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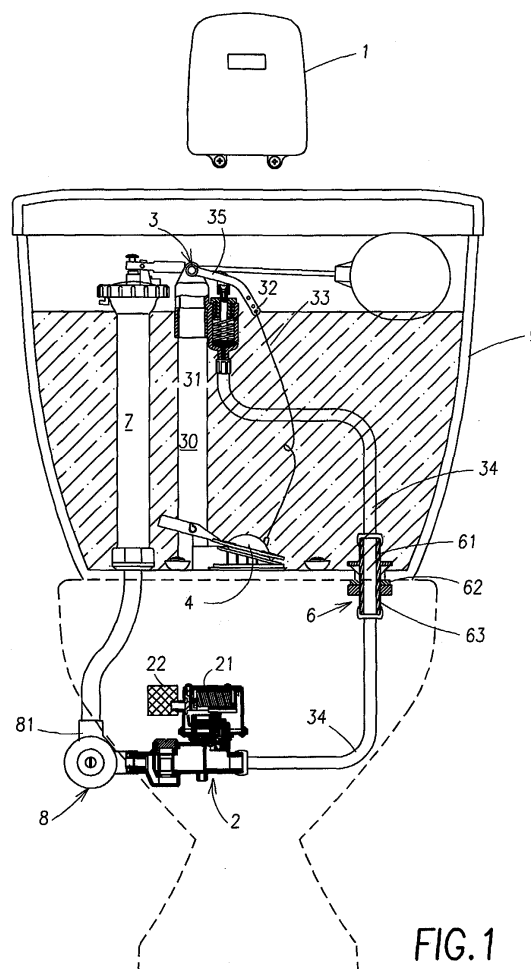
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(54) **Automatic flush apparatus for a toilet tank**

(57) A toilet tank automatic flush apparatus includes a detection module (1) located outside the toilet water tank, a solenoid valve module (2) and a flush module (3). The solenoid valve module (2) is located outside the water tank (9) and connected to a water supply head (8), and is controlled by signals from the detection module (1) to activate a solenoid valve switch (21) to channel water from the water supply head (8) into a hydraulic cylinder (31) of the flush module (3) through a tube (34) to generate a hydraulic pressure to push a hydraulic arm (35) upwards to lift a rocker arm (32). The rocker arm (32) has a distal end fastening to a rope (33) to connect and open a water discharge valve (4) so that water in the water tank (9) may be flushed into the toilet in a large quantity. The solenoid valve switch (21) stops water supply after a preset time period. A spring (36) located in the hydraulic cylinder (31) pushes the hydraulic arm (35) and the rocker arm (32) downwards to release the rope (33) so that the water discharge valve (4) may be closed and water may flow into the water tank (9) again.



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an automatic flush apparatus that has a detection device to control a solenoid valve to channel water supply to generate a hydraulic pressure to actuate a flush module in a water tank that has a rocker arm to actuate a water discharge valve to perform flushing.

2. Description of the Prior Art

[0002] Water for flushing toilets generally is stored in a water tank or a flush tube. Flush control is done manually or by electric detection. In the known techniques for flushing toilets, using the flush tube generally is controlled manually or by electric detection. In the case of using the water tank to supply water for flushing, manual control is still the most widely used approach. Automatic electric control is still not widely adopted. This mainly results from the concern that electronic elements tend to be short circuit and malfunction when exposed to the damp environment in the water tank for a prolonged period of time, and normal flushing operation could be hindered. However, there is still automatic detection flushing apparatus for toilet tank being developed. They generally adopt the flush type automatic sensor to detect user's staying time. When flushing conditions are met, a motor is activated to rotate an axle to wind up a rope connecting to the water discharge valve to open the water discharge valve to flush water stored in the tank into the toilet. The motor is controlled by a circuit or an eccentric cam. The axle may rotate inverse to unwind the rope so that the water discharge valve is closed to prevent the water from flowing out to stop flushing.

[0003] Although the toilet tank automatic flushing apparatus mentioned above can achieve automatic flushing affect same as the flush type flushing, it has problems in practical use. For instance, using generators or motors to wind the rope and open the water discharge valve has to use AC power. It consumes more electricity and is an unstable power supply and more difficult to control. The motor or generator is exposed to the damp water tank, and is easily rusted or tends to incur corrosion even without direct contact with the water, therefore could result in dysfunction of the winding operation. Because of these problems, the toilet tank automatic flushing apparatus is still not widely accepted to date.

SUMMARY OF THE INVENTION

[0004] The primary object of the present invention is to provide a toilet tank automatic flush apparatus to resolve the disadvantages occurred to conventional toilet detection flush apparatus that are installed in the water

tanks and easily damped and malfunctioned.

[0005] The toilet tank automatic flush apparatus according to the invention has all electric control portions installed outside the water tank and automatically activates flushing through hydraulic pressure. It includes a detection module located outside the water tank to detect user's use condition and emit a control signal to a solenoid valve module installed outside the water tank and coupled with a water supply head to actuate a solenoid valve switch to channel water intake through a pipe into a flush module in the water tank that does not contains electric facilities. The flush module includes a hydraulic cylinder to form a hydraulic pressure to drive a hydraulic arm upwards to lift a rocker arm which has a distal end fastened to a rope to move a water discharge valve to flush water of the water tank into the toilet.

[0006] The structure set forth above has the electric controlled detection module and solenoid valve installed outside the water tank, thus eliminates the problems of damp and malfunction that might otherwise occur to the electric elements. Moreover, it uses the same water supply of the water tank to generate the hydraulic pressure to control flushing. Thus it consumes no electric power except a little electric power to actuate the DC solenoid valve during the entire operation. The operational elements do not have malfunction problem caused by rustic conditions. It simultaneously solves the disadvantages of power consuming and erroneous operation happened to the conventional electric motor flushing.

[0007] The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a schematic view of an embodiment of the invention.

FIG. 2 is a schematic view of the invention in a use condition.

FIG. 3 is a schematic view of the invention in a use condition when a user is leaving.

FIG. 4 is a schematic view of an embodiment of the invention in a flushing condition.

FIG. 5 is a schematic view of an embodiment of the invention after the flushing is finished.

FIGS. 6 and 7 are sectional views of an embodiment of the flush module of the invention in operating conditions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] Referring to FIG. 1, the automatic toilet tank flush apparatus according to the invention includes a detection module 1 to detect user's use condition and emit a control signal, a solenoid valve module 2 to receive the signal of the detection module 1 to activate hydraulic operation, and a flush module 3 installed in a water tank to be actuated by the detection module 1 through a hydraulic pressure to actuate a water discharge valve 4 for flushing.

[0010] The detection module 1 is installed on a location sensible to users. In an embodiment of the invention, it is preferably located on a wall above the water tank 9. It includes photoelectric elements that can detect the presence of a user and user's use conditions. The detected result generates a flushing signal transmitted to the solenoid valve module 2 through a signal emission device.

[0011] The solenoid valve module 2 is located below the water tank 9 remote from the damp environment of the water tank to achieve normal operation with less malfunction. It includes a solenoid valve switch 21 which has an input end connecting to a water supply head 8 through a three-way duct 81. The water supply head 8 also is connected to a water intake device 7 through the three-way duct 81. Hence water output from the water supply head 8 supplies water simultaneously to the solenoid valve module 2 and the water intake device 7.

[0012] The flush module 3 is located in the water tank 9 and includes a hydraulic cylinder 31 mounted on one side of a upright post 30, a movable rocker arm 32 located on the top end of the post 30 and a rope 33 fastened to one distal end of the rocker arm connecting to a water discharge valve 4 to open or close the valve for flushing water into the toilet. The hydraulic cylinder 31 further is connected to an output end of the solenoid valve module 2 through a tube 34 to transfer output hydraulic pressure of the solenoid valve module 2 to the hydraulic cylinder 31. The hydraulic cylinder 31 has a hydraulic arm 35 which is movable up and down reciprocally to drive the rocker arm 32 to perform a levering up and down movement. Finally the rope 33 controls the water discharge valve 4 to open for flushing and close for storing water.

[0013] The tube 34 connecting to the hydraulic cylinder 31 and the solenoid valve module 2 runs through the water tank 9 through a connection assembly 6 to communicate the interior of the water tank 9 to the exterior. The connection assembly 6 includes coupling sleeves 61 and 62 located respectively on the inner side and outer side of the bottom of the water tank 9, and coupled by a water check member 63 there between. The coupling sleeves 61 and 62 connect respectively to the tube 34 on two ends to channel water output from the solenoid valve module 2 to the hydraulic cylinder 31.

[0014] Refer to FIGS. 1 through 7 for the invention in operating conditions. The detection module 1 located

above the water tank 9 detects the presence of a user in use; after a selected time period (such as five seconds), referring to FIG. 2, the water tank 9 is filled with water and the solenoid valve module 2 and the flush module 3 are in standby conditions; when the user leaves the sensible area of the detection module 1, the detection module 1 immediately emits a control signal for flushing and activating the solenoid valve switch 21 to the solenoid valve module 2 as shown in FIG. 3; the solenoid valve module 2 has a signal receiver 22 to receive the control signal and activates the solenoid valve switch 21 to draw water intake from the water supply head 8 and channel the water into the hydraulic cylinder 31 through the tube 34 as indicated by the arrows in the drawings; the flowing water generates a hydraulic pressure to the tail end of the hydraulic arm 35 to compress a spring 36 on the upper side and push the rocker arm 32; the rope 33 fastened to the distal end of the rocker arm 32 pulls the water discharge valve 4 open to allow water in the water tank 9 to flush in a large quantity into the toilet as shown in FIGS. 4 and 6, Flushing will continue for a selected time period, then the solenoid valve switch 21 will close to stop water from flowing into the hydraulic cylinder 31 through the tube 34. Without the hydraulic pressure, the spring 36 in the hydraulic cylinder 31 releases the elastic force to push the hydraulic arm 35 downwards, meanwhile the rocker arm 32 also swings downwards to release the tension of the rope 33 on the water discharge valve 4 as shown in FIG. 6 so that the water discharge valve 4 is closed to stop water from flowing into the toilet. The float ball 71 drops due to lowering of the water level and causes the water intake device 7 to open a water intake valve to allow water to flow into the water tank for flushing use of the next cycle, as shown in FIG. 5. The movement of the spring 36 to release the elastic force to push the hydraulic arm 35 downwards can accurately move the rocker arm 32 lifting or descending at the desired time rather than purely rely on the absence of floating force caused by the water discharge valve 4.

[0015] In the construction set forth above, if the water discharge valve 4 is made from a soft material floatable up and down, water discharge and stop control depends on the floating position of the water discharge valve 4, namely when the weight of the water discharge valve 4 is greater than the floating force, it drops to cover the water outlet. On the contrary, it remains open to discharge water. Such conventional design can provide only one type of flush with a selected amount of discharge water. The invention takes into account of different flush requirements for urine and stool. The water discharge valve may be made from a solid or hard material that does not create floating force or move. After the water discharge valve is pulled upwards and the water has been discharged, the rocker arm 32 is pulled downwards and the rope 33 stops pulling the water discharge valve 4, the water discharge valve 4 automatically returns to its original position to stop water flushing. There-

by, referring to FIG. 7, the release elastic force of the spring 36 can push the hydraulic arm 35 downwards to force the rocker arm 32 to return to its original position and produce a smaller amount of discharging water to flush urine. By contrast, to meet the requirement of discharging a greater amount of water to flush stool, the detection time period of the sensor may be set by the circuit in the detection device so that the opening time of the solenoid valve may be set for a desired time period and the hydraulic force may be maintained continuously on the bottom of the hydraulic arm to keep the rocker arm at the lifted condition. Thus the water discharge valve may be prevented from dropping due to its own weight and a greater amount of water may be discharged.

[0016] In summary, the invention can transfer the original flushing water to kinetic energy to drive water discharge operation. And only a small amount of DC electric power is required to activate the mechanism. The related electric detection equipment are installed outside the water tank, thus can reduce malfunction that might otherwise occur.

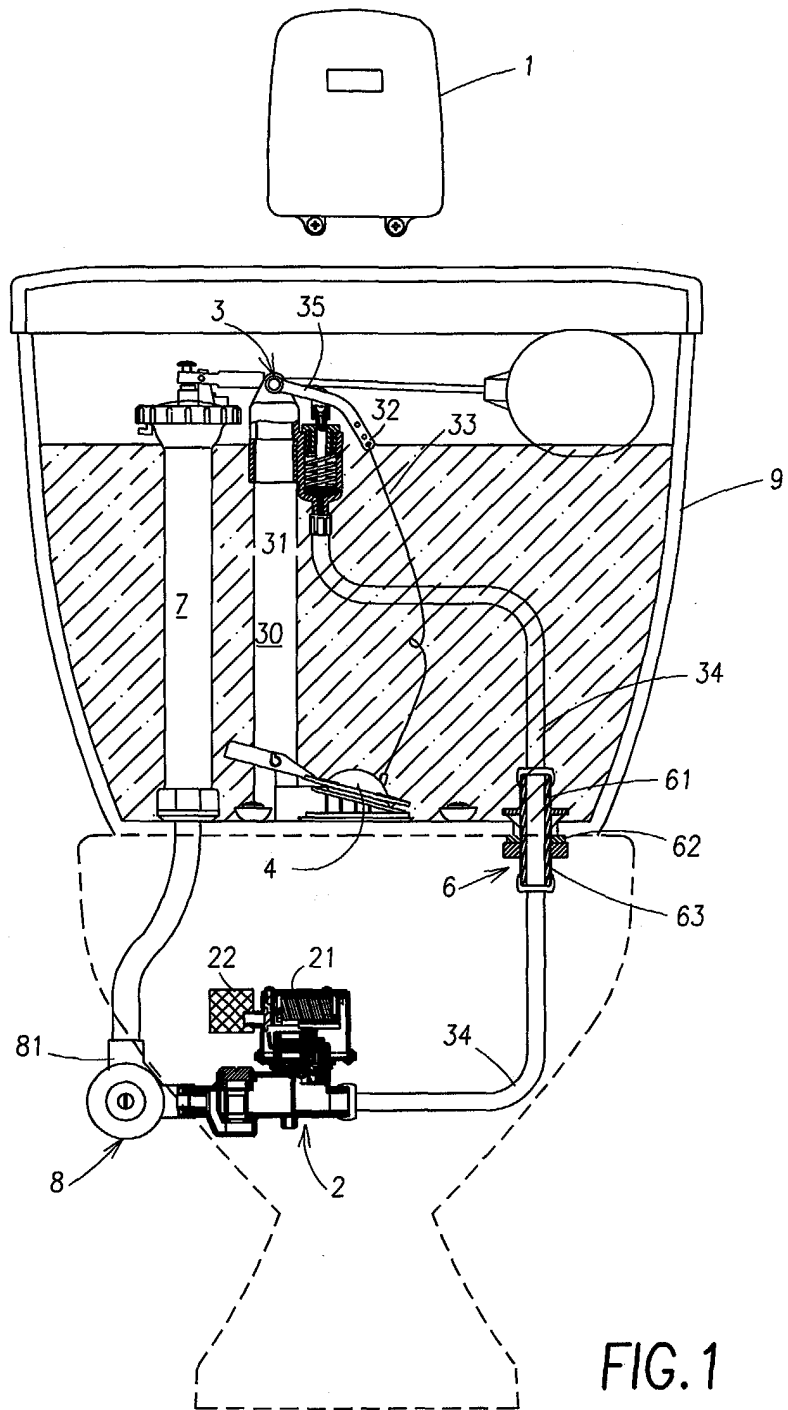
[0017] While the preferred embodiment of the invention has been set forth for the purpose of disclosure, modifications of the disclosed embodiment of the invention as well as other embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are intended to cover all embodiments which do not depart from the spirit and scope of the invention.

Claims

1. A toilet tank automatic flush apparatus comprising a detection module to detect user's use conditions and emit a control signal, a solenoid valve module to receive the control signal to activate hydraulic operation, and a flush module hydraulically controlled by the detection module to execute flushing; wherein:

the detection module is installed outside a toilet water tank on a location sensible to users;
the solenoid valve module is located outside the water tank including a solenoid valve switch which has an input end connecting to a water supply head and a signal receiver; and
the flush module is located in the water tank including an upright post and a hydraulic cylinder mounting on one side the post for housing a hydraulic arm, the hydraulic arm having a top end running through a spring to pivotally couple with a rocker arm, the rocker arm having a distal end fastened to a rope which connects to a water discharge valve of the water tank, the hydraulic cylinder having a bottom end connecting to an output end of the solenoid valve switch.

2. The toilet tank automatic flush apparatus of claim 1, wherein the water supply head connected to the input end of the solenoid valve switch is also the water supply head of the water tank.
3. The toilet tank automatic flush apparatus of claim 2, wherein the water supply head connected to the input end of the solenoid valve switch is coupled to a three-way duct to connect to the solenoid valve switch and the water tank to channel water simultaneously.
4. The toilet tank automatic flush apparatus of claim 1, wherein the water supply head connected to the input end of the solenoid valve switch differs from the water supply head of the water tank.
5. The toilet tank automatic flush apparatus of claim 1, wherein the water discharge valve is a buoyant member floatable upwards and downwards.
6. The toilet tank automatic flush apparatus of claim 1, wherein the water discharge valve is not floatable upwards and downwards.



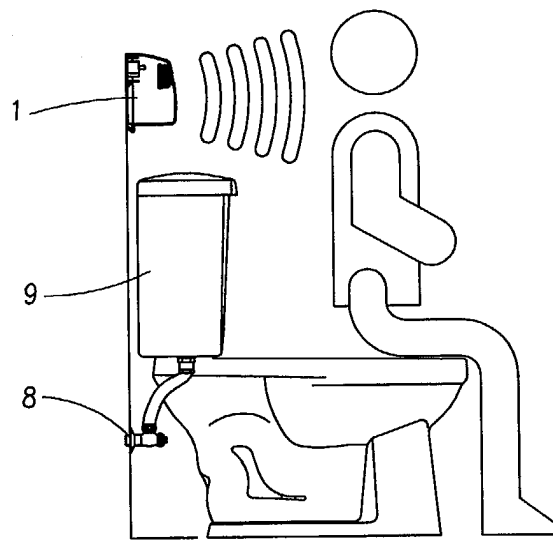


FIG. 2

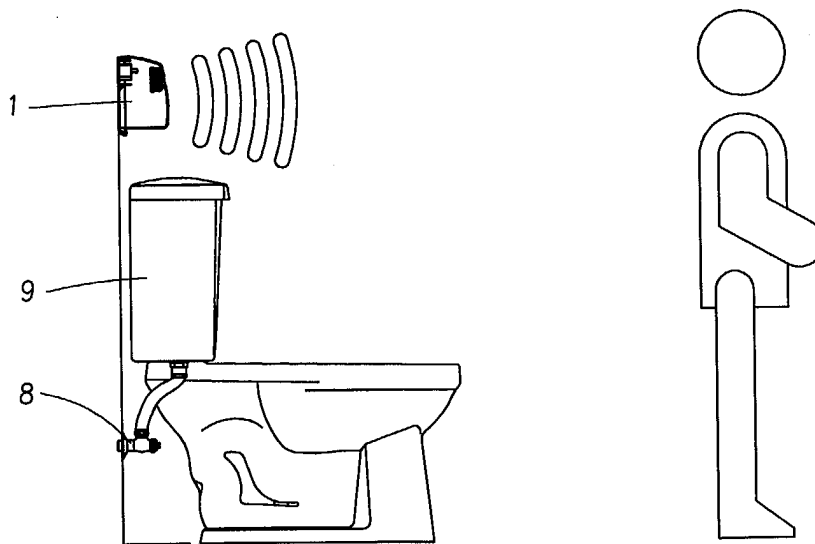
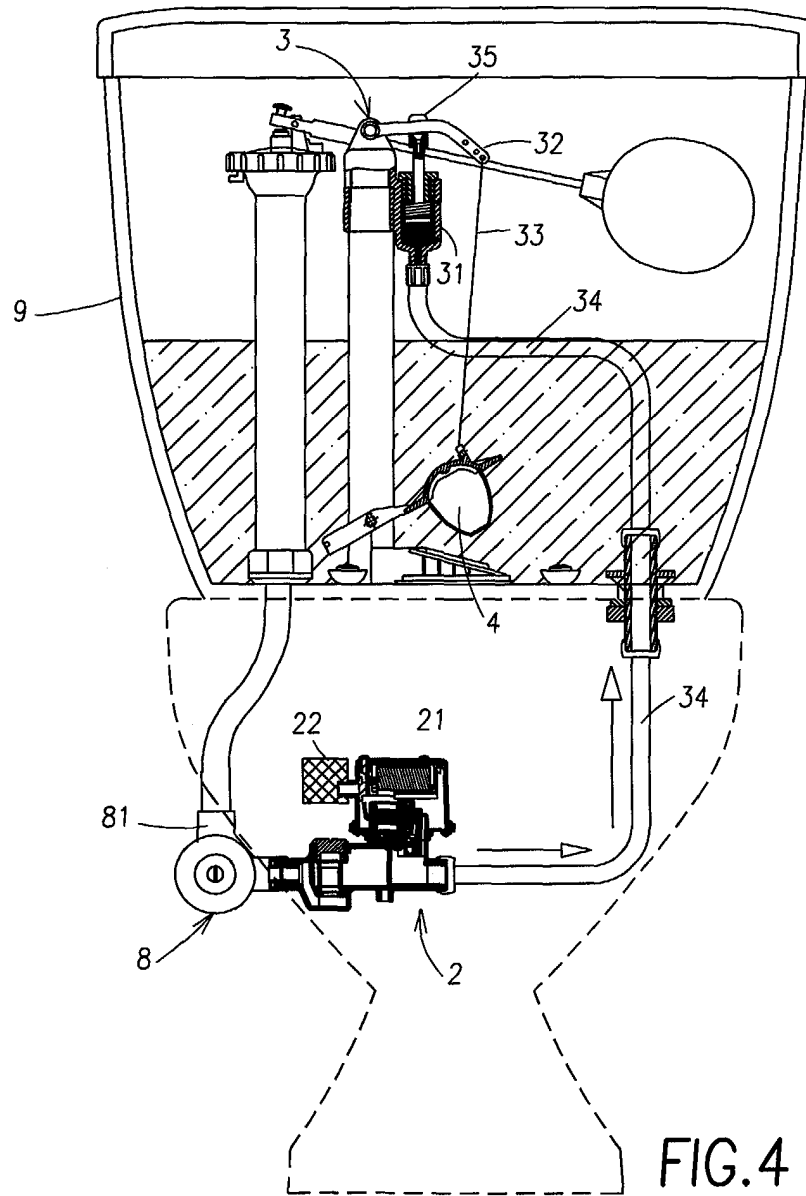
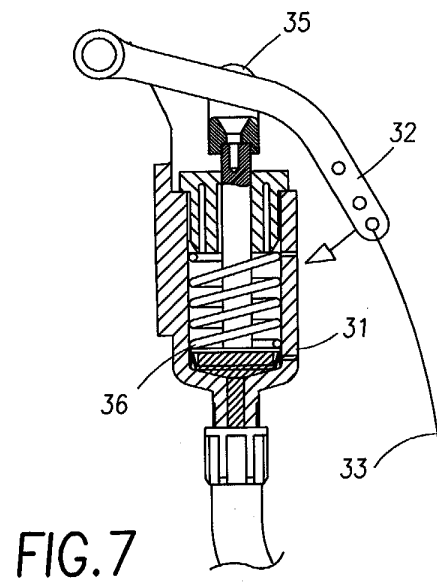
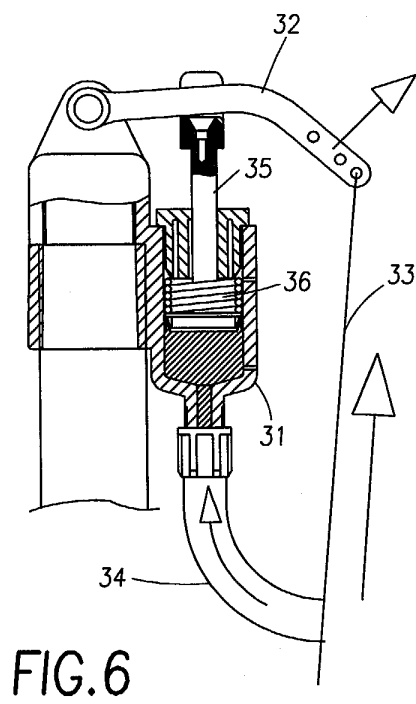
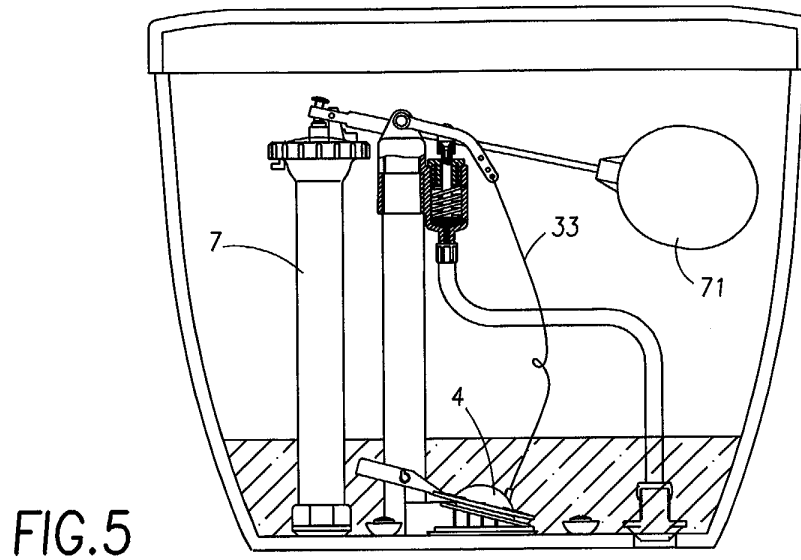


FIG. 3







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EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3667

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 November 2004	Examiner Geisenhofer, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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