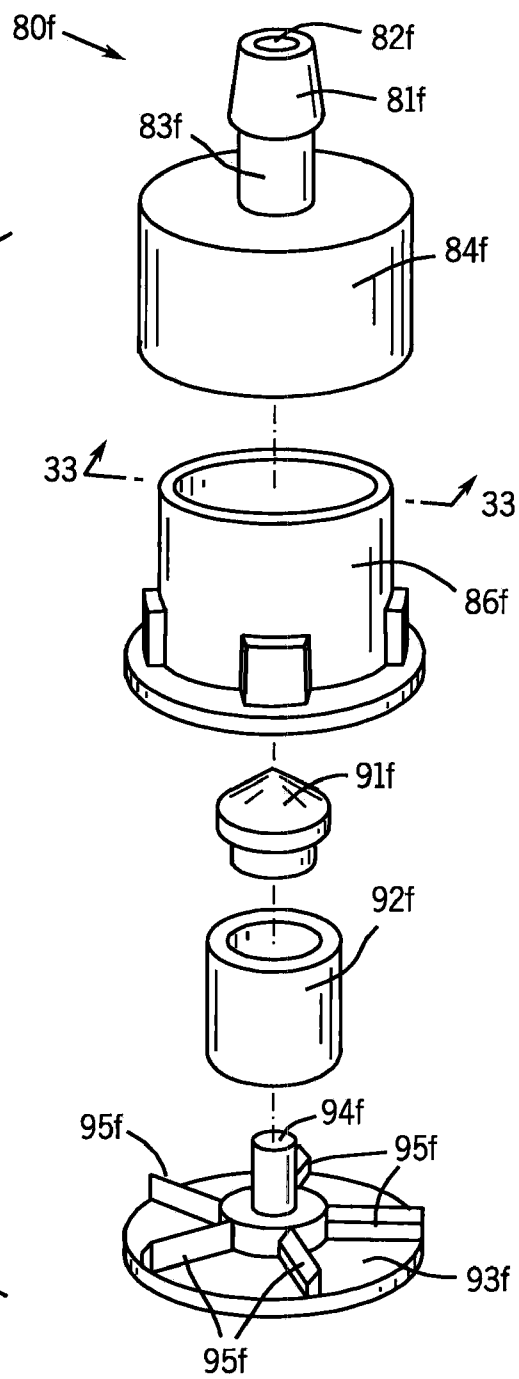


FIG. 31

FIG. 32

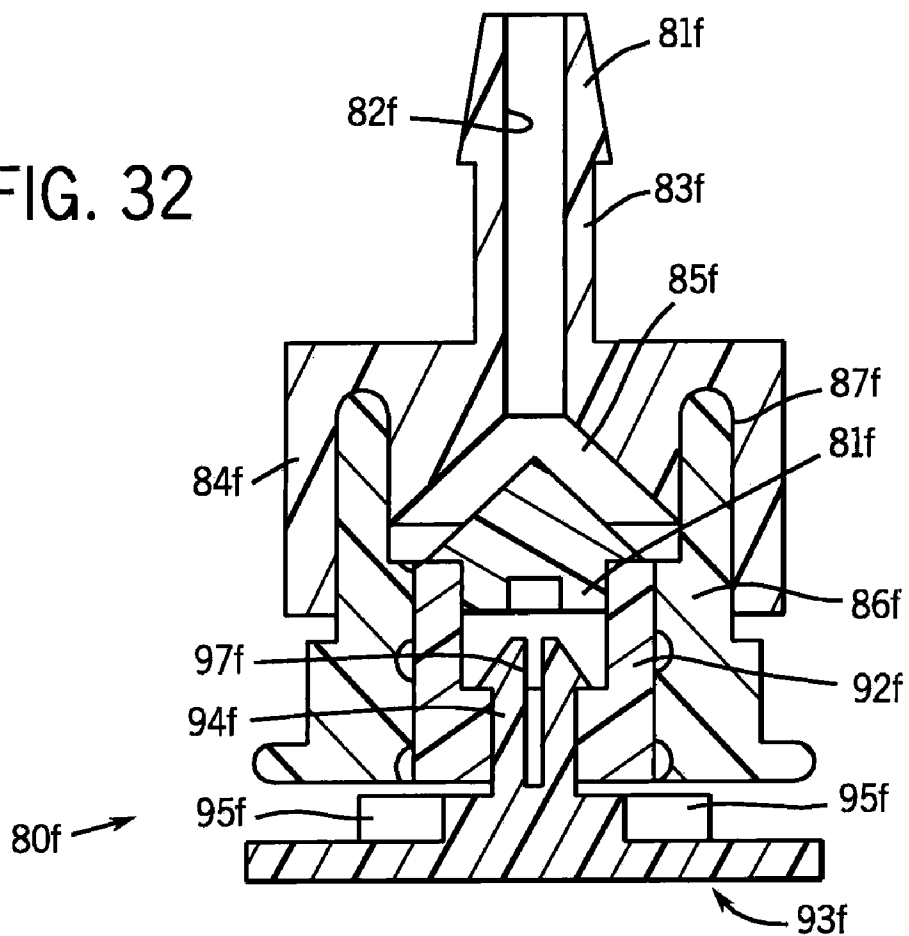


FIG. 33

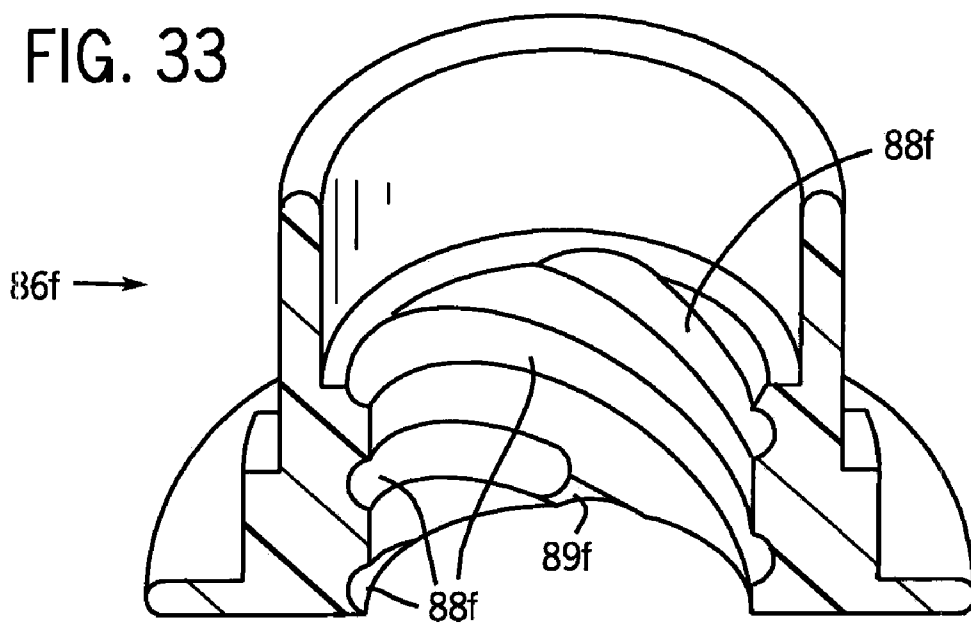
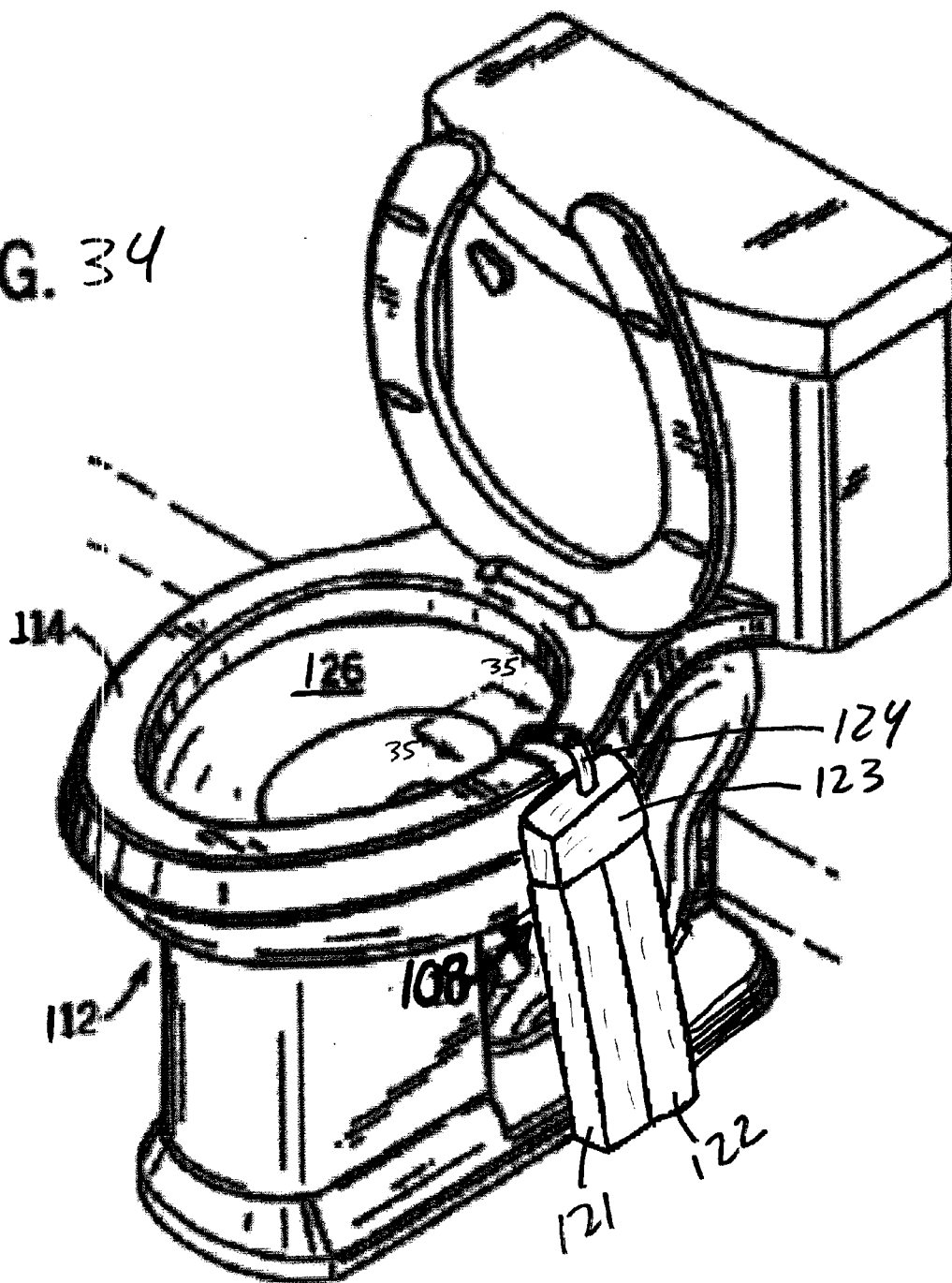


FIG. 34



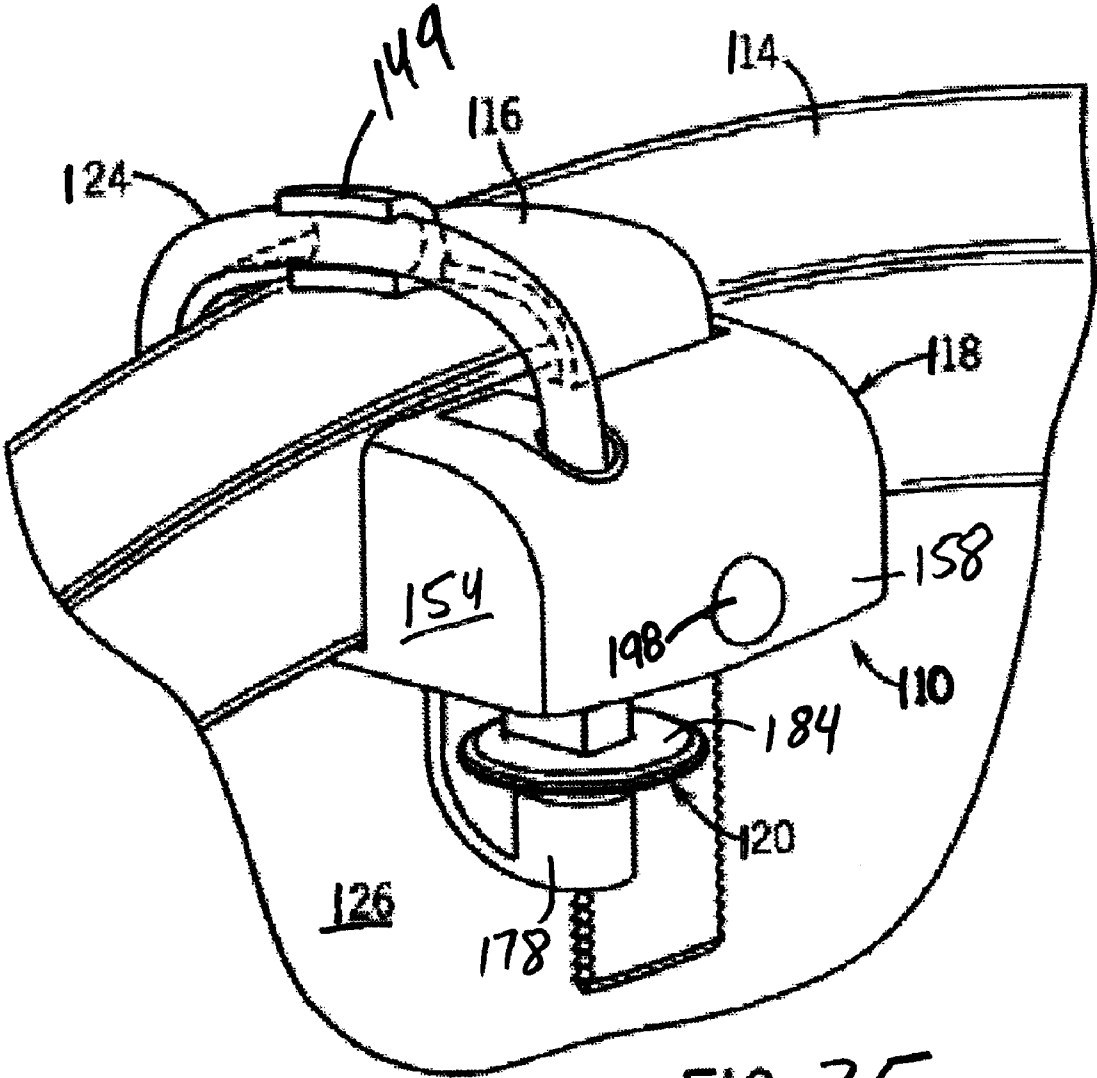


FIG. 35

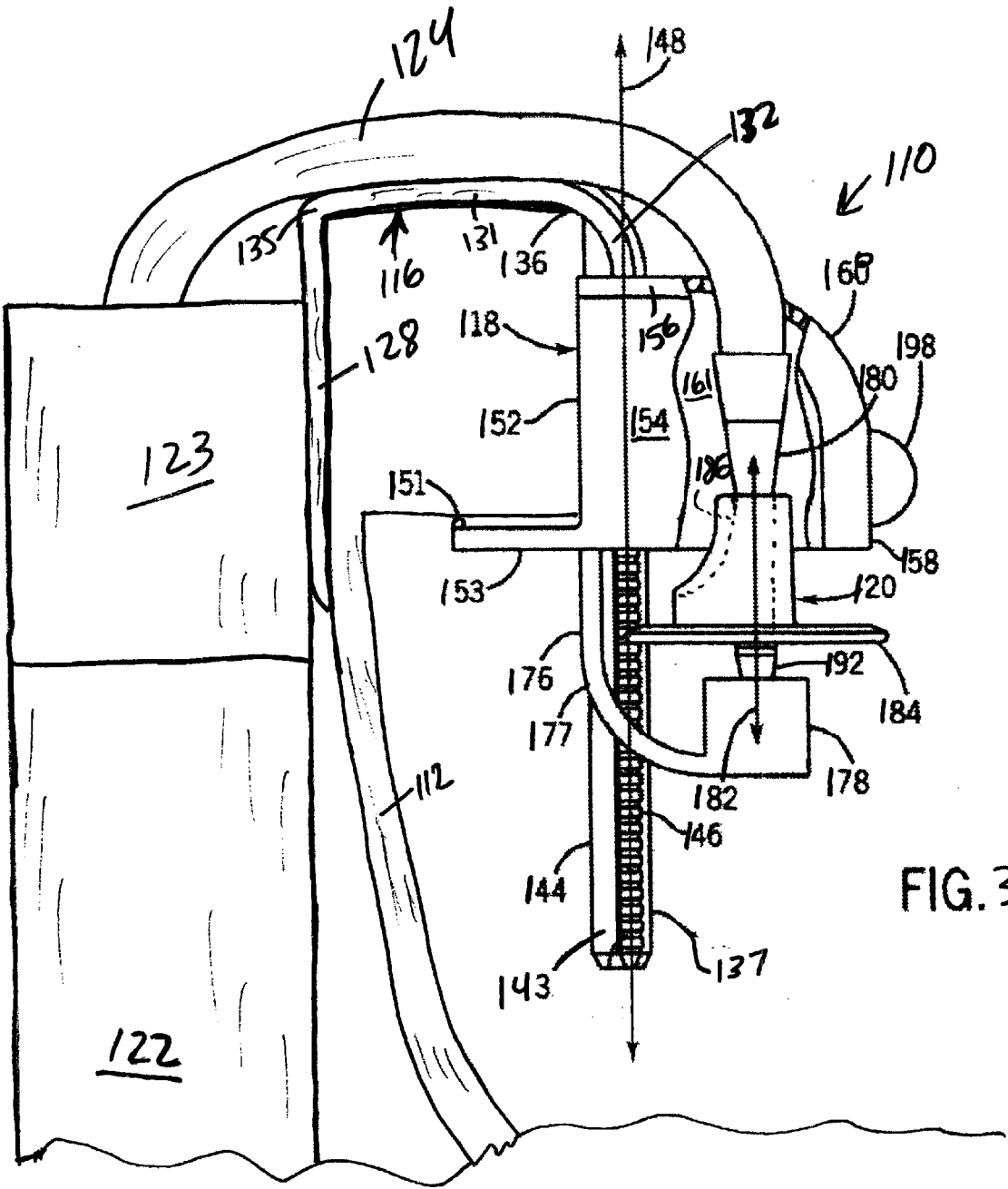


FIG. 36

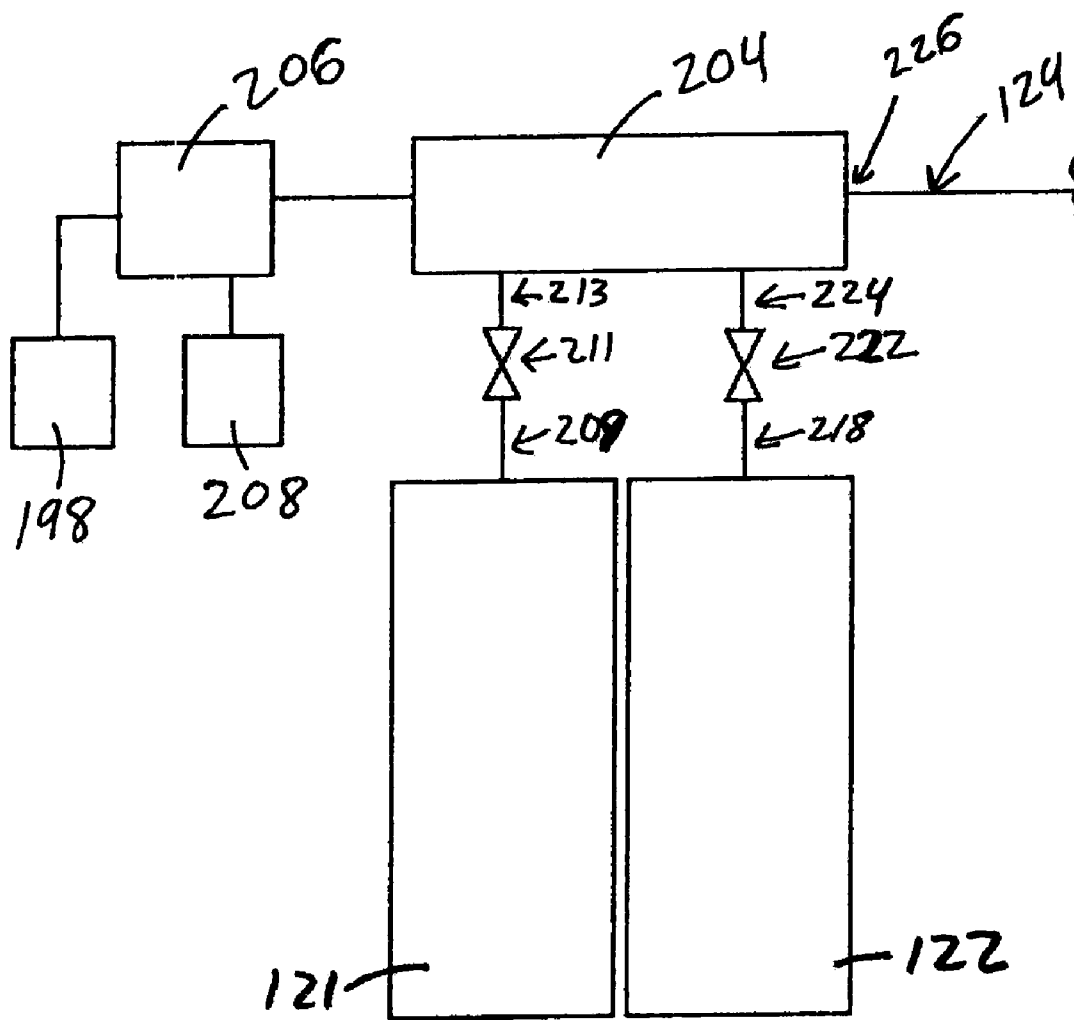
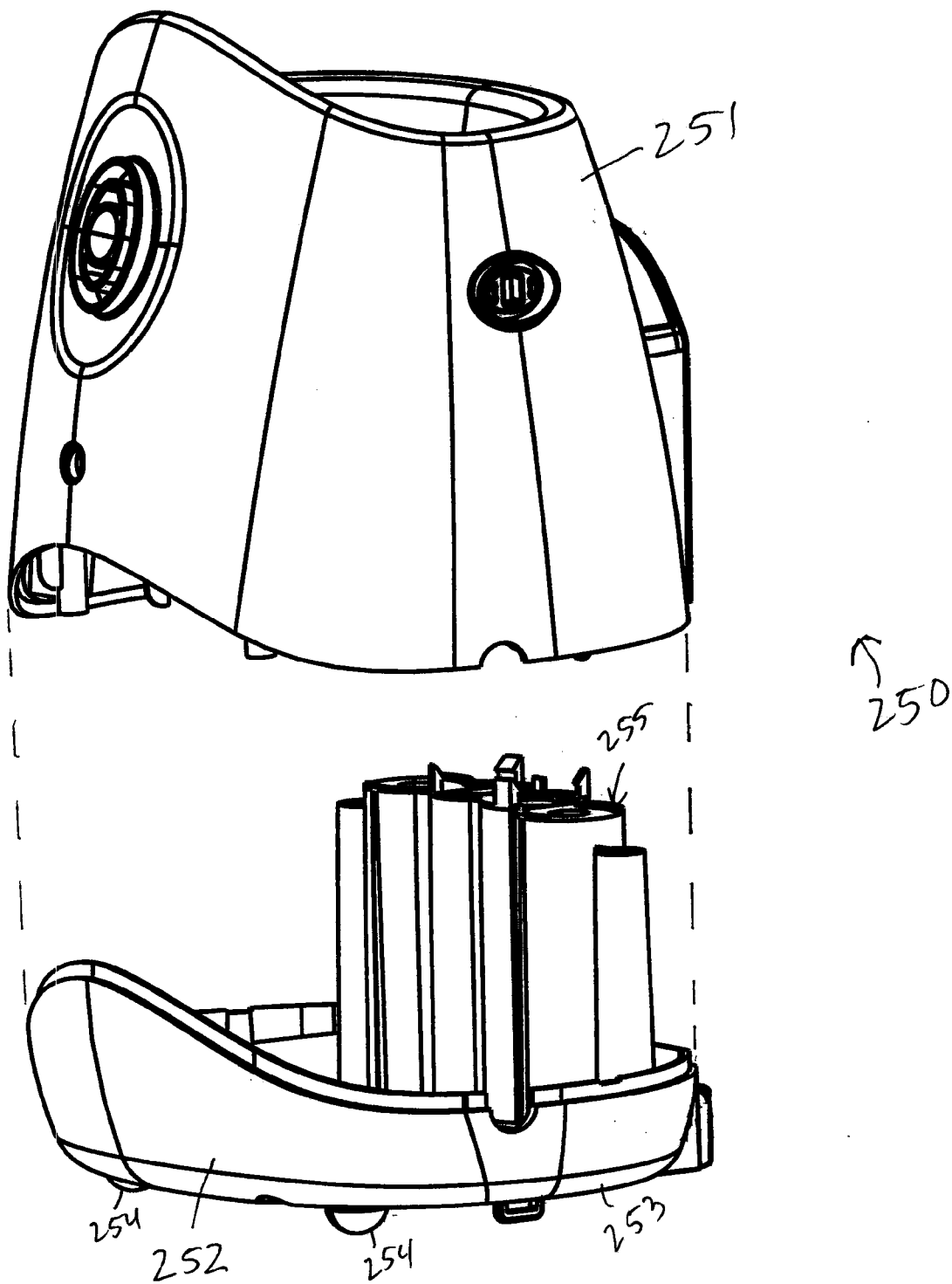


Fig. 37

Fig. 38



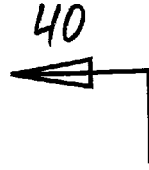


Fig. 39

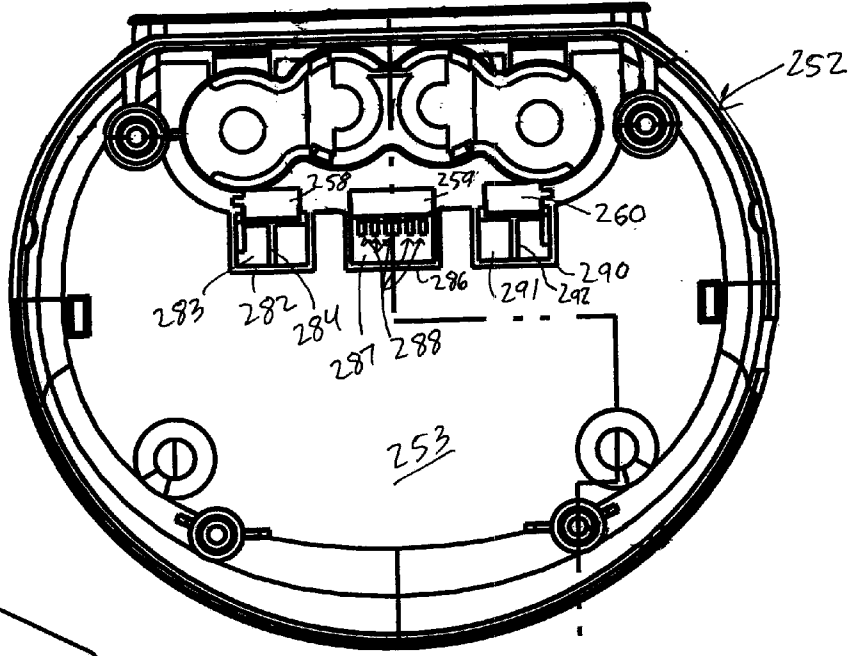


Fig. 41

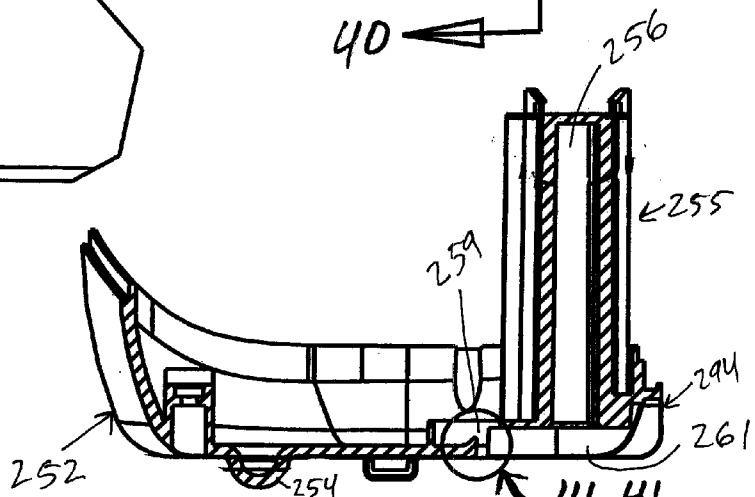
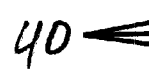
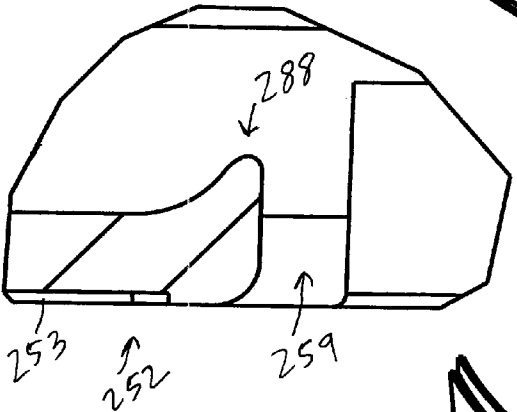


Fig. 40

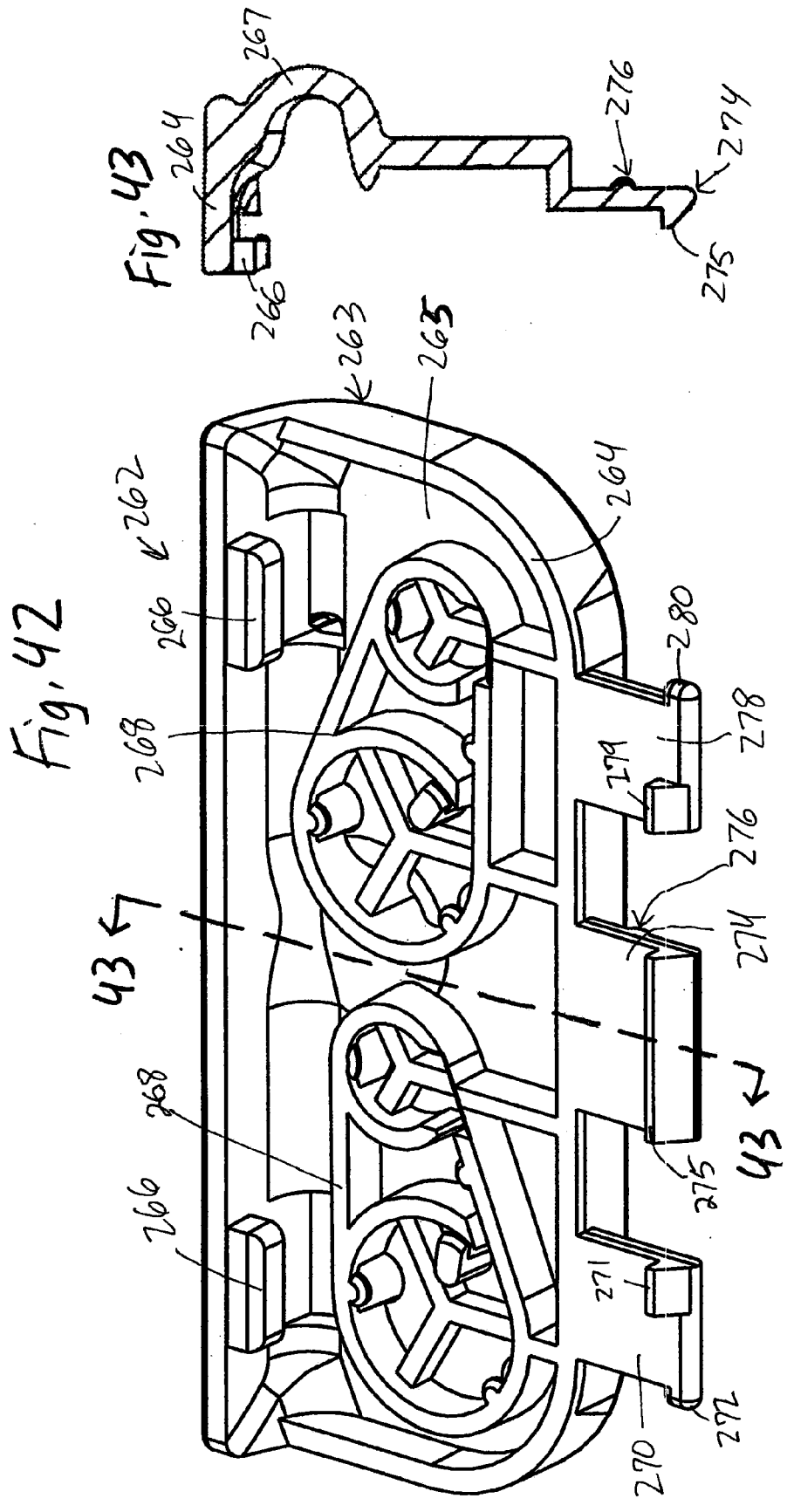
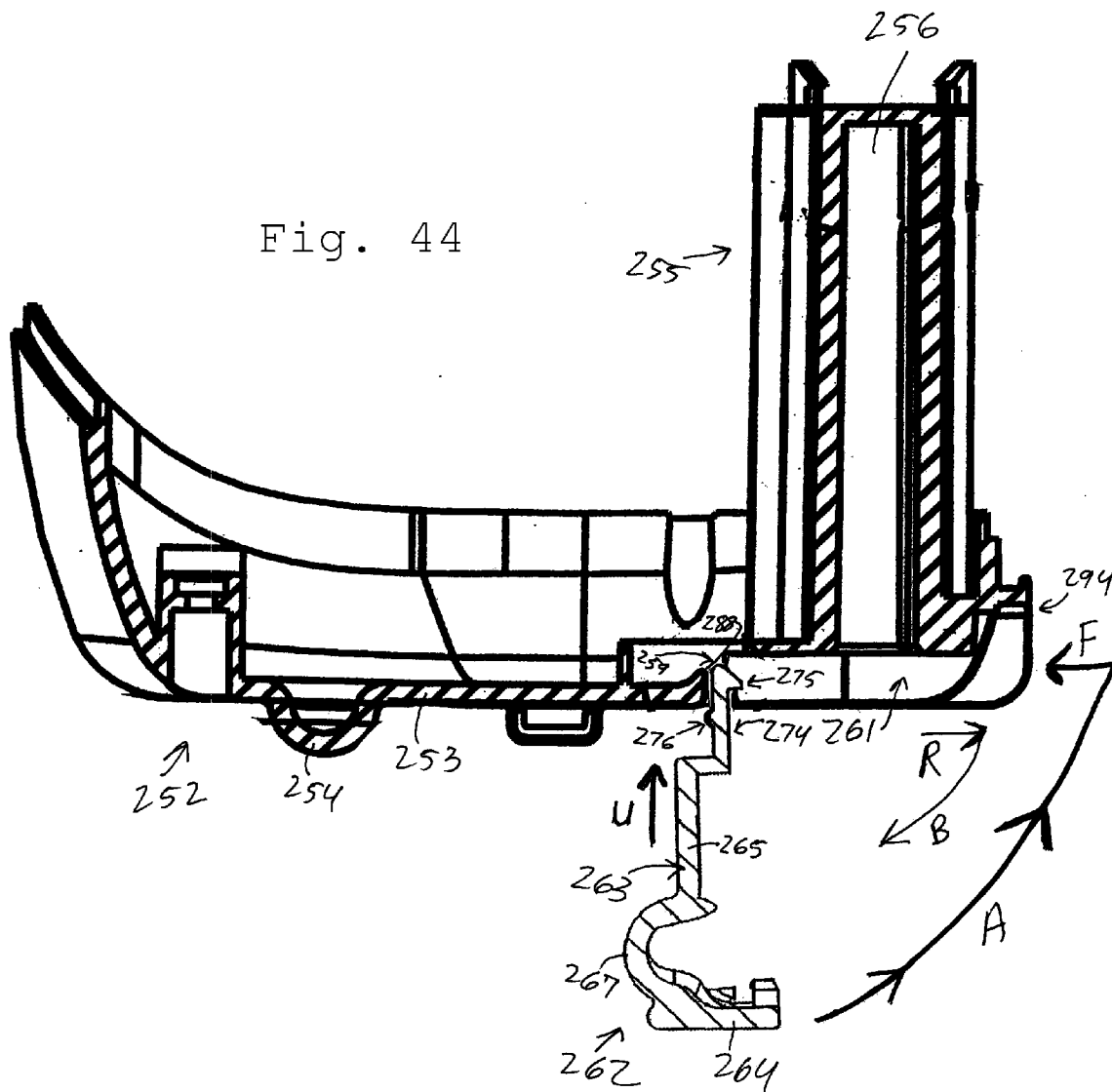


Fig. 44



TOILET BOWL CLEANING AND/OR DEODORIZING DEVICE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 11/312,281 filed Dec. 20, 2005.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not Applicable.

BACKGROUND OF THE INVENTION

[0003] 1. Field of the Invention

[0004] This invention relates to an automatic or manual toilet bowl cleaning device where the inner surface of the toilet bowl can be cleaned around the entire circumference of the toilet bowl at locations below the toilet waterline, and/or locations at the toilet waterline, and/or locations above the toilet waterline, and/or locations under the toilet rim.

[0005] 2. Description of the Related Art

[0006] Toilet bowls require care to prevent the buildup of unsightly deposits, to reduce odors and to prevent bacteria growth. Traditionally, toilet bowls have been cleaned, deodorized and disinfected by manual scrubbing with a liquid or powdered cleaning and sanitizing agent. This task has required manual labor to keep the toilet bowl clean.

[0007] In order to eliminate the manual scrubbing, various toilet bowl cleaner dispensers have been proposed. One type of dispenser comprises a solid block or solid particles of a cleansing and freshening substance that is suspended from the rim of a toilet bowl in a container that is placed in the path of the flushing water. U.S. Pat. No. 4,777,670 (which is incorporated herein by reference along with all other documents cited herein) shows an example of this type of toilet bowl cleaning system. Typically, a portion of the solid block is dissolved in the flush water with each flush, and the flush water having dissolved product is dispensed into the toilet bowl for cleaning the bowl.

[0008] Other toilet bowl cleaning systems use a liquid cleaning agent that is dispensed into a toilet bowl. For example, U.S. Pat. Nos. 6,178,564 and 6,230,334, and PCT International Publication Nos. WO 99/66139 and WO 99/66140 all disclose cleansing and/or freshening devices capable of being suspended from the rim of a toilet bowl for the purpose of introducing liquid active substances from a bottle into the flushing water with each flush. In these under the toilet rim devices, the liquid active substances are delivered downward from a reservoir to a dispensing plate that is supported by a base that is suspended from the toilet bowl rim. The device is suspended from the toilet rim such that the flow of flush water from the toilet contacts the dispensing plate during a flush. The flush water carries the liquid active substances that are on the dispensing plate into the toilet bowl to clean and freshen the toilet.

[0009] Other toilet bowl dispensers use an aerosol deodorizing and/or cleaning agent that is dispensed into a toilet bowl through a conduit attached to the toilet bowl rim. For example, U.S. Pat. No. 3,178,070 discloses an aerosol container mounted by a bracket on a toilet rim with a tube extending over the rim; and U.S. Pat. Nos. 6,029,286 and 5,862,532 disclose dispensers for a toilet bowl including a pressurized

reservoir of fluid, a conduit connected to the source of fluid, and a spray nozzle which is installed on the toilet rim.

[0010] One disadvantage with these known toilet rim dispensing devices is that these devices may only apply the deodorizing and/or cleaning agent to one location in the toilet water or a limited area in the toilet water or on the inner surface of the toilet bowl. As a result, the cleaning of the inner surface of the toilet bowl may be limited to an area of the toilet bowl near the device.

[0011] Thus, there is a need for an improved automatic or manual toilet bowl cleaning device where the inner surface of the toilet bowl is cleaned around the entire circumference of the toilet bowl.

SUMMARY OF THE INVENTION

[0012] The foregoing need can be met with a toilet bowl cleaning and/or deodorizing device according to the invention that automatically or manually delivers a chemical into the toilet bowl. The term “chemical” or “chemistry” means one chemical or a mixture of chemical ingredients. Various cleaning and/or deodorizing chemicals are suitable for use with a toilet bowl cleaning device according to the invention. The toilet bowl cleaning and/or deodorizing device includes appropriate chemistry and a dispensing system. As used herein, the term “cleaning” also includes sanitizing and/or disinfecting, and the term “deodorizing” also includes freshening.

[0013] Regarding the chemistry, a chemical is applied directly onto the inner surface of the toilet bowl and/or into the toilet water so as to continuously clean and freshen the toilet bowl. If applied to the inner surface of the toilet bowl, the chemical will either be a liquid (either single or multiple chemistry system, the multiple chemistry system combining at the point of use to create a new formula which is most effective by mixing it at that point) or a flowable powder. If added to the toilet water, the chemistry may be liquid (single or multiple chemistries) or a flowable solid (powder or crystals) that is added to the water to act as a preventive, or to create an environment that will work to clean the toilet automatically. An example of this would be to create chlorine dioxide using the toilet water, thus creating the chemistry in a gaseous state. The gas would work to coat the bowl surface and work on the various culprits.

[0014] With respect to the dispensing system, the system includes several subsystems which are the means for applying the appropriate chemistry to the inner surface of the toilet bowl to conduct the cleaning process. The dispensing system may include (but is not limited to): (i) a chemistry storage container; (ii) a chemical propulsion system; (iii) a chemical delivery system; (iv) a toilet interface; and (v) a case for the container.

[0015] The chemistry storage container is used to hold and store the chemistry used to clean the toilet bowl. Non-limiting examples include a standard plastic bottle, such as that found on a trigger sprayer, or an aerosol can.

[0016] The chemical propulsion system provides a method of providing the appropriate energy to the chemistry to move it through the delivery system so that it can move from the storage container to the appropriate area within the toilet bowl. Examples of this subsystem include an aerosol container using propellants such as liquid petroleum gas or a similar hydrocarbon based propellant, air, nitrogen or carbon dioxide. Another set of examples uses a pump or pumping mechanism to move a liquid such as a vein pump, impeller

driven pump, peristaltic pump or gear driven pump. In a third example chemical propulsion system, a piston or screw mechanism is used to push the chemical into the delivery system. This system would use a motor or worm gear to drive a platform against the liquid, continuing to move the liquid at a constant pressure into the system. In a fourth example system, a mechanical means of throwing a powder or a liquid into the toilet is employed. Finally, a mechanical means to blow a powder into the toilet can be employed (in conjunction with an air stream).

[0017] The chemical delivery system provides a method of taking moving chemistry from its storage container to the appropriate area within the toilet bowl. This delivery subsystem can include a spigot, actuator, hose and nozzle.

[0018] The toilet interface provides a means and method of attachment to the toilet to keep the hose out of the way, keep it uncrimped, and secure the nozzle into place on the toilet rim or toilet lid.

[0019] The case provides a place to stabilize and store the chemical storage container. The case can include a base and housing unit.

[0020] These subsystems work together to deliver the appropriate chemistry at predetermined times (using predetermined amounts) over the course of each day to deliver the desired consumer benefit.

[0021] Therefore, the invention provides a device for spraying an inner surface of a toilet bowl with a chemical. The device includes a container for the chemical, a spray nozzle through which the chemical can be sprayed laterally at least halfway around a perimeter of the nozzle, a conduit in fluid communication with the container and the spray nozzle, fluid delivery means for delivering chemical from the container through the conduit and to the spray nozzle, and means for attaching the spray nozzle near a rim of the toilet bowl. Optionally, the spray nozzle can spray laterally around the entire perimeter of the nozzle.

[0022] In one form, the spray nozzle is a rotating nozzle such that the chemical can be sprayed laterally around the entire perimeter of the nozzle. For example, the spray nozzle may include a fluid spinner having a helical groove and a deflection plate that rotates when contacted by the chemical exiting the helical groove thereby spraying chemical laterally around the entire perimeter of the nozzle such that chemical covers the entire circumference of the inner surface of the toilet bowl.

[0023] In one version of the invention, the container is pressurized, and the fluid delivery means comprises a propellant in the container and a valve in the conduit. The valve has an open position for delivering chemical from the container through the conduit and to the spray nozzle. The propellant may be selected from the group consisting of hydrocarbon based propellants, air, nitrogen, and carbon dioxide. A case may be provided for the container, and the case may include an activator for moving the valve into the open position thereby delivering chemical from the container through the conduit and to the spray nozzle. The valve may be opened either manually or automatically, and in one form, the valve is a tilt valve.

[0024] The fluid delivery means may further include (i) an actuator for moving the valve into the open position and keeping the valve in the open position during a spray cycle, and (ii) a timing circuit for automatically initiating and terminating the spray cycle. The timing circuit provides a method of automatically spraying the chemical. The timing

circuit initiates a first countdown. At the expiration of the first countdown, the actuator (e.g., solenoid) is activated automatically to open the valve and deliver chemical from the container through the conduit and to the spray nozzle. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated. The fluid delivery means may further include a proximity sensor for detecting presence of a person or household pet near the toilet bowl. The proximity sensor is in electrical communication with the timing circuit for preventing automatic initiation of the spray cycle when a person or household pet is near the toilet bowl.

[0025] Alternatively, the fluid delivery means may be a pump for delivering chemical from the container through the conduit and to the spray nozzle when the pump is activated either manually or automatically. In one embodiment, the pump is automatically activated during a spray cycle in that the fluid delivery means includes a timing circuit for automatically initiating and terminating the spray cycle. The timing circuit provides a method of automatically spraying the chemical. The timing circuit initiates a first countdown. At the expiration of the first countdown, the pump is activated automatically to deliver chemical from the container through the conduit and to the spray nozzle. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump. The fluid delivery means may further include a proximity sensor for detecting presence of a person or household pet near the toilet bowl. The proximity sensor is in electrical communication with the timing circuit for preventing automatic initiation of the spray cycle when a person or household pet is near the toilet bowl. The pump may be selected from the group consisting of vein pumps, impeller driven pumps, peristaltic pumps, gear driven pumps, bellows pumps, and piston pumps. A case may be provided for the container, and the case may include an activator for activating the pump.

[0026] The means for attaching the spray nozzle near a rim of the toilet bowl may be a clip having a base wall and having opposed spaced apart side walls extending away from the base wall that forms a generally U-shaped clip. Optionally, the opposed spaced apart side walls of the clip are movable toward and away from each other such that a distance between the opposed spaced apart side walls is adjustable. This allows for mounting on the clip on toilet bowl rims having various dimensions. Alternatively, the means for attaching the spray nozzle near a rim of the toilet bowl may be a suction device (e.g., a suction cup) or an adhesive material that allows the nozzle to be mounted on a surface.

[0027] The container may have a translucent wall so that a user can see the amount of chemical in the container and know when to replace an empty container with a full container. When a case is provided for the container, the case may include an access door for inserting and removing the container. The case may also include an audible or visual indicator (e.g., a light emitting diode) that signals a level of chemical in the container. For example, the indicator may indicate that no chemical remains in the container such that a user should replace the container with a full container.

[0028] The case may also include a waste bin, or a receptacle for a toilet cleaning device, such as the toilet brush described in U.S. Patent Application Publication No. 2005/0005378. The case may rest on the floor next to the toilet, or the case may have a hanger for suspending the case from a toilet tank. Alternatively, the case may include means for

suspending the case from a vertical surface such as a wall. Adhesive materials are an example of such means for suspending the case from a vertical surface.

[0029] In another aspect, the invention provides a device for spraying an inner surface of a toilet bowl with a chemical. The device includes a container for the chemical, a rotating spray nozzle through which the chemical can be sprayed laterally around a perimeter of the toilet bowl, a conduit in fluid communication with the container and the spray nozzle, fluid delivery means for delivering chemical from the container through the conduit and to the spray nozzle, and means for attaching the spray nozzle near a rim of the toilet bowl. The spray nozzle may include a fluid spinner having a helical groove and a deflection plate that rotates when contacted by the chemical exiting the helical groove. The deflection plate may include upwardly extending ribs that are contacted by the chemical exiting the helical groove to rotate the deflection plate.

[0030] In yet another aspect, the invention provides a device for spraying an inner surface of a toilet bowl with a chemical. The device includes a container for the chemical, a spray nozzle through which the chemical can be sprayed laterally around a perimeter of the toilet bowl, a conduit in fluid communication with the container and the spray nozzle, fluid delivery means for delivering chemical from the container through the conduit and to the spray nozzle, and means for positioning the spray nozzle so that in use the spray nozzle is near a rim of the toilet bowl. Preferably, the spray nozzle is structured such that that chemical can be sprayed laterally around the entire perimeter of the nozzle. The spray nozzle may be a rotating nozzle. In one form, the spray nozzle includes a fluid spinner having a helical groove and a deflection plate that rotates when contacted by the chemical exiting the helical groove.

[0031] In still another aspect, the invention provides a device for spraying an inner surface of a toilet bowl with a chemical from a container. The device includes a spray nozzle through which the chemical can be sprayed laterally at least halfway around a perimeter of the nozzle, a conduit in fluid communication with the spray nozzle, and means for attaching the spray nozzle near a rim of the toilet bowl. Preferably, the spray nozzle is structured such that that chemical can be sprayed laterally around the entire perimeter of the nozzle. In one form, the spray nozzle is a rotating nozzle. In another form, the spray nozzle includes a fluid spinner having a helical groove and a deflection plate that rotates when contacted by the chemical exiting the helical groove.

[0032] The means for attaching the spray nozzle may be a clip having a base wall and having opposed spaced apart side walls extending away from the base wall. The opposed spaced apart side walls of the clip are preferably movable toward and away from each other such that a distance between the opposed spaced apart side walls is adjustable. In another form, the means for attaching the spray nozzle comprises a bracket and a flexible attachment strip having at least one suction cup for attaching to the toilet. In yet another form, the means for attaching the spray nozzle includes a suction device, or an adhesive material. In one embodiment, the means for attaching the spray nozzle further comprises a proximity sensor for detecting presence of a person near the toilet bowl.

[0033] In yet another aspect, the invention provides a device for spraying an inner surface of an enclosure with a fluid. The device includes a container for the fluid, a fluid

delivery device through which the fluid can be applied to the inner surface of the enclosure, a fluid conduit in fluid communication with the container and the fluid delivery device, means for delivering fluid from the container through the fluid conduit and to the fluid delivery device, and a clip for mounting the fluid delivery device adjacent the inner surface of the enclosure wherein the clip includes a sensor. The sensor may be selected from proximity sensors, light sensors, sound sensors, pressure sensors, vibration sensors, motion sensors, and combinations thereof. In one version of the invention, the means for delivering fluid from the container is a pump, and the device further includes a control circuit in electrical communication with the pump and the sensor and a source of electricity, wherein the control circuit executes a stored program to initiate a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device. The enclosure can be a toilet bowl, the sensor can be a flush sensor, and the control circuit can execute the stored program to initiate the cycle after the flush sensor senses a flush. The control circuit can include a timer circuit which automatically initiates the cycle at a set time period after the flush.

[0034] In still another aspect, the invention provides a device for spraying an inner surface of a toilet bowl of a toilet with a fluid. The device includes a container for the fluid, a hanger suitable for suspending the container from the toilet, a fluid delivery device through which the fluid can be applied to the inner surface of the toilet bowl, a fluid conduit in fluid communication with the container and the fluid delivery device, a pump for delivering fluid from the container through the fluid conduit and to the fluid delivery device, and a control circuit in electrical communication with the pump. The control circuit initiates a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device. The hanger can be suitable for suspending the container from a rim of the toilet bowl. The container can be dimensioned such that the container contacts a floor on which the toilet is mounted when the container is suspended from the rim of the toilet bowl. The device can further include a sensor in electrical communication with the control circuit, and the control circuit executes initiates the cycle in response to an electrical signal from the sensor. The sensor can be a flush sensor, and the control circuit initiates the cycle after the flush sensor senses a flush.

[0035] In yet another aspect, the invention provides a device for spraying an inner surface of an enclosure with a fluid. The device includes a first container for a first fluid chemical system, a second container for a second fluid chemical system, a fluid delivery device through which fluid can be applied to the inner surface of the enclosure, means for delivering fluid from the first container and the second container to the fluid delivery device, and a clip for mounting the fluid delivery device adjacent the inner surface of the enclosure. The device can also include a holder attached to the clip wherein the first container and the second container are removably attached to the holder. In one version of the invention, the first container and the second container are attached below the holder. The means for delivering fluid from the container can be a pump, and the device can further include a control circuit in electrical communication with the pump and a source of electricity, wherein the control circuit executes a stored program to initiate a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device. The device can further include a sensor

in electrical communication with the control circuit, and the control circuit can initiate the cycle in response to an electrical signal from the sensor.

[0036] In still another aspect, the invention provides an electrical device including a housing having a battery chamber, a battery cover, and a hinge for connecting the battery cover and the housing. The hinge can include an opening in a wall of the housing and a tab connected to the battery cover. The opening and the tab are dimensioned such that the tab can be inserted into the opening when the battery cover is connected to the housing, and the opening and the tab are dimensioned such that the tab can move in the opening so that the battery cover can pivot with respect to the wall of the housing. The device includes a latch comprising a section of the wall of the housing and a portion of the tab. The latch releasably secures the battery cover to the housing in a closed position for covering an open end of the battery chamber which houses one or more batteries. The section of the wall can include a resilient finger, and the portion of the tab can include a rib. The finger engages the rib in releasably locking relationship when the cover is moved into the closed position. The hinge can further comprise at least one additional opening in the wall of the housing and at least one additional tab connected to the battery cover. Each additional opening is dimensioned such that an associated additional tab can be inserted into the additional opening when the battery cover is connected to the housing. Each additional opening and associated additional tab is dimensioned such that the associated additional tab can move in the additional opening so that the battery cover can pivot with respect to the wall of the housing. The hinge can further include a projection at an end of the tab. The projection prevents the tab from falling out of the opening after the battery cover is connected to the housing. The device can include means for delivering fluid from a container through a fluid conduit and to a fluid delivery device.

[0037] It is therefore an advantage of the invention to provide a toilet bowl cleaning device where the inner surface of the toilet bowl is cleaned around the entire circumference of the toilet bowl. The device provides for overall toilet bowl cleanliness by enhanced shine and the retardation of biofilm, mold and/or mildew growth. The device can remove or eliminate stains (hard water, metals, organic), mold, mildew, germs, odors, and bacteria.

[0038] These and other features, aspects, and advantages of the present invention will become better understood upon consideration of the following detailed description, drawings, and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] FIG. 1A is a perspective view of a toilet bowl cleaning device according to a first embodiment of the invention.

[0040] FIG. 1B is a perspective view taken along line 1B-1B of FIG. 1A showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 1A.

[0041] FIG. 1C is a perspective view showing the chemical container and container case of the toilet bowl cleaning device of FIG. 1A.

[0042] FIG. 2A is a perspective view of a toilet bowl cleaning device according to a second embodiment of the invention.

[0043] FIG. 2B is a perspective view showing the mounting and spray nozzle of the toilet bowl cleaning device of FIG. 2A.

[0044] FIG. 2C is a side view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 2A.

[0045] FIG. 2D is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 2A.

[0046] FIG. 2E is a perspective view showing an alternative chemical container case for use with the toilet bowl cleaning device of FIG. 2A.

[0047] FIG. 3A is a perspective view of a toilet bowl cleaning device according to a third embodiment of the invention.

[0048] FIG. 3B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 3A.

[0049] FIG. 3C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 3A.

[0050] FIG. 4A is a perspective view of a toilet bowl cleaning device according to a fourth embodiment of the invention.

[0051] FIG. 4B is a perspective view showing the mounting bracket and spray nozzle of the toilet bowl cleaning device of FIG. 4A.

[0052] FIG. 4C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 4A.

[0053] FIG. 4D is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 4A.

[0054] FIG. 5A is a perspective view of a toilet bowl cleaning device according to a fifth embodiment of the invention.

[0055] FIG. 5B is a perspective view showing the mounting strip and spray nozzle of the toilet bowl cleaning device of FIG. 5A.

[0056] FIG. 5C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 5A.

[0057] FIG. 5D is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 5A.

[0058] FIG. 6A is a perspective view of a toilet bowl cleaning device according to a sixth embodiment of the invention.

[0059] FIG. 6B is a perspective view showing the mounting case and spray nozzle of the toilet bowl cleaning device of FIG. 6A.

[0060] FIG. 6C is a rear view showing the mounting case of the spray nozzle of the toilet bowl cleaning device of FIG. 6A.

[0061] FIG. 6D is a perspective view showing the chemical container and container case of the toilet bowl cleaning device of FIG. 6A.

[0062] FIG. 7A is a perspective view of a toilet bowl cleaning device according to a seventh embodiment of the invention.

[0063] FIG. 7B is a perspective view showing the mounting bracket and spray nozzle of the toilet bowl cleaning device of FIG. 7A.

[0064] FIG. 7C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 7A.

[0065] FIG. 8A is a perspective view of a toilet bowl cleaning device according to an eighth embodiment of the invention.

[0066] FIG. 8B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 8A.

[0067] FIG. 8C is a side view of the chemical container case of the toilet bowl cleaning device of FIG. 8A suspended from the toilet tank.

[0068] FIG. 8D is a front right perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 8A.

[0069] FIG. 8E is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 8A.

[0070] FIG. 9A is a perspective view of a toilet bowl cleaning device according to a ninth embodiment of the invention.

[0071] FIG. 9B is a perspective view showing the container case of the toilet bowl cleaning device of FIG. 9A.

[0072] FIG. 9C is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 9A.

[0073] FIG. 10A is a perspective view of a toilet bowl cleaning device according to a tenth embodiment of the invention.

[0074] FIG. 10B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 10A.

[0075] FIG. 10C is a perspective view showing the chemical container case and toilet brush of the toilet bowl cleaning device of FIG. 10A.

[0076] FIG. 11A is a perspective view of a toilet bowl cleaning device according to an eleventh embodiment of the invention.

[0077] FIG. 11B is a front perspective view showing the chemical container case and toilet brush of the toilet bowl cleaning device of FIG. 11A.

[0078] FIG. 11C is a rear perspective view showing the chemical container case and toilet brush of the toilet bowl cleaning device of FIG. 11A.

[0079] FIG. 11D is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 11A.

[0080] FIG. 12A is a perspective view of a toilet bowl cleaning device according to a twelfth embodiment of the invention.

[0081] FIG. 12B is an exploded perspective view showing the mounting clip, spray nozzle, cleaner container, and container case of the toilet bowl cleaning device of FIG. 12A.

[0082] FIG. 13A is a perspective view of a toilet bowl cleaning device according to a thirteenth embodiment of the invention.

[0083] FIG. 13B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 13A.

[0084] FIG. 13C is a top perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 13A suspended in the toilet tank.

[0085] FIG. 13D is a top perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 13A.

[0086] FIG. 13E is a front cutaway view of a toilet bowl cleaning device according to a thirteenth embodiment of the invention having the fluid delivery conduit inserted in the overflow tube of the toilet.

[0087] FIG. 14A is a perspective view of a toilet bowl cleaning device according to a fourteenth embodiment of the invention.

[0088] FIG. 14B is a perspective view showing the under-the-lid spray nozzle of the toilet bowl cleaning device of FIG. 14A.

[0089] FIG. 14C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 14A.

[0090] FIG. 14D is a perspective view showing the chemical container inserted in the container case of the toilet bowl cleaning device of FIG. 14A.

[0091] FIG. 15A is a perspective view of a toilet bowl cleaning device according to a fifteenth embodiment of the invention.

[0092] FIG. 15B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 15A.

[0093] FIG. 15C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 15A.

[0094] FIG. 16A is a perspective view of a toilet bowl cleaning device according to a sixteenth embodiment of the invention.

[0095] FIG. 16B is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 16A attached to a wall.

[0096] FIG. 16C is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 16A.

[0097] FIG. 17A is a perspective view of a toilet bowl cleaning device according to a seventeenth embodiment of the invention.

[0098] FIG. 17B is a perspective view showing the mounting clip and spray nozzle of the toilet bowl cleaning device of FIG. 17A.

[0099] FIG. 17C is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 17A.

[0100] FIG. 17D is a perspective view showing the waste bin of the container case of the toilet bowl cleaning device of FIG. 17A.

[0101] FIG. 17E is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 17A.

[0102] FIG. 18A is a perspective view of a toilet bowl cleaning device according to an eighteenth embodiment of the invention.

[0103] FIG. 18B is a perspective view showing the chemical container case of the toilet bowl cleaning device of FIG. 18A.

[0104] FIG. 18C is a perspective view showing the chemical container being inserted in the container case of the toilet bowl cleaning device of FIG. 18A.

[0105] FIG. 18D is a perspective view showing the removable waste bin of the container case of the toilet bowl cleaning device of FIG. 18A.

[0106] FIG. 19A is a perspective view of a toilet bowl cleaning device according to a nineteenth embodiment of the invention.

[0107] FIG. 19B is a perspective view showing the mounting base and spray nozzle of the toilet bowl cleaning device of FIG. 19A.

[0108] FIG. 19C is a side view showing the chemical container case of the toilet bowl cleaning device of FIG. 19A mounted on a toilet.

[0109] FIG. 20A is a perspective view of a toilet bowl cleaning device according to a twentieth embodiment of the invention.

[0110] FIG. 20B is a perspective view showing the mounting base and spray nozzle of the toilet bowl cleaning device of FIG. 20A.

[0111] FIG. 21A is a perspective view of the container base, container, fluid conduit, mounting clip, and spray nozzle of a toilet bowl cleaning device according to a twenty-first embodiment of the invention.

[0112] FIG. 21B is an exploded perspective view of the toilet bowl cleaning device of FIG. 21A.

[0113] FIG. 22A is a right perspective view of the container case and fluid conduit of a toilet bowl cleaning device according to a twenty-second embodiment of the invention.

[0114] FIG. 22B is a front view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 22A.

[0115] FIG. 22C is a right side view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 22A.

[0116] FIG. 22D is a top view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 22A.

[0117] FIG. 22E is a left perspective view showing the container case and fluid conduit of the toilet bowl cleaning device of FIG. 22A.

[0118] FIG. 22F is a perspective view showing the toilet bowl cleaning device of FIG. 22A mounted on the side wall of a toilet tank.

[0119] FIG. 22G is a right perspective view showing the container case and container access door of the toilet bowl cleaning device of FIG. 22A.

[0120] FIG. 22H is a side view showing the toilet bowl cleaning device of FIG. 22A mounted on the side wall of a toilet tank.

[0121] FIG. 22I is a rear perspective view showing the container case and hanger of the toilet bowl cleaning device of FIG. 22A.

[0122] FIG. 22J is a side detailed view showing the hanger of the toilet bowl cleaning device of FIG. 22A as mounted on a toilet tank.

[0123] FIG. 22K is a perspective detailed view showing one case leveling set screw of the toilet bowl cleaning device of FIG. 22A.

[0124] FIG. 23A is a right perspective view of the container case and fluid conduit of a toilet bowl cleaning device according to a twenty-third embodiment of the invention.

[0125] FIG. 23B is a front view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 23A.

[0126] FIG. 23C is a right side view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 23A.

[0127] FIG. 23D is a top view showing the internal container and fluid delivery means of the toilet bowl cleaning device of FIG. 23A.

[0128] FIG. 23E is a left perspective view showing the container case and fluid conduit of the toilet bowl cleaning device of FIG. 23A.

[0129] FIG. 23F is a perspective view showing the toilet bowl cleaning device of FIG. 23A mounted on the side wall of a toilet tank.

[0130] FIG. 23G is a right perspective view showing the container case and container access door of the toilet bowl cleaning device of FIG. 23A.

[0131] FIG. 23H is a side view showing the toilet bowl cleaning device of FIG. 23A mounted on the side wall of a toilet tank.

[0132] FIG. 23I is a rear perspective view showing the container case and hanger of the toilet bowl cleaning device of FIG. 23A.

[0133] FIG. 23J is a side detailed view showing the hanger of the toilet bowl cleaning device of FIG. 23A as mounted on a toilet tank.

[0134] FIG. 23K is a perspective detailed view showing one case leveling set screw of the toilet bowl cleaning device of FIG. 23A.

[0135] FIG. 24A is a perspective showing yet another mounting clip and spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0136] FIG. 24B is an enlarged perspective of the mounting clip and spray nozzle of FIG. 24A.

[0137] FIG. 24C is another perspective of the mounting clip and spray nozzle of FIG. 24A.

[0138] FIG. 24D is a top right perspective view showing the mounting clip and spray nozzle of FIG. 24A mounted on the rim of a toilet bowl.

[0139] FIG. 24E is a top left perspective view showing the mounting clip and spray nozzle of FIG. 24A mounted on the rim of a toilet bowl.

[0140] FIG. 25 is a perspective view of one embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0141] FIG. 26 is an exploded perspective view of another embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0142] FIG. 27 is an exploded perspective view of yet another embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0143] FIG. 28 is an exploded perspective view of still another embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0144] FIG. 29 is an exploded perspective view of yet another embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0145] FIG. 30 is a perspective view of still another embodiment of a spray nozzle suitable for use with a toilet bowl cleaning device according to the invention.

[0146] FIG. 31 is an exploded perspective view of the spray nozzle of FIG. 30.

[0147] FIG. 32 is a cross-sectional view of the spray nozzle of FIG. 30 taken along line 32-32 of FIG. 30.

[0148] FIG. 33 is a cross-sectional view of the fluid spinner body of the spray nozzle of FIG. 31 taken along line 33-33 of FIG. 31.

[0149] FIG. 34 is a perspective view of a toilet bowl cleaning device according to a twenty-third embodiment of the invention.

[0150] FIG. 35 is a perspective, fragmentary view taken along line 35-35 of FIG. 34 showing a clip of the toilet bowl cleaning device of FIG. 34.

[0151] FIG. 36 is a side elevational view having a cutout showing a portion of the interior of the clip of FIG. 35.

[0152] FIG. 37 is a schematic showing control circuit and fluid delivery paths in the toilet bowl cleaning device of FIG. 34.

[0153] FIG. 38 is an exploded perspective view of another embodiment of a housing for supporting an inverted container of a toilet bowl cleaning device according to the invention.

[0154] FIG. 39 is a top view of the bottom part of the housing of FIG. 38.

[0155] FIG. 40 is a cross-sectional view of the housing of FIG. 39 taken along line 40-40 of FIG. 39.

[0156] FIG. 41 is a cross-sectional detailed view of the housing taken along line 41-41 of FIG. 40.

[0157] FIG. 42 is a top, front perspective view of a battery cover for a battery chamber of the housing of FIG. 38.

[0158] FIG. 43 is a cross-sectional detailed view of the battery cover of FIG. 42 taken along line 43-43 of FIG. 42.

[0159] FIG. 44 is a cross-sectional view similar to FIG. 40 showing the battery cover being installed in the housing of FIG. 38.

[0160] Like reference numerals will be used to refer to like parts from Figure to Figure in the following description of the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0161] The invention provides a device for spraying an inner surface of a toilet bowl with a chemical. Various embodiments of the invention will now be described with reference to the Figures. The embodiments are shown and described for the purposes of illustration and are not intended to limit the invention in any way.

[0162] Turning to FIGS. 1A-1C, there is shown an embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 50 for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 50 and the spray nozzle 80, and a mounting clip 60 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water so as to continuously clean and deodorize the toilet bowl 12 as described below.

[0163] The container 50 is housed upside down in a case 30. A fitment is provided in the case 30 for engaging an outlet of the container 50. The fitment of the case 30 is also connected to the fluid supply conduit 49. A wall 51 of the container 50 may be translucent so the user can see when the container is empty. The case 30 includes a container holder 36 that keeps the container 50 securely mounted in the case 30. In one form, the container holder 36 is downwardly biased plate that may be lifted by a user in the direction of arrow A to release and remove an empty container 50 and thereafter load a new container 50.

[0164] A use-up cue light emitting diode (LED) 34 is provided in the case 30. A pressure-based fluid level sensor senses a pressure drop in the container 50 when the container 50 is empty and the pressure-based fluid level sensor triggers the LED to emit light and signal that an empty container 50 exists. Optionally, the pressure-based fluid level sensor triggers an audible alarm to signal that an empty container 50 exists. Alternatively, the LED is part of a control circuit including a counter. The counter is incremented after each depression of an activator button (such as manual activator button 32 described below). After a certain number of depressions of the activator button, the counter triggers the LED to emit light and signal that an empty container 50 exists.

[0165] The case 30 also includes a manual activator button 32. In one version of the invention, the container 50 is pressurized and includes a propellant in the container 50 and an outlet valve. The manual activator button 32 moves the valve into an open position for delivering chemical from the container 50 through the conduit 49 and to the spray nozzle 80.

For example, the activator button 32 pushes the container 50 downward such that the valve at the bottom of the container 50 opens.

[0166] FIG. 1B shows the mounting clip 60 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 60 has a base wall 62, a first side wall 64, and a second side wall 67 spaced from the first side wall 64 to create an inverted generally U-shaped clip 60. The clip 60 is formed from a flexible plastic to allow for expansion and contraction to accommodate various toilet bowl rim sizes. The conduit 49 is threaded through a hole 65 in the first side wall 64, over the base wall 62, and through a hole 68 in the second side wall 67. This controls location of the conduit 49 to next to the mounting clip 60 and serves to hide part of the conduit 49. The spray nozzle 80 engages an end of the conduit 49 as shown in FIG. 1B and receives chemical from the conduit 49.

[0167] Referring now to FIGS. 2A-2E, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 150 for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 150 and the spray nozzle 80, and a mounting clip 160 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0168] The container 150 is housed in a case 130. A fitment is provided in the case 130 for engaging an outlet of the container 150. The fitment of the case 130 is connected to the fluid supply conduit 49 by a rotating hose connector 142 that allows the conduit 49 to rotate in direction C. The case 130 includes an access door 138 that may be opened by a user as shown in FIG. 2C to remove an empty container 150 and thereafter load a new container 150. A hinge 140 is provided at the bottom of the door 138 for swinging movement of the door 138. A latch 139 keeps the door 138 shut until a user unlatches the door 138. A use-up cue light emitting diode (LED) 134 is provided in the case 130. A pressure-based fluid level sensor senses a pressure drop in the container 150 when the container 150 is empty and the pressure-based fluid level sensor triggers the LED to emit light and signal that an empty container 150 exists. Alternatively, the LED 134 is part of a control circuit including a counter. The counter is incremented after each depression of an activator button or foot pedal (such as manual activator foot pedal 141 described below). After a certain number of depressions of the activator button or foot pedal, the counter triggers the LED 134 to emit light and signal that an empty container exists.

[0169] The case 130 also includes a manual activator foot pedal 141. In one version of the invention, the container 150 is pressurized and includes a propellant in the container 150 and an outlet valve. The manual activator foot pedal 141 moves the container 150 upward such that the valve at the top of the container 150 opens and delivers chemical to the conduit 49. The valve may be a standard vertical aerosol valve in this embodiment.

[0170] FIG. 2B shows the mounting clip 160 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 160 has a base wall 162, a first side wall 164, and a second side wall 167 spaced from the first side wall 164 to create an inverted generally U-shaped clip 160. The second side wall 167 slides on the base wall 162

such that the first side wall 164 and the second side wall are movable toward and away from each other. This expansion and contraction of the clip 160 accommodates various toilet bowl rim sizes. The conduit 49 is connected to a passageway 163 in the base wall 162. The spray nozzle 80 engages an end of the passageway 163 as shown in FIG. 2B and receives chemical from the passageway 163.

[0171] FIG. 2E shows another case 230 for the container 150. A fitment is provided in the case 230 for engaging an outlet of the container 150. The case 230 includes an access door 238 that may be opened by a user to remove an empty container 150 and thereafter load a new container 150. A hinge is provided at the bottom of the door 238 for swinging movement of the door 238. A latch button 239 keeps the door 238 shut until a user unlatches the door 238. A use-up cue light emitting diode (LED) 234 is provided in the case 230 and operates as LED 134 described above. The case 230 also includes a manual activator foot pedal 241 which operates as manual activator foot pedal 141 described above.

[0172] Turning to FIGS. 3A-3C, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container and the spray nozzle 80, and a mounting clip 360 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0173] The container is housed in a case 330. The container may be exposed at the rear of the case 330. A fitment is provided in the case 330 for engaging an outlet of the container. The fitment of the case 330 is connected to the fluid supply conduit 49. The case 330 includes a T-shaped activator handle 333. The container may be pressurized and include a propellant in the container and an outlet valve. The activator handle 333 pushes the container 50 downward such that the valve at the bottom of the container 50 opens for delivering chemical from the container through the conduit 49 and to the spray nozzle 80. The handle 333 also allows the case 300 to be carried around by a user. A circular use-up cue light emitting diode (LED) 334 is provided in the case 330 around the base of the handle 333. The LED 334 operates as LED 134 described above.

[0174] FIG. 3B shows the mounting clip 360 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 360 has a base wall 362 and a side wall 164 to create an inverted generally L-shaped clip 160 that may be adhered to the toilet rim 14 by an adhesive or a suction cup. The conduit 49 is connected to a passageway in the base wall 362. The spray nozzle 80 engages an end of the passageway 363 as shown in FIG. 3B and receives chemical from the passageway.

[0175] Referring now to FIGS. 4A-4D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 550 for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 550 and the spray nozzle 80, and a mounting assembly 560 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by

the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0176] The container 550 is housed in a case 530. A fitment is provided in the case 530 for engaging an outlet of the container 550. The fitment of the case 530 is connected to the fluid supply conduit 49 which exits at the back of the case 530. The case 530 includes a top access door 538 that may be opened by a user as shown in FIG. 4D to remove an empty container 550 and thereafter load a new container 550. A hinge 540 is provided at the bottom rear of the door 538 for swinging movement of the door 538. A latch 539 keeps the door 538 shut until a user unlatches the door 538. A use-up cue light emitting diode (LED) 534 is provided in the case 530. A pressure-based fluid level sensor senses a pressure drop in the container 550 when the container 550 is empty and the pressure-based fluid level sensor triggers the LED to emit light and signal that an empty container 550 exists.

[0177] The case 530 also includes a manual activator foot pedal 541. In one version of the invention, the container 550 is pressurized and includes a propellant in the container 550 and an outlet valve. The manual activator foot pedal 541 moves the container 550 such that the valve of the container 550 opens and delivers chemical to the conduit 49.

[0178] FIG. 4B shows the mounting assembly 560 for attaching the spray nozzle 80 under the toilet seat 18 of the toilet 10. The mounting assembly 560 has a T-shaped bracket 570 and a suction cup 571 that may be adhered to the toilet seat 18. The conduit 49 is connected to a passageway in the T-shaped bracket 570. The spray nozzle 80 engages an end of the passageway as shown in FIG. 4B and receives chemical from the passageway.

[0179] Turning to FIGS. 5A-5D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 650 for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 650 and the spray nozzle 80, and a mounting bracket 660 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0180] The container 650 is housed in a case 630. A retaining ring 637 keeps the container 650 secure in the case 630. A fitment is provided in the case 630 for engaging an outlet of the container 650. The fitment of the case 630 is connected to the fluid supply conduit 49. The case 630 includes an access door 638 that may be opened forwardly by a user as shown in FIG. 5D to remove an empty container 650 and thereafter load a new container 650 in direction B shown in FIG. 5D. A hinge is provided at the bottom of the door 638 for swinging movement of the door 638. A latch keeps the door 638 shut until a user unlatches the door 638. A use-up cue light emitting diode (LED) 634 is provided in the case 630. The LED 634 operates as LED 134 described above. The case 630 also includes a manual activator foot pedal 641. In one version of the invention, the container 650 is pressurized and includes a propellant in the container 650 and an outlet valve. The manual activator foot pedal 641 moves the container 650 such that the valve of the container 650 opens and delivers chemical to the conduit 49.

[0181] FIG. 5B shows the mounting clip 660 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 660 has a base wall 662 and a side

wall 664 to create an inverted generally L-shaped bracket 673 that may be adhered to the toilet rim 14 by a double sided adhesive strip 674. The adhesive strip 674 can be removed by pulling the tab. The conduit 49 is connected to a passageway in the L-shaped bracket 673 by moving the conduit 49 in the direction of arrow A. The spray nozzle 80 engages an end of the passageway as shown in FIG. 5B and receives chemical from the passageway.

[0182] Referring now to FIGS. 6A-6D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 750 for a chemical, spray nozzles 778 through which the chemical can be sprayed laterally around a perimeter of the nozzles 778, a fluid supply conduit 49 in fluid communication with the container 750 and the spray nozzles 778, and a mounting assembly 760 having the spray nozzles 778 which are positioned near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzles 778 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0183] The container 750 is housed in a case 730 and displayed at an angle from vertical. The container 750 may be translucent so the user can see when the container is empty. The case 730 includes a container holder 736 that keeps the container 750 securely mounted in the case 730. In one form, the container holder 736 is downwardly biased plate that may be lifted upward by a user to release and remove an empty container 750 and thereafter load a new container 750. A fitment is provided in the case 730 for engaging an outlet of the container 750. The fitment of the case 730 is connected to the fluid supply conduit 49. The case 730 also includes a manual activator button 732. In one version of the invention, the container 750 is pressurized and includes a propellant in the container 750 and an outlet valve. The manual activator button 732 moves the valve into an open position for delivering chemical from the container 750 through the conduit 49 and to the spray nozzle 80. For example, the activator button 732 pushes the container 750 downward such that the valve at the bottom of the container 750 opens. A use-up cue light emitting diode (LED) 734 is also provided in the case 730. The LED 734 operates as LED 134 described above.

[0184] FIG. 6B shows the mounting assembly 760 which positions the spray nozzles 778 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting assembly 760 has a housing wall 776 that may be adhered to the toilet rim 14 by suction cup 777. The conduit 49 is connected to the spray nozzles 778 via a passageway in the mounting assembly 760.

[0185] Turning to FIGS. 7A-7C, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container for a chemical, spray nozzles 878 through which the chemical can be sprayed laterally around a perimeter of the spray nozzles 878, a fluid supply conduit 49 in fluid communication with the container 750 and the spray nozzles 878, and a mounting assembly 860 having the spray nozzles 878 which are positioned near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzles 878 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0186] The container is housed in a case 830. The case 830 may be a translucent housing 831 so the user can see when the container is empty. The case 830 includes a container holder that keeps the container securely mounted in the case 830. A fitment is provided in the case 830 for engaging an outlet of

the container. The fitment of the case 830 is connected to the fluid supply conduit 49. The case 830 acts as a manual activator button. In one version of the invention, the container is pressurized and includes a propellant in the container and an outlet valve. The case 830 acts as a manual activator button by moving the valve into an open position for delivering chemical from the container through the conduit 49 and to the spray nozzles 878. For example, the case 830 pushes the container downward such that the valve at the bottom of the container opens. The translucent housing 831 may also provide a use-up cue. A pressure-based fluid level sensor senses a pressure drop in the container when the container is empty and the pressure-based fluid level sensor triggers a light within the translucent housing 831. The housing 831 then glows to signal that an empty container exists.

[0187] FIG. 7B shows a mounting bracket 860 which positions the spray nozzles 878 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting bracket 860 has a T-shaped bracket 870 that may be adhered to the toilet rim 14 by suction cups 871. The conduit 49 is connected to the spray nozzles 878 via a passageway in the T-shaped bracket 870. A plastic tab 879 allows a user to grab the T-shaped bracket 870 without unwanted interaction with the toilet 10.

[0188] Referring now to FIGS. 8A-8E, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 950 for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 950 and the spray nozzle 80, and a mounting clip 960 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0189] The container 950 is housed in a case 930. A wall 951 of the container 950 may be translucent so the user can see when the container 950 is empty. A fitment is provided in the case 930 for engaging an outlet of the container 950. The fitment of the case 930 is connected to the fluid supply conduit 49 by a rotating hose connector 942. The case 930 includes an access door 938 that may be opened by a user as shown in FIG. 8E to remove an empty container 950 and thereafter load a new container 950 in direction B shown in FIG. 8E. A hinge is provided at the side of the door 938 for swinging movement of the door 938. A latch keeps the door 938 shut until a user unlatches the door 938. A use-up cue light emitting diode (LED) 934 is provided in the case 930. The LED 934 operates as LED 134 described above. The case 930 also includes a manual activator button 932. In one version of the invention, the container 950 is pressurized and includes a propellant in the container 950 and an outlet valve. The manual activator button 932 moves the container 950 such that the valve of the container 950 opens and delivers chemical to the conduit 49. The case 930 has an inverted J-shaped hanger 944 that extends upwardly from the case 930. The hanger 944 of the case 930 allows a user to suspend the case 930 from a side wall 24 of the toilet tank 22 as shown in FIG. 8C.

[0190] FIG. 8B shows the mounting clip 960 for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 960 has a base wall 962, a first side wall 964, and a second side wall 967 spaced from the first side wall 964 to create an inverted generally U-shaped clip 960. The mounting clip 960 is flexible such that the first side wall 164 and the second side wall are movable toward and

away from each other. This expansion and contraction of the clip **960** accommodates various toilet bowl rim sizes. The conduit **49** is connected to a passageway **963** in the mounting clip **960**. The spray nozzle **80** engages an end of the passageway **963** as shown in FIG. **8B** and receives chemical from the passageway **963**. The low profile wide bowl clip **960** hides the appearance of the conduit **49**.

[0191] Turning to FIGS. **9A-9C**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50a** for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container **50a** and the spray nozzle **80**, and a mounting clip **60a** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0192] The container **50a** is housed in a case **30a**. A fitment is provided in the case **30a** for engaging an outlet of the container **50a**. The fitment of the case **30a** is connected to the fluid supply conduit **49**. The case **30a** includes an access door **38a** that may be opened by a user as shown in FIG. **9C** to remove an empty container **50a** and thereafter load a new container **50a** in direction **B** shown in FIG. **9C**. A hinge is provided at the bottom of the door **38a** for swinging movement of the door **38a** in direction **A** of FIG. **9B**. A latch **39a** keeps the door **38a** shut until a user unlatches the door **38a**. A use-up cue light emitting diode (LED) **34a** is provided in the case **30a**. The LED **34a** operates as LED **134** described above. The case **30a** also includes a manual activator button **32a**. In one version of the invention, the container **50a** is pressurized and includes a propellant in the container **50a** and an outlet valve. The manual activator button **32a** moves the container **50a** such that the valve of the container **50a** opens and delivers chemical to the conduit **49**. The case **30a** has an inverted J-shaped hanger **44a** that extends upwardly from the case **30a**. The hanger **44a** of the case **30a** allows a user to suspend the case **30a** from a side wall **24** of the toilet tank **22** as shown in FIG. **9A**.

[0193] Referring now to FIGS. **10A-10E**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container and the spray nozzle **80**, and a mounting clip **60b** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0194] The container is housed in a case **30b**. A fitment is provided in the case **30b** for engaging an outlet of the container. The fitment of the case **30b** is connected to the fluid supply conduit **49**. The case **30b** includes a top access door **38b** that may be opened by a user to remove an empty container and thereafter load a new container. A hinge is provided on the door **38b** for swinging movement of the door **38b**. The case **30b** also includes a well **45b** and a pair opposed spaced apart protrusions **46b**. The head of a toilet brush **58b** may be placed in the well **45b** and the handle **59b** of the toilet brush **58b** may rest between the protrusions **46b**. The case **30b** may rest on the floor next to the toilet and conveniently hold the toilet brush **58b** as shown.

[0195] FIG. **10B** shows the mounting clip **60b** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The mounting clip **60b** has a base wall and a side wall to create an inverted generally L-shaped clip **73b** that may be adhered to the toilet rim **14** by a suction cup **75b**. The conduit **49** is connected to a passageway in the L-shaped clip **73b**. The spray nozzle **80** engages an end of the passageway as shown in FIG. **10B** and receives chemical from the passageway.

[0196] Turning to FIGS. **11A-11D**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50c** for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container **50c** and the spray nozzle **80**, and a mounting clip **60c** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0197] The container **50c** is housed in a case **30c**. A fitment is provided in the case **30c** for engaging an outlet of the container **50c**. The fitment of the case **30c** is connected to the fluid supply conduit **49**. The case **30c** includes an access door **38c** that may be opened by a user by latch **39c** to remove an empty container and thereafter load a new container **50c**. A hinge is provided on the door **38c** for swinging movement of the door **38c** in direction **A** of FIG. **11D**. The case **30c** also includes a rear well **45c**. The head of a toilet brush **58c** may be placed in the well **45c** and the handle of the toilet brush **58b** may rest against the case **30c** as shown in FIG. **11C**. The case **30c** may rest on the floor next to the toilet and conveniently hold the toilet brush **58c** in the back of the case **30c** as shown.

[0198] A use-up cue light emitting diode (LED) **34c** is provided in the case **30c**. A pressure-based fluid level sensor senses a pressure drop in the container **50c** when the container **50c** is empty and the pressure-based fluid level sensor triggers the LED to emit light and signal that an empty container **50c** exists. The case **30c** also includes a manual activator foot pedal **41c**. In one version of the invention, the container **50c** is pressurized and includes a propellant in the container **50c** and an outlet valve. The manual activator foot pedal **41c** moves the container **50c** such that the valve of the container **50c** opens and delivers chemical to the conduit **49**.

[0199] Referring now to FIGS. **12A-12B**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50d** for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container **50d** and the spray nozzle **80**, and a mounting clip **60d** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0200] The container **50d** is housed horizontally in a case **30d**. A fitment is provided in the case **30d** for engaging an outlet of the container **50d**. The fitment of the case **30d** is connected to the fluid supply conduit **49**. The container **50d** may be reloaded from the bottom or back of the case **30d**. The case **30d** may rest on the floor behind the toilet as shown in FIG. **12A**. The case **30d** includes a manual activator foot pedal **41d**. In one version of the invention, the container **50d** is pressurized and includes a propellant in the container **50d**.

and an outlet valve. The manual activator foot pedal **41d** moves the container **50d** such that the valve of the container **50d** opens and delivers chemical to the conduit **49**. FIG. 12B shows that the container **50d** may be mounted horizontally in the case **30d**. This demonstrates another mounting orientation in addition to the upside down (valve at the bottom) orientation of FIG. 1C, and the right side up (valve at the top) orientation of FIG. 2D. Thus, the invention does not limit orientation of the container.

[0201] FIG. 12B shows the mounting clip **60d** for attaching the spray nozzle **80d** near the rim **14** of the toilet bowl **12** of the toilet **10**. The mounting clip **60d** has a base wall **62d**, a first side wall **64d**, and a second side wall **67d** spaced from the first side wall **64d** to create a generally C-shaped clip **60d**. The clip **60d** is formed from a flexible plastic to allow for expansion and contraction to accommodate various toilet bowl rim sizes. The second side wall **67d** rests on the top of the toilet rim **14** when installed. The conduit **49** is threaded through a retaining ring **37d** on the second side wall **67d** and through a retaining ring **37d** on the base wall **62d**. The spray nozzle **80d** engages an end of the conduit **49** as shown in FIG. 12B and receives chemical from the conduit **49**.

[0202] Turning to FIGS. 13A-13D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50e** for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container **50e** and the spray nozzle **80**, and a mounting clip **60e** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0203] The container **50e** is housed in a case **30e**. A fitment is provided in the case **30e** for engaging an outlet of the container **50e**. The fitment of the case **30e** is connected to the fluid supply conduit **49**. The case **30e** includes a top access door **38e** that may be opened by a user as shown in FIG. 13D to remove an empty container **50e** and thereafter load from the top a new container **50e** in direction B shown in FIG. 13D. A hinge is provided at the side of the door **38e** for swinging movement of the door **38e**. A use-up cue light emitting diode (LED) **34e** is provided in the case **30e**. The LED **34e** operates as LED **134** described above. The case **30e** has an inverted J-shaped hanger **44e** that extends from the case **30e**. The hanger **44e** of the case **30e** allows a user to suspend the case **30e** from a side wall **24** inside of the toilet tank **22** as shown in FIG. 13D to reduce visibility and conserve water. The case **30e** also includes a manual activator **41e** at a lower area of the hanger **44e** of the case **30e**. The manual activator **41e** opens the valve of the container **50e** and delivers chemical to the conduit **49**.

[0204] FIG. 13B shows the mounting clip **60e** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The mounting clip **60e** has a top wall **62e** and a side wall **67e** to create an inverted generally L-shaped bracket **73e** that may be adhered to the toilet rim **14** by a double sided adhesive strip or a suction cup. The conduit **49** is connected to a passageway in the L-shaped bracket **73e**. The spray nozzle **80** engages an end of the passageway and receives chemical from the passageway. Looking at FIG. 13E, there is shown an alternative version of the invention where the conduit **49** travels down the over-flow tube **26** inside the tank **22** of the toilet **10** to deliver chemical into the flush water.

[0205] Referring now to FIGS. 14A-14D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50f** for a chemical, a spray nozzle **97f** disposed in the toilet lid **20** through which the chemical can be sprayed laterally around a perimeter of the nozzle **97f**, and a fluid supply conduit **49** in fluid communication with the container **50f** and the spray nozzle **97f**. The chemical can be sprayed by the spray nozzle **97f** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0206] The container **50f** is housed in a case **30f**. A fitment is provided in the case **30f** for engaging an outlet of the container **50f**. The fitment of the case **30f** is connected to the fluid supply conduit **49**. The case **30f** includes an access door **38f** that may be opened by a user in direction A as shown in FIG. 14D to remove an empty container **50f** and thereafter load a new container **50f**. A hinge is provided at the top of the door **38f** for swinging movement of the door **38f**. A use-up cue light emitting diode (LED) **34f** is provided in the case **30f**. The LED **34f** operates as LED **134** described above.

[0207] The case **30f** also includes a manual activator button **32f**. In one version of the invention, the container **50f** is pressurized and includes a propellant in the container **50f** and an outlet valve. The manual activator button **32f** moves the valve into an open position for delivering chemical from the container **50f** through the conduit **49** and to the spray nozzle **97f**. For example, the activator button **32f** pushes the container **50f** downward such that the valve at the bottom of the container **50f** opens.

[0208] Looking at FIG. 14B, the spray nozzle **97f** is integrated into the toilet lid **20** for spraying the chemical laterally around a perimeter of the nozzle **97f**. The toilet lid also includes a pressure sensor or proximity sensor **99f** to sense when the lid **20** is down. The toilet bowl cleaning and/or deodorizing device only operates when the lid **20** is closed as sensed by the pressure sensor or proximity sensor **99f**. For example, in the lid down position, a portion of the lid contacts the pressure sensor. A control circuit for operation of the pressure sensor or proximity sensor **99f** is described below.

[0209] Turning to FIGS. 15A-15C, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container for a chemical, a spray nozzle through which the chemical can be sprayed laterally around a perimeter of the nozzle, a fluid supply conduit **49** in fluid communication with the container and the spray nozzle, and a mounting clip **60g** for attaching the spray nozzle near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0210] The container is housed in a case **30g**. The case **30g** may be a translucent housing so the user can see when the container is empty. The translucent housing may also provide a use-up cue. A pressure-based fluid level sensor senses a pressure drop in the container when the container is empty and the pressure-based fluid level sensor triggers a light within the translucent housing. The housing then glows to signal that an empty container exists.

[0211] A fitment is provided in the case **30g** for engaging an outlet of the container. The fitment of the case **30g** is connected to the fluid supply conduit **49**. The case **30g** acts as a manual activator button. In one version of the invention, the container is pressurized and includes a propellant in the container and an outlet valve. The case **30g** acts as a manual

activator button by the user pressing the case 30g in direction A to move the valve into an open position for delivering chemical from the container through the conduit 49 and to the spray nozzle. For example, the case 30g pushes the container sideways such that a tilt valve at the bottom of the container opens. An adhesive strip 44g is provided at the rear of the case 30g for mounting the case 30g on a wall as shown in FIG. 15C, or on the toilet tank.

[0212] FIG. 15B shows the mounting clip 60g for attaching the spray nozzle near the rim 14 of the toilet bowl 12 of the toilet 10. The mounting clip 60g has a base wall 62g, a first side wall 64g, and a second side wall 67g spaced from the first side wall 64g to create an inverted generally U-shaped clip 60g. The clip 60g is formed from a flexible plastic to allow for expansion and contraction to accommodate various toilet bowl rim sizes. The conduit 49 is connected to a passageway in the base wall 62g and the first side wall 64g. The spray nozzle engages an end of the conduit 49 and receives chemical from the conduit 49.

[0213] Referring now to FIGS. 16A-16C, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 50h for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 50h and the spray nozzle 80, and a mounting clip 60h for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0214] The container 50h is housed in a case 30h. A fitment is provided in the case 30h for engaging an outlet of the container 50h. The fitment of the case 30h is connected to the fluid supply conduit 49. The case 30h includes an access door 38h that may be opened by a user as shown in FIG. 16C to remove an empty container 50h and thereafter load a new container 50h in direction B shown in FIG. 16C. A hinge is provided at the bottom of the door 38h for swinging movement of the door 38h in direction A of FIG. 16C. A cover release button 39h keeps the door 38h shut until a user unlatches the door 38h. A use-up cue light emitting diode (LED) 34h is provided in the case 30h. The LED 34h operates as LED 134 described above. The case 30h also includes a manual activator button 32h. In one version of the invention, the container 50h is pressurized and includes a propellant in the container 50h and an outlet valve. The manual activator button 32h moves the container 50h downward such that the valve at the bottom of the container 50h opens and delivers chemical to the conduit 49. An adhesive strip is provided at the rear of the case 30h for mounting the case 30h on a wall as shown in FIG. 16A or on the toilet tank.

[0215] Turning to FIGS. 17A-17E, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 50i for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 50i and the spray nozzle 80, and a mounting clip 60i for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0216] FIG. 17B shows the mounting clip 60i for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the

toilet 10. The mounting clip 60i has a base wall 62i and a side wall 64i to create an inverted generally L-shaped bracket 73i that may be adhered to the toilet rim 14 by an adhesive or a suction cup. The conduit 49 is connected to a passageway in the base wall 62i and the side wall 64i. The spray nozzle 80 engages an end of the passageway and receives chemical from the passageway.

[0217] The container 50i is housed in a case 30i. A fitment is provided in the case 30i for engaging an outlet of the container 50i. The fitment of the case 30i is connected to the fluid supply conduit 49. The case 30i includes an access door that may be opened by a user to remove an empty container 50i in direction B as shown in FIG. 17E and thereafter load a new container 50i. A use-up cue light emitting diode (LED) 34i is provided in the case 30i. A pressure-based fluid level sensor senses a pressure drop in the container 50i when the container 50i is empty and the pressure-based fluid level sensor triggers the LED to emit light and signal that an empty container 50i exists.

[0218] The case 30i also includes a storage bin section 47i covered by a storage bin lid 48i that opens in direction D as shown in FIG. 17D to access the storage bin section 47i. A recess 46i in the case 30i provides an area for a user's hand to open the lid 48i. The case 30i also includes a manual activator foot pedal 41i. In one version of the invention, the container 50i is pressurized and includes a propellant in the container 50i and an outlet valve. The manual activator foot pedal 41i moves the container 50i downward such that the valve at the bottom of the container 50i opens and delivers chemical to the conduit 49. The case 30i sits next to the toilet 10 and provides storage for garbage, toilet tissue or sanitary products.

[0219] Referring now to FIGS. 18A-18D, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 50j for a chemical, a spray nozzle 80 through which the chemical can be sprayed laterally around a perimeter of the nozzle 80, a fluid supply conduit 49 in fluid communication with the container 50j and the spray nozzle 80, and a mounting clip 60j for attaching the spray nozzle 80 near the rim 14 of the toilet bowl 12 of the toilet 10. The chemical can be sprayed by the spray nozzle 80 directly onto the inner surface 16 of the toilet bowl 12 and/or into the toilet water as described below.

[0220] The container 50j is housed in a case 30j. A fitment is provided in the case 30j for engaging an outlet of the container 50j. The fitment of the case 30j is connected to the fluid supply conduit 49. The case 30j includes an access door 38j that may be opened by a user to remove an empty container 50j and thereafter load a new container 50j and batteries (if provided) in direction B as shown in FIG. 18c. A door latch button 39j keeps the door 38j shut until a user unlatches the door 38j. The case 30j also includes a removable storage bin 47j. A recess 46j in the storage bin 47j provides an area for a user's hand to lift the storage bin 47j in direction D shown in FIG. 18D.

[0221] The case 30j also includes a manual activator button 32j. In one version of the invention, the container 50j is pressurized and includes a propellant in the container 50j and an outlet valve. The manual activator button 32j moves the container 50j downward such that the valve at the bottom of the container 50j opens and delivers chemical to the conduit 49. The case 30j sits next to the toilet 10 and provides storage for garbage.

[0222] Turning to FIGS. 19A-19C, there is shown another embodiment of the invention. The toilet bowl cleaning and/or

deodorizing device includes a container **50k** for a chemical, a spray nozzle **97k** through which the chemical can be sprayed laterally around a perimeter of the nozzle **97k**, a fluid supply conduit **49** in fluid communication with the container **50k** and the spray nozzle **97k**, and a mounting pad **60k** for attaching the spray nozzle **97k** to the lid **20** of the toilet **10**. The chemical can be sprayed by the spray nozzle **97k** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below.

[0223] The container **50k** is housed in a case **30k**. The case **30k** hooks on the back of the toilet **10** under the tank **22** as shown in FIG. **19C**. A fitment is provided in the case **30k** for engaging an outlet of the container. The fitment of the case **30k** is connected to the fluid supply conduit **49**. The container **50k** may be pressurized and include a propellant in the container and an outlet valve. An activator button **32k** opens the valve such that the container **50k** delivers chemical from the container through the conduit **49** and to the spray nozzle **97k**.

[0224] Looking at FIG. **19B**, the spray nozzle **97k** is mounted to the toilet lid **20** by a mounting pad **60k** for spraying the chemical laterally around a perimeter of the nozzle **97k**. The mounting pad **60k** also includes a pressure sensor or proximity sensor **99k** to sense when the lid **20** is down. The toilet bowl cleaning and/or deodorizing device only operates when the lid **20** is closed as sensed by the pressure sensor or proximity sensor **99k**.

[0225] Referring now to FIGS. **20A-20B**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container and the spray nozzle **80**, and a mounting clip **60m** for attaching the spray nozzle **80** near the rim **14** of the toilet bowl **12** of the toilet **10**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface **16** of the toilet bowl **12** and/or into the toilet water as described below. The toilet bowl cleaning and/or deodorizing device also includes a valve assembly **73m** with a proximity sensor **98m** to detect the presence of a person. When a person is not present (as detected by the proximity sensor **98m**), a valve in the valve assembly **73m** is in an open position such that chemical may be delivered to the spray nozzle **80**. When a person is present (as detected by the proximity sensor **98m**), the valve in the valve assembly **73m** is in a closed position such that chemical cannot be delivered to the spray nozzle **80**. A control circuit for operation of the pressure sensor or proximity sensor **98m** is described below.

[0226] Turning to FIGS. **21A-21B**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50n** for a chemical, a spray nozzle **80** through which the chemical can be sprayed laterally around a perimeter of the nozzle **80**, a fluid supply conduit **49** in fluid communication with the container **50n** and the spray nozzle **80**, and a mounting clip **60n** for attaching the spray nozzle **80** near the rim of the toilet bowl. An annular base **30n** is provided for holding the container **50n**. A connector **69n** attaches the conduit **49** to the clip **60n**. The chemical can be sprayed by the spray nozzle **80** directly onto the inner surface of the toilet bowl and/or into the toilet water as described below.

[0227] A spigot **54n** is fluid communication with the container **50n** and an actuator button **53n** which is in fluid communication with the conduit **49**. An actuator cap **52n** sur-

rounds the actuator button **53n**. The container **50n** is pressurized and includes a propellant in the container **50n** and an outlet valve. The actuator button **53n** moves the valve downward into an open position for delivering chemical from the container **50n** through the conduit **49** and to the spray nozzle **80**. Output pressures of 30-35 psi from the valve are some non-limiting examples of suitable pressures.

[0228] A variation of the device of FIGS. **21A-21B** can provide another toilet bowl cleaning and/or deodorizing device that is manually activated. For example, the outside diameter of the end of the conduit **49** that is opposite the spray nozzle **80** may be properly sized such that the end may be inserted into an orifice of an actuator button of a pressurized container. The user then activates the device by pressing the actuator button downward (or laterally) into an open position for delivering chemical from the container through the conduit and to the spray nozzle **80** to dispense cleaning solution into the toilet. In this device, the fluid supply conduit **49**, the spray nozzle **80**, and the mounting clip **60n** for attaching the spray nozzle **80** near the rim of the toilet bowl may be conveniently provided as a kit for connection to separately available pressurized containers including cleaning and/or deodorizing chemical. Thus, the nozzle, conduit and mounting clip can be disconnected from the container and thrown away, and a new kit can be installed. This can be important to consumers if they feel the nozzle gets soiled, or they do not like to keep the nozzle in their toilet for a long time.

[0229] Referring now to FIGS. **22A-22K**, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container **50p** for a chemical, a spray nozzle through which the chemical can be sprayed laterally around a perimeter of the nozzle, a fluid supply conduit **49p** in fluid communication with the container **50p** and the spray nozzle, and a mounting clip for attaching the spray nozzle near the rim of the toilet bowl of the toilet. The chemical can be sprayed by the spray nozzle directly onto the inner surface of the toilet bowl and/or into the toilet water as described below.

[0230] The container **50p** is housed in a case **30p**. A fitment is provided in the case **30p** for engaging an outlet of the container **50p**. The fitment of the case **30p** is connected to the fluid supply conduit **49p**. The case **30p** includes a top access door **38p** that may be opened by a user as shown in FIGS. **22G** and **22H** to remove an empty container **50p** in direction A shown in FIG. **22H** and thereafter load a new container **50p**. A hinge **40p** is provided at the side of the door **38p** for swinging movement of the door **38p**. A use-up cue light emitting diode (LED) **34p** is provided in the case **30p**. The LED **34p** operates as LED **134** described above. The case **30p** also includes a battery use-up cue light **35p** that signals a low voltage on the batteries **450** and **452**. The case **30p** also includes a manual activator switch **32p**. The base of the container **30p** provides extra space for storage of extra conduit **49p** as shown by the coiled conduit **49p** in FIG. **22C**. This allows a user to shorten the portion of the conduit **49p** that is exposed to a user's view.

[0231] In one version of the invention of FIGS. **22A-22K**, the container **50p** is pressurized and includes a propellant in the container **50p** and an outlet valve **460**. The manual activator switch **32p** completes a circuit that provides power from the batteries **450**, **452** to a motor that drives a set of meshing gears **453**, **454**, **455**, **456**. The gears rotate a cam **458** in circular direction C of FIG. **22B** such that the cam **458** moves the valve **460** of the container **50p** to open the valve **460** and deliver chemical to the conduit **49p**.

[0232] The case 30p has an inverted generally J-shaped hanger 44p that extends upwardly from the case 30p as shown in FIGS. 22I and 22J. The hanger 44p of the case 30p allows a user to suspend the case 30p from a side wall 24 of the toilet tank 22 as shown in FIGS. 22F and 22J. Looking at FIG. 22I, the hanger 44p has a pair of oblong slots 471 with an enlarged hole 472 at one end. Pins 474 are mounted on the case 30p. The pins 474 include a shank having a width that is slightly less than the width of the slots 471 and a head having a diameter that is slightly less than the diameter of the holes 472. The hanger 44p may be attached to the case 30p by inserting the head of the pins 474 into the holes 472 and pulling the hanger 44p upward such that the shanks of the pins 474 move into the bottom of the slots 471 as shown in FIG. 22I. In this manner, the toilet bowl cleaning and/or deodorizing device of FIGS. 22A-22K may be mounted on the toilet tank 22 using the hanger 44p, or the hanger 44p may be removed for placing the case 30p on the floor. The case 30p may also include leveling set screws 42p that may be screwed in or out to vary the distance between the set screw head 43p and the case 30p. As shown in FIG. 22H, the leveling set screws 42p may be set such that the leveling set screws 42p contact the toilet tank 22 and keep the case 30p level with respect to the floor on which the toilet is installed.

[0233] The conduit 49p is connected to the case 30p with a connector 69p as shown in FIG. 22I. The connector 69p includes a chemical orifice 71p that is in fluid communication with the fitment and the container 50p for delivering chemical from the container 50p and into the conduit 49p. The connector 69p also includes an electrical connector 72p that places a control circuit of the device in electrical communication with a proximity sensor near the toilet. This feature will be described below with reference to FIGS. 24A-24E. The connector 69p is press fit into a recess 431 in the bottom of the case 30p. A first hole 432 of the recess 431 receives the electrical connector 72p, and a second hole 433 of the recess 431 receives the chemical orifice 71p.

[0234] Turning now to FIGS. 23A-23K, there is shown another embodiment of the invention. The toilet bowl cleaning and/or deodorizing device includes a container 50q for a chemical, a spray nozzle through which the chemical can be sprayed laterally around a perimeter of the nozzle, a fluid supply conduit 49q in fluid communication with the container 50q and the spray nozzle, and a mounting clip for attaching the spray nozzle near the rim of the toilet bowl of the toilet. The chemical can be sprayed by the spray nozzle directly onto the inner surface of the toilet bowl and/or into the toilet water as described below.

[0235] The container 50q is mounted upside down (i.e., outlet valve down) in a base 30q. A fitment is provided in the base 30q for engaging an outlet of the container 50q. The fitment of the base 30q is connected to the fluid supply conduit 49q. A user may remove an empty container 50q in direction A shown in FIG. 23H and thereafter load a new container 50q. A use-up cue light emitting diode (LED) 34q is provided in the base 30q (see FIG. 23E). The LED 34q operates as LED 134 described above. The base 30q also includes a battery use-up cue light 35q that signals a low voltage on the batteries 450 and 452. The case 30q also includes a manual activator switch 32q.

[0236] In one version of the invention of FIGS. 23A-23K, the container 50q is pressurized and includes a propellant in the container 50q and an outlet valve 460. The manual activator switch 32q completes a circuit that provides power from

the batteries 450, 452 to a motor that drives a set of meshing gears 453, 454, 455, 456. The gears rotate a cam 458 in circular direction C of FIG. 23B such that the cam 458 moves the valve 460 of the container 50q to open the valve 460 and deliver chemical to the conduit 49q.

[0237] The case 30q has an inverted generally J-shaped hanger 44q that extends upwardly from the base 30q as shown in FIGS. 23G and 23I. The hanger 44q of the base 30q allows a user to suspend the base 30q from a side wall 24 of the toilet tank 22 as shown in FIGS. 23F and 23J. Looking at FIG. 23I, the hanger 44q has a pair of oblong slots 471 with an enlarged hole 472 at one end. Pins 474 are mounted on the base 30q. The pins 474 include a shank having a width that is slightly less than the width of the slots 471 and a head having a diameter that is slightly less than the diameter of the holes 472. The hanger 44q may be attached to the base 30q by inserting the head of the pins 474 into the holes 472 and pulling the hanger 44q upward such that the shanks of the pins 474 move into the bottom of the slots 471 as shown in FIG. 23I. In this manner, the toilet bowl cleaning and/or deodorizing device of FIGS. 23A-23K may be mounted on the toilet tank 22 using the hanger 44q, or the hanger 44q may be removed for placing the base 30q on the floor. The base 30q may also include leveling set screws 42q that may be screwed in or out to vary the distance between the set screw head 43q and the base 30q. As shown in FIG. 23H, the leveling set screws 42q may be set such that the leveling set screws 42q contact the toilet tank 22 and keep the base 30q level with respect to the floor on which the toilet sits. The hanger 44q also includes a pair of resilient arms 45q (see FIGS. 23B, 23C, 23F, 23H) that secures the container 50q in the base 30q. Because the base 30q has no top, a container of any height can be placed in the base 30q.

[0238] The conduit 49q is connected to the base 30q with a connector 69q as shown in FIG. 23I. The connector 69q includes a chemical orifice 71q that is in fluid communication with the fitment and the container 50q for delivering chemical from the container 50q and into the conduit 49q. The connector 69q also includes an electrical connector 72q that places a control circuit of the device in electrical communication with a proximity sensor near the toilet. This feature will be described below with reference to FIGS. 24A-24E. The connector 69q is press fit into a recess 431 in the bottom of the base 30q. A first hole 432 of the recess 431 receives the electrical connector 72q, and a second hole 433 of the recess 431 receives the chemical orifice 71q.

[0239] Referring now to FIGS. 24A-24E, there is shown another mounting clip 60p and spray nozzle 80 for use with the invention. The mounting clip 60p has a base wall 62p and a side wall 64p that create an inverted generally L-shaped bracket 73p that may be adhered to the toilet rim 14 by a flexible mounting strip 74p. The mounting strip 74p is formed from an elastomeric material (such as rubber) that can conform to the shape of the top of the toilet rim and the outer side surface of the toilet bowl. The mounting strip 74p includes suction cups 75p on its inner surface.

[0240] When installing the mounting clip 60p on the toilet rim 14, the L-shaped bracket 73p is placed on top of the toilet rim as shown in FIG. 24D, and the mounting strip is then pushed onto the top of the toilet rim and the outer side surface of the toilet bowl. The suction cups 75p keep the mounting strip 74p secured on the toilet bowl. Other suction cups 76p are provided on the inner surface of the L-shaped bracket 73p to keep the mounting clip secured on the toilet bowl. The

L-shaped bracket **73p** provides the structure to keep the nozzle at a fixed height in relation to the toilet rim.

[0241] The nozzle **80** is mounted to the side wall **64p** of the clip **60p**. The conduit **49p** is connected to a fluid passageway in the mounting strip **74p**, the base wall **62p**, and the side wall **64p**. The fluid passageway receives chemical from the conduit **49**, and the spray nozzle **80** engages an end of the fluid passageway and receives chemical from the fluid passageway.

[0242] The side wall **64p** of the mounting clip **60p** defines a space that houses a proximity sensor **98p**. The proximity sensor **98p** detects the presence of a person. A control circuit for operation of the proximity sensor **98p** is described below. The control circuit and the proximity sensor **98p** are placed in electrical communication by way of wire **51p** that extends from the proximity sensor **98p** to the control circuit. Using the device of FIGS. 22A-22K as an example, the control circuit is housed in the case **30p**, and the wire **51p** extends from the proximity sensor **98p** to the control circuit by way of the electrical connector **72p** of FIG. 22L.

[0243] Referring now to FIG. 25, there is shown an embodiment of a static spray nozzle **80a** for use with the invention. The spray nozzle **80a** may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle **80a** has a sealing head **81a** that may be inserted into the open end of the conduit **49** in the manner shown in FIG. 1B. The sealing head **81a** increases in outside diameter toward a middle section **83a** of the spray nozzle **80a**. A disc shaped dispensing head **84a** is integrally connected to the middle section **83a**. The disc shaped dispensing head **84a** has dispensing orifices **85a** arranged around the perimeter of the disc shaped dispensing head **84a**. The dispensing orifices **85a** are in fluid communication with a central fluid passageway **82a** that runs along the axis of the spray nozzle **80a** from the sealing head **81a** to the disc shaped dispensing head **84a**. Preferably, the dispensing orifices **85a** are evenly spaced around the perimeter of the disc shaped dispensing head **84a**.

[0244] An illustration of the use of the spray nozzle **80a** can be detailed with reference to FIGS. 1A-1C. When a user presses the manual activator button **32**, the valve of the pressurized container **50** moves into an open position for delivering chemical from the container **50** through the conduit **49** and to the central fluid passageway **82a** of the spray nozzle **80a**. The chemical then exits the dispensing orifices **85a** arranged around the perimeter of the disc shaped dispensing head **84a**. Because the dispensing orifices **85a** are arranged around the entire perimeter of the disc shaped dispensing head **84a**, the chemical is sprayed laterally around the entire perimeter of the nozzle **80a**. The angle of the dispensing orifices **85a** with respect to the axis of the disc shaped dispensing head **84a** of the spray nozzle **80a** can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the disc shaped dispensing head **84a** of the spray nozzle **80a** and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper selection of the angle of the dispensing orifices **85a** with respect to the axis of the disc shaped dispensing head **84a** of the spray nozzle **80a**, chemical can also be directed under the toilet rim. The angle of each of the dispensing orifices **85a** can be individually set to create any number of spray patterns.

[0245] Turning to FIG. 26, there is shown an embodiment of a rotating spray nozzle **80b** for use with the invention. The

components of the spray nozzle **80b** may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle **80b** has a sealing head **81a** that may be inserted into the open end of the conduit **49** in the manner shown in FIG. 1B. The sealing head **81a** increases in outside diameter toward a middle section **83b** of the spray nozzle **80b**. A tubular flow passage **86b** is integrally connected to the middle section **83b**. The tubular flow passage **86b** is in fluid communication with a central fluid passageway **82a** that runs along the axis of the spray nozzle **80b** from the sealing head **81b** to the tubular flow passage **86b**.

[0246] The spray nozzle **80b** has a fluid spinner **87b** located within the tubular flow passage **86b**. The fluid spinner **87b** is generally cylindrical and has a helical groove **88b** extending from one end to the other end of the fluid spinner **87b**. An interference fit can be used to keep the fluid spinner **87b** in the tubular flow passage **86b** of the spray nozzle **80b**. The spray nozzle **80b** also has a deflector plate **91b** connected to the bottom end of the fluid spinner **87b**. The deflector plate **91b** has a connector shaft **92b** that may be inserted in a central hole in the end of the fluid spinner **87b** for rotation with respect to the fluid spinner **87b**. The deflector plate **91b** also has radial ribs **93b** that extend radially from the connector shaft **92b** to the edge of the deflector plate **91b**.

[0247] An illustration of the use of the spray nozzle **80b** can be detailed with reference to FIGS. 1A-1C. When a user presses the manual activator button **32**, the valve of the pressurized container **50** moves into an open position for delivering chemical from the container **50** through the conduit **49** and to the central fluid passageway **82b** of the spray nozzle **80b**. The chemical enters the tubular flow passage **86b** and flows in the helical groove **88b** of the fluid spinner **87b**. The helical groove **88b** creates a spinning motion in the chemical. The spinning chemical then contacts the deflector plate **91b**. The chemical creates rotation of the deflector plate **91b** when impacting the radial ribs **93b** of the deflector plate **91b**. The chemical is then sprayed laterally around the entire perimeter of the nozzle **80b**. As a result, the rotating deflector plate **91b** can uniformly spread the chemical around the entire perimeter of the inner surface of the toilet bowl with sudsing and without seat interference. The slope of the surface of the deflector plate **91b** and/or the shape of the radial ribs **93b** can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the deflector plate **91b** of the spray nozzle **80b** and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper selection of the shape of the deflector plate **91b** of the spray nozzle **80b**, chemical can also be directed under the toilet rim. For example, the edge of the deflector plate **91b** may have an upwardly sloping lip. The shape of the radial ribs **93b** can be individually set to create any number of spray patterns.

[0248] Referring now to FIG. 27, there is shown another embodiment of a spray nozzle **80c** for use with the invention. The components of the spray nozzle **80c** may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle **80c** has a sealing head **81c** that may be inserted into the open end of the conduit **49** in the manner shown in FIG. 1B. The sealing head **81c** increases in outside diameter toward a middle section **83c** of the spray nozzle **80c**. A disc shaped flow chamber **84c** is integrally connected to the middle section **83c**. The disc shaped flow chamber **84c** is in

fluid communication with a central fluid passageway **82c** that runs along the axis of the spray nozzle **80c** from the sealing head **81c** to the disc shaped flow chamber **84c**.

[0249] The spray nozzle **80c** has a disc **89c** with radial slots **90c**. The disc **89c** is located within the disc shaped flow chamber **84c**. The spray nozzle **80c** also has a deflector plate **91c** connected to the disc shaped flow chamber **84c**. An interference fit can be used to keep the deflector plate **91c** connected to the disc shaped flow chamber **84c**. The deflector plate **91c** has teeth **94c** around its perimeter that create dispensing slots **95c** around a perimeter of the deflector plate **91c**.

[0250] An illustration of the use of the spray nozzle **80c** can be detailed with reference to FIGS. 1A-1C. When a user presses the manual activator button **32**, the valve of the pressurized container **50** moves into an open position for delivering chemical from the container **50** through the conduit **49** and to the central fluid passageway **82c** of the spray nozzle **80c**. The chemical then exits the dispensing slots **95c** that are arranged around the perimeter of the deflector plate **91c**. Because the dispensing slots **95c** are arranged around the entire perimeter of the deflector plate **91c**, the chemical is sprayed laterally around the entire perimeter of the nozzle **80c**. The dimensions of the dispensing slots **95c** of the spray nozzle **80c** can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the deflector plate **91c** of the spray nozzle **80c** and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper selection of the dispensing slots **95c** of the spray nozzle **80a**, chemical can also be directed under the toilet rim. The dimensions of each of the dispensing slots **95c** can be individually set to create any number of spray patterns.

[0251] Turning to FIG. 28, there is shown another embodiment of a static spray nozzle **80d** for use with the invention. The components of the spray nozzle **80d** may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle **80d** has a sealing head **81d** that may be inserted into the open end of the conduit **49** in the manner shown in FIG. 1B. The sealing head **81d** increases in outside diameter toward a middle section **83d** of the spray nozzle **80d**. A frustoconical flow chamber **84d** is integrally connected to the middle section **83d**. The flow chamber **84d** is in fluid communication with a central fluid passageway **82d** that runs along the axis of the spray nozzle **80d** from the sealing head **81d** to the flow chamber **84d**.

[0252] The spray nozzle **80d** has a deflector plug **91d** connected to the flow chamber **84d**. An interference fit can be used to keep the deflector plug **91d** connected to the flow chamber **84d**. The deflector plug **91d** has a generally dome-shaped section **96d** with dispensing channels **95d** around its perimeter. A lower flange **94d** extends outward from the bottom of the dome-shaped section **96d**.

[0253] An illustration of the use of the spray nozzle **80d** can be detailed with reference to FIGS. 1A-1C. When a user presses the manual activator button **32**, the valve of the pressurized container **50** moves into an open position for delivering chemical from the container **50** through the conduit **49** and to the central fluid passageway **82d** of the spray nozzle **80d**. The chemical then enters the dispensing channels **95d** that are arranged around the perimeter of the dome-shaped section **96d** of the deflector plug **91d**. The chemical then contacts the flange **94d** and because the dispensing channels

95d are arranged around the entire perimeter of the deflector plug **91d**, the chemical is sprayed laterally around the entire perimeter of the nozzle **80d**. The dimensions of the dispensing channels **95d** and lower flange **94d** of the spray nozzle **80d** can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the deflector plug **91d** of the spray nozzle **80d** and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper dimensioning of the dispensing channels **95d** and flange **94d** of the spray nozzle **80d**, chemical can also be directed under the toilet rim. For example, the edge of the flange **94d** may have an upwardly sloping lip. The dimensions of each of the dispensing channels **95d** can be individually set to create any number of spray patterns.

[0254] Referring now to FIG. 29, there is shown another embodiment of a rotating spray nozzle **80e** for use with the invention. The components of the spray nozzle **80e** may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle **80e** has a sealing head **81e** that may be inserted into the open end of the conduit **49** in the manner shown in FIG. 1B. The sealing head **81e** increases in outside diameter toward a middle section **83e** of the spray nozzle **80e**. A disc shaped flow chamber **84e** is integrally connected to the middle section **83e**. The disc shaped flow chamber **84e** is in fluid communication with a central fluid passageway **82e** that runs along the axis of the spray nozzle **80e** from the sealing head **81e** to the disc shaped flow chamber **84e**.

[0255] The spray nozzle **80e** also includes a fluid spinner **87e** and associated mounting disc **89e**. The fluid spinner **87e** is placed on the disc shaped flow chamber **84e** by inserting the sealing head **81e** and the middle section **83e** through a central hole **91e** in the fluid spinner **87e**. The mounting disc **89e** may be press fit into the fluid spinner **87e** such that the fluid spinner **87e** and the mounting disc **89e** may rotate with respect to the disc shaped flow chamber **84e**. The fluid spinner **87e** has flow deflectors **88e** that extend outward from an annular section **85e** of the fluid spinner **87e**.

[0256] An illustration of the use of the spray nozzle **80e** can be detailed with reference to FIGS. 1A-1C. When a user presses the manual activator button **32**, the valve of the pressurized container **50** moves into an open position for delivering chemical from the container **50** through the conduit **49** and to the central fluid passageway **82e** of the spray nozzle **80e**. The chemical enters the disc shaped flow chamber **84e** and then contacts the mounting disc **89e**. The chemical then flows outward and contacts the flow deflectors **88e** of the fluid spinner **87e** creating rotation of the fluid spinner **87e**. The chemical is then sprayed laterally around the entire perimeter of the nozzle **80e**. The slope of the surface of the mounting disc **89e** and/or the shape of the flow deflectors **88e** of the fluid spinner **87e** can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the mounting disc **89e** of the spray nozzle **80e** and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper selection of the shape of the mounting disc **89e** and fluid spinner **87e** of the spray nozzle **80e**, chemical can also be directed under the toilet rim. The shape of the flow deflectors **88e** of the fluid spinner **87e** can be individually set to create any number of spray patterns.

[0257] Referring now to FIGS. 30-33, there is shown yet another embodiment of a rotating spray nozzle 80f for use with the invention. The components of the spray nozzle 80f may be formed from a thermoplastic material such as polyethylene or polypropylene. The spray nozzle 80f has a sealing head 81f that may be inserted into the open end of the conduit 49 in the manner shown in FIG. 1B. The sealing head 81f increases in outside diameter toward a tubular middle section 83f of the spray nozzle 80f. A tubular flow passage 84f is integrally connected to the middle section 83f. The tubular flow passage 84f is in fluid communication with a central fluid passageway 82f that runs along the axis of the spray nozzle 80f from the sealing head 81f to the tubular flow passage 84f. The central fluid passageway 82f has a conically diverging end 85f.

[0258] The spray nozzle 80f has a tubular fluid spinner 86f that is press fit into an annular channel 87f in the tubular flow passage 84f as shown in FIG. 32. Looking at FIG. 33, the fluid spinner 86f is generally cylindrical and has four helical grooves 88f on a lower section of the inner surface of the fluid spinner 86f. Each of the helical grooves 88f tapers to a narrow slot 89f creating a high pressure stream of fluid.

[0259] The spray nozzle 80f also has a domed deflector button 91f connected to the top end of a cylindrical mounting tube 92f that is press fit into the fluid spinner 86f. A deflector plate 93f has a split connector shaft 94f that may be inserted in a central hole 97f in the end of mounting tube 92f for rotation with respect to the fluid spinner 86f. The deflector plate 93f also has radial ribs 95f that extend upward from the deflector plate 93f and extend radially from the connector shaft 94f to the edge of the deflector plate 93f. As shown in FIG. 31, the radial ribs 95f may have ramped sections 96f at their upper end.

[0260] An illustration of the use of the spray nozzle 80f can be detailed with reference to FIGS. 1A-1C and FIG. 32. When a user presses the manual activator button 32, the valve of the pressurized container 50 moves into an open position for delivering chemical from the container 50 through the conduit 49 and to the central fluid passageway 82f of the spray nozzle 80f. The chemical enters the diverging end 85f of the passageway 82f and flows in the helical grooves 88f of the fluid spinner 86f. The helical grooves 88f create a spinning motion in the chemical. The spinning chemical then contacts the deflector plate 93f. The chemical creates rotation of the deflector plate 93f when impacting the radial ribs 95f of the deflector plate 93f. The chemical is then sprayed laterally around the entire perimeter of the nozzle 80f. As a result, the rotating deflector plate 93f can uniformly spread the chemical around the entire perimeter of the inner surface of the toilet bowl with sudsing and without seat interference. The slope of the surface of the deflector plate 93f and/or the shape of the radial ribs 95f can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. Also, the distance between the deflector plate 93f of the spray nozzle 80f and the toilet waterline can be varied to directly spray chemical below the toilet waterline, and/or at the toilet waterline, and/or above the toilet waterline. By proper selection of the shape of the deflector plate 93f of the spray nozzle 80f, chemical can also be directed under the toilet rim. For example, the edge of the deflector plate 93f may have an upwardly sloping lip. The shape of the radial ribs 95f can be individually set to create any number of spray patterns.

[0261] FIGS. 25 to 33 show non-limiting examples of spray nozzles for use in the invention. In this regard, other nozzles are also suitable for use with the invention. For instance, the invention may include the use of nozzles that sit within the toilet, or on or over the toilet itself. The nozzles may include a stationary head, rotating or spinning heads, or oscillating heads (such as those described in U.S. Pat. No. 4,562,867) provide a means to dispense a variety of chemistries to provide appropriate coverage within the toilet bowl and under the toilet rim.

[0262] With respect to the devices described above, manual delivery of the chemical from the container to the conduit can be achieved in many different manners. For example, as described above, manual activation buttons or foot pedals can be used to move the valve of a pressurized container and deliver chemical into the conduit 49 and into the spray nozzle 80. Alternatively, a manual trigger type sprayer, such as that shown in U.S. Pat. No. 4,618,077 can be used to introduce chemical from a container into the conduit 49 and into the spray nozzle 80.

[0263] An electric motor driven sprayer such as that shown in U.S. Patent Application Publication No. 2005/0133540 can also be used to introduce chemical from a container into the conduit 49 and into the spray nozzle 80. In this type of electric motor driven sprayer, batteries power a motor for a piston pump. A flexible pick-up tube extends from the container with the chemical. An air vent is provided from the sprayer back down to the container to vent the container as liquid is pulled out. The motor in the spray head housing drives a circular member with a radial projection. The projection rides in a slot of a cam follower up and down to drive a piston head forward and back in a piston cylinder adjacent the outlet nozzle. Suitable check valves permit flow from the container to the outlet in response to piston movement, yet prevent return flow from the piston chamber. The nozzle of such an electric motor driven sprayer could be connected to the conduit 49.

[0264] Automatic delivery of the chemical from the container to the conduit and into the spray nozzle can be achieved in many different ways. When using a pressurized container with a tilt valve, chemical can be released from the container into the conduit and into the spray nozzle using a control circuit and a solenoid. In particular, the control circuit can energize the solenoid and when energized, the core of the solenoid moves against (depresses) the tilt valve of the container to release the chemical from the pressurized container and into the conduit. Other means for releasing the chemical from the pressurized container and into the conduit are also suitable. The control circuit can energize a motor that meshes with gears with a lever, and the lever moves against the tilt valve of the container to release the chemical from the pressurized container and into the conduit. The control circuit can also energize a motor that meshes with gears that move against the tilt valve of the container to release the chemical from the pressurized container and into the conduit. The control circuit can also energize a motor that meshes with gears with a cam, and the cam moves against the tilt valve of the container to release the chemical from the pressurized container and into the conduit as shown in FIGS. 22B and 23B.

[0265] The control circuit may include a battery and a programmable time-of-day timer such that the solenoid is energized and chemical is released from the container into the conduit according to an adjustable time pattern. For instance,

chemical may be released from the container into the conduit at eight hour intervals. Of course, such programmable time-of-day timers allow for any number of time periods between release of chemical into the conduit and spray nozzle. Thus, a control circuit with a programmable time-of-day timer provides for a continuous action toilet bowl cleaning system.

[0266] Other control circuits are also suitable. For example, the control circuit may include a processor in electrical communication with a proximity sensor that detects the presence of a person near the toilet. The processor includes a timing circuit such that the solenoid is energized and chemical is released from the container into the conduit at a time period after a person is no longer sensed near the toilet. For instance, the proximity sensor sends a signal to the processor that a person is near the toilet. When the person leaves, the proximity sensor sends another signal to the processor indicating that no person is now near the toilet. A countdown timer in the processor then delays release of chemical from the container into the conduit. The processor then allows for additional time periods between release of chemical into the conduit and spray nozzle. In one example, after the proximity sensor indicates to the processor that a person has left the area of the toilet, delivery of the chemical begins 30 minutes later and continues at periodic intervals. Alternatively, delivery of the chemical may begin immediately after the user presses an activation button and then continues at eight hour (or any other time period) intervals. Thus, these control circuits provide for a continuous action toilet bowl cleaning system that reduces time and effort in cleaning the toilet bowl. Any time period may be chosen for the periodic interval of chemical delivery. Suitable intervals may be at least 30 minutes, at least 2 hours, at least 6 hours, etc.; approximately 8 hours is preferred.

[0267] Automatic delivery of chemical from the container to the conduit can also be achieved using an electrically driven pump and a control circuit. For instance, the electrically driven pump sprayer of U.S. Patent Application Publication No. 2005/0133540 described above could include a control circuit with programmable time-of-day timer such that the pump operates according to an adjustable time pattern thereby delivering chemical from the container to the conduit and into the spray nozzle. Such control circuits can be quite advantageous in that automatic and/or manual override of the programmed time periods can be implemented to stop initiation of a spray cycle of the chemical. For example, a user may turn off the device, or a proximity sensor in electrical communication with the control circuit can stop initiation of a spray cycle if a person or household animal is near the toilet bowl. Another example of control circuit can include a toilet water proximity sensor where the level drop of the top of the toilet water during a flush is sensed by the toilet water proximity sensor and a timer circuit automatically initiates a spray cycle at a set time period after the flush.

[0268] Turning now to FIGS. 34-36, there is shown another example embodiment of a device (indicated generally at 108) for spraying an inner surface of a toilet bowl with a chemical. The device 108 includes a clip 110 for mounting a fluid delivery device to an enclosure, here a toilet bowl 112. The clip 110 is secured to the rim 114 of the toilet bowl 112 by a hook 116. A base 118 is supported by the hook 116 and houses a fluid delivery device, here a nozzle 120. A first container 121 and a second container 122 supply fluids via a fluid conduit 124 to the nozzle 120 to be dispensed onto the inside surface 126 of the toilet bowl 112. The fluids can be supplied from the

containers 121, 122 to the nozzle 120 by way of a pumping apparatus and controller that are housed in a container holder 123. The pumping apparatus, the controller, and the container holder 123 are described in further detail below.

[0269] The hook 116 for supporting the base 118 and attaching the clip 110 to the toilet bowl 112 has three main segments. A bowl segment 128, a top rim segment 131, and an inner rim segment 132. All three segments 128, 131, 132 are preferably integrally molded from plastic (e.g., polyethylene or polypropylene) and form a flexible hook 116. The bowl segment 128 has a substantially rectangular cross-section and secures the clip 110 to the toilet bowl 112. The bowl segment 128 extends substantially vertically upward and transitions into the top rim segment 131 at a flexible elbow 135 that allows the hook 116 to flex to secure the clip 110 to toilet bowls of various shapes and sizes. The top rim segment 131 has a substantially rectangular cross-section and extends horizontal across the rim 114 of the toilet bowl 112 where it transitions into the inner rim segment 132 at another flexible elbow 136, also allowing the hook 116 to flex. The inner rim segment 132 extends vertically downward from the elbow 136 and is configured to engage and support the base 118.

[0270] The inner rim segment 132 of the hook 116 has a front face 137 and a rear face 144 joined by two short side faces 143. The short side faces 143 have ratchet teeth 146 used in conjunction with the base 118 to restrain vertical movement of the base 118 along a vertical axis 148. Other restraints may be used, such as a friction fit between the hook 116 and base 118, or the like.

[0271] The bowl segment 128 and the top rim segment 131 include a C-shaped channel 149 that restrain the conduit 124 as it is routed around the perimeter of the hook 116 on its way to the nozzle 120 in the base 118. The base 118 has a back face 152, a pair of spaced apart side faces 154 extending forward of the back face 152, a top face 156 and a front face 158 extending between the side faces 154, and a curved face 168 extending between the side faces 154, top face 156, and front face 158. The faces 152, 154, 156, 158, 168 define a partial cavity 161 housing a portion of the nozzle 120. The base 118 has a tab 153 that extends rearward from the back face 152 of the base 118. The tab 153 and a tab 151 help orientate the base 118 with respect to the rim 114 when the clip 110 is mounted to the toilet bowl 112. The tab 153 may be one continuous member as shown in the example embodiment, or alternatively, the tab 153 may include a plurality of members extending from the base 118. The base 118 is preferably molded from plastic (e.g., polyethylene or polypropylene).

[0272] The base 118 further includes a means to attach a fluid delivery device (e.g., a nozzle 120). In the example embodiment, the nozzle 120 is restrained laterally between a fluid inlet 180 and a barrel 178. The base 118 includes an arm 176 extending downward from the base 118. The arm 176 has a flat bar support segment 177 with a J-shaped bend extending forward with the barrel 178 located at the distal end of the support segment 177. The barrel 178 includes a tubular recess for receiving the bottom of the nozzle 120. The fluid inlet 180 and the barrel 178 are used in conjunction to restrain lateral movement of the nozzle 120, but allow the nozzle 120 to rotate about the nozzle axis 182. The nozzle 120 is restrained laterally in the base 118 by inserting a spindle 192 extending from the underside of a fluid deflection plate 184 into the recess in the barrel 178 of the arm 176 and by inserting the tapered end of the fluid inlet 80 into a passageway 186.

[0273] A sensor 198 for sensing the environment surrounding the clip 110 is mounted to the base 118 or hook 116. Preferably, the sensor 198 is mounted substantially to the front face 158, but may be mounted on the angled face 168 or any other suitable location providing a view, for example, of the user to accurately determine the presence or absence thereof. The sensor 198 may be a proximity sensor, a light sensor, a sound sensor, a vibration sensor, a motion sensor, a tilt sensor, a flush sensor, or any combination of two or more of these sensors. The sensor 198 is electrically connected to the controller to influence when the fluid is dispensed to the toilet bowl 112 based upon predetermined logic.

[0274] In operation, fluid is moved from the containers 121, 122 through the conduit 124 which is routed through the channel 149 along the hook 116, and into the fluid inlet 180 on the base 118. Fluid flows into the top of the nozzle 120, down the passageway 186 in the nozzle where it is directed radially outward. As the fluid exits, its path is altered by angled fins flanking the passageway 186. The reaction causes the nozzle 120 to rotate counterclockwise. As a result, the fluid is expelled radially outward from the plate 184 of the nozzle 120 onto the inside surface 126 of the toilet bowl 112.

[0275] Turning now to FIG. 37, fluid flow from the first container 121 and the second container 122 to the conduit 124 in the toilet bowl cleaning device 108 of FIGS. 34-36 can be explained further. The first container 121 can be mounted to the container holder 123 (see FIGS. 34 and 36) by way of a hollow neck of the first container 121 that is removably sealingly attached to a first interface of the container holder 123. Suitable means for attaching the first container 121 to the first interface of the container holder 123 include conventional threads, bayonet-type threads, or a snap lock system on the hollow neck of the first container 121 and the first interface of the container holder 123. The second container 122 can be mounted to the container holder 123 (see FIGS. 34 and 36) by way of a hollow neck of the second container 122 that is removably sealingly attached to a second interface of the container holder 123. Suitable means for attaching the second container 122 to the second interface of the container holder 123 include conventional threads, bayonet-type threads, or a snap lock system on the hollow neck of the second container 122 and the second interface of the container holder 123. The first container 121 and the second container 122 can be sized such that the bottom wall of each of the first container 121 and the second container 122 contacts the floor that supports the toilet.

[0276] Still looking at FIG. 37, the toilet bowl cleaning device 108 of FIGS. 34-36 includes the sensor 198 (see FIGS. 35-36) that is electrically connected to a controller 206 to influence when the fluid is dispensed to the toilet bowl 112. The controller 206 receives electrical power from a source of electricity 208 such as batteries. The controller 206 is in electrical communication with an electric pump 204, which may be selected from the group consisting of vein pumps, impeller driven pumps, peristaltic pumps, gear driven pumps, bellows pumps, and piston pumps.

[0277] The first interface of the container holder 123 is in fluid communication with a first conduit 209, which is in fluid communication with a first one way check valve 211 (such as a ball valve) that allows fluid flow away from the first container 121 but does not allow for fluid flow back toward the first container 121. A conduit 213 provides a fluid path from the first check valve 211 to the pump 204. The second interface of the container holder 123 is in fluid communication

with a second conduit 218, which is in fluid communication with a second one way check valve 222 (such as a ball valve) that allows fluid flow away from the second container 122 but does not allow for fluid flow back toward the second container 122. A conduit 224 provides a fluid path from the second check valve 222 to the pump 204. On a suction stroke of the pump 204, fluid from the first container 121 and fluid from the second container 122 are drawn into a chamber of the pump. On an ejection stroke of the pump 204, the mixed fluids that are in the pump chamber are delivered from the pump chamber out of a pump outlet 226 and into the conduit 124 in the toilet bowl cleaning device 108. The fluids continue to the nozzle 120 to rotate the nozzle 120 counterclockwise. As a result, the fluid is expelled radially outward from the plate 184 of the nozzle 120 onto the inside surface 126 of the toilet bowl 112.

[0278] The pump 204 can be automatically activated during a spray cycle in that the controller 206 includes a timing circuit for automatically initiating and terminating the spray cycle. The timing circuit provides a method of automatically spraying the chemical. The timing circuit initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the conduit 124 and to the spray nozzle 120. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0279] In general, the sensor is a device that measures a physical quantity and converts it into a signal which can be processed by the controller 206. For example, a passive infrared sensor (PIR sensor) is an electronic device that measures infrared light (i.e., the physical quantity) radiating from objects in its field of view and converts it into an electrical signal. Motion is detected when an infrared source with one temperature, such as a human or household pet, passes in front of an infrared source with another temperature, such as a wall.

[0280] In one example version of the invention, the sensor 198 is a proximity sensor that detects the presence of a person or household pet near the toilet bowl. The sensor 198 is in electrical communication with the timing circuit of the controller 206 for preventing automatic initiation of the spray cycle when a person or household pet is near the toilet bowl 112.

[0281] In another example version of the invention, the sensor 198 is a light sensor that detects a change in light intensity, such as when a light is turned on and then off in a bathroom. After the turning off of a light is detected by the light sensor, the timing circuit of the controller 206 initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the conduit 124 and to the spray nozzle 120. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0282] In another example version of the invention, the sensor 198 is a sound sensor that detects the sound from a toilet flush. After the flush sound is detected by the sound sensor, the timing circuit of the controller 206 initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the

conduit 124 and to the spray nozzle 120. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0283] In another example version of the invention, the sensor 198 is a vibration sensor that detects movement around the toilet bowl. After the vibration is detected by the vibration sensor, the timing circuit of the controller 206 initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the conduit 124 and to the spray nozzle 120. The timing circuit also automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0284] In another example version of the invention, the sensor 198 is a flush sensor that detects a flush either by contact with the flush water or sensing a change in the water level, such as by a proximity sensor. After the flush is detected by the flush sensor, the timing circuit of the controller 206 initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the conduit 124 and to the spray nozzle 120. The timing circuit automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0285] In another example version of the invention, the sensor is a pressure sensor that senses when the toilet lid 20 is down. After the "lid down" position is detected by the pressure sensor, the timing circuit of the controller 206 initiates a first countdown. At the expiration of the first countdown, the pump 204 is activated automatically to deliver chemical from the first container 121 and second container 122 through the conduit 124 and to the spray nozzle 120. The timing circuit automatically initiates a second countdown at the end of which the spray cycle is automatically terminated by deactivating the pump 204.

[0286] Turning now to FIGS. 38-44, another feature of a toilet cleaning device according to the invention is shown. FIGS. 38-44 show a housing 250 that can be used for supporting a container in an inverted manner similar to that shown in FIG. 23A where container 50g is supported by case 30g. The housing 250 can house a pump, a controller, and suitable components for delivering fluid from the container to a nozzle.

[0287] The housing 250 includes a top part 251 that mates with a bottom part 252. The top part 251 and the bottom part 252 can be fastened together with screws or other another suitable fastening method. The bottom part 252 has a bottom wall 253 with downward bulges 254 that provide floor supports for the housing 250. The top part 251 and the bottom part 252 can be constructed from a suitable polymeric material such as a polyolefin. The bottom part 252 includes a hollow battery chamber 255 that extends upward from the bottom wall 253 of the bottom part 252. The battery chamber 255 has hollow cylindrical regions 256 that accept batteries that serve as the source of electricity 208. The battery chamber 255 has a lower open end 261. In the example embodiment shown, the battery chamber 255 houses four AA batteries. The battery chamber 255 can be configured to receive other numbers and sizes of batteries. The bottom wall 253 of

the bottom part 252 has generally rectangular openings 258, 259, 260 that form part of a hinge assembly as explained below.

[0288] Looking at FIGS. 42-43, the housing 250 includes a battery cover 262, which can be constructed from a suitable polymeric material such as a polyolefin. The battery cover 262 covers the lower open end 261 of the battery chamber 255 as explained below. The battery cover 262 has a body 263 having a side wall 264 that extends upward from a bottom wall 265. The side wall 264 has inwardly directed protrusions 266. The bottom wall 265 has a downward bulge 267 that provides floor support for the housing 250. The battery cover 262 includes battery contact structures 268 that provide a circuit path between batteries and also securely retain the batteries in the battery chamber 255. The battery contact structures 268 include electrically conductive materials such as conductive wire forms or springs in order to provide a circuit path between batteries.

[0289] The battery cover 262 includes at its forward end an outwardly directed first tab 270 with an upwardly directed projection 271 and an outwardly directed pin 272. The battery cover 262 also includes an outwardly directed second tab 274 with an upwardly directed projection 275 and a downwardly directed rib 276 on an opposite side of the second tab 274. The battery cover 262 also includes an outwardly directed third tab 278 with an upwardly directed projection 279 and an outwardly directed pin 280.

[0290] Looking at FIG. 39, the bottom wall 253 of the bottom part 252 of the housing 250 has an upwardly directed first wall 282 located adjacent the opening 258 in the bottom wall 253. The wall 282 defines a receiving area 283 for the first tab 270 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252 of the housing 250. In the receiving area 283, a ridge 284 extends upward from the bottom wall 253 of the bottom part 252 of the housing 250. The ridge 284 engages the bottom surface of the first tab 270 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252. The bottom wall 253 of the bottom part 252 of the housing 250 also has an upwardly directed second wall 286 located adjacent the opening 259 in the bottom wall 253. The second wall 286 defines a receiving area 287 for the second tab 274 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252 of the housing 250. In the receiving area 287, resilient fingers 288 extend upward from the bottom wall 253 of the bottom part 252 of the housing 250. The fingers 288 engage the rib 276 on the bottom surface of the second tab 274 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252 of the housing 250. The bottom wall 253 of the bottom part 252 of the housing 250 also has an upwardly directed third wall 290 located adjacent the opening 260 in the bottom wall 253. The third wall 290 defines a receiving area 291 for the third tab 278 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252 of the housing 250. In the receiving area 291, a ridge 292 extends upward from the bottom wall 253 of the bottom part 252 of the housing 250. The ridge 292 engages the bottom surface of the third tab 278 when the battery cover 262 is assembled to the bottom wall 253 of the bottom part 252.

[0291] Having described the components of the housing 250 of FIGS. 38-44, use of the housing 250 for containment of batteries that serve as the source of electricity 208 for the toilet cleaning device can be explained further. First, batteries are installed in the open end 261 of the battery chamber 255

in a conventional manner. Now looking at FIG. 44, the first tab 270 of the battery cover 262 is inserted in the opening 258 in the bottom wall 253 of the bottom part 252, the second tab 274 of the battery cover 262 is inserted in the opening 259 in the bottom wall 253 of the bottom part 252, and the third tab 278 is inserted in the opening 260 in the bottom wall 253 of the bottom part 252. FIG. 44 shows the second tab 274 of the battery cover 262 being inserted in the opening 259 in the bottom wall 253 of the bottom part 252; however, the first tab 270 and the third tab 278 enter the openings 258, 260 in a similar manner.

[0292] The battery cover 262 is moved first from an open position of FIG. 44 in direction U and then in direction A in FIG. 44 such that the first tab 270 moves into receiving area 283 for the first tab 270, the second tab 274 moves into the receiving area 287 for the second tab 274, and the third tab 278 moves into the receiving area 291 for the third tab 278. The battery cover 262 is then moved in direction F in FIG. 44 to a forward closed position such that the inwardly directed protrusions 266 of the side wall 264 of the battery cover 262 enter slots 294 in the bottom part 252. When entering the forward closed position, the fingers 288 of the bottom wall 253 of the bottom part 252 of the housing 250 ride under the rib 276 on the bottom surface of the second tab 274 such that the fingers 288 engage the rib 276 on the bottom surface of the second tab 274 thereby latching the battery cover 262 in the forward closed position. When a user wishes to install new batteries, the battery cover 262 is moved in direction R in FIG. 44 such that the fingers 288 of the bottom wall 253 of the bottom part 252 of the housing 250 ride under the rib 276 on the bottom surface of the second tab 274. The battery cover 262 is then rotated in direction B in FIG. 44 to provide access to the open end 261 of the battery chamber 255. The projection 271, the pin 272, the projection 275, the projection 279, and the pin 280 serve to keep the battery cover 262 from falling out of the bottom wall 253 of the bottom part 252 of the housing 250 by engaging the bottom wall 253. During movement in directions F and R in FIG. 44, the battery contact structures 268 and associated electrically conductive materials cause a wiping effect between the ends of the batteries and the battery contact structures 268 and associated electrically conductive materials which prevents corrosion of the battery connections that occurs in a wet environment such as a bathroom.

[0293] Various cleaning and/or deodorizing chemicals are suitable for use with a toilet bowl cleaning device according to the invention. For example, mildly acidic and near neutral pH antimicrobial compositions such as those described in U.S. Pat. Nos. 6,471,974 and 6,162,371 can be advantageous when used with a toilet bowl cleaning device according to the invention. Alkaline antimicrobial toilet bowl cleaning formulations such as those described in U.S. Pat. No. 6,425,406 can also be advantageous. Acidic compositions such as those described in U.S. Pat. No. 6,812,196 may also be suitable. When using acidic compositions, a steel container with a plastic liner or a bladder with a surrounding propellant may be desirable to minimize acidic corrosion of the steel container. Aluminum containers may also be an option for acidic compositions. The amount of chemical applied to the toilet bowl and/or toilet water depends on the composition chosen. For example, in an acidic composition including lactic acid, surfactant, and solvent, a 2-10 milliliter dose of chemical may be appropriate. The above chemicals are non-limiting illustrative examples of cleaning and/or deodorizing chemicals suit-

able for use with a toilet bowl cleaning device according to the invention. Other example suitable chemicals include, for example, enzymes, chelating agents, corrosives and amino acids.

[0294] Thus, the present invention provides a toilet bowl cleaning device that manually or automatically sprays a chemical laterally around a perimeter of a nozzle of the device. As a result, full coverage of the chemical around the inner surface of the toilet bowl is possible.

[0295] Although the present invention has been described in detail with reference to certain embodiments, one skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which have been presented for purposes of illustration and not of limitation. Therefore, the scope of the invention should not be limited to the description of the embodiments contained herein.

INDUSTRIAL APPLICABILITY

[0296] The present invention provides a toilet bowl cleaning device for spraying an inner surface of the toilet bowl, and/or the toilet water, and/or under the toilet rim with a chemical.

What is claimed is:

1. A device for spraying an inner surface of an enclosure with a fluid, the device comprising:
 - a container for the fluid;
 - a fluid delivery device through which the fluid can be applied to the inner surface of the enclosure;
 - a fluid conduit in fluid communication with the container and the fluid delivery device;
 - means for delivering fluid from the container through the fluid conduit and to the fluid delivery device; and
 - a clip for mounting the fluid delivery device adjacent the inner surface of the enclosure, the clip including a sensor.
2. The device of claim 1 wherein:
 - the sensor is selected from proximity sensors, light sensors, sound sensors, pressure sensors, vibration sensors, motion sensors, tilt sensors, flush sensors, and combinations thereof.
3. The device of claim 1 wherein:
 - the means for delivering fluid from the container is a pump; and
 - the device further includes a control circuit in electrical communication with the pump and the sensor and a source of electricity, wherein the control circuit executes a stored program to initiate a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device.
4. The device of claim 3 wherein:
 - the enclosure is a toilet bowl,
 - the sensor is a flush sensor, and
 - the control circuit executes the stored program to initiate the cycle after the flush sensor senses a flush.
5. The device of claim 4 wherein:
 - the control circuit includes a timer circuit which automatically initiates the cycle at a set time period after the flush.
6. A device for spraying an inner surface of a toilet bowl of a toilet with a fluid, the device comprising:
 - a container for the fluid;
 - a hanger suitable for suspending the container from the toilet;

a fluid delivery device through which the fluid can be applied to the inner surface of the toilet bowl;
 a fluid conduit in fluid communication with the container and the fluid delivery device; and
 a pump for delivering fluid from the container through the fluid conduit and to the fluid delivery device;
 a control circuit in electrical communication with the pump, the control circuit initiating a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device.

7. The device of claim 6 wherein:
 the hanger is suitable for suspending the container from a rim of the toilet bowl.

8. The device of claim 7 wherein:
 the container is dimensioned such that the container contacts a floor on which the toilet is mounted when the container is suspended from the rim of the toilet bowl.

9. The device of claim 6 wherein:
 the device further includes a sensor in electrical communication with the control circuit, and
 the control circuit executes initiates the cycle in response to an electrical signal from the sensor.

10. The device of claim 6 wherein:
 the sensor is a flush sensor, and
 the control circuit initiates the cycle after the flush sensor senses a flush.

11. A device for spraying an inner surface of an enclosure with a fluid, the device comprising:
 a first container for a first fluid chemical system;
 a second container for a second fluid chemical system;
 a fluid delivery device through which fluid can be applied to the inner surface of the enclosure;
 means for delivering fluid from the first container and the second container to the fluid delivery device; and
 a clip for mounting the fluid delivery device adjacent the inner surface of the enclosure.

12. The device of claim 11 further comprising:
 a holder attached to the clip, the first container and the second container being removably attached to the holder.

13. The device of claim 12 wherein:
 the first container and the second container are attached below the holder.

14. The device of claim 11 wherein:
 the means for delivering fluid from the container is a pump; and
 the device further includes a control circuit in electrical communication with the pump and a source of electricity, wherein the control circuit executes a stored program

to initiate a cycle in which the pump delivers fluid from the container through the fluid conduit and to the fluid delivery device.

15. The device of claim 14 wherein:
 the device further includes a sensor in electrical communication with the control circuit, and
 the control circuit executes initiates the cycle in response to an electrical signal from the sensor.

16. An electrical device comprising:
 a housing having a battery chamber;
 a battery cover; and
 a hinge for connecting the battery cover and the housing, the hinge comprising an opening in a wall of the housing and a tab connected to the battery cover, the opening and the tab being dimensioned such that the tab can be inserted into the opening when the battery cover is connected to the housing, and the opening and the tab being dimensioned such that the tab can move in the opening so that the battery cover can pivot with respect to the wall of the housing,
 wherein the device includes a latch comprising a section of the wall of the housing and a portion of the tab, the latch releasably securing the battery cover to the housing in a closed position for covering an open end of the battery chamber.

17. The device of claim 16 wherein:
 the section of the wall comprises a resilient finger, and the portion of the tab comprises a rib, the finger engaging the rib in releasably locking relationship when the cover is moved into the closed position.

18. The device of claim 16 wherein:
 the hinge further comprises at least one additional opening in the wall of the housing and at least one additional tab connected to the battery cover, each additional opening being dimensioned such that an associated additional tab can be inserted into the additional opening when the battery cover is connected to the housing, and each additional opening and associated additional tab being dimensioned such that the associated additional tab can move in the additional opening so that the battery cover can pivot with respect to the wall of the housing.

19. The device of claim 16 wherein:
 the hinge further comprises a projection at an end of the tab, the projection preventing the tab from falling out of the opening after the battery cover is connected to the housing.

20. The device of claim 16 further comprising:
 means for delivering fluid from a container through a fluid conduit and to a fluid delivery device.

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