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(54) **Title:** NON-CONTACT SPRAY TOILET BOWL CLEANING DEVICE

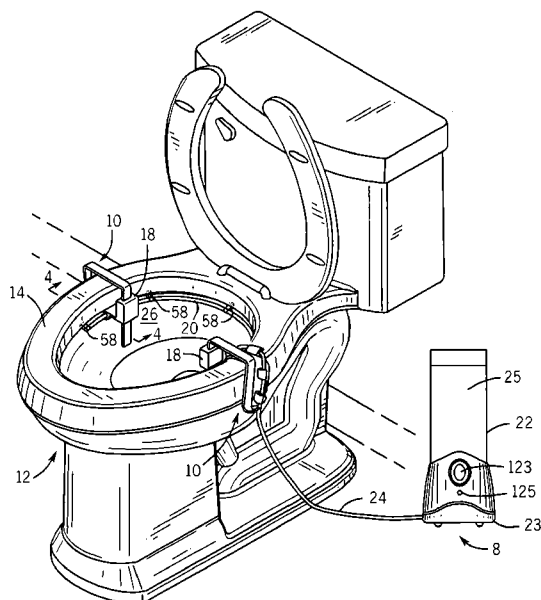


FIG. 1

(57) **Abstract:** A device for spraying an inner surface of a toilet bowl with a cleaning fluid is disclosed. The device includes a container for the fluid, a fluid spray bar through which the fluid can be sprayed on the wall of the enclosure, a pumping apparatus for delivering fluid from the container to the fluid spray bar, and a controller. The fluid spray bar includes spray nozzles with different configurations and nozzle bodies to effectively spray the inner surface of the enclosure.

WO 2011/049618 A1

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## NON-CONTACT SPRAY TOILET BOWL CLEANING DEVICE

### CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] Not Applicable.

5                   STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not Applicable.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

10           [0003] This invention relates to an automatic and/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. The device includes a spray bar that  
effectively delivers a cleaner around the circumference of a toilet bowl. The spray  
bar may include nozzles to direct the flow of the cleaner.

#### 2. Description of the Related Art

15           [0004] 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.

20           [0005] In order to eliminate the detested 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. Patent No. 4,777,670 shows an example of this type of toilet bowl  
25           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.

30           [0006] Other toilet bowl cleaning systems use a liquid cleaning agent that is  
dispensed into a toilet bowl. For example, U.S. Patent 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 introducing liquid active substances

-2-

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 may be 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/or freshen the toilet.

**[0007]** 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. Patent 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. Patent 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. Accordingly, such devices are often referred to as "under the rim"-type devices.

**[0008]** One disadvantage with traditional 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.

**[0009]** U.S. Patent Application Publication Nos. 2007/0136937, 2007/0234470, 2007/0240252, 2008/0017762, and 2009/0000016 (which are incorporated herein by reference) are owned by the owner of the current invention. These publications set forth, among others, an automatic and/or manual toilet bowl cleaning device where the inner surface of the toilet bowl is cleaned around the entire circumference of the toilet bowl.

**[0010]** In one example embodiment illustrated in U.S. 2007/0136937, the downstream end of a fluid supply conduit terminates in a nozzle capable of spraying the cleaning fluid outwardly onto the inner surface 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. A mounting clip at a location near the rim of the toilet bowl may attach the nozzle to

-3-

the toilet bowl. The mounting clip can house a proximity or motion sensor that detects the presence of a person. Manual delivery of the cleaning fluid from a fluid supply container to the fluid supply conduit may be achieved by pressing a manual activation button that is in electrical communication with a control circuit that turns on an electrically driven pump that delivers the cleaning fluid into the fluid supply conduit and into the spray nozzle. Automatic delivery of the cleaning fluid from a fluid supply container to the fluid supply conduit can also be achieved pressing an activation button that is in electrical communication with a control circuit that controls on an electrically driven pump. Immediately after the user presses the activation button, fluid delivery occurs at selected time intervals (e.g. every eight hours). The proximity sensor that is in electrical communication with the control circuit can stop initiation of a spray cycle if a person is near the toilet bowl.

**[0011]** In addition to such under the rim devices, a number of devices have been described that deliver a composition via a spray nozzle to the toilet bowl. An exemplary device is described in PCT Pub. No. WO 2009/027246. Such a device may perform exceptionally well in the delivery of the cleanser and/or fragrance and/or composition to the inside of the toilet bowl. However, such a device may not effectively dispense chemicals and/or composition to the toilet while a consumer is using the toilet because of concerns that the consumer may be surprised by any contact with the composition. Existing spray-type devices often include one or more sensors to reduce or eliminate such concerns. Alternatively, some automated toilet products provide a relatively mild alkaline or acidic composition that will not irritate consumers' skin in anticipation of the composition contacting a consumer.

**[0012]** Thus, there is a need for an improved automatic or manual toilet bowl-cleaning device where substantially the entire inner surface of the toilet bowl may be cleaned while also providing a high level of comfort to the user, even while the user may be otherwise engaged in using the toilet. In some embodiments of the envisioned improved automatic toilet bowl-cleaning device, the device may be activated while a consumer is using the toilet and/or the device may be activated

in such a way that there is little to no opportunity for discharging composition onto the user.

**[0013]** In view of the advances in the art provided by the devices of U.S. Patent Application Publication Nos. 2007/0136937, 2007/0234470, 2007/0240252, 5 2008/0017762 and 2009/0000016 even further improvements to this technology would be beneficial to consumers.

#### SUMMARY OF THE INVENTION

10 In one nonlimiting embodiment, the present invention is directed to a device for spraying an inner surface of a wall of an enclosure with a fluid, the device comprising: (1) a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure; and (2) a plurality of spray nozzles through which the fluid can be sprayed, the spray nozzles being in fluid communication with the interior space of the spray 15 bar, at least one of the spray nozzles having a nozzle body defining a fluid path in fluid communication with the interior space, the nozzle body extending away from an outer surface of the spray bar.

20 In another nonlimiting embodiment, the present invention is directed to a device for spraying an inner surface of a wall enclosure with a fluid, the device comprising: (1) a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure; a first spray nozzle through which the fluid can be sprayed, the first spray nozzle being in fluid communication with the interior space of the spray bar, arranged on the fluid spray bar and located between the source of the fluid and a first end of 25 the spray bar, the first spray nozzle having a nozzle body defining a fluid path in connection with the interior space, the nozzle body of the first spray nozzle extending away from the outer surface of the spray bar wherein the first spray nozzle has a first spray hole having a first axis, the first spray hole being in fluid communication with the fluid path, wherein the first axis faces substantially away 30 from the source of the fluid; and (2) a second spray nozzle through which fluid can be sprayed, the second spray nozzle being in fluid communication with the interior space of the spray bar, arranged on the fluid spray bar having a nozzle body

-5-

defining a fluid path in fluid communication with the interior space, the nozzle body of the second spray nozzle extending away from the outer surface of the spray bar wherein the second spray nozzle has a second spray hole having a second axis, the second spray hole being in fluid communication with the fluid path, wherein the second axis faces in a different direction than the first axis.

In yet another nonlimiting embodiment, the present invention is directed to a device for spraying an inner surface of a wall enclosure with a fluid, the device comprising: (1) a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure; and (2) a clip for attaching the spray bar to the enclosure, the clip including a hook and a base wherein the base includes an opening for receiving an inner rim segment of the hook.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Figure 1 is a perspective view of a toilet bowl cleaning device in accordance with an embodiment of the invention.

[0015] Figure 2 is a side elevation view of the clip of Figure 1.

[0016] Figure 3 is a perspective view of a toilet bowl cleaning device in accordance with a first embodiment of the invention.

[0017] Figure 4 is a side elevation, fragmentary view taken along line 4-4 of Figure 1 showing a clip and spray bar assembly of the toilet bowl cleaning device of in accordance with the first embodiment of the invention.

[0018] Figure 5A is a top view of the toilet bowl cleaning device of Figure 3 and its associated spray pattern.

[0019] Figure 5B is a side view of the toilet bowl cleaning device of Figure 3 and its associated spray pattern.

[0020] Figure 6 is a top view of an exemplary toilet bowl cleaning device in accordance with an embodiment of the invention.

[0021] Figure 7A is a perspective, fragmentary view taken along line 7A-7A of Figure 6 showing a spray nozzle of the toilet bowl cleaning device in Figure 6 with the clip and the fluid conduit removed.

[0022] Figure 7B is a cross-sectional view taken along line 7B-7B.

**[0023]** Figure 8A is a top view of an exemplary toilet bowl cleaning device in accordance with an embodiment of the invention.

**[0024]** Figure 8B is a top view of an exemplary toilet bowl cleaning device in accordance with an embodiment of the invention.

5 **[0025]** Figure 9 is a top plan view showing the container holder of the toilet bowl cleaning device of Figure 1.

**[0026]** Figure 10 is an exploded perspective view of an example electrical pump suitable for use in the toilet bowl cleaning device of Figure 1.

10 **[0027]** Figure 11 is a functional flow diagram of the steps in an example operating method for the toilet bowl cleaning device of Figure 1

**[0028]** Like reference numerals will be used to refer to like parts from Figure to Figure in the following description of the drawings.

15 **[0029]** It should be understood that the drawings are not necessarily to scale and that the disclosed embodiments are sometimes illustrated diagrammatically and in partial views. In certain instances, details which are not necessary for an understanding of the disclosed methods and apparatuses or which render other details difficult to perceive may have been omitted. It should be understood, of course, that this disclosure is not limited to the particular embodiments illustrated herein.

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#### DETAILED DESCRIPTION OF THE INVENTION

25 **[0030]** A cleaning device according to the invention may be used to dispense cleaning fluid or some other cleaning composition into an enclosure and/or the inside surface(s) of an enclosure. An enclosure may include a toilet bowl, shower stall, bathtub, and the like. Various nonlimiting embodiments of the invention are described with reference to the Figures.

30 **[0031]** The foregoing needs described above may be met with a toilet bowl cleaning and/or deodorizing device according to the invention that delivers a chemical into the toilet bowl. The term "chemical" or "chemistry" means one or more compounds and/or combination of 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" may also include sanitizing and/or disinfecting, and the term "deodorizing" may also include freshening, odor absorbing, providing perfume and/or any function related to improving a user's olfactory experience.

**[0032]** Regarding the chemistry, a chemical, or other such cleansing composition, may be provided onto the inner surface of the toilet bowl and/or directly into the toilet water to clean and/or freshen the toilet bowl. If applied to the inner surface of the toilet bowl, the chemical will typically be a liquid (single or multiple chemistries). If added to the toilet water, the chemistry can also be a liquid (single or multiple chemistries) that is added to the water to act as a preventive, or to create an environment that will work to clean the toilet automatically.

**[0033]** With respect to the dispensing system, the system includes several subsystems that may provide a suitable 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 not be limited to: (i) a chemistry storage container; (ii) a chemical propulsion system; (iii) a chemical delivery system; and (iv) a toilet interface. These subsystems work together to deliver the appropriate chemistry (using predetermined amounts) to deliver the desired consumer benefit.

**[0034]** The chemistry storage container may be 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.

**[0035]** 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 a pump or pumping mechanism to move a liquid such as a vein pump, bellows pump, impeller driven pump, piston pump, peristaltic pump or gear driven pump. In another embodiment, the chemical may be provided in a pressurized system wherein the drop in pressure between the chemistry storage container and the ambient surroundings provides an adequate gradient to effectively dispense the chemical composition.

**[0036]** The chemical delivery system provides a method of moving chemistry from its storage container to the appropriate area within the toilet bowl. This delivery subsystem can include a hose and a sprayer (e.g., one or more spray bars).

5 **[0037]** 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 spray bar into place on the toilet rim or toilet lid.

**[0038]** In one exemplary embodiment, the toilet bowl cleaning and/or deodorizing device includes a replaceable plastic transparent container filled with  
10 a toilet bowl cleaning solution (chemical composition) that uniquely locks into an inverted position in a container holder base dispensing unit. The container holder base accepts a refill container with a unique lock and key and spill-proof closure. The device detects when a container is inserted into the container holder base and available for safe dispensing. A button release system secures the container  
15 through a locking tab that engages the container closure. The base dispensing unit activates a pump, such as one similar to the one available in the Scrubbing Bubbles® Automatic Shower Cleaner device, to automatically transfer fluid from the container through a conduit into a spray bar assembly approximately three times a day. The spray bar assembly may be attached to the rim of the toilet bowl  
20 with the cleaning fluid dispenser spray bar inside the toilet bowl and below the inner rim. A functional dispensing cycle results in a continuous coating of chemical from the plastic container onto the walls of the toilet bowl from the water line up to the bottom of the rim.

**[0039]** In one aspect, the invention provides a device for spraying an inner  
25 surface of a wall of an enclosure with a fluid. The enclosure can be one of a tub, shower and/or toilet. In another aspect, the device includes one or more fluid spray bars wherein each spray bar may include one or more spray nozzles, spray holes and/or nozzle bodies through which the fluid (e.g., chemical composition and/or cleaning composition) can be sprayed. In a particular nonlimiting  
30 embodiment, the spray bar has an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure. The spray nozzles are in fluid communication with the interior space of the spray bar.

At least one of the spray nozzles has a nozzle body defining a fluid path in fluid communication with the interior space, and the nozzle body extends away from an outer surface of the spray bar.

5 [0040] In one embodiment, each of the spray nozzles has a nozzle body. The nozzle bodies define a fluid path in fluid communication with the interior space, and each of the nozzle bodies extend away from an outer surface of the spray bar.

10 [0041] In a second embodiment, at least one spray nozzle has a first spray hole having a first axis and a second spray hole having a second axis. The first and second spray holes are in fluid communication with the fluid path. The first axis faces in a different direction than the second axis to provide a relatively wide coverage area for the spray.

15 [0042] In a third embodiment, at least one spray nozzle has a third spray hole having a third axis. The third spray hole is in fluid communication with the fluid path, and the third axis is substantially opposite the direction of the first axis and the second axis to provide a relatively wide coverage area for the spray.

20 [0043] In a fourth embodiment, the first and second spray nozzles have nozzle bodies defining a fluid path in fluid communication with the interior space of the fluid spray bar. The nozzle body of the first spray nozzle is arranged substantially on a first end of the fluid spray bar. The first spray nozzle has a first spray hole with a first axis. The nozzle body of the second nozzle is arranged substantially on a second end of the fluid spray bar. The second spray nozzle has a second spray hole with a second axis. The first and second axes face substantially opposite the fluid spray bar to provide a relatively wide coverage area for the spray.

25 [0044] In a fifth embodiment, at least one spray nozzle body extends laterally and upwardly away from the outer surface of the spray bar.

30 [0045] In a sixth embodiment, a pumping apparatus delivers fluid from the source of the fluid through a fluid conduit to the interior space of the fluid spray bar when the pumping apparatus is activated.

[0046] In a seventh embodiment, a controller is in electrical communication with the pumping apparatus. The controller executes a stored program to activate

-10-

the pumping apparatus at an end of a predetermined time interval stored in the controller. The controller may also be in electrical communication with one or more sensor mechanisms wherein the sensor mechanisms may provide a means for detecting the presence (or lack thereof) of a user. As described above, many automatic dispensing devices for bathroom-type enclosures, such as WO 5 2009/034306(A1), WO 2009/034303(A1), WO 2009/034330(A1), WO 2009/034304(A1), and WO 2009/0276246, do not provide a suitable means for accounting for the presence (or lack thereof) of a user. Applicants unexpectedly observe that, as an alternative/in addition to the use of a sensor mechanism, it 10 may be desirable to provide a device that may spray cleansing composition from a nozzle or other means for discharge. Further, it is even more surprisingly observed that in such a device, such a device may be especially favored from a consumer standpoint if such device may distribute composition to a substantial portion of the inner surface of the toilet bowl.

15 **[0047]** It is also thought that bathroom enclosures, residential bathroom enclosures in particular, may be particularly difficult to monitor by a sensor because of limitations in the sensor device and/or unique ambient conditions in each bathroom. For example, certain bathrooms may be unusually warm, such that an IR detector may not operate properly, or that the sensor itself may become 20 soiled and thus become non-functional, etc. The inventors observed that due to the size and layout of a residential bathroom, many enclosures may be relatively warm and/or humid, thus causing unusual difficulties when designing and/or using a sensor. Thus, the inventors have found a unique solution to the problem of accidental discharge of the chemical composition by providing new and unique 25 spray bar configuration(s). In some embodiments, the spray bar is provided such that the spray device may further comprise spray nozzles (or some other means for discharge) wherein the chemical composition is provided to the inner surface of the enclosure in such a way that there is no contact with the user during discharge of the chemical composition.

30 **[0048]** In one embodiment, the nozzle body of the first spray nozzle extends away from the outer surface of the spray bar. The first spray nozzle has a first spray hole, wherein the first spray hole has a first axis. The first spray hole is in

fluid communication with the fluid path, and the first axis faces substantially away from the source of the fluid.

5 [0049] The second spray nozzle is in fluid communication with the interior space of the spray bar. The second spray nozzle is arranged on the fluid spray bar and has a nozzle body defining a fluid path in fluid communication with the interior space. The nozzle body of the second spray nozzle extends away from the outer surface of the spray bar. The second spray nozzle has a second spray hole which has a second axis. The second spray hole is in fluid communication with the fluid path, and the second axis faces in a different direction than the first axis.

10 [0050] In a first embodiment, the fluid is delivered to the fluid spray bar through a fluid conduit. The fluid conduit is in fluid communication with the source of the fluid and the interior space of the spray bar. The fluid conduit is located substantially next to the first end of the spray bar.

15 [0051] In a second embodiment, the pumping apparatus delivers fluid from the source of the fluid through the fluid conduit and to the fluid spray bar when the pumping apparatus is activated.

20 [0052] In a third embodiment, a controller is in electrical communication with the pumping apparatus. The controller executes a stored program to activate the pumping apparatus at an end of a predetermined time interval stored in the controller.

25 [0053] In yet another embodiment, the invention provides a device for spraying an inner surface of a wall enclosure with a fluid. The enclosure can be one of a tub, shower, or toilet. The device may include one or more fluid spray bars and a one or more clips for attaching the spray bars to the enclosure. Each fluid spray bar may have an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure. In one nonlimiting embodiment the clip includes a hook and a base. The base may include an opening for receiving an inner rim segment of the hook.

30 [0054] In one embodiment, the base is movable along the inner rim segment of the hook such that the distance between the base and the top of the hook is adjustable.

-12-

[0055] In another embodiment, a tab extends away from the base. The tab engages an inner surface of the toilet when the clip is installed on the toilet.

[0056] In another embodiment, a channel in the tab engages the spray bar. The channel opens away from the base.

5 [0057] In another embodiment, a pumping apparatus delivers fluid from the source of the fluid through a fluid conduit to the fluid spray bar when the pumping apparatus is activated.

[0058] In another embodiment, a controller is in electrical communication with the pumping apparatus. The controller executes a stored program to activate the  
10 pumping apparatus at the end of a predetermined time interval stored in the controller.

[0059] 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.

15

### **Pump System**

[0060] Particular nonlimiting embodiments of a pump system are described in greater detail *supra*. For the purpose of the testing of devices and examples of devices that may be provided throughout this specification, the spray devices are  
20 provided with a pump system that is similar to the one described in U.S. Pat. No. 6,820,821. A nonlimiting example of a pump is that available for retail is the unit in the Scrubbing Bubbles® Automatic Shower Cleaner.

[0061] An exemplary cleansing composition is described in U.S. Pat. Nos. 6,162,371 and 6,471,974. One of skill in the art will appreciate that any amount of  
25 composition may be provided during the dispensing from a device. Further, one of skill in the art will appreciate that the composition may have any density and/or viscosity and/or other physical properties which may be suitable for the intended purpose of the composition.

### **Extended-Bar Spray Device**

30 [0062] Certain known automatic toilet bowl cleaning devices provide a constant stream or spray that is directed at the surface of an enclosure, such as a toilet, by

-13-

using a rotating nozzle or other similar means to maximize the coverage to the surface of the toilet. Other known automatic toilet bowl cleaning devices may provide a stream or spray that is directed towards the center of the toilet bowl in order to provide coverage throughout the center of the toilet bowl and to the  
5 opposite side of the toilet bowl from the spray origin. Such a device is described in WO 2009/027246.

**[0063]** Figures 1 and 2 provide a nonlimiting embodiment of a fluid spray bar assembly (indicated generally at 20) for spraying an inner surface of a toilet bowl 26 with a chemical. The device, such as a fluid spray bar assembly 20 includes a  
10 clip 10 for mounting a fluid spray bar assembly 20 to an enclosure, here a toilet bowl 12. The clip 10 is secured to the rim 14 of the toilet bowl 12 by a hook 16. A base 18 is supported by the hook 16. The base includes a tab 50, which creates a channel 54 for engaging the fluid spray bar assembly 20. A container 22 supplies fluid and/or some embodiment of a chemical composition and/or  
15 chemical cleanser 25 via a fluid conduit 24 to the fluid spray bar assembly 20 to be dispensed onto the inside surface 26 of the toilet bowl 12. The fluid 25 can be supplied from the container 22 to the fluid spray bar assembly 20 by way of a pumping apparatus or by providing some sort of pressure to the container 22. Such pressure source and/or controller to actuate a pumping apparatus may be  
20 housed in a container holder 23. The pressure source, pumping apparatus, controller, and container holder 23 are described in further detail below.

**[0064]** Turning to Figure 2, the clip 10 comprises a hook 16 for supporting the base 18 and attaching the clip 10 to the toilet bowl 12 has three main segments. A bowl segment 28, a top rim segment 30, and an inner rim segment 32. In one  
25 embodiment, the three segments 28, 30, 32 may be integrally molded from plastic (e.g., polyethylene or polypropylene) and form a flexible hook 16. In the embodiment shown, the bowl segment 28 has a substantially rectangular cross section and a flared elastomeric gripping foot 34. The bowl segment 28 extends substantially vertically upward and transitions into the top rim segment 30 at a  
30 flexible elbow 35 that allows the hook 16 to flex predominantly in the F-F direction to secure the clip 10 to toilet bowls of various shapes and sizes. The top rim segment 30 has a substantially rectangular cross-section and extends horizontally

-14-

across the rim 14 of the toilet bowl 12 where it transitions into the inner rim segment 32 at another flexible elbow 36, also allowing the hook 16 to flex. The inner rim segment 32 extends vertically downward from the elbow 36 and is configured to engage and support the base 18.

5     **[0065]**     The inner rim segment 32 of the hook 16 has a front face 38 and a rear face 40 joined by two short side faces 42. A rib 44 protrudes from the rear face 40 of the inner rim segment 32 and extends the length thereof. The rib 44 limits the angle of rotation of the base 18 with respect to the hook 16. The rib of the example embodiment has a substantially rectangular cross-section, however, the  
10     rib 44 may have a curved cross-section, a square cross-section, comprise two spaced apart members, and the like. Additionally, the rib 44 need not extend the length of the inner rim segment 32 provided the rib 44 engages the base 18 throughout the desired adjustable range of the base. The short side faces 42 have ratchet teeth 46 used in conjunction with the base 18 to restrain vertical  
15     movement of the base 18 along a vertical axis 48. Other restraints may be used, such as a friction fit between the hook 16 and base 18, or the like.

**[0066]**     The base 18 has a tab 50 that extends rearward away from the base 18. The tab 50 helps orientate the base 18 with respect to the rim 14 when the clip 10 is mounted to the toilet bowl 12, as discussed below. The tab 50 may be  
20     one continuous member as shown in the example embodiment, or alternatively, the tab 53 may include a plurality of members extending from the base 18. The base 18 is preferably molded from plastic (e.g., polyethylene or polypropylene). The tab 50 includes a channel 54 for engaging the fluid spray bar 56. The channel 54 opens away from the base 18.

25     **[0067]**     The base 18 includes an opening 64 for receiving the inner rim segment 32 of the hook 16. The opening 64 includes a slit 66 for receiving the rib 44 having an entrance 68, an exit 70, and intermediate position 72 (which may or may not be equidistant from the entrance 68 and the exit 70). The width of the slit 66 decreases from the entrance to the intermediate position 72 and increases  
30     from the intermediate position 72 to the exit. In one embodiment, the intermediate position 72 is approximately half way between the entrance 68 and the exit 70; however, the narrowest point need not be halfway between the entrance 68 and



-15-

exit 70, but may occur anywhere between the extremes of the slit 66. Additionally, the maximum width of the slit 66 may vary depending on the desired degree of adjustment of the base 18 with respect to the hook 16. If greater rotational adjustment of the base 18 is desired, the maximum width of the slit 66 at the entrance 68 and exit 70 may be increased; alternatively, or in addition, the width of the rib 44 may be decreased. In another embodiment, a spring and/or elastic band and/or other resistance device, may be included in the rib to provide some sort of force to help the clip 10 maintain a strong fit to the toilet bowl 12 despite the adjustability of the clip 10.

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**[0068]** Turning to Figures 3-4, a nonlimiting embodiment of the fluid spray assembly 20 is described. The fluid spray assembly 20 includes a fluid spray bar 56 in fluid communication with a plurality of spray nozzles 62. In one embodiment, the fluid spray bar 56 is molded from a flexible plastic (e.g. polyethylene and polypropylene). The fluid spray bar 56 has an interior space 57 (shown in Figure 7B) which defines a path that may provide fluid communication from the fluid conduit 24 to the rest of the fluid spray bar 58. At least one spray nozzle 62 (shown in Figure 6) is in fluid communication with a nozzle body 58, which is preferably molded from an engineering plastic (e.g. polyacetal, acetal resin, polytrioxane, polyformaldehyde, and paraformaldehyde). In certain embodiments, the nozzle body 58 defines a fluid path from the interior space 57 of the fluid spray bar 56. In certain other embodiments, the spray nozzle 62 may simply be a puncture, or other orifice, through which fluid and/or a cleaning composition 25 (Figure 1) may flow. The fluid spray bar 56 is flexible so that it conforms to the shape of the toilet and is held securely in place by two clips 10.

**[0069]** In the example embodiment shown in Figure 5A, the fluid spray bar 56 has five spray nozzles 62 evenly spaced along the fluid spray bar 56. Each spray nozzle 62 has a nozzle body 58 attached to the outer surface of the fluid spray bar 56 over the spray nozzle 62, and the nozzle body 58 defines a fluid path from the interior space 57 of the fluid spray bar 56. Each nozzle body has three spray holes 59 in fluid communication with the interior space 57 of the fluid spray bar 56 for dispensing chemical onto the inner surface 26 of the toilet bowl 12. In one embodiment, the spray holes 59 have a diameter of from about 0.4 mm to about

-16-

1.2 mm. In another embodiment, the spray holes 59 have a diameter of from about 0.5 mm to about 1.0 mm. In another embodiment still, the spray holes have a diameter of from about 0.6 mm to about 0.8 mm. It is thought that by providing a smaller spray hole size, smaller particles are released. Because small particles

5 have less mass than large particles, such particles are more likely to drift from their intended path, thus running the risk of unwanted contact with the user and/or not reaching the intended surface for coverage. Such small particles, or mist, may be suitable for fragrancing applications, but inventors observe such surprising results to provide optimal coverage for cleansers or cleansing applications.

10 Further, spray particle size increases as spray pressure decreases. The spray pressure may be selected to provide a spray that provides adequate coverage within the intended enclosure. In other words, that is, adequate pressure must be provided to avoid misting the chemical composition, but at the same time able to provide coverage to the surface.

15 **[0070]** Further, it is surprisingly discovered that by providing the multi-directional spray as exemplified in Figures 5A and 5B, the spray nozzle 62 may remove the need for any sort of moving spray delivery system. By providing multi-directional spray from a spray nozzle 62, or by providing some sort of angular characteristic to an orifice or other spray hole 59, spray can be provided in a

20 plurality of directions substantially parallel to the X-Y plane, but which will reach a relatively high percentage of the inner surface 26 of the toilet bowl 12 is provided with cleaning composition 25. In particular, by providing spray that is directed away from, and/or relatively tangential to, the nearest point on the circumference of the inner portion of the toilet bowl.

25 **[0071]** Returning to Figure 5A, an exemplary embodiment is provided wherein there are three spray holes 59 from the spray nozzle 62, a first spray hole 59a is directed to provide a first spray  $S_1$  that may be substantially normal to a line tangent to the spray bar 56 at the spray hole 59 and/or nozzle 62. A second spray hole 59b may provide a second spray  $S_2$  that is aimed in a direction that is

30 different from the first spray  $S_1$  and at such an angle  $\alpha_2$  that the first spray  $S_1$  and second spray  $S_2$  do not cross. A third spray hole 59c may provide a third spray  $S_3$  that is aimed in a direction and at an angle  $\alpha_3$  such that the first spray  $S_1$  and the

-17-

second spray  $S_2$  do not cross the third spray  $S_3$ . In an alternative embodiment, the spray holes 59a, 59b, 59c, do not necessarily have to be located on a single nozzle 62, but may simply be adjacent orifices in the fluid spray bar 56 or located on adjacent nozzles 62. One of skill in the art will appreciate that the number and size of the spray nozzles 62 and nozzle bodies 58 may be varied in order to adjust the level of coverage of the chemical. Additionally, it is understood that the number and direction of the spray holes 59 may also be modified. The nozzle bodies 58 at the end of the fluid spray bar 56 may provide a fourth spray  $S_4$  that is directed away from the fluid spray bar 56 in order to provide a relatively high level of coverage

**[0072]** In one embodiment,  $\alpha_2$  and/or  $\alpha_3$  is from about  $0^\circ$  to about  $80^\circ$ . In another embodiment,  $\alpha_2$  and/or  $\alpha_3$  is from about  $10^\circ$  to about  $50^\circ$ . In still another embodiment,  $\alpha_2$  and/or  $\alpha_3$  is from about  $15^\circ$  to about  $30^\circ$ . In a different embodiment, each spray hole 59, spray nozzle 62 and/or nozzle body 58 may provide spray in the same direction. In one embodiment, the direction may be one that is substantially normal to a line which may be tangent to the spray bar 56 at the spray hole 59, spray nozzle 62 and/or nozzle body 58.

**[0073]** Figure 5B shows an embodiment of the sprayer 20 of Figure 5A in the X-Y plane. In the embodiment shown, the sprays ( $S_1$ ,  $S_2$ ,  $S_3$ ) may be directed upward relative to the X-Y plane, at an angle  $\beta_1$ , to contact the rim 14 of the toilet bowl 12. In a different embodiment, the sprays ( $S_1$ ,  $S_2$ ,  $S_3$ ) may be directed in a direction substantially co-planar with the spray holes and/or nozzle 62. In a different embodiment still, the sprays ( $S_1$ ,  $S_2$ ,  $S_3$ ) may be directed downward relative to the X-Y plane, at an angle  $\beta_2$ , to contact the rim 14 of the toilet bowl 12. One of skill in the art will appreciate that the spray holes 59 in a particular spray nozzle 62 need not be directed in the same direction with respect to the X-Y plane, but may be directed in any way that will provide the user with the user's desired final result. Similarly, the shape and/or size of the nozzle bodies 58 and/or spray nozzles 62 and/or spray holes 59 may be any size that suits the user's intended function. The nozzle bodies 58 are all oriented to intersect the inner surface 26 of the toilet bowl 12 in such a way as to prevent the fluid spray bar 56 from blocking the flushing jets of the toilet.

-18-

**[0074]** In one embodiment,  $\beta_1$  and/or  $\beta_2$  is from about  $0^\circ$  to about  $80^\circ$ . In another embodiment,  $\beta_1$  and/or  $\beta_2$  is from about  $10^\circ$  to about  $60^\circ$ . In one embodiment,  $\beta_1$  and/or  $\beta_2$  is from about  $20^\circ$  to about  $45^\circ$ .

5 **[0075]** The diameter of each spray nozzle 62 (or in an alternative embodiment, the diameter of each spray hole 59) is from about 0.4 mm to about 1.2 mm. In another embodiment, the diameter of each spray nozzle is from about 0.5 mm to about 1.0 mm. In another embodiment, the diameter of each spray nozzle is from about 0.6 mm to about 0.8 mm.

10 **[0076]** In one nonlimiting embodiment, the spray holes 59 are configured to produce a conical spray having a cone angle of from about  $30^\circ$  to about  $150^\circ$ . In another embodiment, the spray holes 59 are configured to produce a conical spray having a cone angle of from about  $45^\circ$  to about  $135^\circ$ . In another embodiment still, the spray holes 59 are configured to produce a conical spray having a cone angle of from about  $75^\circ$  to about  $105^\circ$ .

15 **[0077]** With general reference to Figures 2 and 4, an exemplary clip 10 may be mounted follows: The clip 10 is secured to the rim 14 of the toilet bowl 12 by urging the hook 16 in the F-F direction away from the base 18 and placing the clip 10 over the rim 14. Once the hook 16 is secured, the base 18 is slid along the vertical axis 48 up the hook 16 and ratchet teeth 46 until the tab 50 engages the  
20 underside of the rim 14. In another embodiment, a spring, elastic band, or other resistance means may be provided to allow for a relatively tightly secured fit between the clip 10 and the rim 14. In yet an alternative embodiment, the clip 10 may be provided such that the weight of the clip is approximately equal at opposite sides to provide a counterbalance.

25 **[0078]** The fluid spray bar 56 slides into the channel 54 on the base 18 of the clip 10. The fluid spray bar 56 is held securely in position by the channel 54. The fluid spray bar 56 may also be snap-fit to the channel 54 or may be wedged into the channel 54.

30 **[0079]** Turning now to Figures 6-7, an alternate exemplary embodiment of the fluid spray assembly 20a is described. The fluid spray assembly 20 includes a fluid spray bar 56 in fluid communication with a plurality of spray nozzles 62. In a different embodiment, the fluid spray assembly 20 includes a fluid spray bar 56 in

fluid communication with a plurality of spray holes 59 (not shown). Returning to the embodiment shown in Figures 6-8, the fluid spray bar 56 may be molded from a flexible plastic (e.g. polyethylene and polypropylene). The fluid spray bar 56 has an interior space 57 that defines a fluid path from the fluid conduit 24. A plurality of spray nozzles 62 are in fluid communication with nozzle bodies 58, which may be molded from an engineering plastic (e.g. polyacetal, acetal resin, polytrioxane, polyformaldehyde, and paraformaldehyde). The nozzle bodies 58 define a fluid path from the interior space 57 of the fluid spray bar 56. The fluid spray bar 56 is flexible so that it conforms to the shape of the toilet and is held securely in place by two clips 10.

**[0080]** In the exemplary embodiment, the fluid spray bar 56 has sixteen spray nozzles 62 evenly spaced along the fluid spray bar 56 which define a fluid path from the interior space 57 of the fluid spray bar 56. The diameter of each spray nozzle 62 (or in an alternative embodiment, the diameter of each spray hole 59) is from about 0.4 mm to about 1.2 mm. In another embodiment, the diameter of each spray nozzle is from about 0.5 mm to about 1.0 mm. In another embodiment, the diameter of each spray nozzle is from about 0.6 mm to about 0.8 mm. The spray nozzles 62 may be provided at angles and directions as described for the embodiment above.

**[0081]** One spray nozzle 62 at each end of the fluid spray bar 56 has a nozzle body 58 attached to the outer surface of the fluid spray bar 56 over the spray nozzle 62. Each nozzle body 58 defines a fluid path from the interior space 57 of the fluid spray bar 56 and has one spray hole 59 for dispensing chemical from the interior space 57 of the fluid spray bar 56 onto the inner surface 26 of the toilet bowl 12. In this embodiment, the spray holes 59 on both nozzle bodies 58 are provided in a direction substantially opposite the fluid spray bar 56. As such, the nozzle bodies 58 have a spray  $S_4$  in a direction that is substantially opposite the fluid spray bar 56.

**[0082]** Figure 8A illustrates the orientation of the spray nozzles 62 and the spray holes 59 in the nozzle bodies 58 of the example embodiment. The spray nozzles 62 are directed substantially normal to lines tangent to the spray nozzles 62 at each spray nozzle. As a result, a spray pattern  $S_n$  (where  $n = A$  to  $J$ ,

-20-

depending on the particular sprayer) is provided. Figure 8B illustrates the orientation of adjacent spray nozzles, but wherein the adjacent spray nozzles are directed in different angles.

5 [0083] One of skill in the art will appreciate that the number and size of the spray nozzles 62 and nozzle bodies 58 could be varied in order to adjust the level of coverage of the chemical. Additionally, it is understood that the number and direction of the spray holes 59 could also be modified.

### **Container and Pump Mechanisms**

10 [0084] Figure 9 shows an exemplary means for moving fluid 25 (Figure 1) from the container 22 (Figure 1) through the conduit 24 (Figure 1) and to the spray nozzles 62 (Figure 1) and spray holes 59 (Figure 1) on the fluid spray bar 56 (Figure 1) to be dispensed onto the inside surface 26 (Figure 1) of the toilet bowl 12 (Figure 1) can now be described. Looking at Figure 9, the container holder 23  
15 includes an exterior wall 103 having a rear mounting bracket 105 for supporting a hanger (not shown) that can be used to hang the container holder 23 and container 22 on the toilet tank. The container holder has a well 107 that supports the container 22 in an inverted position as shown in Figure 1. The bottom wall 109 of the well 107 has an upwardly extending piercing post 111 that pierces a  
20 frangible seal on the container 22 and then enters a mouth of the container 22 when the container 22 is placed in the well 107 of the container holder 23. The piercing post 111 has a central piercing edge 113, an air vent inlet 115, and a fluid outlet 117.

[0085] The air vent inlet 115 is in fluid communication with a check valve (not  
25 shown). The check valve is normally closed so that fluid 25 does not leak out via the air vent inlet 115. The check valve opens by negative pressure that develops as fluid 25 is withdrawn from the container 22. The opened check valve aspirates air to the container 22 in a consistent manner, without introducing air in a manner that would cause foaming or gurgling. The check valve remains open until the  
30 pressure in the container 22 has equalized sufficiently to alleviate the negative pressure and then it closes.

-21-

**[0086]** The fluid outlet 117 provides a fluid path from the container 22 to a conduit and then to a pump inlet port 248 as described below. A valve 119 controls release of fluid 25 from the fluid outlet 117. The weight of the container 22 opens the valve 119 when the container is installed in the container holder 23.

5 A power switch 121 in the bottom wall 109 of the well 107 moves downward when the weight of the container 22 is applied to the power switch 121 when the container 22 is installed in the container holder 23. The power switch 121 supplies power from batteries (not shown) to a controller and pumping apparatus as described below. The front vertical surface of the container holder 23 also  
10 includes a manual actuator button 123 and a light emitting diode (LED) 125 which are in electrical communication with the controller. The container holder 23 also includes a push button 127 that moves a locking tab 129 that engages the container closure to lock the container 22 in the container holder 23.

**[0087]** Turning now to Figure 10, an exploded perspective view of a pump 200 that is part of the pumping apparatus is shown. The pump 200 may be secured  
15 inside the container holder 23. The pump 200 includes an electric DC motor 202 that is in electrical communication with batteries (not shown) and the controller. The motor 202 includes a drive shaft 204. The motor 202 is housed in a top pump housing 206 in the top annular wall 208 of the top pump housing 206. The pump  
20 200 includes a drive gear 210 that is connected at the lower end of the drive shaft 204. The drive gear 210 meshes with a second gear 212 in the pump drive train. The gear 212 has an eccentric circular disk 213 on its upper surface. The gears 210, 212 are housed in a bottom pump housing 214.

**[0088]** The pump 200 includes a piston crank 215 having a collar 216 at one  
25 end. The collar 216 receives the circular disk 213 of the gear 212 when the pump 200 is assembled. The pump 200 also includes a piston 217 having a connector 218 that is assembled with a connecting pin 220 to a yoke 222 at the forward end of the piston crank 215. An O-ring seal 224 is arranged in an outer groove 226 on a forward section of the piston 217. The piston 217 reciprocates in a cylindrical  
30 pump chamber 228 with the O-ring seal 224 engaging an inner surface of the pump chamber 228 to prevent fluid leakage. The pump chamber 228 includes a pair of O-ring valve seals 232 and valve holders 234, 236 that engage umbrella

-22-

check valves 238, 242. A pump connector 244 closes a forward end 245 of the pump chamber 228. The pump connector 244 includes a pump outlet port 246 and a pump inlet port 248.

**[0089]** During operation of the pump 200, the controller supplies electrical current from the batteries to the motor 202 under certain conditions described below. When current is provided to the motor 202, the drive shaft 204 rotates the drive gear 210 which in turn rotates the second gear 212. The circular disk 213 of the gear 212 moves the piston crank 215 forward and rearward by way of the engagement of the eccentric disk 213 and the collar 216. On the rearward stroke of the piston crank 215 (which is movement toward the collar end of the piston crank 215), fluid is drawn into the pump chamber 228 by way of the pump inlet port 248 which is in fluid communication by way of a conduit (not shown) with the fluid outlet 117 of the piercing post 111. On the forward stroke of the piston crank 215 (which is movement toward the pump connector 244), fluid is expelled from the pump chamber 228 by way of the pump outlet port 246 which is in fluid communication with the conduit 24 which delivers the fluid to the fluid spray bar 56 to be dispensed onto the inside surface 26 of the toilet bowl 12 as described above. The aforementioned pump is hereinafter referred to as the "toilet pump system".

#### **Use of the Device**

**[0090]** Having described the components of an example embodiment of a device 8 for spraying an inner surface of a toilet bowl with a chemical, a functional flow diagram of a software program routine for operating the device 8 can be explained with reference to Figure 11. The functional flow diagram is used to generate a software program used to control the device 8. The controller of the device 8 includes a microprocessor under the control of the software program which is stored on memory of the controller. The software program can be stored in the controller memory using conventional techniques. The controller may be secured inside the container holder 23. The controller is in electrical communication with the power switch 121, the manual actuator button 123, the LED 125, the motor 202 of the pump 200, and a source of electricity (e.g.,



-23-

batteries secured inside the container holder 23). Suitable controllers are microcontrollers available from Elan Microelectronics Corp., Hsinchu City, Taiwan.

**[0091]** Referring to the functional flow diagram of Figure 13, in a first step 400, a user inserts batteries into a battery compartment in the container holder 23.

5 Battery compartments and their wiring to a controller are known in the art and therefore will not be explained further. In a second step 402, the container 22 (which may be a liquid refill) is installed in the container holder 23 causing the power switch 121 in the bottom wall 109 of the well 107 of the container holder 23 to move downward thereby completing a circuit to supply electrical power from  
10 batteries to the controller. This results in a reset of all controller system counters and fault conditions, and causes the LED 125 to flash to indicate to the user that the device 8 has properly powered up and a timer has been started for the first automatic discharge as described below. The LED 125 then remains on. In one example embodiment, the timer may be started on an automatic discharge that  
15 will take place eight hours from the reset of all controller system counters and fault conditions.

**[0092]** The software routine then advances to step 406. The device 8 should function until the average battery voltage reaches a lower threshold voltage when the pump 200 is not running. In step 406, the controller checks the available  
20 battery voltage. If the battery voltage is below a predetermined value, a low voltage shutdown occurs at step 408 prior to controller microprocessor loss. In step 408, the LED 125 is turned off and a power down sequence occurs. If the battery voltage is at or above a predetermined value, the routine proceeds to step 410.

25 **[0093]** At step 410, the controller responds to any manual cycle request from the pressing of the manual actuator button 123. If the manual actuator button 123 has been pressed, the routine advances to step 412. The manual cycle will dispense cleaning solution five seconds after the depression and release of the manual actuator button 123. At step 412, the LED 125 will flash after the manual  
30 actuator button 123 has been pressed. The routine then proceeds to step 416 in which the controller provides electrical current to the motor 202 of the pump 200 to deliver fluid to the fluid spray bar 56 to be dispensed onto the inside surface 26

-24-

of the toilet bowl 12 as described above. The controller can provide electrical current to the motor 202 of the pump 200 for any selected time period depending on the amount of fluid that is desired to be dispensed onto the inside surface 26 of the toilet bowl 12. One non-limiting example of a pumping time period is one  
5 second after which the routine moves to step 418. After step 418, the routine proceeds back to step 406.

**[0094]** When step 406 indicates that the battery voltage is not low and step 410 indicates that a manual cycle request has not been initiated by pressing the manual actuator button 123, the routine proceeds to step 426. At step 426, the  
10 controller checks the time count of the automatic discharge timer that was started on the reset of all controller system counters and fault conditions. If the time count of the automatic discharge timer indicates that an automatic dispensing is not set to occur, the routine proceeds back to step 406. If the time count of the automatic discharge timer indicates that an automatic dispensing is to occur (e.g.,  
15 the eight hour dispensing interval has been reached), the routine proceeds to step 428.

**[0095]** At step 428, the controller first provides electrical current to the motor 202 of the pump 200 to deliver fluid to the nozzle 20 to be dispensed onto the  
20 inside surface 26 of the toilet bowl 12 as described above. After a predetermined time period, the controller measures the voltage drop from the batteries. If the voltage drop is less than or equal to a predetermined value, the controller provides electrical current to the motor 202 of the pump 200 for a predetermined pumping time period (in some embodiments, about 1.3 seconds, in another embodiment  
25 from about 1 to about 5 seconds, in a different embodiment from about 1 to about 3 seconds). However, if the voltage drop exceeds a predetermined value, the controller provides electrical current to the motor 202 of the pump 200 for a pumping time period (e.g., 1.7 seconds) greater than the predetermined pumping time period (e.g., 1.3 seconds). In addition, the magnitude of the measured  
30 voltage drop can be used to select the length of the extended pumping time. For example, greater voltage drops may lead to 1.4 or 1.6 seconds of pumping time. Suitable software subroutines can be used to select the extended pumping time. The extended pumping time at lower voltages is beneficial in that lower voltages

-25-

result in lower pump motor speeds which reduce the fluid dispensed to the toilet bowl 12. By extending the pumping time at lower pump speeds, a consistent amount of fluid can be dispensed (e.g., 5 milliliters) even though the pump speed has decreased in relation to the pump speed at higher voltages.

5 **[0096]** At the end of the pumping time period, the routine proceeds to step 432 in which the timer may be restarted on a second automatic discharge that will take place 8 hours from the end of the pumping time period. The routine then proceeds back to step 406. Because the routine is looping, when step 432 is next reached in the routine, the timer will be restarted on a third automatic discharge  
10 that will take place 8 hours from the end of the second pumping time period. This process will repeat itself such that automatic dispensings will continue at these 8 hour intervals until the battery voltage becomes too low (see steps 406 & 408) or the fluid is depleted.

**[0097]** It should be appreciated that any number of alternative time periods can  
15 be used in the software routine. For example, the automatic dispensing intervals could be, without limitation, four hours, six hours, or ten hours. Software programming techniques can be used to readily adjust these and other variables.

**[0098]** Thus, the present invention provides a toilet bowl cleaning and/or  
20 deodorizing device that delivers a chemical into the toilet bowl. The device provides consumers with an automatic, unattended dispensing of the toilet bowl cleaning fluid. The device can keep the toilet bowl clean for up to thirty days without scrubbing, and gets a dirty toilet bowl cleaner in days. The device provides overall bowl cleanliness by enhanced shine, removal of hard water lines and retardation of biofilm, mold and mildew growth. The device has quiet,  
25 unattended operation, and manual dispensing is available in addition to automatic cycles.

**[0099]** 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,  
30 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.

-26-

## INDUSTRIAL APPLICABILITY

**[00100]** The present invention provides an automatic and/or manual toilet bowl cleaning device where the inner surface of the toilet bowl can be cleaned  
5 around the entire circumference of the toilet bowl by application of a cleaning fluid without contacting the user while the user is using the toilet bowl.

-27-

## CLAIMS

What is claimed is:

1. A device for spraying an inner surface of a wall of an enclosure with a fluid, the device comprising:
  - a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure; and
  - a plurality of spray nozzles through which the fluid can be sprayed, the spray nozzles being in fluid communication with the interior space of the spray bar, at least one of the spray nozzles having a nozzle body defining a fluid path in fluid communication with the interior space, the nozzle body extending away from an outer surface of the spray bar.
  
2. The device of claim 1 wherein:
  - each of the spray nozzles has a nozzle body defining a fluid path in fluid communication with the interior space, each of the nozzle bodies extending away from an outer surface of the spray bar.
  
3. The device of claim 1 wherein:
  - the at least one spray nozzle has a first spray hole having a first axis, the first spray hole being in fluid communication with the fluid path and a second spray hole having a second axis, the second spray hole being in fluid communication with the fluid path wherein the first axis faces in a different direction than the second axis.

-28-

4. The device of claim 3 wherein:

the at least one spray nozzle has a third spray hole having a third axis, the third spray hole being in fluid communication with the fluid path wherein the third axis is substantially opposite the direction of the first axis.

5. The device of claim 3 wherein:

a least one of the first spray hole and the second spray hole is configured to produce a conical spray.

6. The device of claim 1 wherein:

a first spray nozzle having a nozzle body defining a fluid path in fluid communication with the interior space is arranged substantially on a first end of the fluid spray bar and a second spray nozzle having a nozzle body defining a fluid path in fluid communication with the interior space is arranged substantially on a second end of the fluid spray bar wherein the first spray nozzle has a first spray hole having a first axis, the first spray hole being in fluid communication with the fluid path and the second spray nozzle has a second spray hole having a second axis, the second spray hole being in fluid communication with the fluid path wherein the first and second axes face substantially opposite the fluid spray bar.

7. The device of claim 1 wherein:

the at least one spray nozzle body extends laterally and upwardly away from the outer surface of the spray bar.

-29-

8. The device of claim 1 further comprising:

a pumping apparatus for delivering fluid from the source of the fluid through a fluid conduit and to the interior space of the fluid spray bar when the pumping apparatus is activated.

9. The device of claim 7 further comprising:

a controller in electrical communication with the pumping apparatus wherein the controller executes a stored program to activate the pumping apparatus at an end of a predetermined time interval stored in the controller.

10. The device of claim 1 wherein:

the enclosure is a toilet.

11. A device for spraying an inner surface of a wall enclosure with a fluid, the device comprising:

a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure;

a first spray nozzle through which the fluid can be sprayed, the first spray nozzle being in fluid communication with the interior space of the spray bar, arranged on the fluid spray bar and located between the source of the fluid and a first end of the spray bar, the first spray nozzle having a nozzle body defining a fluid path in connection with the interior space, the nozzle body of the first spray nozzle extending away from the outer surface of the spray bar wherein the first spray nozzle has a first spray hole having a first axis, the first spray hole being in

-30-

fluid communication with the fluid path, wherein the first axis faces substantially away from the source of the fluid; and

a second spray nozzle through which fluid can be sprayed, the second spray nozzle being in fluid communication with the interior space of the spray bar, arranged on the fluid spray bar having a nozzle body defining a fluid path in fluid communication with the interior space, the nozzle body of the second spray nozzle extending away from the outer surface of the spray bar wherein the second spray nozzle has a second spray hole having a second axis, the second spray hole being in fluid communication with the fluid path, wherein the second axis faces in a different direction than the first axis.

12. The device of claim 11 wherein:

the fluid is delivered to the fluid spray bar through a fluid conduit in fluid communication with the source of the fluid and the interior space of the spray bar wherein the fluid conduit is located substantially next to the first end of the spray bar.

13. The device of claim 12 further comprising:

a pumping apparatus for delivering fluid from the source of the fluid through the fluid conduit and to the fluid spray bar when the pumping apparatus is activated.



-31-

14. The device of claim 13 further comprising:

a controller in electrical communication with the pumping apparatus wherein the controller executes a stored program to activate the pumping apparatus at an end of a predetermined time interval stored in the controller.

15. The device of claim 11 wherein:

a least one of the first spray hole and the second spray hole is configured to produce a conical spray.

16. The device of claim 11 wherein:

the enclosure is a toilet.

17. A device for spraying an inner surface of a wall enclosure with a fluid, the device comprising:

a fluid spray bar having an interior space for receiving fluid from a source of the fluid and for spraying the inner surface of the wall of the enclosure; and

a clip for attaching the spray bar to the enclosure, the clip including a hook and a base wherein the base includes an opening for receiving an inner rim segment of the hook.

18. The device of claim 17 wherein:

the enclosure is a toilet.

-32-

19. The device of claim 17 wherein:

the base is movable along the inner rim segment of the hook such that the distance between the base and the top of the hook is adjustable.

20. The device of claim 19 further comprising:

a tab extending away from the base, the tab engaging an inner surface of the toilet when the clip is installed on the toilet.

21. The device of claim 20 further comprising:

a channel in the tab for engaging the spray bar wherein the channel opens away from the base.

22. The device of claim 17 further comprising:

a pumping apparatus for delivering fluid from the source of the fluid through a fluid conduit and to the fluid spray bar when the pumping apparatus is activated.

23. The device of claim 22 further comprising:

a controller in electrical communication with the pumping apparatus wherein the controller executes a stored program to activate the pumping apparatus at the end of a predetermined time interval stored in the controller.

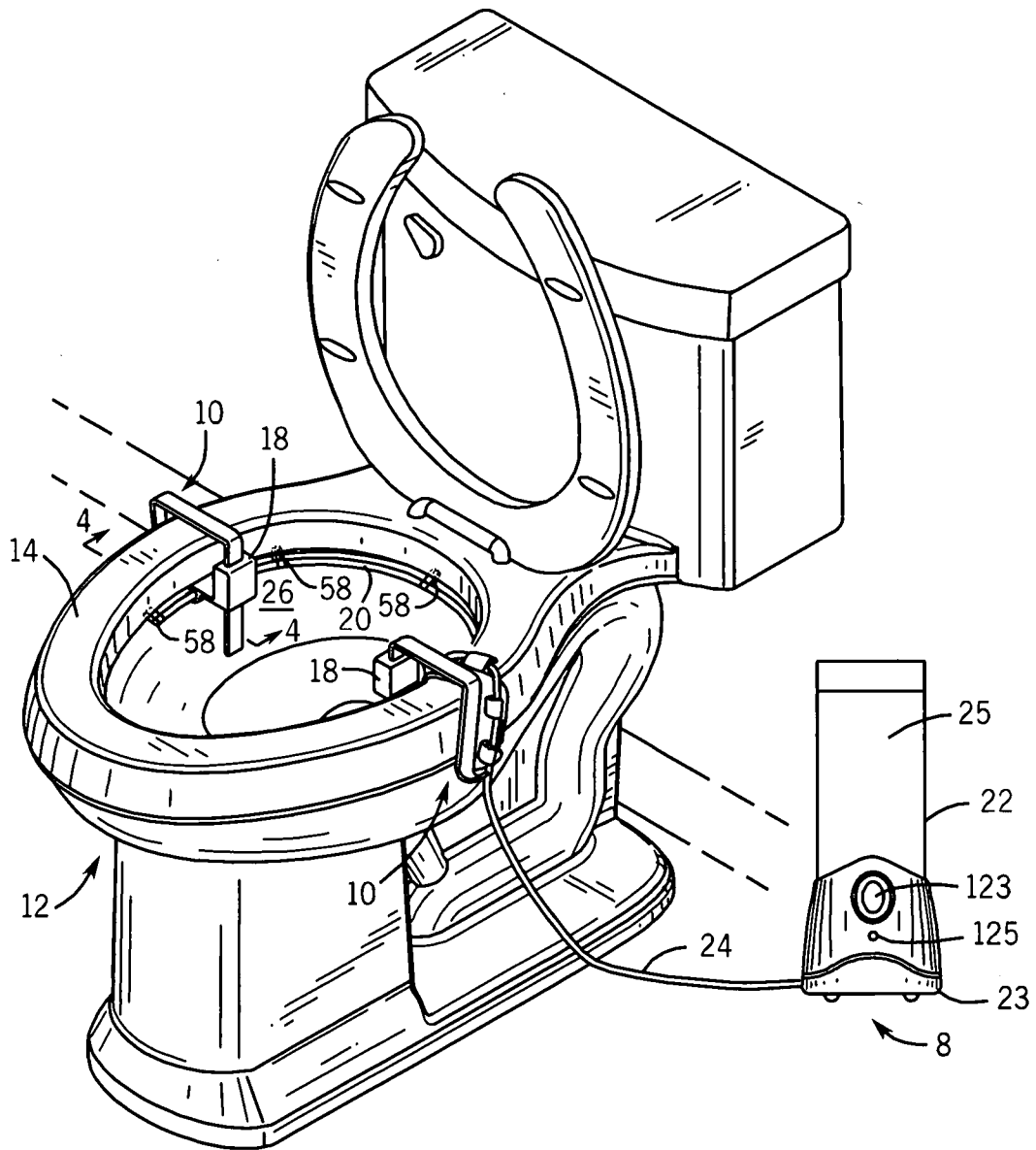
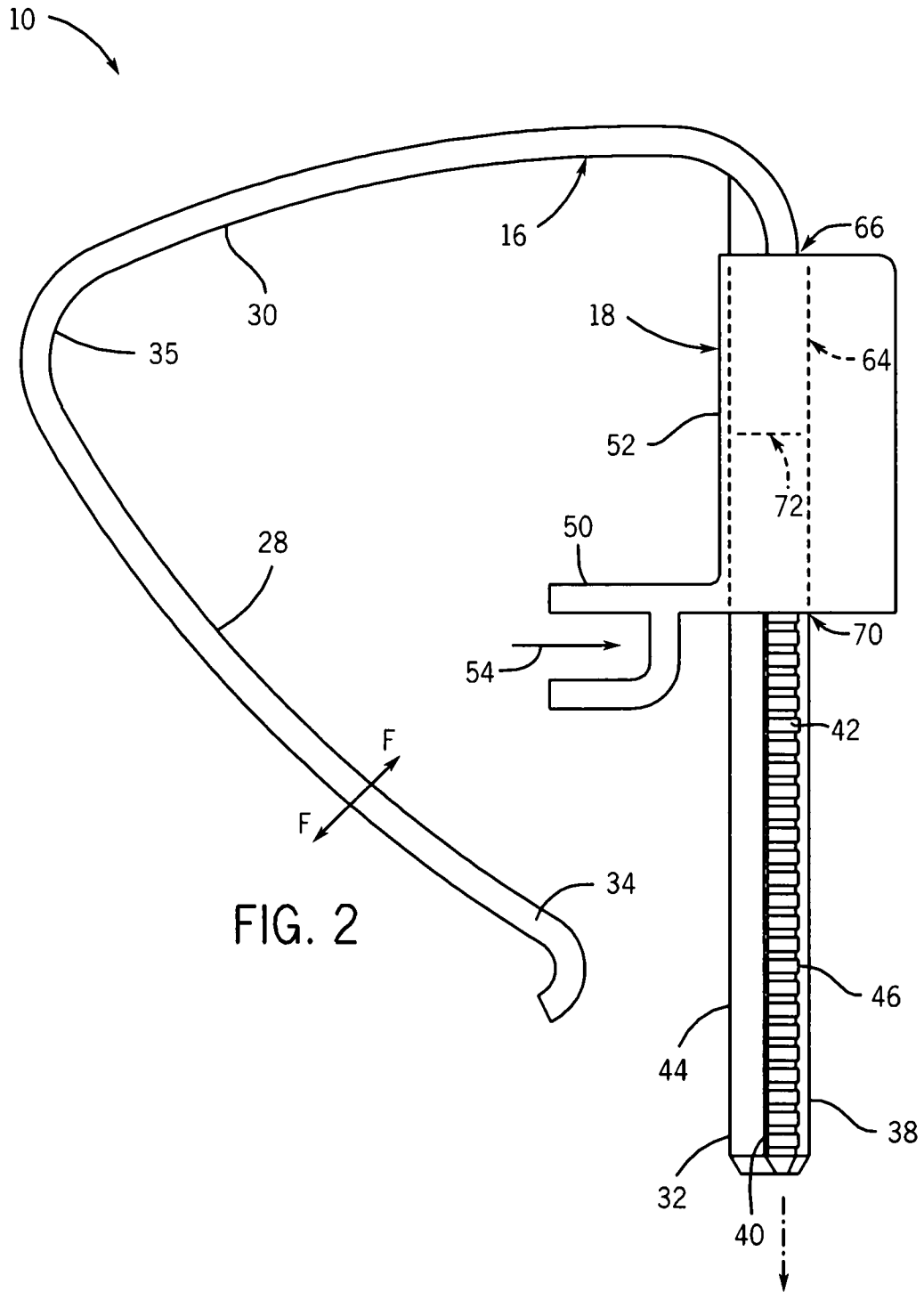


FIG. 1



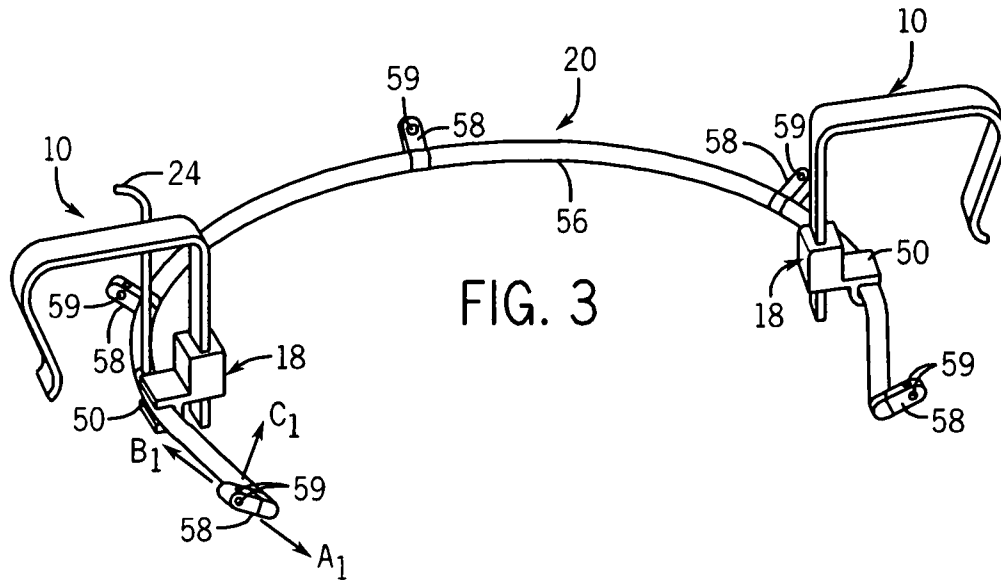


FIG. 3

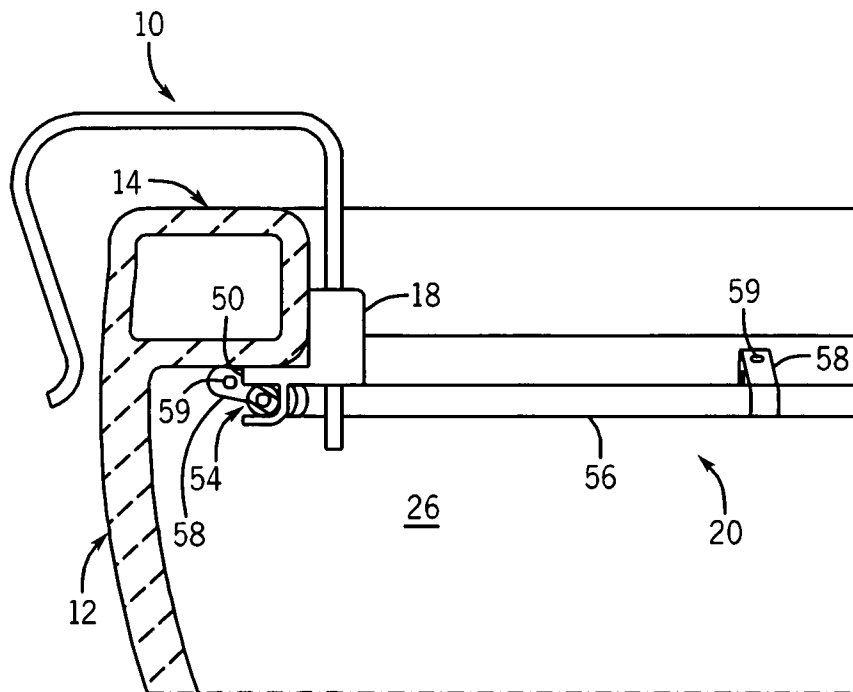


FIG. 4

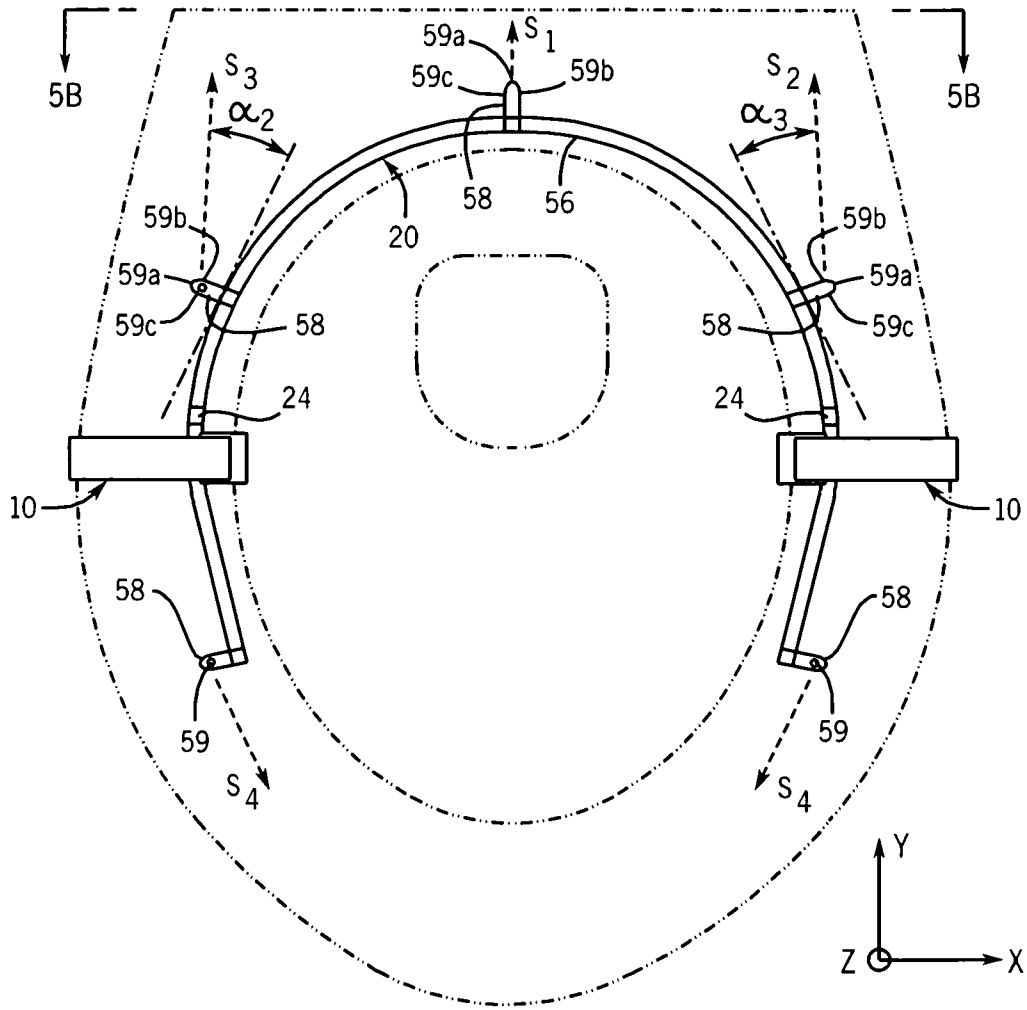


FIG. 5A

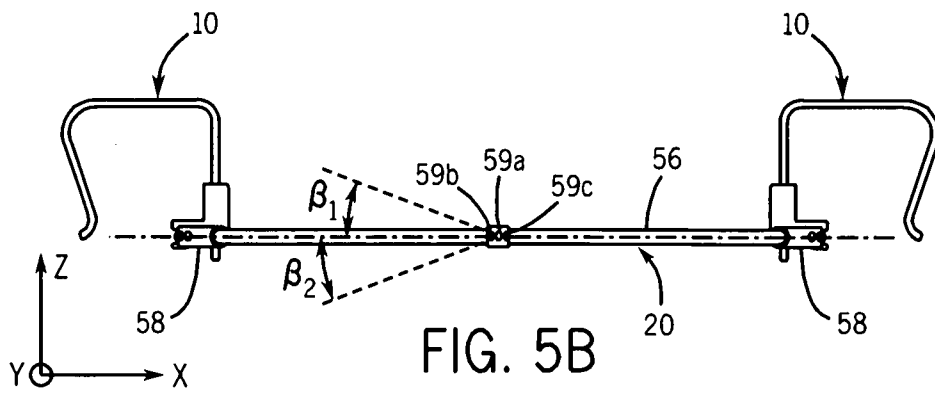


FIG. 5B

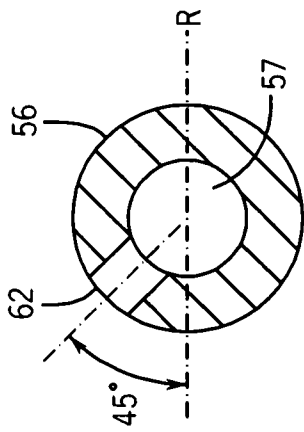
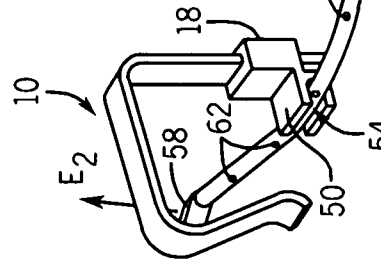
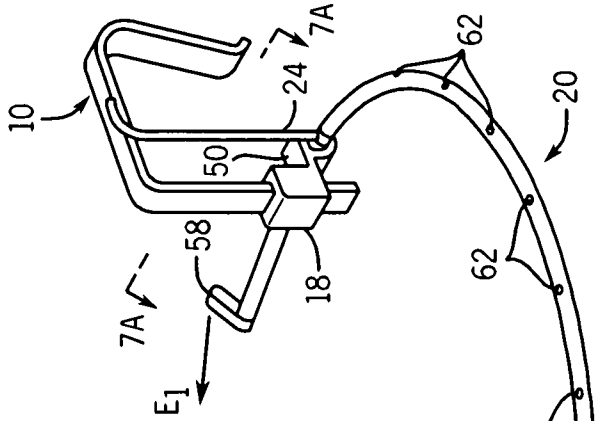


FIG. 7B

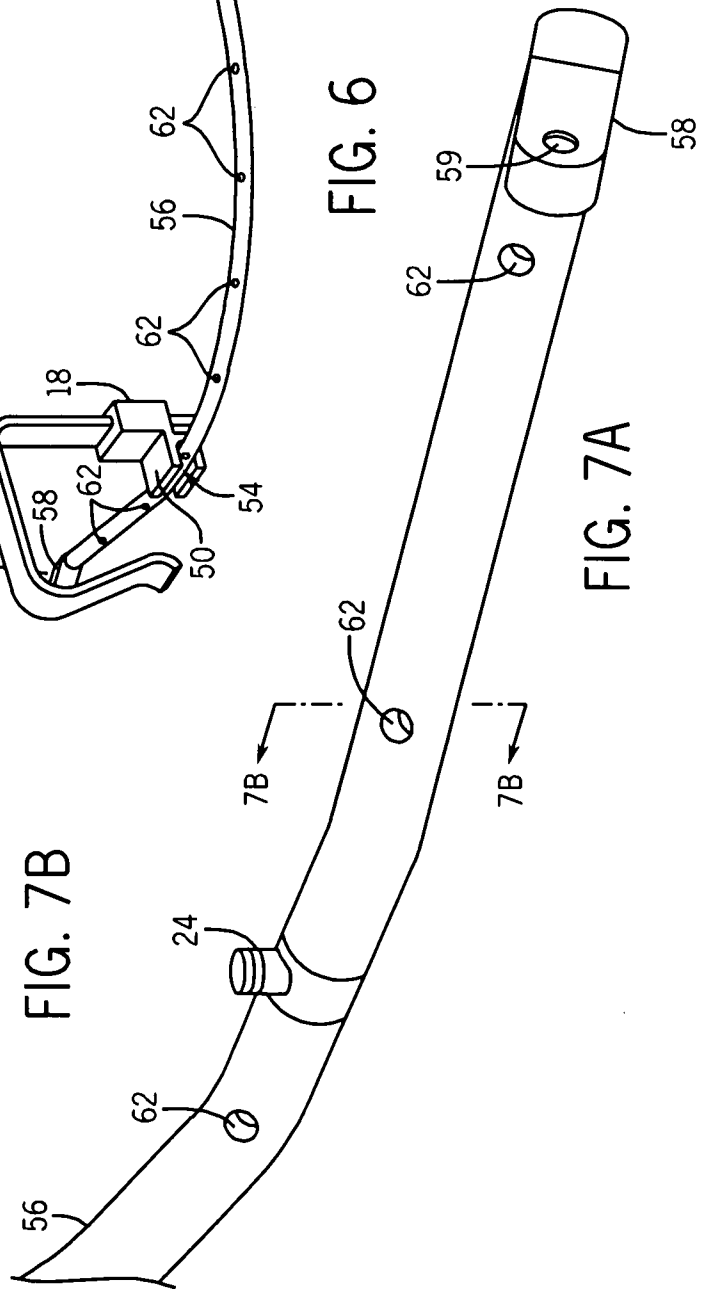


FIG. 7A

FIG. 6

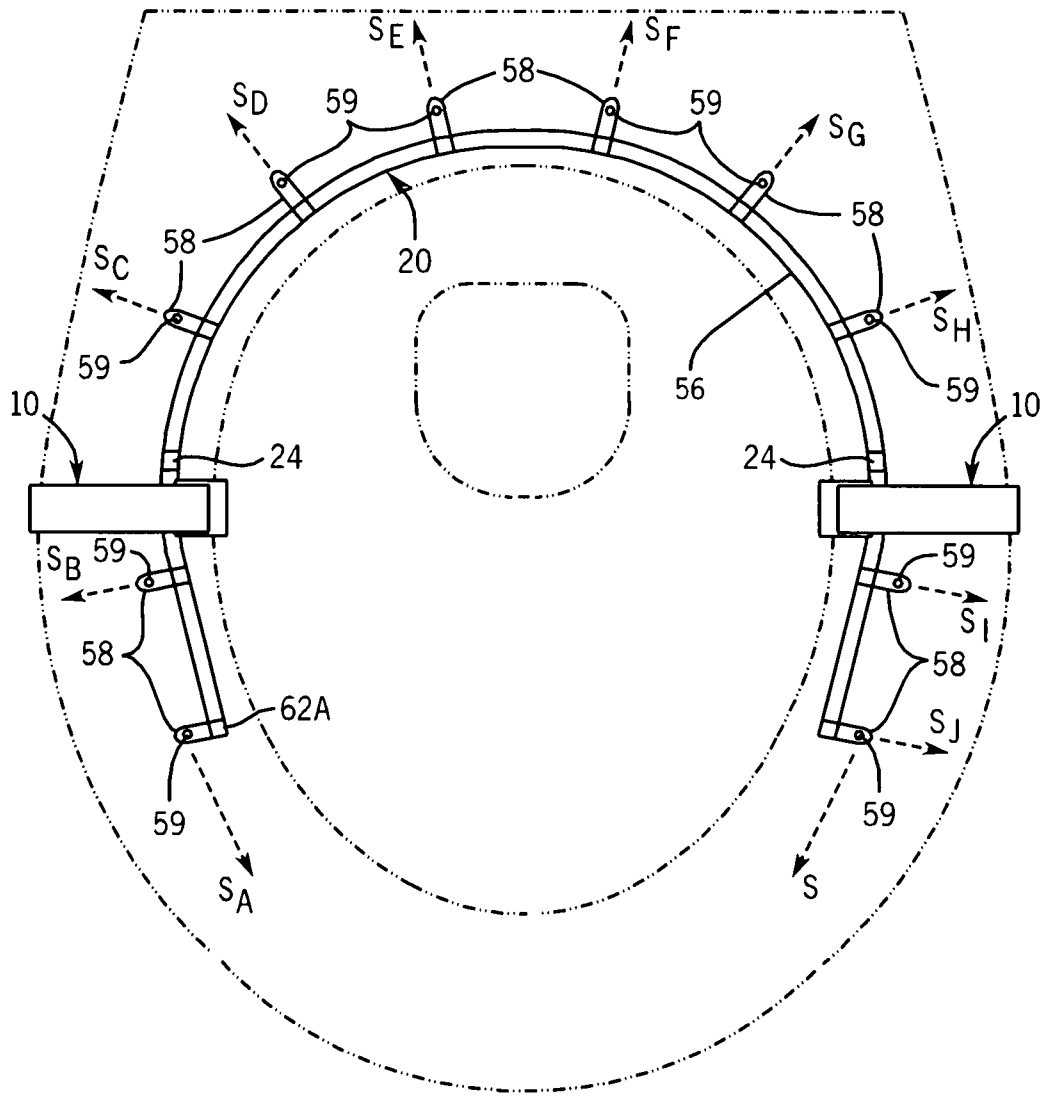


FIG. 8A



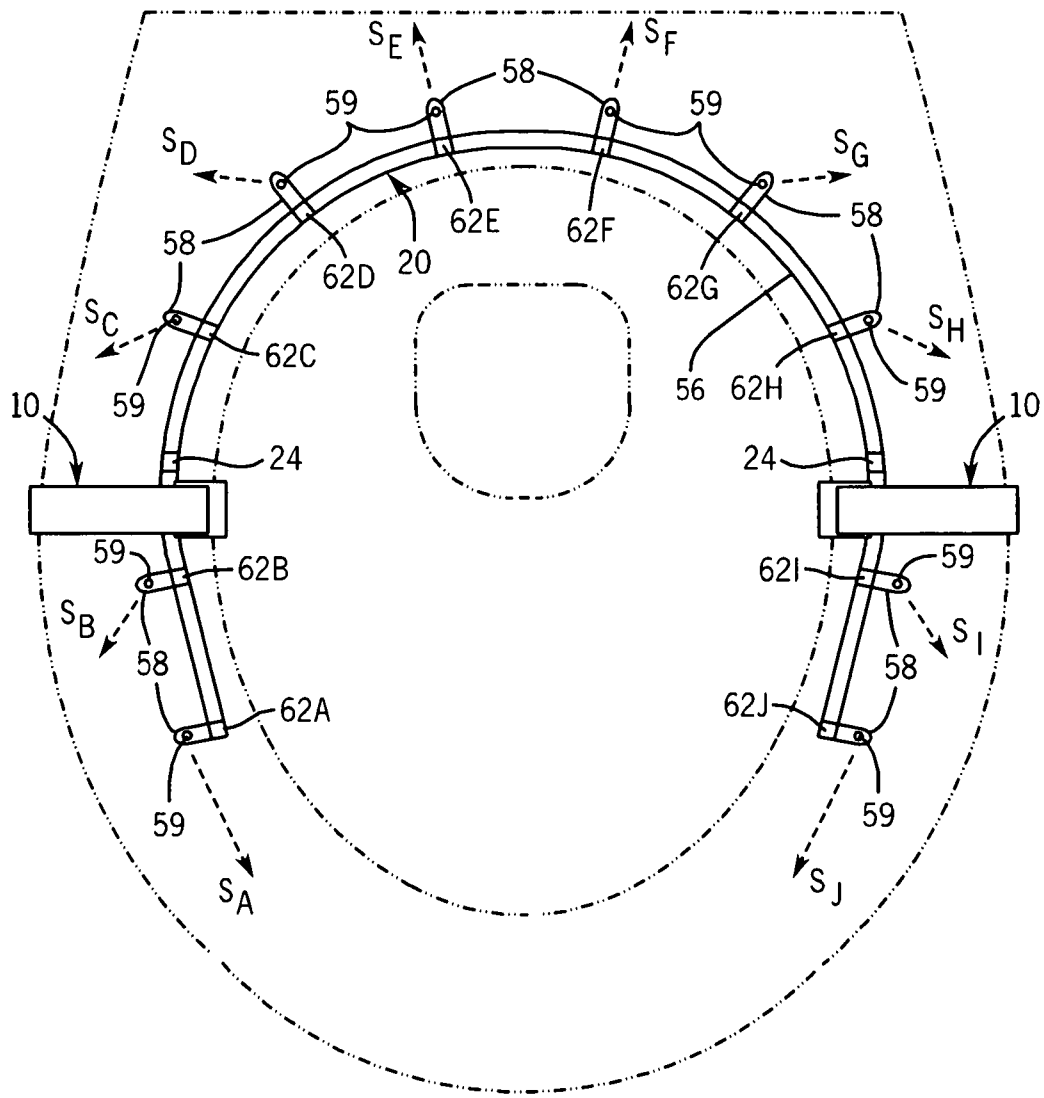


FIG. 8B

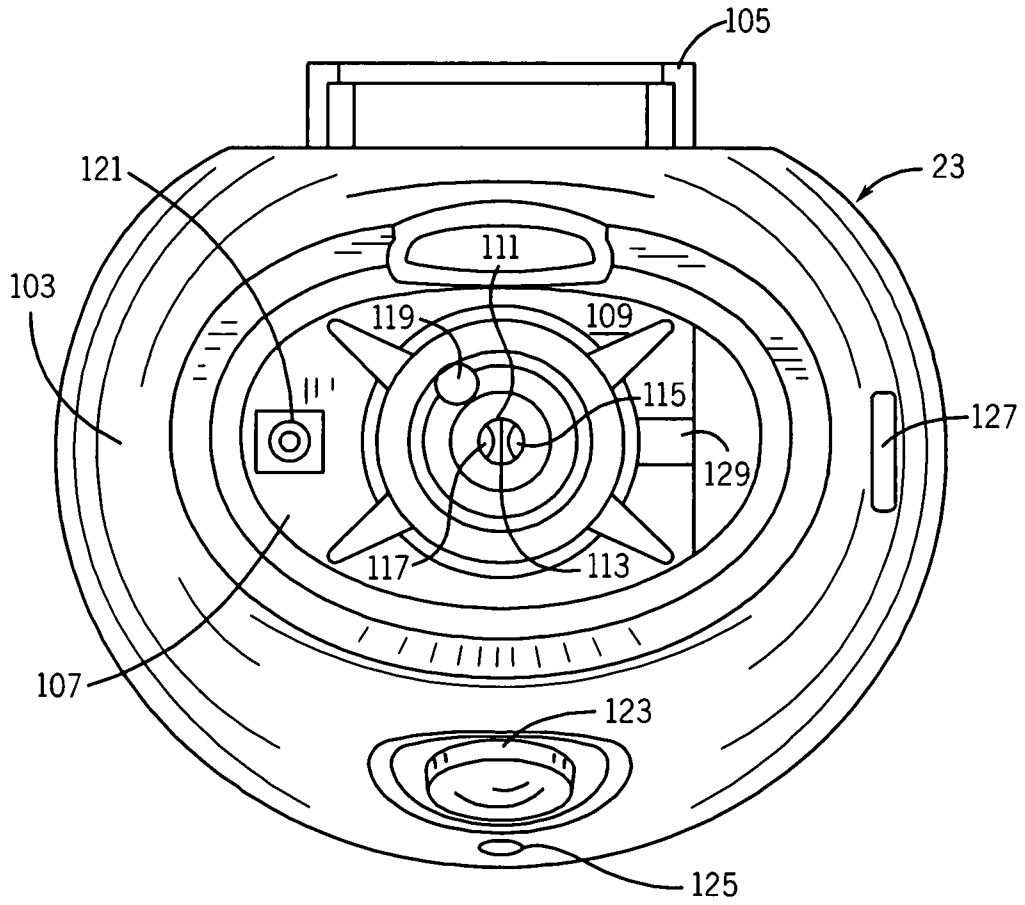


FIG. 9

FIG. 10

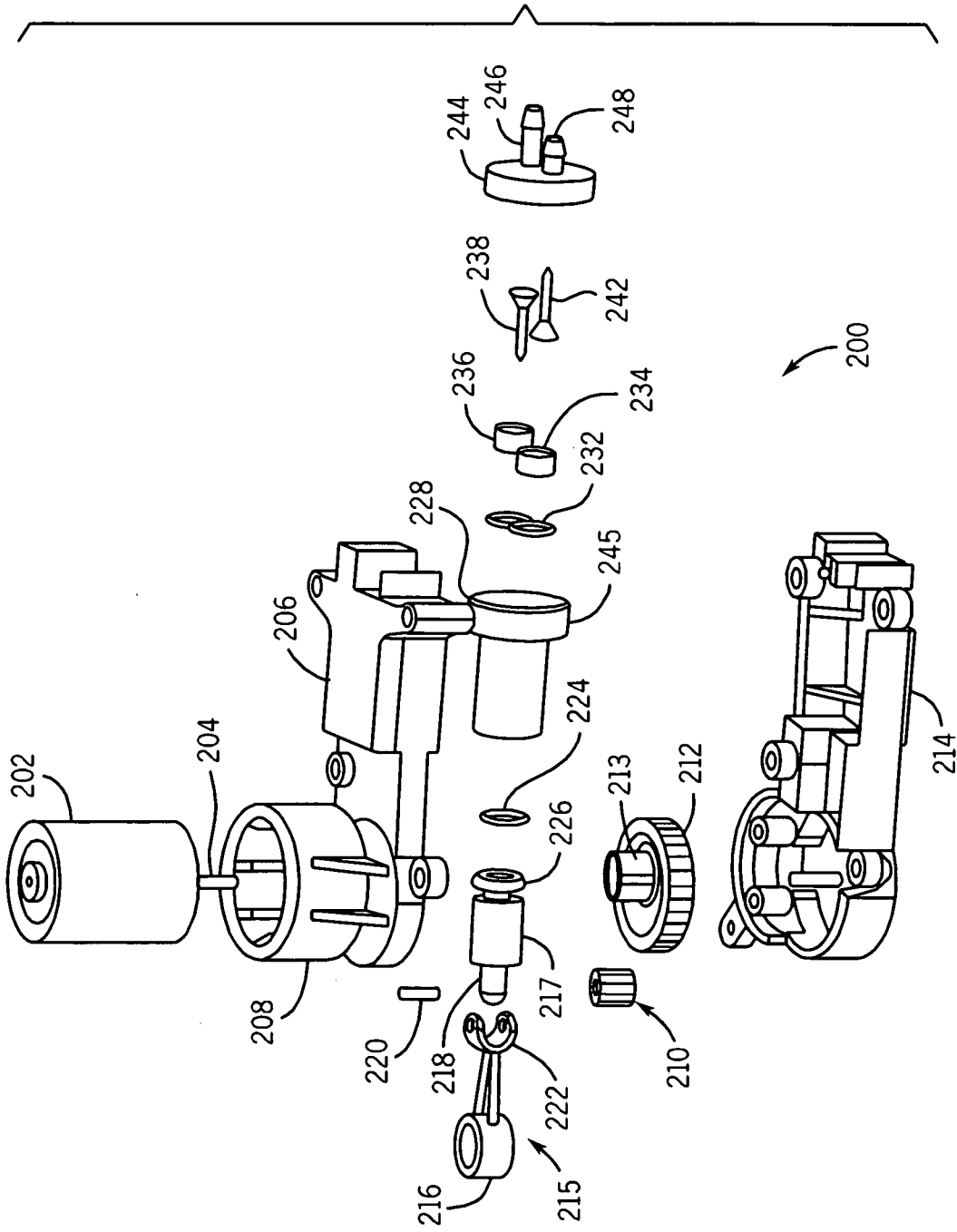
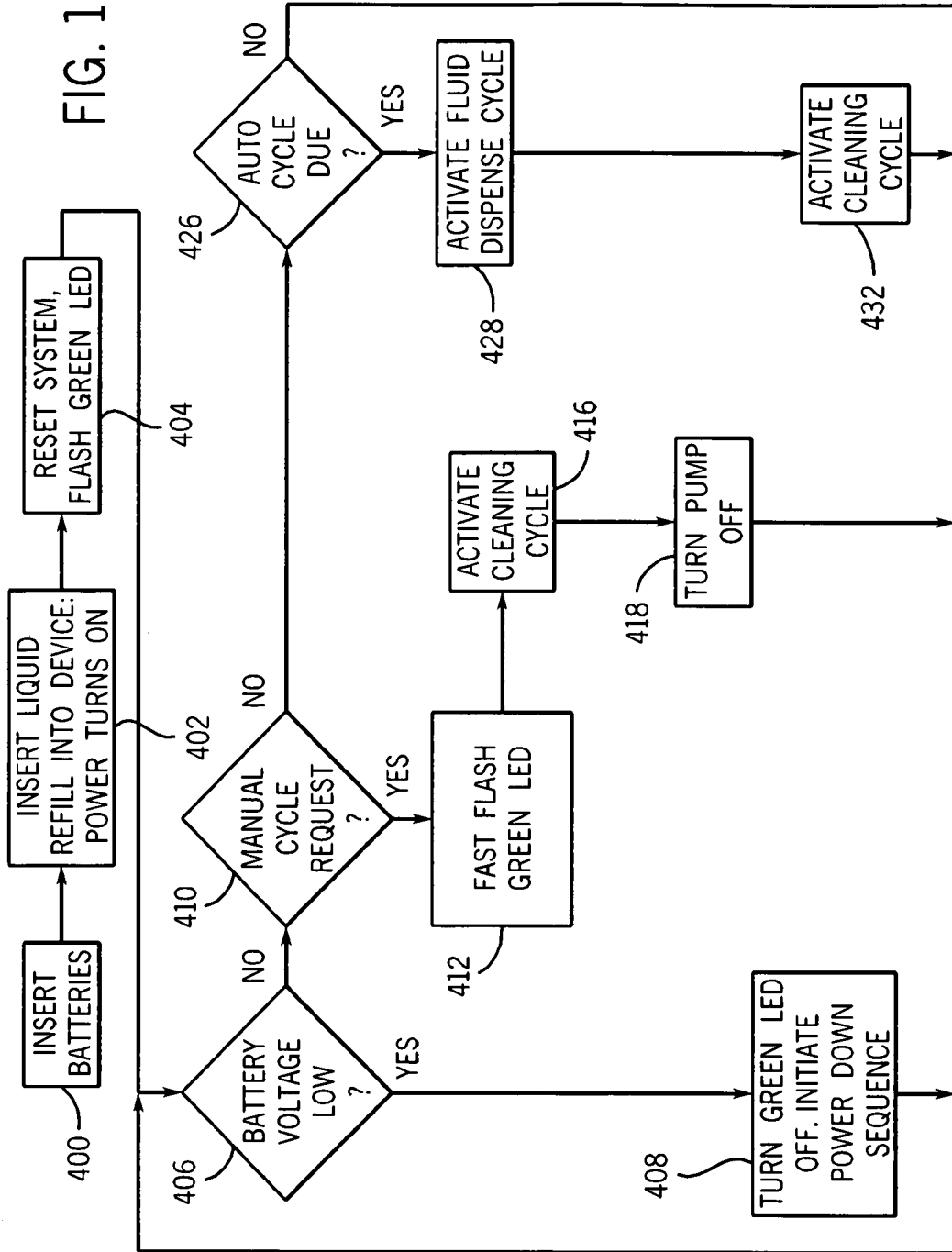


FIG. 11



# INTERNATIONAL SEARCH REPORT

International application No PCT/US2010/002788
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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. E03C1/048 E03D9/03 ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols) E03C E03D				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	FR 2 874 038 A1 (SUPRATECH [FR]) 10 February 2006 (2006-02-10)	1,2,7-10		
Y	page 4, line 5 - page 5, line 6 figures	3,4, 17-23		
-----				
X	DE 28 26 094 A1 (AMELN HELMUT VON) 20 December 1979 (1979-12-20)	1-3,5-8, 10-14,16		
A	page 3, lines 1-15 figure	4,15, 17-23		
-----				
X	WO 2004/082447 A2 (PICCHI MARCELLO [IT]) 30 September 2004 (2004-09-30)	1,2,6,7, 10-12, 15,16		
A	page 2, lines 16-31 figures 1, 2	3-5,8,9, 13,14, 17-23		
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-/--				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.</td> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> See patent family annex.</td> </tr> </table>			<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.			
* Special categories of cited documents :				
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family			
Date of the actual completion of the international search	Date of mailing of the international search report			
17 February 2011	25/02/2011			
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Urbahn, Stephanie			

**INTERNATIONAL SEARCH REPORT**

International application No PCT/US2010/002788
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009/000016 A1 (SAWALSKI MICHAEL M [US] ET AL) 1 January 2009 (2009-01-01) paragraphs [0048], [0 52], [0 53]; figures 1-4  -----	17-23
Y	US 2002/148908 A1 (LINSTEDT BRIAN K [US] ET AL LINSTEDT BRIAN K [US] ET AL) 17 October 2002 (2002-10-17) paragraph [0099] figures 1, 16  -----	3,4

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2010/002788

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-16

spraying device with specific nozzle form

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2. claims: 17-23

spraying device with fixing clip

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No <b>PCT/US2010/002788</b>
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Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
FR 2874038	A1	10-02-2006	NONE	
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DE 2826094	A1	20-12-1979	NONE	
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WO 2004082447	A2	30-09-2004	NONE	
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US 2009000016	A1	01-01-2009	AU 2009260784 A1 WO 2009154743 A2	23-12-2009 23-12-2009
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US 2002148908	A1	17-10-2002	AR 033134 A1 CA 2442560 A1 CN 1509213 A DE 10296650 T5 GB 2389547 A HK 1060541 A1 HK 1067961 A1 JP 3919665 B2 JP 2004524968 T MX PA03009289 A NZ 528505 A TW 557231 B WO 02084034 A2 US 2005127204 A1	03-12-2003 24-10-2002 30-06-2004 22-04-2004 17-12-2003 03-06-2005 30-09-2005 30-05-2007 19-08-2004 29-01-2004 24-02-2006 11-10-2003 24-10-2002 16-06-2005
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