

Water flushing mechanism for toilet water tank

The invention involves a water flushing mechanism for toilet water tank (WC) fitted for the evacuation, out of the pre-filled water tank, into a toilet bowl, of two different volumes of water by action on at least one control button, the said mechanism being surrounded by an envelop and comprising of one overflow tube equipped, at its lower end, with an air-tight valve co-operating with a evacuation hole designed at the bottom of the basin, the said overflow tube being fitted to occupy at least three axial positions, that is a low closing position of the evacuation hole, a middle position called small flush allowing the evacuation of a first volume of water and a upper position called big flush allowing the evacuation of a second volume of water bigger than the said first volume of water; control means ensuring the axial traveling of the overflow tube from its low position up to the middle position or the high position, the mechanism consisting in addition a first float called small flush float mounted on a height adjusting screw and a second float called big flush float mounted pivoting around an fixed axis in relation to the envelop.

In order to save water, which is costly and precious, we have developed, for WC water tank, water flushing mechanism allowing the evacuation, at the choice of the user, of two different volumes of water.

These "double flushing" mechanisms, like some of the usual mechanisms with a single water flushing, comprise in general a mobile overflow tube in vertical translation to the interior of an envelop, the lower end of the overflow tube forming an airtight valve between the water tank and the toilet bowl. The traveling of the overflow tube is controlled by at least one control button acting on one transmission. Two floats, one called big flush float and the other called small flush float, determine the respective volume of water evacuated when the level of water in the water tank reaches the respective float, which liberates the overflow tube, which descends again to close the communication between the water tank and the bowl. The adjustment of the volume evacuate water in small flush can be obtained by adjustment of the position in height of the small flush float in relation to the water level in the water tank.

Numerous propositions were made for such mechanisms, with various solutions essentially for the transmission between the control button or buttons and the overflow tube and the mode of co-operation between the floats and the overflow tube. We can quote, among other documents, WO-97/17503, FR-A-2 770 421. Known documents in the state of the technique does not provide total satisfaction in the area of security and durability of the function, access for maintenance or repair, ease of mounting and/or the securing of a water tank.

In addition, the costs of these known mechanisms are relatively high because they involve the assembling of a relatively big number of constitutive parts.

We know, through EP-A-0 915 210 (US-A-6 094 753), a water flushing mechanism corresponding to the state of the technique described herein above. This known

mechanism presents the inconvenience of using a transmission with lever, lodged inside the overflow tube, therefore hardly accessible and cumbersome. Furthermore, the big flush float is held in place by a mechanical lock that is suppressed by direct action of the small flush float, which constitutes a cause of wear and tear and a risk of poor function. Furthermore, the whole mechanism is badly congested, particularly in the top section.

Consequently, the present invention aims to provide a new double flush mechanism for toilet water tank that does not have the inconvenience of the mechanisms herein above.

In this way, the mechanism according to the invention is characterized in that the adjusting screw is articulated, near its lower end, on one tip of a lever, the other tip of which is articulated around a fixed axis in relation to the envelop, the said lever is equipped with a co-operating pin, in the course of the traveling of the said overflow tube from its low position to its middle position, with a first cam carried by the external surface of the said overflow tube and the second float called the big flush float is equipped with an co-operating pin, in the course of the traveling of the said overflow tube between its middle position and its high position, with the second cam carried by the said overflow tube and further from the airtight valve than the first cam.

The mechanism according to the invention offers the advantage of a sure function, even with a minimal level of water in the water tank. Its constitution makes it possible to reduce the bulkiness in height of the mechanism and its overall cost.

Preferably, the overflow tube has a lateral shoulder, with which a lever co-operates pivoting around an orthogonal axis in relation to the traveling direction of the overflow tube, the said lever being controlled in rotation by a cable under casing, a tip of which is fixed to the said lever and the other tip to a slide controlled based on two different courses by a control button with two positions.

The transmission by cable under casing between the control button and the pivoting lever allows a simple, economical, reliable and compact structure which authorizes, moreover, the mounting of the flushing mechanism free from or without fixing to cover of the water tank.

Other characteristics and advantages of the present invention will be shown in the following description of a sample, with reference to the annexed drawings, among which:

- Figure 1 is a schematic view in perspective of the water flushing mechanism mounted in a flushing water tank, the cover being fixed to the water tank through the said flushing mechanism, the cover and the water tank being partially cut off for a better understanding,
- Figure 2 is similar to figure 1, the cover not being fixed to the water tank but simply placed on top,
- Figure 3 is a schematic view in elevation of the flushing mechanism, the water tank being full, the envelop of the mechanism being supposed transparent,

- Figure 4 is similar to figure 3, the water tank being empty, some parts being represented in section,
- Figure 5 is similar to figures 3 and 4, the mechanism being in small flush position,
- Figure 6 is similar to figure 5, the mechanism being in big flush position,
- Figure 7 is a schematic view in perspective of the mechanism and of a part of the control means, the cover being open,
- Figures 8, 9 and 10 represent, in perspective, the double button control of the mechanism respectively in resting position, with the small flush button pressed down and with the big flush button pressed down,
- Figures 11 to 16 represent respectively the various phases of locking of the cover to the water tank through the function of the mechanism and,
- Figure 17 illustrates a disassembling phase of the whole set as mentioned above.

The mechanism according to the invention consists of an overflow tube 1 mounted in translation in an envelop 2. The overflow tube 1 carries, at its lower end, a head 3 equipped with a flat peripheral airtight joint 4, which form an airtight valve co-operating with a base cap 5, joint to the envelop 2 by columns 6.

This whole unit is mounted to the inside of a water tank 10 supplied with water by refilling means (not represented) including a refill limiting device such as a float controlling a valve. The base cap 5 is lodged in a lower hole of the water tank 10 so that, when the airtight valve 3, 4 is separated from the base cap 5 forming valve seating, the water contained in the water tank 10 can flow in a toilet (WC) bowl (not represented).

The cover of the water tank 10 (figure 1) can be joint to the water tank through the water flushing mechanism and a control button rest 12 rosette (13) fixed to the said cover. In the example according to figure 2, the box 15 is simply fixed to the inside of the water tank 10 under the control button rest rosette.

The button 12, the structure and the function of which will be explained in more details with reference to figures 8 to 10, consists of an external button rest rosette 13 lodged in an opening of the cover and screwed, by a wired ledge 14 (figures 8 to 10) on a box 15. A casing 16 is in abutment, at one end, on the box 15 and, at the other end, on the envelop 2. A control cable 17 (see figure 7) is lodged in the casing 16.

In the case of a locking of the cover 11 of the water tank (figure 1), a brace A is fixed between the box 15 and the cover 11 and its arms have catches B which co-operate each with a flexible fastener C joint to the envelop 2, so that the putting in place of the cover 11 can be done by simple pressing of the arms in the said flexible fasteners C. This locking will be explained more in details with reference to figures 11 to 17.

The overflow tube 1 has an external shoulder 20 with which co-operates a nose 21 of a lever 22 pivoting around an axis 23 orthogonal to the translation direction of the overflow

tube 1, an end of the control cable 17 being fixed to the lever 22 so that a traction on the control cable 17 produces a rising of the overflow tube 1.

A small flush float 30 is mounted on a fine height adjusting micrometric screw 31 which adjusts the delivered quantity of water. This screw has a upper screwing head 32 and its lower end is equipped with an articulation ball joint 33 of a lever 34, of which the end opposite the ball joint 33 is articulated around an fixed axis 35 in relation to the envelop 2. The lever 34 carries a pin 36 which co-operates with a first cam 37 carried by the overflow tube 1. The adjustment screw 31 can best be in a sufficiently supple material to allow for an initial putting in place of the small flush float 30, equipped with a catch 30' (figure 4), by pressing forcefully on the adjustment screw 31, the fine adjustment of the position in height of the small flush float 30 being done classically through action on the screw head 32.

A big flush float 40, pivoting around a fixed axis 41 in relation to the envelop 2, is mounted on a side sensibly diametrically opposite the small flush float in relation to the overflow tube 1. The big flush float 40 is equipped with a pin 42 which co-operates with a second cam 43 carried by the overflow tube 1.

The function of the mechanism which has just been described is as follows:

When the water tank 10 is full (figure 3) or when it is empty (figure 4), the valve 3, 4 is resting on the seating of the base cap 5, so that the communication between the water tank 10 and the basin is closed.

A traction in small flush on the control cable 17 brings the overflow tube 1 to the emptying position in small flush (figure 5) in which the small flush float 30 is raised, of a determined height, and the valve 3, 4 is separated of a certain height from the seating of the base cap 5 and frees the passage between the water tank 10 and the bowl. The pin 36 of the lever 34 slit along the first cam 37 and came to be lodged under a shoulder formed by this cam 37. The small flush float 30 thus locks the overflow tube 1 and only releases when the water level in the water tank descended of a height such that the small flush float 30 is not supported by the water and re-descends, while causing the lever 34 to pivot. The pin 36 escapes then from the shoulder of the cam 37 and the overflow tube 1 drops abruptly interrupting the emptying function.

A traction on the control cable 17 by a bigger quantity brings the overflow tube 1 to a higher emptying position in big flush (figure 6). The pin 42 of the big flush float 40 came to be lodged under a shoulder of the second cam 43, so that the big flush float 40 locks the overflow tube 1. As in the previous situation, the overflow tube 1 only releases when the water level in the water tank 10 frees the big flush float 40 which, by pivoting, separates the pin 42 from the cam 43. The overflow tube 1 then falls abruptly into closing position, the quantity of water emptied corresponding to the big flush.

The control of traction of the cable 17 according to two different courses can be done by various means.

According to a preferred form of realization of the invention represented in figures 8 to 10, the button 12 has two sliding push rods 50 and 51 retrieved towards the outside of the body 13 by springs 52 and 53 respectively. The push rods 50 and 51 carry each an axial extension 54, 55 sliding in the wired ledge 14, on both sides of a slide 56 linked to the near end of the cable 17. In resting position (figure 8), the extensions 54, 55 are resting respectively on a lateral support 57, 58 of the slide 56. By pressing down the small flush push rod 50 (figure 9), the slide 56 descends under the action of the ledge 54 on the support 57, by a predetermined course while, during the pressing down of the big flush push rod 51 (figure 10), the slide 56 descends by a higher course under the action of the ledge 55 on the support 58. The slide 56 is furthermore equipped with two lateral ledges 59 co-operating respectively with a shoulder 59' of the axial extensions 54, 55 to hold the non activated push rod 50, 51.

In the realization example represented, the envelope 2 of the mechanism is realized in a single piece in polypropylene in two semi-shells articulated around a hinge 60 (figure 7) parallel to the axis of the overflow tube 1. The open envelop 2 makes it possible to assemble easily all the components inside. Its closing ensures the positioning of all the elements.

In addition, a trap with groove 61 is mounted by sliding on a lateral opening 61' arranged in the portion of the envelop 2 forming the water retention basin so as to allow an adjustment of the residual water level from 15 to 65 mm at the bottom of the envelop 2, defining the delay of the closing of the valve 3, 4. Furthermore, and as represented on figures 5 and 7, a release 62 arranged in the lower part of the overflow tube forms a passage of water flow in small flush position between the overflow tube 1 and the envelop 2 which ensures a neutralization of the temporization when the small flush float 30 is adjusted in the bottom of the envelop 2. The height of the retention basin is determined by the inlets 63 arranged in the envelope 2, the lowest inlet deciding the height of the temporization.

The mechanism which has just been described offers in addition the advantage of allowing a very low adjustment of the small flush, functioning with a minimal level of water in the water tank (100 mm for example). This result is obtained through the independence of floats 30 and 40, the small flush float 30 being able to descend while crossing the big flush float 40.

In the example represented, the base cap 5 is without protruding seating and presents an inner form in tulip 5 against which comes resting the spoke of 1 mm located on the external diameter of the flat joint (4) of the valve head (3). The water flow and the flush rate are thus improved. Besides, the opening effort of valve 3 is sensibly reduced thanks to the diminution of the section of the water column which is applied onto the flat joint 4.

We will also notice, that the device which has just been described has a marking 65 guaranteeing a minimum evacuation level of 3 liters imposed by norm. This marking is arranged at the upper section of the small flush float 30.

We now refer to figures 11 to 17 which illustrate the locking of the cover 11 to the water tank through the double flush mechanism, as represented in figure 1. The wanted and requested by ceramists is to avoid all complicated adjustment of the mechanism while fixing the cover 11 onto the water tank 10.

In a first phase (figure 11), the cover 11 is resting on the elastic legs 70 that presents the upper part of the brace A, ready to push this brace A towards the bottom. The lowest catches B of the brace A are hooked to the grooved wings 71 of the flexible fastener C joint to the envelop 2. The box 15 is immobilized temporarily by the catches 72 of the head of the brace A.

Then (see figure 12), the cover 11 is pushed by hand to come to rest on the top of the water tank 10. The brace A descends and the grooved wings 71 come to be positioned respectively on two catches B. The box 15 is immobilized temporarily in the brace A by the catches 72.

Then (see figure 13), the button rest (12) rosette (13) is screwed by its wired ledge 14 in a nut 73 confined in the head of the brace A. The wired ledge 14 is terminated by a conical end 74 which is engaged in a corresponding hollow conical part 75 of the box 15, which is always immobilized in the brace A by the catches 72.

We then continue to screw the rosette 13 in the nut 73 (figure 14), the rosette 13 being still not in contact with the cover 11. At the linking between the conical part 74 and the wiring of the wired ledge 14 of the rosette 13, a neck 76 is arranged in which a circular ledge 77 of the hollow conical part 75 of the box 15 comes to be engaged, so that the rosette 13 becomes joint to the box 15 which is always immobilized temporarily in the brace A by the catches 72.

Then, while continuing to screw the rosette 13 in the nut 73 (figure 15), the rosette 13 pulls along the box 15, which disengages itself from the brace A through exit of the catches 72. The rosette 13 then comes into contact with the cover 11.

The screwing of the rosette 13 in the nut 73 continues (see figure 16), so that the brace A moves closer to the cover 11 while running over the elastic legs 70. The catches B of the brace A hanging positively to the grooved wings 71 and the cover 11 is thus finally fixed.

For the dismantling of the brace A (figure 17), after unscrewing and exit of the rosette 13 and dismounting of the cover 11, we separate the grooved wings 71, of which the end stoppers 78 hooks onto the envelop 2 of the water flushing mechanism. The brace A is thus released and can be re-mounted or retrieved.

The locking of the cover 11 onto the water tank 10, through the water flushing mechanism, is therefore extremely simple and quick and does not need any particular adjustment nor special adjustment.

Claims

1. Water flushing mechanism for toilet water tank (10) fitted to allow for the evacuation, out of the pre-filled water tank (10), of two different volumes of water by action on at least one control button (12), the said mechanism comprising of one overflow tube (1) equipped, at its lower end, with an air-tight valve (3, 4) co-operating with a evacuation hole (5') designed at the bottom of the water tank (10), the said overflow tube (1) being arranged to occupy at least three axial positions, that is a low closing position of the evacuation hole (5'), a middle position called small flush allowing the evacuation of a first volume of water and a upper position called big flush allowing the evacuation of a second volume of water bigger than the said first volume of water, control means (12, 16, 17, 21, 22) ensuring the axial traveling of the overflow tube (1) from its low position up to the middle position or the high position, the mechanism consisting in addition a first float (30) called small flush float mounted on a height adjusting screw (31) and a second float (40) called big flush float mounted to pivot around an fixed axis (41) in relation to the envelop (2), a first locking cam (37) carried by the external surface of the said overflow tube (1) which also carries a second locking cam (43),
characterized in that an envelop (2) surrounds the whole mechanism,
the adjusting screw (31) is articulated (33), near its lower end, on a tip of a lever (34), the other end of which is articulated around a fixed axis (35) in relation to the envelop (2),
the said lever (34) is equipped with a pin (36) co-operating, in the course of the traveling of the said overflow tube (1) from its low position to its middle position with the first locking cam (37), and
the second float (40) called big flush float is equipped with a pin (42) co-operating, in the course of the traveling of the said overflow tube (1) between its middle position and its high position, with the second locking cam (43).
2. Water flushing mechanism according to claim 1, characterized in that the overflow tube (1) has a lateral shoulder (20), with which a lever (21, 22) co-operates, pivoting around an axis (23) orthogonal to the traveling direction of the overflow tube (1), the said lever (21, 22) being controlled in rotation by a cable (17) overflow tube (1) under casing (16), a tip of which is fixed to the said lever (21, 22) and the other tip to a slide (56) controlled in two different courses by a control button (12) with two positions.
3. Water flushing mechanism according to claim 2, characterized in that the said control button (12) comprises of two sliding push rods (50, 51) retrieved towards the outside by springs (52, 53), the push rods (50, 51) comprising of axial extensions (54, 55) disposed on both sides of the said slide (56) and co-operating by resting respectively on a lateral rest (57, 58) of the slide (56).

4. Water flushing mechanism according to claims 1 to 3, characterized in that the envelop (2) of the mechanism is of a single piece in two sections articulated around a hinge (60) parallel to the axis of the overflow tube (1).
5. Water flushing mechanism according to claims 1 to 4, characterized in that a base cap (5) mounted at the bottom of the water tank (10) is without protruded seating and presents an internal form in tulip (5') against which comes resting the spoke located on the external diameter of a flat joint (4) constituting with a head (3) the airtight valve.
6. Water flushing mechanism according to claims 1 to 5, characterized in that the envelop (2) comprises of inlets (63) delimiting a water retention basin at the bottom of the envelop (2).
7. Water flushing mechanism according to claims 6, characterized in that a trap with groove (61) is mounted by sliding on a lateral opening (61') designed in the section of the envelop (2) forming the retention basin to allow for the adjustment of the water residual level in the said retention basin.
8. Water flushing mechanism according to claims 1 to 7, characterized in that the overflow tube (1) has, at its lower part, a release (62) forming a water flow passage in small flush position between the overflow tube (1) and the envelop (2).
9. Water flushing mechanism according to claims 1 to 8, characterized in that the adjusting screw (31) is constituted with a soft material allowing the forced sinking of the small flush float (30) comprising a catch (30') co-operating with the said adjusting screw (31).
10. Water flushing mechanism according to claims 1 to 9, characterized in that a brace (A) is fixed between the box (15) and the cover (11) of the water tank (10) and comprises of two arms equipped with catches (B) co-operating each with a flexible fastener (C) joint to the envelop (2) of the mechanism.
11. Water flushing mechanism according to claims 10, characterized in that the brace (A) is equipped with elastic push legs (70) of the cover (11) and immobilization catches (72) of a box (15) joint to be fixed at the tip of a wired ledge (14) of a button rest (12) rosette (13), the said wired ledge (14) co-operating with a screw (73) lodged in the brace (A), the said box (15) having a circular ledge (77) co-operating with a neck (76) of the wired ledge (14), the said wired ledge (14) having a conical tip (74) co-operating with a corresponding hollow conical part (75) of the box (15).
12. Water flushing mechanism according to claims 1 to 9, characterized in that it consists of a marking (65) designed at the higher section of the small flush float (30) and guaranteeing a predetermined minimum volume of evacuation.