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(54) **HYDRAULIC ACTUATOR DEVICE FOR RAISING AND LOWERING A SEAT AND LID**

(57) The present invention generally relates to means and devices used in toilets or lavatories; particularly relates to means used for automatically raise and lower the toilet covering lids and more specifically relates to a hydraulic drive device for raising and lowering the covering lid and seat of the toilet hole; **characterized in that** comprises a housing that comprises two adjoining hollow chambers, one left and one right, the chambers housing a left rotating shaft and a right rotating shaft, respectively; both shafts comprise a fixed counterweight that can rotate along with the shaft inside the chambers; each chamber also houses a left elastic diaphragm and

a right one, adjoined and interacting with the counterweights; said diaphragms comprising at least one connecting pivot wherein an inlet and/or outlet working fluid duct is connected so as to drive-push the counterweights when are inflated with working fluid supplied by an automatic system or by a contact driving elements system, and causing the swinging of said shafts connected to a toilet lid and seat, respectively, and which comprise in the back part a left connection flange and a right one with orifice, through which a left fixing bolt is inserted and a right one, fixed to the ends of the rotating shafts with the corresponding counterweights.

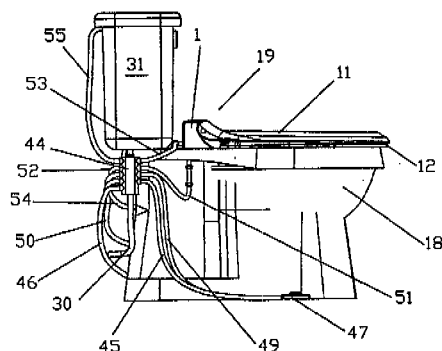


FIG. 12

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## Description

### Field of the Invention

**[0001]** The present invention generally relates to means and devices used in toilets or lavatories, and particularly relates to means used for automatically raising and lowering the toilet covering lids and, more specifically, relates to a hydraulic drive device for raising and lowering the covering lid and seat of a toilet.

### BACKGROUND OF THE INVENTION

**[0002]** It is well known that toilets are commonly shaped in such a way that structurally comprise a bowl consisting of a body with a central hollow round or oblong hole, with an internal trap that discharges to a base fixed to the floor where the exit of the trap is connected to the sanitary drainage network, said bowl comprises an upper tank where a volume of water is deposited, which is connected through a duct to said bowl, wherein said ducts comprise a ball-cock supply valve with actuating means for discharging water into the bowl.

**[0003]** A water supply duct from a water supply source of a domestic network or public network connects directly into the water storage upper tank comprising a control bypass valve, wherein said tank includes valve means controlled by a float element to control the water volume to be stored and fed to the toilet, so as to dislodge urine and/or feces.

**[0004]** The rear part of the toilet bowl hole comprises some orifices where fixing means of a swinging lid and seat that cover the hole are inserted, which are disposed over the hole for hygiene reasons, preventing the user from direct contact with the toilet surface, as well as to provide greater comfort to the user.

**[0005]** The covering lid of the bowl consists of a solid body in a similar shape to the hole (round or oblong) and the seat has an annular or elliptical shape that follows the contour of the bowl hole, some seats are shaped like a horseshoe. Said seat is used so that people sit over it and avoid the direct contact with the bowl surface; in some cases the seat is padded for comfort, while the lid covers the bowl hole.

**[0006]** When a female person uses the toilet, she usually tends to lift the lid with her hands or with at least with one hand, which can lead to contamination, poor hygiene, etc..

**[0007]** As for a male person, the existing problems are well known, such as when a man is trying to urinate, usually (if he has good manners), lifts with his hands both the lid and the seat to avoid splashing the seat with urine and to keep the seat clean, with the sanitary implications already indicated due to the direct contact of the hand with the lid and seat. However, in many cases men, when the lid is covering the bowl hole, just lift the lid, or if the lid is lifted, no longer finds it necessary to lift the seat, which when they urinate, leads to splashing and wetting

with the seat with urine, causing displeasure to other users of the toilet and causing contamination of the lid that could be a source of infection for other users.

**[0008]** In the prior art, various hydraulic and pneumatic mechanisms and mechanical devices were found that allow lift the toilet lid and/or seat, thus by example PA/a/2001/006808 Mexican patent application to Jaime Barrios Gomez Garibay, of July 2, 2001 which seeks to protect a mechanism for lifting the lid of toilets indirectly and without use the hands, that comprises a hydraulic system with two plastic valves, one of which is disposed on the floor and the other ring-shaped or horseshoe-shaped valve under the lower plastic lid, covering the upper surface of the toilet bowl; both valves being interconnected through a high pressure hose, the valve provided on the floor being of round pouch shape with convex upper surface, housing the same within certain amount of a liquid; while the valve disposed below the ring-shaped or horseshoe shaped lower plastic lid is a cylinder with a piston inside or in accordion bellows shape.

**[0009]** We found the patent application GB 2376475 (A) to Moran Lynn and Murphy Daryl of December 18, 2002, which seeks to protect a mechanism to lift the seat 6 and lid 7, designed to be fitted to standard toilets, which is drive to lift the lid and seat pressing a foot--operated pedal 4 surrounding the bottom of the toilet bowl, a metal casing 3 which houses the drive mechanism 5 to lift said lid 7 and seat 6, consisting of rods and levers.

**[0010]** We found the utility model PA/u/2005/000273, grant number MX1636 to David Herrera Gurrola, issued on December 18, 2006, which protects a device for raising and lowering a toilet seat, the device generally comprises a rotation shaft placed under the toilet seat and is attached to or makes contact with the same; a lever attached to the rotation shaft and moved by a user so as to transmit its movement to the rotation shaft, which being attached to the seat or making contact with it, achieves the desired motion of ascent or descent of the seat, the rotation shaft that is hosted on channels or ducts of the existing hinges formed by the lid, the seat and the toilet hinge brackets or is housed along of a housing provided on a support base fixed to the mounting orifices existing in the back part of the toilet ring.

**[0011]** We also found the Mexican patent application document Pa/a/2006/012503 to Mark Anthony Darcksen and Johannes Gideon Francois Johannes, which seeks to protect a foot-operated hydraulic toilet seat lift that may be installed easily in a toilet; the universal bracket with a retained cylinder and a piston is mounted to the toilet bowl using the existing toilet seat fasteners; the toilet seat lift is activated by foot pressure applied to the pedal, which in turn opens a valve to deliver water pressure from the existing toilet water supply to the cylinder and piston.

**[0012]** U.S. Patent 4,291,422 to John J. Shoemaker and Kenneth R. Stark, of September 29, 1981, was also uncovered. This patent discloses a device for raising and lowering the lid and seat members of a toilet comprising a pair of independent hydraulic systems, operatively as-

sociated to one of the toilet members (lid or seat). Each hydraulic system includes a manually-operable control valve, a hydraulic cylinder having a water inlet/connection port disposed on each of its distal and medium ends operatively connecting the piston rod of the cylinder with the member (lid or seat) associated to the toilet. Any member of the toilet (lid or seat) can be controlled with the hydraulic system associated with a control valve that directs water to one of the ports of the cylinder, while the other port that moves the piston rod in a first direction receives water from the extractor, moving to the toilet member (lid or seat) rotationally in one direction.

**[0013]** In operation, the toilet member lowers the control valve to reverse the cylinder ports that receive and deplete the water that makes the piston rod to move in a second direction by which the rotating toilet member is moved in the other direction.

**[0014]** None of the aforementioned documents protect or disclose a hydraulic drive device for automatically raising and lowering the toilet covering lid and seat and using the same fluid source used to fill the elevated tank and to dislodge the excreta down the drain, wherein said device is of a simple structure, easy installation and easy operation that may be activated by sensors or by manual driving buttons or by the feet.

**[0015]** Said device is novel and represents inventive activity, as the same has been designed and developed after much testing, development, research, investment of financial, personnel and supply resources, allowing the creation of the device which we believe is novel, because there are not any documents that disclose its existence and neither may it be deduced from the combination of information in the found documents, so that it complies with inventive activity.

### OBJECTS OF THE INVENTION

**[0016]** The main object of the present invention is to make available a hydraulic drive device for automatically raising and lowering the toilet covering lid and seat, so as to avoid the use of the hands and avoid wetting the seat with urine when it is used by men to urinate in the toilet.

**[0017]** Another object of the present invention is to make available said hydraulic drive device for raising and lowering the toilet covering lid and seat, that also provides greater safety and hygiene to the toilet users.

**[0018]** Yet another object of the invention is to make available said hydraulic drive device for raising and lowering the toilet covering lid and seat, which also avoids the possibility of infection by the users avoiding splashing the seat with urine.

**[0019]** Still another object of the invention is to make available said hydraulic drive device for raising and lowering the toilet covering lid and seat that is also structurally simple, easy to manufacture, easy to drive and easy installation.

**[0020]** And a final object of the invention is to make

available the hydraulic drive device for raising and lowering the toilet covering lid and seat that can also be driven indirectly using driving sensors and directly with contact drive elements.

5 **[0021]** And all those qualities and objects that will become apparent from a description of the present invention supported on the illustrated embodiments.

### SUMMARY OF THE INVENTION

10 **[0022]** Generally, the hydraulic drive device for raising and lowering the toilet covering lid and seat in accordance with the present invention consists of a housing comprising two adjoining hollow chambers, one left and one right, the chambers housing a left rotating shaft and a right rotating shaft, respectively, both shafts having a fixed counterweight that can rotate along with the shaft inside the chambers; said shafts are fixed within the housing capable of rotating motion; each chamber also houses a left and right elastic diaphragm, adjoined and interacting with the counterweights, said diaphragms comprising at least one connecting pivot wherein an inlet and/or outlet duct of working fluid is connected so as to drive-push the counterweights when the diaphragms are inflated with fluid, and cause the swinging of said shafts, a lid of the toilet hole and a seat disposed below the lid and over the periphery of the toilet bowl hole are comprised by two left and right connection flanges with holes on the rear portion, through which is inserted a fixing bolt that is fixed at the ends of the rotating shafts with the counterweights, anchoring the lid to the left shaft and the seat to the right shaft; so that the left rotating shaft is firmly fixed to the left connection flange of the lid, the shaft passes through the orifice of the seat left flange without locking the seat, and the right rotating shaft is fixed to the seat right flange, the shaft passes through the orifice in the lid flange without locking the lid.

30 **[0023]** When the pressurized fluid is introduced through the pivots, the diaphragms are filled with fluid, pushing the counterweights attached to the left and right rotating shafts, and thereby rotating them, and since the left and right shafts are attached to the lid and seat respectively, the lid and seat will be driven to raise, when the fluid is expelled from the diaphragms, helping the counterweight to the soft gravity drop of the lid and seat.

40 **[0024]** The device can operate in different ways in different settings, for example, it only permits the lid to be lifted when both the lid and the seat are folded down, this when it will be used to defecate by men and women; to lift the lid and seat simultaneously when they are both folded down, this when it will be used for a man to urinate; to lower the seat when the lid and seat are lifted, this when it will be used to defecate by men and women; to lift the seat when the lid is lifted and the seat is folded down, this when it will be used for a man to urinate.

50 **[0025]** Said device housing in its preferred embodiment consists of two modules, a left module and right module, both modules are adapted to engage each other.

Said housing includes on its underside, a pair of exteriorly threaded hollow fixing tubes, spaced, inferiorly projected and coincident with the orifices in the toilet bowl by means of which is fixed with nuts to that bowl. The working fluid supply duct for said diaphragms passes through said hollow tubes.

**[0026]** In its preferred embodiment, the chambers are semicircular and the counterweights attached to the rotating shafts are substantially of a triangular prism shape with curved bases, which are smaller than said chambers so as to be moved rotationally inside the same when pressing the diaphragms.

**[0027]** There are two embodiments of the invention for passing the working fluid to the diaphragms within the chambers of the device housing and to allow the raising and lowering of the seat and lid of the toilet, where the working fluid used is water from the main supply water tap to the toilet tank.

**[0028]** In one of the embodiments of the invention, the device is automatically driven ("Premium" version) and in other of the embodiments the device is driven by contact drive elements ("standard" version).

**[0029]** In the automatic actuating embodiment ("Premium" version), the device is powered by a network of water supply pipes, the supply of which is regulated by three-way solenoid valves, two left and right motion sensors and a central presence sensor in communication with a circuit board that processes the sensor signals so as to actuate said solenoid valves.

**[0030]** This embodiment then consists of two supply ducts connected to a duct diversion from the main supply source into the toilet water tank and into one way of the two three-way solenoid valves arranged on the sides of the back part of the bowl; in the second solenoid position, the supply duct is connected to the pivot of the left and right diaphragms, and in the third solenoid position, the water discharge ducts of the diaphragms are connected from the solenoids to a main discharge duct that discharges into the toilet water tank.

**[0031]** In this embodiment the diaphragms only have a pivot where the working fluid enters and leaves.

**[0032]** The left and right motion sensors, the central presence sensor and the circuit board, are housed within the driving device housing, the sensors being exposed at the upper front part of the device housing; said circuit board is connected to solenoid valves to activate them as needed by the hydraulic system.

**[0033]** In operation, in different work settings, as indicated above, the device operates as follows:

**[0034]** The Premium version device can lift the lid or the seat and lid at the same time by water pressure. To lift only the lid it is necessary to pass a hand or foot past the left motion sensor, and when said sensor is triggered, the signal travels to the circuit board and this in turn sends a signal to the left solenoid valve to actuate, thereby allowing the water flow through the left supply duct to the left diaphragm; the left diaphragm is then inflated by water pressure to press the left counterweight fixed to the left

rotating shaft, and to move it into the left chamber and rotating-lifting the lid connected by means of a bolt to said left rotating shaft to the open position.

**[0035]** In order to lift the lid and the seat at the same time, it is necessary to pass a hand or foot past the right motion sensor, and when said sensor is triggered the signal travels to the circuit board, and this in turn sends a signal to the left and right solenoid valves, these are activated to allow the water flow through the left and right ducts into the two diaphragms; through water pressure said diaphragms are inflated, forcing and pressing each diaphragm to their corresponding counterweights to move the counterweight into the device chambers and rotating-lifting the lid and seat simultaneously, into the open position.

**[0036]** In both situations while the person is located near the device, the central presence sensor sends a signal to the electronic board to keep open both solenoid valves forcing the lid and seat to remain in the open position. Once the person leaves the place, the central presence sensor sends a signal to the electronic board so that this in turn sends the signal to both solenoid valves, closing the water supply and opening the way where the water discharge ducts are connected to the drain into the toilet tank or into the toilet itself by the main discharge duct. This action releases the diaphragm pressure and the lid or lid and seat are closed, as appropriate, by operation of gravity.

**[0037]** This closing action also happens if both the lid and the seat are in the open position and the person passes his hand or foot past the left sensor and said sensor sends a signal to the circuit board, which in turn activates left solenoid valve to release the pressure off of the left diaphragm and release the water into the toilet tank or into the toilet itself so as to lower the seat by gravity without the need to manually lower the lid.

**[0038]** Similarly, if the lid is in the open position, the user can pass the hand or foot past the right motion sensor, when the sensor is triggered the signal travels to the circuit board and this in turn sends a signal to the right solenoid valve, it is driven and allows water flow through the right duct to the right diaphragm. Using water pressure said diaphragm is inflated forcing the right counterweight to move into the right device chamber and rotating-lifting the seat to the open position.

**[0039]** In the Standard embodiment where the device is driven with contact elements, the device is supplied by a network of pipelines from a distribution element; said distribution elements are arranged in the back part of the bowl and connect directly the main water supply duct to the toilet tank.

**[0040]** In the case of the left diaphragm of the device, comprises a first left supply duct connected to the distribution element and to a left driving button or foot or hand-operated valve disposed on the floor next to the toilet, which takes water from the main water supply duct; a second left distribution duct connected from the left driving button to the distribution element in communication

with a third left supply duct coming out of said distribution element and is connected to a first upper pivot of the device left diaphragm, a fourth discharge duct connected to a second pivot of the left diaphragm and the distribution element and discharging water from said diaphragm and a main discharge duct connected from the distribution element into the toilet water tank comprising in its end a valve with pressure device which opens when the tank is discharged due to the pressure differential, allowing the water discharge from the system.

**[0041]** The right diaphragm comprises the same configuration of piping connections and a left driving button or foot or hand-operated valve.

**[0042]** In operation of the standard version device, the lid or the seat and the lid may be lifted at the same time, by water pressure. To lift only the lid it is necessary to press the left driving button or valve by foot or hand; this allows the water flow from the main supply duct through the first left supply duct and continuing by the second left distribution duct to the distribution element, to pass through the third left supply duct into the left diaphragm. Using water pressure, said left diaphragm is inflated to press the left counterweight, moving it into the left device chamber and rotating-lifting the lid to the open position.

**[0043]** To lift the lid and the seat at the same time, it is necessary to press the right driving button by foot or hand or the right driving valve with the foot, allowing the water flow from the main supply duct through the first right supply duct and continuing by the second right distribution duct to the distribution element, to pass through the third left duct and also through the third right supply duct to the left and right diaphragms to press the counterweights and rotating the left and right shafts to lift the lid and the seat to the open position. To close the lid and seat, it is necessary to discharge the toilet water tank and once the level drops, the water pressure sensitive valve placed at the end of the main discharge duct opens, allowing the left and right diaphragms to discharge water inside the toilet tank and allowing the lid and seat down to the closed position by gravity and the weights of the counterweights.

**[0044]** The lid and the back, in any of the embodiments are lifted to an angle of about 85° which allows have some slope, favoring the gradual descent of the lid and seat, helped by the counterweights.

**[0045]** The device as described, further allows a user may to lift the lid and seat by hand if the user does not wish to drive the device with the automatic driving system or deactivate it with the contact element driving system.

**[0046]** In another of the embodiments, where the toilet is used exclusively for a male person, the system allows to deactivate the valve and left sensor to only be able to drive the valve and right sensor, which allows to drive the system for raising and lowering the seat only, keeping lifted the lid permanently.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0047]** To better the understanding of the invention characteristics, it is attached to this description, as an integral part of it, the drawings for purposes of illustration but not limitation, as described below.

Figure 1 shows an exploded view of the hydraulic drive device for raising and lowering the toilet covering lid and seat, in accordance with the present invention;

Figure 2 shows a conventional perspective view of the assembled device for the hydraulic driving, for raising and lowering the covering lid and the seat of a toilet, without displaying the external housing;

Figure 3 illustrates a side view of a conventional toilet with the hydraulic drive device for raising and lowering the toilet covering lid and seat;

Figure 4 shows an exploded view of the hydraulic drive device for raising and lowering the toilet covering lid and seat in the automatic actuating embodiment (Premium version);

Figure 5 illustrates a side view of a toilet with the device for raising and lowering the toilet covering lid and seat in the automatic actuating embodiment (Premium version) with the lid and seat folded down or closed;

Figure 6 shows a side view of a toilet with the device for raising and lowering the toilet covering lid and seat, in the automatic actuating embodiment (Premium version) with the lid raised and the seat folded down or closed;

Figure 7 illustrates a side view of a toilet with the device for raising and lowering the toilet covering lid and seat in the automatic actuating embodiment (Premium version) with the lid and seat lifted;

Figures 8a to 8e illustrate cross sections of the device in the automatic actuating embodiment (Premium version), illustrating the evolution of a diaphragm during its filling with working fluid to drive the counterweight and rotate it along with the rotating shaft to lift the lid and/or seat;

Figures 9a to 9e illustrate cross sections of the device in the automatic actuating embodiment (Premium version), illustrating the evolution of a diaphragm during its draining of the working fluid, to return the counterweight and the rotating shaft to a resting position which leads to cover and/or seat to a lying position;

Figure 10 illustrates an electronic circuit diagram, circuit board-solenoid valves-motion sensors-central presence sensor;

Figure 11 shows an exploded view of the hydraulic drive device for raising and lowering the toilet covering lid and seat in the actuating embodiment with contact elements (Standard version);

Figure 12 illustrates a side view of a toilet with the device for raising and lowering the toilet covering lid

and seat in the actuating embodiment with contact elements (Standard version) with the lid and seat folded down or closed;

Figure 13 shows a side view of a toilet with the device for raising and lowering the toilet covering lid and seat in the actuating embodiment with contact elements (Standard version) with the lid raised and the seat folded down or closed;

Figure 14 illustrates a side view of a toilet with the device for raising and lowering the toilet covering lid and seat in the actuating embodiment with contact elements (Standard version) with the lid and seat lifted;

Figures 15a 15e illustrate cross sections of the device in the actuating embodiment with contact elements (standard version), illustrating the evolution of a diaphragm during its filling with working fluid to drive the counterweight and rotate it together with the rotary shaft to lift the lid and/or the seat; and Figures 16a to 16e illustrate cross sections of the device in the actuating embodiment with contact elements (standard version), illustrating the evolution of a diaphragm during its draining of the working fluid, to return the counterweight and the rotating shaft to a resting position leading the lid and/or the seat to a lying position.

**[0048]** For better understanding of the invention, a detailed description of any of its embodiments will be made, which is shown in the drawings that for illustrative but not limitative purposes are annexed to the present description.

## DETAILED DESCRIPTION OF THE INVENTION

**[0049]** The characteristic details of the hydraulic drive device for raising and lowering the toilet covering lid and seat, is clearly shown in the following description and the appended illustrative drawings, serving the same reference signs to indicate the same parts.

**[0050]** Referring to Figure 1 shows an exploded view of the hydraulic drive device for raising and lowering the toilet covering lid and seat in accordance with the present invention. In said figure the device comprises a housing 1 comprising two modules 1a and 1b, a left module 1a and a right module 1b, both modules are adapted to engage each other, the housing already assembled defines a left hollow chamber 2 and a right hollow chamber 3 (not shown) in semicircular shape, adapted to receive a left rotating shaft 4 and a right rotating shaft 5, and to accommodate a left counterweight 6 and a right counterweight 7, respectively. Said shafts are fixed within the chambers with a rotating motion capacity; each of the chamber 2 and 3 also houses one left elastic diaphragm 8 and one right 9, adjoining and interacting with the counterweights 6 and 7; said diaphragm 8 and 9 include at least one connecting pivot 10 where a supply duct and/or working fluid outlet (not shown) are connected making

such diaphragms increase in volume to drive-push the counterweights 6, 7 and cause the rotation of said left 4 and right 5 shafts.

**[0051]** Referring to Figures 1 and 2, a lid 11 of the toilet hole and a seat 12 disposed below the lid 1 and on the periphery of the toilet bowl hole (not shown), the lid and seat comprise on the rear part, two left connection flanges 13a, 13b and right 14a, 14b with a hole through which a left fixing bolt 15 is inserted and right 16 which is fixed at the ends of the respective rotating shafts, left 4 and right 5. The left bolt 15 fixes and anchors the lid 11 to the left shaft 4, the left connection flange 13a being passing without fixing through the orifice of the left connection flange 13b of the seat 12, allowing it to spin; while the right bolt 16 fixes and anchors the seat 12 to the right shaft 5 through the right connection flange 14b passing without fixing through the orifice of the right connection flange 14a of the lid 11 allowing it to spin.

**[0052]** When the pressurized fluid is introduced through the pivots 10, the diaphragms 8 and 9 are filled with water, pushing the counterweights 6 and 7 attached to the rotating shafts, left 4 and right 5, rotating them, and being united shafts, left 4 and right 5 to the lid 11 and seat 12, respectively, allow them to rise. When the water is expelled from the diaphragms 8 and 9, the counterweights 6 and 7 help gravity to softly drop of the lid 11 and seat 12.

**[0053]** Referring to Figure 1, said housing 1 comprises on its underside a pair of exterior threaded hollow fixing tubes 17, spaced, inferiorly projected and coincident with the orifices in the toilet bowl (not shown) by means of which is fixed with nuts (not shown) to said bowl. Through said hollow tubes 17 is passed the working fluid supply duct to said diaphragms 8 and 9.

**[0054]** Referring to Figure 3 illustrates a side view of a conventional toilet with the hydraulic drive device for raising and lowering the toilet covering lid and seat. In said figure, the device is fixed in a bowl 18 of a toilet 19 by means of the hollow tubes 17 of the housing 1 with nuts 20 so that the lid 11 and seat 12 are disposed on the bowl 18.

**[0055]** Referring to Figure 4 shows an exploded view of the hydraulic drive device for raising and lowering the toilet covering lid and seat in the automatic actuating embodiment (Premium version). In said figure, the same numerical references described in Figures 1 to 3 are used, in case of the device, in this embodiment, the device is supplied by a water supply pipe network which supply is regulated by two three-way solenoid valves 21 and 22, two motion sensors, left 23 and right 24 and a central presence sensor 25 in communication with a circuit board 26 which processes the sensor signals to actuate said solenoid valves 21 and 22.

**[0056]** Referring to Figures 4 to 7, two supply ducts, left 27 and right 28 are connected to a duct bypass 29 of the main supply source 30 that supply water to the toilet water tank 31 and to one way of the corresponding associated solenoid valves 21 and 22 of the three ways

disposed at the sides of the back part of the bowl 18; at the second way of the solenoid valves are connected the supply ducts, left 32 and right 33 which is connected to pivot 10 of the diaphragms, left 8 and right 9, and in the third way of the solenoids are connected the water discharge ducts 34 and 35 of the diaphragms, connected from the solenoids 21 and 22 to a main discharge duct 36 that drain in the toilet water tank 31.

**[0057]** Figure 4 also shows the covering lids, left 37 and right 38 of housing 1 of the device.

**[0058]** In Figures 5 to 7 are used the same reference numbers to indicate the elements described in Figure 4. Figure 5 shows the lid 11 and seat 12 folded down over the bowl hole 18 of toilet 19. Figure 6 shows the lid 11 lifted and the seat 12 folded down. Figure 7 shows the lid 11 and the seat 12 lifted.

**[0059]** In Figures 8a to 8e are illustrated cross sections of the device in the automatic actuating embodiment (Premium version), illustrating the evolution of a diaphragm during its filling with working fluid to drive the counterweight and rotate it along with the rotating shaft to lift the lid and/or seat. In said figures is observed the three-way solenoid valve 21, being the lower way 39 where the left supply duct 27 is connected (not shown), connected to the duct bypass 29 of the main supply source 30 (not shown); in the second way 40 is connected the left supply duct 32 which is connected to pivot 10 of the left diaphragm 8 disposed within the left chamber 2 of the housing 1 of the device, adjoining to the counterweight 6, and passing through the inner of the threaded hollow tube 17 with which is fixed with the nut 20 to the bowl; and the third way 41 is connected to the water discharge duct 34 (not shown) through which water is discharged out from the left diaphragm 8.

**[0060]** Figures 8a to 8e illustrate the gradual filling sequence of working fluid of the left diaphragm 8, which allows the left diaphragm 8 to push the counterweight 6 fixed to the left rotating shaft 4 inside the chamber 2, so that when it is inflated with water, causes the rotation of the left shaft 4 which is fixed to the lid 11 (not shown) lifting it.

**[0061]** In figures 9a to 9e, there is a reverse sequence, illustrating the evolution of a left diaphragm 8, which is reduced in volume in the draining, returning the counterweight 6 and the rotating shaft 4 to a resting position that leads the lid to the lying position.

**[0062]** In these figures is observed how the solenoid valve 21 is operated by activating the plunger 42 which clears the third way 41, where the discharge duct 34 is connected (not shown), draining the water out of the diaphragm 8.

**[0063]** This operation is the same with the right elements of the device in which the right shaft is fixed to the seat to lift or lower it.

**[0064]** Figure 10 shows the two motion sensors, left 23 and right 24, and the central presence sensor 25 in communication with an circuit board 26 which processes the sensor signals to actuate said solenoid valves 21 and

22 with which are in communication.

**[0065]** Figure 10 shows the sensitivity adjustment means 43 of the sensors 23, 24, 25.

**[0066]** Referring to Figures 4 to 10, in operation the following events occur:

**[0067]** The Premium version device allows the user to lift the lid 11 or the seat 12 and lid 11 at the same time by water pressure. To lift only the lid 11 it is necessary to pass the hand or foot by the left motion sensor 23; triggering said sensor, the signal travels to the circuit board 26 and this in turn sends a signal to the left solenoid valve 21 to activate it, allowing the water to flow through the left supply duct 32 to the left diaphragm 8; by the water pressure said left diaphragm 8 is inflated to press the left counterweight 6 fixed to the left rotating shaft 4 to move it inside the left chamber 2 and rotating-lifting the lid 11 which is connected by bolt 15 to said left rotating shaft 4 to the open position.

**[0068]** To lift the lid 11 and the seat 12 at the same time, it is necessary to pass the hand or foot by the right motion sensor 24; triggering said sensor, the signal travels to the circuit board 26 and this in turn sends a signal to the solenoid valves, left 21 and right 22, these are activated allowing the water to flow through the ducts, left 32 and right 33 to the two diaphragms 8 and 9; by the water pressure said diaphragms are inflated, pressing each diaphragm to the corresponding counterweights, left 6 and right 7, to move into the chambers 2 and 3 of the device and rotating-lifting the lid 11 and seat 12 simultaneously, to the open position.

**[0069]** In both situations, while the person is located near the device, the central presence sensor 25 sends a signal to the circuit board 26 to keep open both solenoid valves 21 and 22, forcing the lid 11 and seat 12 to remain in open position. Once the person leaves the place, the central presence sensor 25 sends a signal to the circuit board 26 so that this in turn sends the signal to both solenoid valves 21, 22, closing the water supply and opening the way which are connected the water discharge ducts 34, 35 for the drain through the main discharge duct 36 into the toilet tank 31 or to the toilet itself. This action relieves the pressure from the diaphragms 8 and 9, and closes the lid 11 or the lid 11 and seat 12 by gravity, as appropriate.

**[0070]** This closing action is also true if both lid 11 and seat 12 are in the open position and the person passes his hand or foot by the left sensor 23 and said sensor sends a signal to the circuit board 26 where it in turn activates the left solenoid valve 21 that releases the pressure of the left diaphragm 8 and release the water in the toilet tank 31 or into the toilet itself so as to lower the seat 12 by gravity without the need to lower the lid.

**[0071]** Similarly, if the lid 11 is in the open position, the user can pass the hand or foot by the right motion sensor 24; triggering said sensor, the signal travels to the circuit board 26 and this in turn sends a signal to the right solenoid valve 22, activating it and allows the water flow through the right duct 33 into the right diaphragm 9. Using

water pressure said diaphragm 9 is inflated, forcing the right counterweight to move into the right chamber 3 of the device and rotating-lifting the seat 12 to the open position.

**[0072]** Referring to Figures 11 to 14 shows the hydraulic drive device for raising and lowering the toilet covering lid and seat, in the actuating embodiment with contact elements (Standard version). In said figures the same numerical references are used, as described in Figures 1 through 3 for the case of the device; in this embodiment, the device is supplied by a pipe network from a distribution element 44, the distribution element is disposed in the rear part of the bowl 18 and connected directly to the main water supply duct 30 to the tank 31 of the toilet 19.

**[0073]** The diaphragms, left 8 and right 9, comprise a first supply duct, left 45 and right 46 respectively, connected to the distribution element 44 and to an actuating button or valve, left 47 and right 48, respectively, arranged on the floor next to the toilet, which take water from the main water supply duct 30; a second distribution duct, left 49 and right 50 connected from the corresponding foot or hand-operated valve, left 47 and right 48 to the distribution element 44 in communication with a third supply duct, left 51 and right 52, which coming out from said distribution element 44 and is connected to a first upper pivot 10 of the corresponding diaphragms, left 8 and right 9 of the device; a fourth discharge duct, left 53 and right 54 connected to a second pivot (not shown) of the diaphragm, left 8 and right 9 and to the distribution element 44 and which discharges water from said diaphragms, and a main discharge duct 55 connected from the distribution element 44 into the water tank 31 of the toilet 19 comprising at its end a valve with pressure device 56 which is opened when the tank 31 is discharged due to pressure differential, allowing the water discharge from the system.

**[0074]** In Figures 12 to 14 are used the same reference numbers to indicate the elements described in Figure 11.

**[0075]** Figure 12 shows the lid 11 and seat 12 folded down over the hole of the bowl 18 of toilet 19. Figure 13 shows the lid 11 lifted and the seat 12 folded down. Figure 14 shows the lid 11 and seat 12 lifted.

**[0076]** Referring to Figures 15a 15e illustrate cross sections of the device in the actuating embodiment with contact elements (Standard version), illustrating the evolution of a diaphragm during its filling with working fluid to drive the counterweight and rotate it together with the rotating shaft to lift the lid and/or seat. In said figures, it shows the threaded hollow tube 17 which fixes the device into the orifices of the toilet bowl by means of nuts 20; through the hollow tube 17 is passed the third left supply duct 51 where water is dispensed from the distribution element 44 (not shown) and which is connected to the first upper pivot 10 of the left diaphragm 8 disposed within the left chamber 2 of the device housing 1, adjoining to the counterweight 6. Said figures show the gradual filling sequence of working fluid of the left diaphragm 8, which allows the left diaphragm 8 pushing the counterweight 6

fixed to the left rotating shaft 4 within the chamber 2, so that when inflated with water, causes the rotation of the left shaft 4 which is fixed to the lid 11 (not shown) lifting it.

**[0077]** In Figures 16a to 16e is observed a reverse sequence, illustrating the evolution of the left diaphragm 8, which is reduced in volume in the draining, returning the counterweight 6 and the rotating shaft 4 to a resting position that leads to the lid into the lying position, when the water goes through the fourth left discharge duct 53 connected at a second pivot 57 of the diaphragm 8, which drains water to the distribution element 44 and this discharge it through the main discharge duct 55 (not shown) into the water tank 31 of the toilet 19 which comprises at its end a valve with pressure device 56 which is opened when the tank 31 is discharged due to the pressure differential, allowing the water discharge from the system (see Figures 12 to 14).

**[0078]** This operation is the same with the right elements of the device, on which the right shaft is fixed to the seat for lifting or lowering it.

**[0079]** Referring to Figures 11 to 14 and 15a-15e and 16a-16e, in operation of the standard version device, the lid 11 or the seat 12 and lid 11 may be lifted at the same time by the water pressure. To lift only the lid 11 it is necessary to press by foot or hand the left actuating button or valve 47; this allows the water flow from the main supply duct 30 by the first left supply conduit 45 connected to the distribution element 44 and continuing by the second left distribution duct 49 into the distribution element 44, to pass through the third left supply duct 51 to the left diaphragm 8. Using water pressure said left diaphragm 8 is inflated pressing the left counterweight 6 displacing it within the left chamber 2 of the device and rotating-lifting the lid 11 to the open position.

**[0080]** To lift the lid 11 and seat 12 at the same time, it is necessary to press by foot or hand the right actuating button or valve 48, allowing the water flow from the main supply duct 30 through the first right supply duct 46 connected to the distribution element 44 and continues by the second right distribution duct 50 into the distribution element 44, to pass through the third left duct 51 and also by the third right supply duct 52 into the diaphragms, left 8 and right 9 to press the counterweights 6 and 7 and rotates the shafts, left 4 and right 5 to lift the lid 11 and seat 12 to the open position. To close the lid 11 and seat 12, it is necessary to drain the water from the toilet tank 31 and once the level drops, the water pressure sensitive valve 56 disposed at the end of the main discharge duct 55 is opened, allowing the diaphragms, left 8 and right 9, discharge the water inside the toilet tank 31 allowing the lid 11 and seat 12 down to the closed position by gravity and the weights of the counterweights 6 and 7.

**[0081]** The invention has been described sufficiently to allow a person with ordinary skill in the art to reproduce and obtain the results mentioned in the present invention. However, any person skilled in the technical field which pertains the present invention may be able to make modifications not described in this application, however, if the



implementation of these modifications in a particular structure or in the manufacturing process of the same, the matter claimed in the following claims is required, such structures should be included within the scope of the invention.

**[0082]** Having sufficiently described the invention, it is considered as a novelty and so it is claimed as property what is expressed and contained in the following claiming clauses. What claimed is:

### Claims

1. A hydraulic drive device for raising and lowering the toilet covering lid and seat, comprising: a housing comprising two adjoining hollow chambers, one left and one right, the chambers house a left rotating shaft and a right rotating shaft, respectively; both shafts comprise a fixed counterweight that can be rotated along with the shaft inside the chambers; each chamber also houses a left elastic diaphragm and a right one, adjoining and interacting with the counterweights, said diaphragms comprise at least one connection pivot where a supply duct and/or working fluid outlet is connected to drive-push the counterweights which when are inflated with working fluid supplied by an automatic system or a system of contact driving elements, cause the rotation of said shafts connected to a toilet lid and seat, respectively, and which consist in the back part of a left connection flange and a right one with orifice, through which is inserted a left fixing bolt and a right one, which are fixed at the ends of the rotating shafts with the corresponding counterweights.
2. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 1, wherein said left bolt fixes and anchors the lid to the left shaft with its left connection flange, passing without fixing the left connection flange of the seat; while the right bolt fixes and anchors the seat to the right shaft through the right connection flange, passing without fixing through the right connection flange of the lid.
3. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 1, wherein said housing of the device consists of two modules, a left module and a right module, both modules are adapted to engage each other.
4. A hydraulic drive device for raising and lowering the toilet covering lid and seat, according to claims 1 to 3, wherein said housing comprises on its underside a pair of exterior thread hollow fixing tubes, spaced, inferiorly projected and coincident with the orifices in the toilet bowl by means of which is fixed with nuts to said bowl.
5. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 4, wherein said working fluid supply ducts pass through said hollow tubes to said diaphragms.
6. A hydraulic drive device for raising and lowering the toilet covering lid and seat, according to claims 1 to 4, wherein the chambers of said housing are preferably semicircular and the counterweights attached to the rotating shafts are substantially of triangular prism shape with curved bases, which are smaller than said chambers so as to move rotationally inside the same and press the diaphragms.
7. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 1, wherein the automatic working fluid supply system to the diaphragms consists of two left and right supply ducts, connected to a duct bypass of the main supply source that supplies water to the toilet water tank and the corresponding left and right three-way solenoid valves arranged on the sides of the back part of the bowl; in the second way of the solenoid valves, the left and right supply ducts are connected which are connected to the pivot of the left and right diaphragms, and in the third way of the solenoids are connected the left and right water discharge ducts of the diaphragms, connected from the corresponding solenoid valves to a main discharge duct that drains into the toilet water tank; two left and right motion sensors and a central presence sensor in communication with a circuit board that processes signals from the sensors to actuate said solenoid valves.
8. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 7, wherein said left and right motion sensors, the central presence sensor and the circuit board, are housed within the housing of the actuating device, the sensors being exposed at the front upper part of the device housing; said circuit board is connected to the solenoid valves to activate them depending on the need of the hydraulic system.
9. A hydraulic drive device for raising and lowering the toilet covering lid and seat according to claim 1, wherein the working fluid supply system to the diaphragms with contact elements consists of a distribution element provided in the back part of the bowl, connected directly the main water supply duct to the toilet tank; a first left supply duct and a right one connected to said distribution and to a left foot or hand-operated valve and a right one respectively, disposed on the floor next to the toilet; a second left distribution duct and a right one, connected from the corresponding left and right foot-operated actuating valves to the distribution element, in communication

with a third left supply duct and with a right one, which leave from said distribution element and are connected to a first upper pivot of the corresponding left and right diaphragm; a fourth left and right discharge ducts connected to a second pivot of the corresponding left and right diaphragms, and to the distribution element and discharging water from said diaphragms, and a main discharge duct connected from the distribution element into the toilet water tank, which comprises at its end a valve with pressure device that opens when the tank is discharged due to the pressure differential, allowing the water discharge from the system.

10. A hydraulic drive device for raising and lowering the toilet covering lid and seat, according to the preceding claims, wherein the lid and back are lifted to an angle of about 85° which allows have some slope, favoring the gradual descent, helped by the counterweights.
11. An automatic actuating method of a hydraulic device for lifting the lid of the toilet bowl to use it, when the lid and seat are folded down, according to the device of claim 1, comprising the steps of: passing the hand or foot by the left motion sensor to generate a signal traveling to the circuit board, which in turn sends a signal to the left solenoid valve which allows the water flow through the left supply duct into the left diaphragm; using water pressure said left diaphragm inflates pushing the left counterweight fixed to the left rotating shaft to move into the left chamber and rotating-lifting the lid connected by means of a bolt to said left rotating shaft to the open position.
12. An automatic actuating method of a hydraulic device for lifting the lid and seat of the toilet bowl at the same time, to be used when the lid and seat are folded down, according to the device of claim 1, comprising the steps of: passing the hand or foot by the right motion sensor to generate a signal traveling to the circuit board, which in turn sends a signal to the left and right solenoid valves, these ones are actuated and allow water flow through the left and right ducts to the two diaphragms; using water pressure said diaphragms are inflated forcing each diaphragm to press the corresponding counterweights, to move it into the chambers of the device and rotating-lifting the lid and the seat simultaneously, to the open position.
13. An automatic actuating method of a hydraulic device to keep lifted the lid or keep lifted the lid and the seat of a toilet while in use of Claim 11, wherein the central presence sensor detects the presence of a user and sends a signal to the circuit board to keep open the left solenoid valve or to keep open both solenoid valves, forcing the lid or the lid and seat to remain in

the open position while the toilet is in use.

14. An automatic actuating method of a hydraulic device for lowering the lid and the seat of a toilet once it has been used of Claim 11, wherein the central presence sensor detects the absence of a user after some time and sends a signal to the electronic board so as to this in turn send the signal to both solenoid valves, closing the water supply and opening the way where the water discharge ducts are connected to the drain into the toilet tank or into the toilet itself by means of the main discharge duct, releasing the diaphragm pressure and by gravity the lid and seat are lowered.
15. An automatic actuating method of a hydraulic device for lowering a toilet seat for use when they are lifted both the lid and the seat that have been lifted previously of Claim 11 further comprising passing the hand or foot by the left sensor to generate a signal that is sent to the circuit board which in turn activates left the solenoid valve so as to release the pressure of the left diaphragm and release the water in the toilet tank or into the toilet itself so that the seat is lowered by gravity without the need to lower the lid.
16. An automatic actuating method of a hydraulic device for lifting a toilet seat when the lid is lifted previously of Claim it further comprising: passing the hand or foot by the right motion sensor, triggering said sensor the signal, travels to the circuit board and this in turn sends a signal to the right solenoid valve, it is activated and allows water flow through the right duct into the right diaphragm, whereby using water pressure said diaphragm is inflated forcing to right counterweight to move inside the right chamber of the device and rotating-lifting the seat to the open position.
17. An actuating method with contact elements of a hydraulic device for lifting the lid of the toilet bowl to use it, when the lid and seat are folded down of Claim 11, further comprising: pressing by foot or hand the left foot-operated button or valve to generate a water flow from the main supply duct through the first left supply duct and continuing along the seconds left distribution duct to the distribution element, to pass through the third left supply duct to the left diaphragm; the water pressure inflates said left diaphragm, pressing the left counterweight moving it into the left chamber of the device and rotating-lifting the lid to the open position.
18. An actuating method with contact elements of a hydraulic device for lifting the lid and seat of the toilet bowl at the same time, to be used when the lid and seat are folded down of Claim 11, further comprising: pressing by means of the foot, the right actuating button or valve, allowing the water flow from the main

supply duct through the first right supply duct and continuing by the second right distribution duct to the distribution element, to pass through the third left duct and also by the third right supply duct to the left and right diaphragms to press the counterweights and rotating the left and right shafts to lift the lid and seat to the open position. 5

19. An actuating method with contact elements of a hydraulic device for closing the lid and the seat of the toilet bowl at the same time, after use, when the lid and seat are lifted of Claim 11, further comprising discharging water from the toilet tank, and when the water level is down, the water pressure sensitive valve placed at the end of the main discharge duct is open, allowing left and right diaphragms, discharge water inside the toilet tank allowing by gravity and the weights of the counterweights, the lid and seat lower to the closed position. 10 15 20

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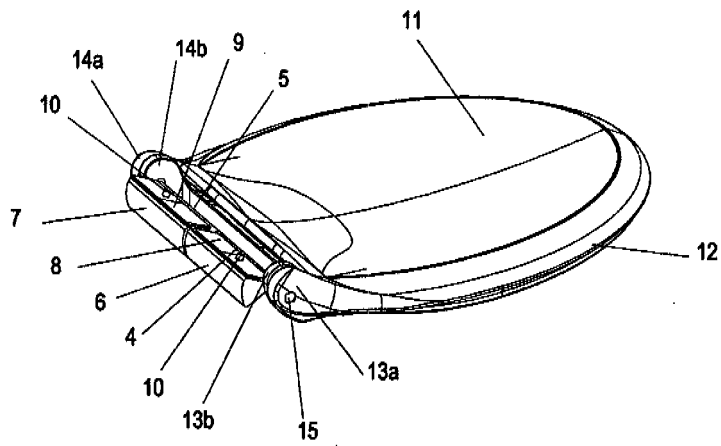
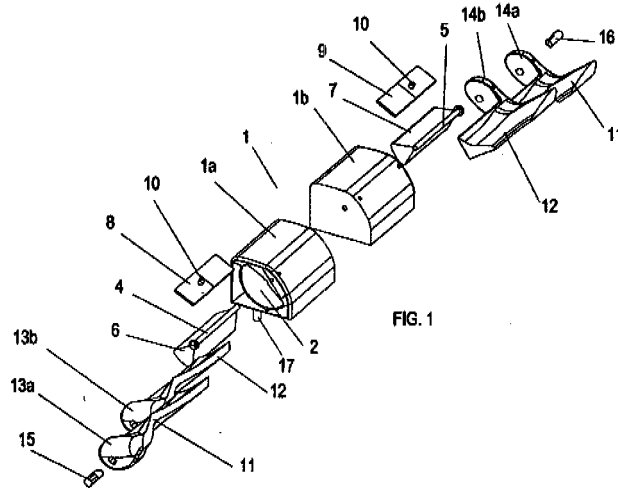


FIG. 2

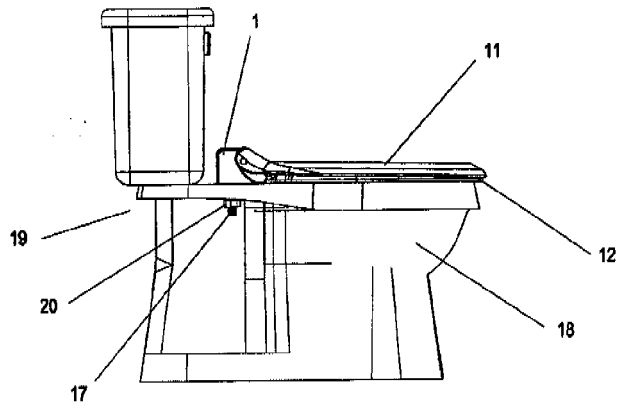


FIG. 3

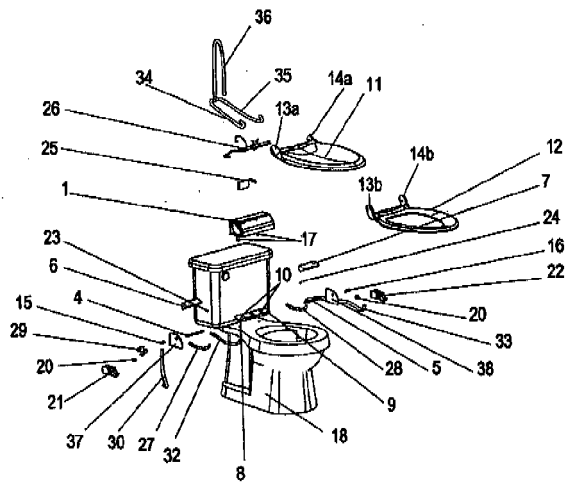
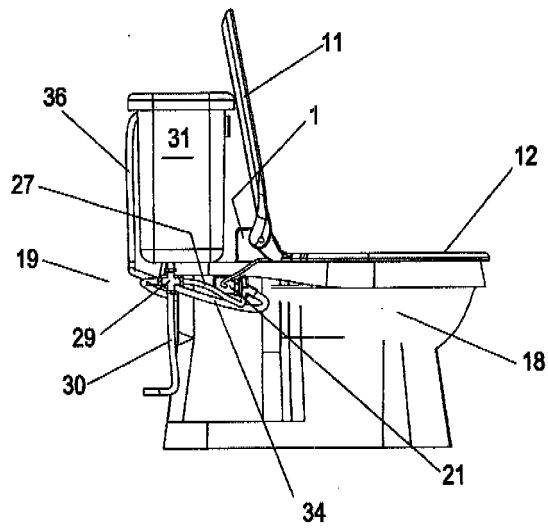
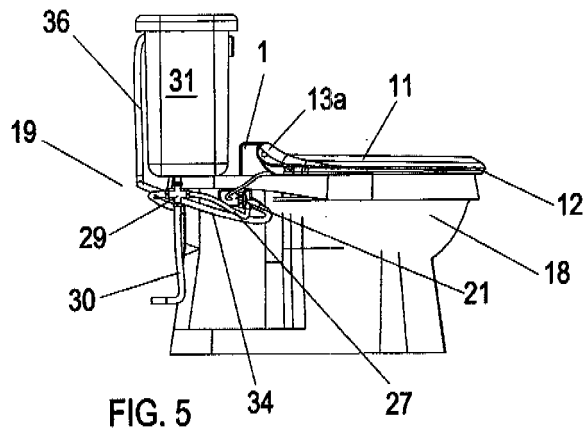


FIG. 4



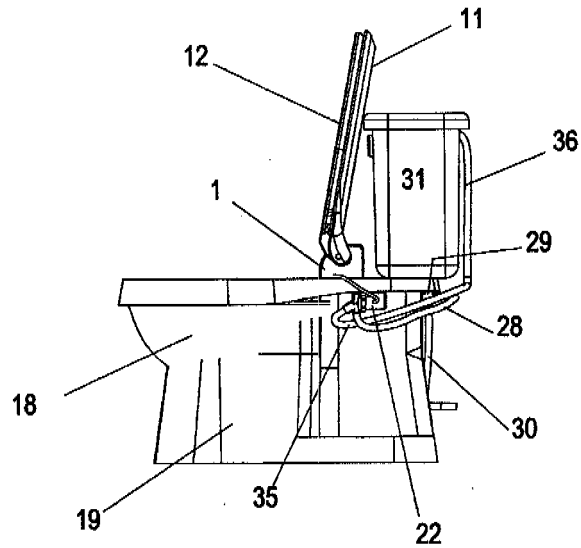
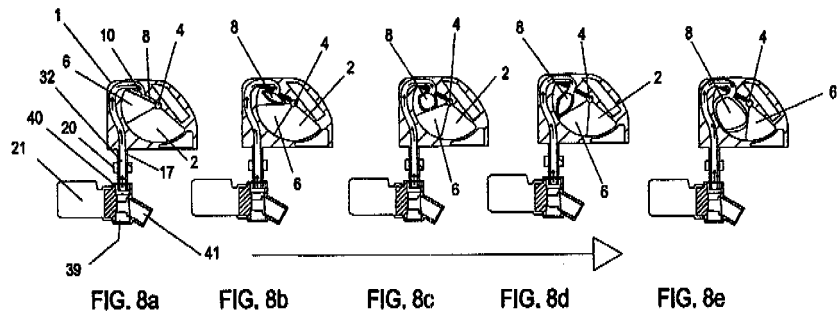
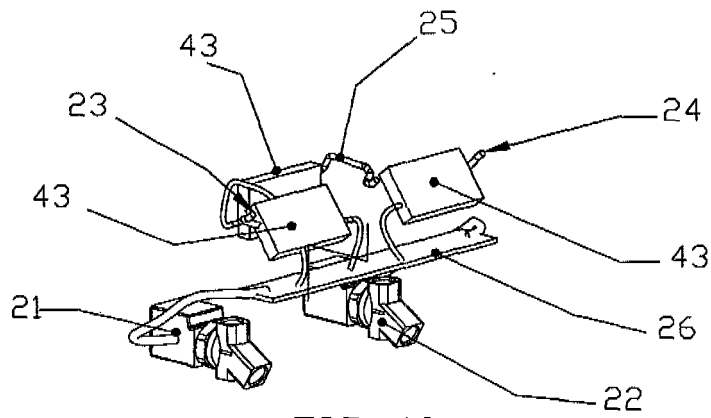
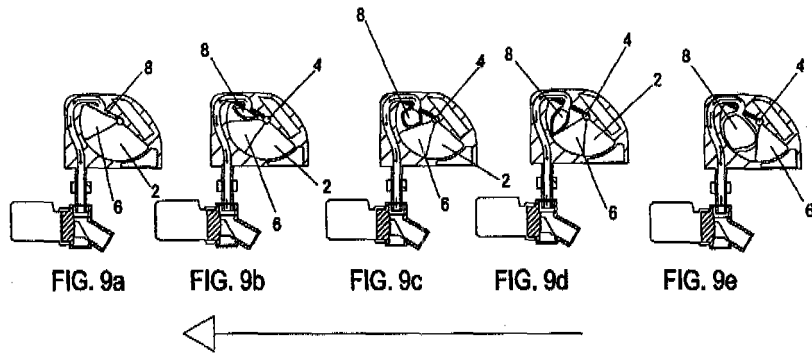


FIG. 7







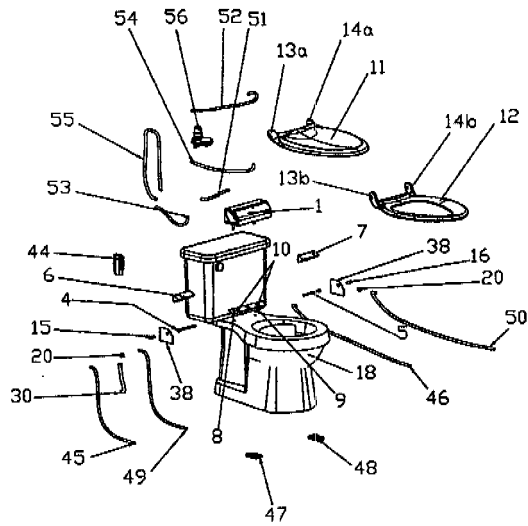


FIG. 11

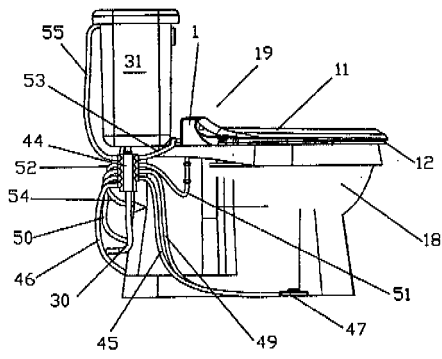


FIG. 12

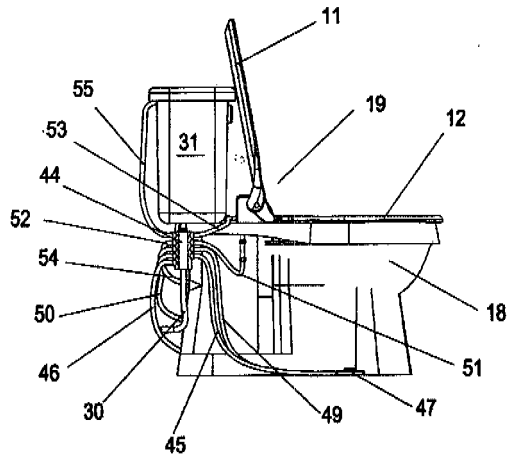


FIG. 13

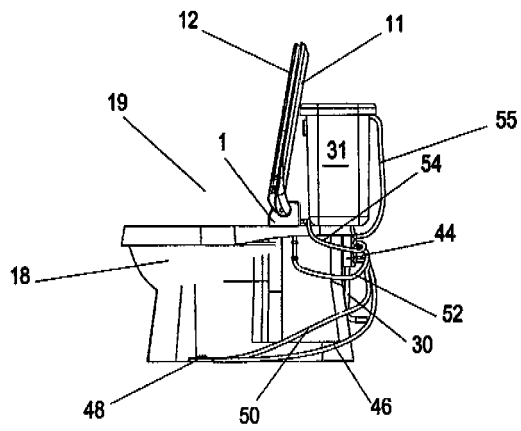
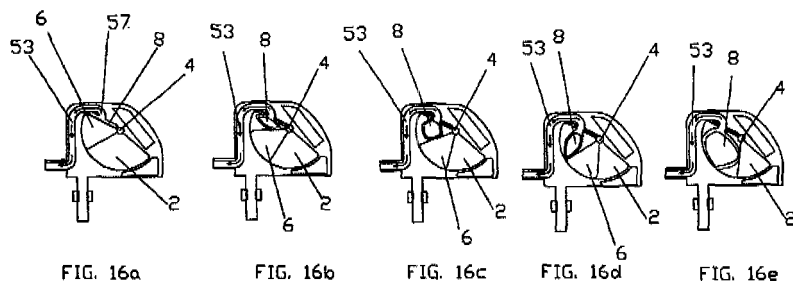
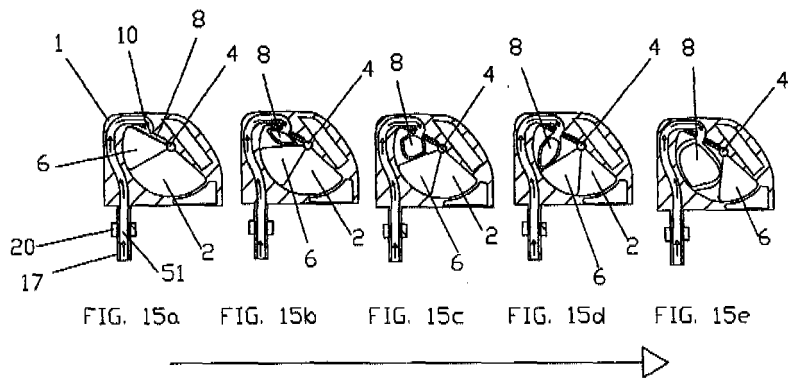


FIG. 14



INTERNATIONAL SEARCH REPORT

International application No.  
PCT/ MX 2010/000040

A. CLASSIFICATION OF SUBJECT MATTER		
A47K 13/10 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) A47K13		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) INVENES,EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02062191 A1 (KANG KYUNGTAEK) 15.08.2002, page 1, line 12 - page 14, line 14; figures 1-6.	1-19
A	US 5279000 A (MERCIER et al.) 18.01.1994, description; figures.	1-19
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A	JP 2006263112 A (AISIN SEIKI) 05.10.2006, description; figures; abstract of WPI database (retrieved from EPOQUE; AN 2006-750945).	1-19
A	US 5604936 A (MAUSOLF et al.) 25.02.1997, description; figures.	1-19
A	US 5153946 A (YOKE et al.) 13.10.1992, description; figures.	1-19
<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.	"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	
"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)	"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	
"O" document referring to an oral disclosure use, exhibition, or other means	"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 documents, such combination being obvious to a person skilled in the art	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
03 September 2010 (03.09.2010)	(05/10/2010)	
Name and mailing address of the ISA/ O.E.P.M.	Authorized officer	
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	Telephone No. +34 91 349 34 47	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/MX 2010/000040

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 6070298 A (SORIMACHI et al.) 06.06.2000, description; figures.	1-19
A	WO 9510971 A1 (ABDALLAH IMAN AL AMIN) 27.04.1995, description; figures.	1-19

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

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US 6081936 A	04.07.2000	NONE	
WO 9510971 A	27.04.1995	NONE	

Form PCT/ISA/210 (patent family annex) (July 2009)

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