(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 252 240 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
06.12.2017 Bulletin 2017/49

(21) Application number: **15827366.4**

(22) Date of filing: **27.07.2015**

(51) Int Cl.:
E03D 3/10 *(2006.01)* ***E03D 1/34*** *(2006.01)*

(86) International application number:
PCT/CN2015/000536

(87) International publication number:
WO 2016/015452 (04.02.2016 Gazette 2016/05)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **27.07.2014 CN 201410374249**
27.07.2014 CN 201410374250
29.07.2014 CN 201410378396
15.09.2014 CN 201410472104
29.09.2014 CN 201410510590
09.02.2015 CN 201510071012

(71) Applicant: **Wang, Yongqiang**
Tangshan, Hebei 063705 (CN)

(72) Inventor: **Wang, Yongqiang**
Tangshan, Hebei 063705 (CN)

(74) Representative: **Cabinet Chaillot**
16/20, avenue de l'Agent Sarre
B.P. 74
92703 Colombes Cedex (FR)

(54) **TOILET WATER TANK AND TUBE PRESSURE VALVE**

(57) A toilet water tank includes a sealed pressure cylinder barrel (54), a piston (55), a piston rod (56) that penetrates through one end of the cylinder barrel (54), a first water inlet pipe (52), a second water inlet pipe (50), and a water outlet pipe (40), where the first water inlet pipe (52) and the second water inlet pipe (50) are located at two sides of the cylinder barrel piston and are both in communication with a pressurized water inlet main channel (53); the first water inlet pipe (52) is also a cylinder barrel water outlet pipe, and water inlet and outlet functions are alternatively applied; and a pressure valve is provided on each of the second water inlet pipe (50) and the water outlet pipe (40). Further provided is a toilet pipe pressure valve. The toilet water tank in this application has a simple structure.

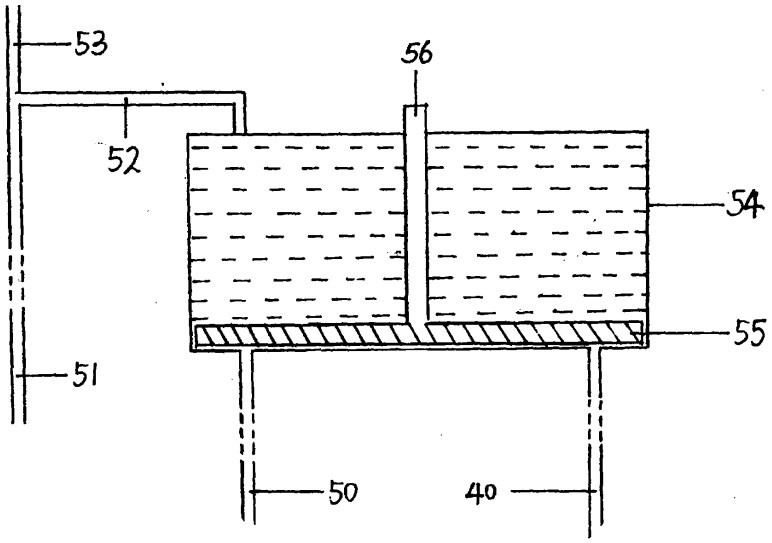

FIG. 1

EP 3 252 240 A1

Description

BACKGROUND

Technical Field

[0001] The present application relates to the field of application technologies of a water saving toilet.

Related Arts

[0002] The present application relates to the field of application technologies of a water saving toilet, which has a structure that is almost totally different from that of a conventional toilet, and mainly relates to the China patent application with publication No. CN102864830A published on January 9, 2013 and the China patent application with publication No. CN102720256A published on October 10, 2012. The present application is an improvement of a toilet that is applied for and published before.

[0003] In a washroom with an existing toilet, generally, a wastepaper basket of a plastic material is disposed, and a plastic bag is generally sleeved on the wastepaper basket. Use of a plastic bag definitely pollutes the environment; in addition, a plastic wastepaper basket is sure to be dirty after a period of time. Because generally the wastepaper basket is not fixed, is very light, and is used in a special environment, it is very inconvenient to clean the dirty wastepaper basket. In addition, the wastepaper basket is made of a plastic material; therefore, the service life of the wastepaper basket is relatively short, and the service life of a wastepaper basket in a washroom in a public place is even shorter. Consequently, a wastepaper basket of a plastic material that has a relatively short service life is adverse to keeping a good hygienic condition in a washroom, and use costs of the wastepaper basket in the washroom are relatively high.

[0004] Generally, a hand basin is further disposed in an existing washroom.

[0005] The foregoing two toilet water tanks that are applied for may be smaller than a conventional water tank, but still need to take up some space. In addition, the water tank may be separated from a toilet body.

SUMMARY

[0006] For a toilet water tank in the present application, mainly, some constituent parts of the toilet water tank are omitted, and the toilet water tank has a very simple structure.

[0007] The toilet water tank mainly includes a sealed pressure cylinder barrel (54), a piston (55), a piston rod (56), cylinder barrel water inlet and outlet pipes, and valves on the pipes. A first water inlet pipe (52), a second water inlet pipe (50), and a water outlet pipe (40) are provided outside the sealed pressure cylinder barrel (54) formed by the cylinder barrel piston (55) and a cylinder barrel wall. The piston rod is connected to the piston, and penetrates through one end of the cylinder barrel. A valve (461) is provided on the second water inlet pipe; and a valve (46) is also provided on the water outlet pipe.

[0008] The two water inlet pipes of a toilet are connected to the sealed pressure cylinder barrel (54) of the toilet, and the two pipes are located at two sides of the cylinder barrel piston. The first water inlet pipe (52) is also a cylinder barrel water outlet pipe, and inlet water and outlet water functions of the first water inlet pipe are alternatively applied.

[0009] The first water inlet pipe is in communication with a pressurized water inlet main channel (53). The second water inlet pipe is in communication with the main channel (53) by using the first pressure control valve (461). The first and second water inlet pipes are in communication. Cavities at the two sides of the cylinder barrel piston of the toilet water tank and the first and second water inlet pipes are a communicating vessel when the valve (461) of the pipe (50) is opened.

[0010] At two sides of the piston in the cylinder barrel, because one side of the piston is connected to a pull rod (21) and the pull rod penetrates through the water tank, when the piston in the cylinder barrel is subject to water pressure, in the case of pressure, an area, subject to water pressure, of one side of the piston with the pull rod is less than an area, subject to water pressure, of one side of the piston without the pull rod by an area of circular cross-section of the piston rod that penetrates through the water tank. When the valve (461) of the second water inlet pipe of the water tank is opened, the two water inlet pipes have a same high-pressure water flow. If the piston of the water tank is not located on the bottom of the water tank with one side at which the piston is subject to relatively low pressure, that is, the piston rod does not completely penetrate through the water tank, the water flow pushes the piston to move, to make the pull rod completely penetrate through the water tank, and then the piston stops moving, and is located on the bottom of one side of the cylinder barrel. The pull rod of the water tank in the present application has a function of controlling movement of the piston of the water tank.

[0011] The water tank in the present application does not need a guy wire, the pull rod that extends out of the water tank is not subject to a spring, and in the water tank, there is no pipe for discharging a water flow to the outside of the water tank, so that an overall structure of the water tank is simple, and multiple parts and elements can be omitted when compared with most water tanks.

[0012] A flow valve is provided on the water inlet pipe (50) of the water tank and can control a flow rate in a unit time when water is added to the toilet water tank, to add different amounts of water to the water tank in different toilet time in a case of not exceeding a maximum amount of added water of the water tank.

[0013] In the pressure valve of the toilet that is subject to gravity control in the present application, a guy wire and a gravity external conduction pipe are omitted, the structure is simple, and control pressure required for con-

trolling the valve is much lower than pressure required for a valve in a solution in the prior arts.

[0014] When the pressure valve A and the pressure valve B of the toilet in the present application that are subject to gravity control are installed on the toilet, the pressure valve A and the pressure valve B are valves whose opening and closing states are always opposite.

[0015] Two pressure valves of a squat toilet that are subject to gravity control are installed below stepping locations at two sides of a toilet bowl. When people use the toilet, two feet directly or indirectly step on gravity conduction plates of the two valves, so as to control the pressure valves to be opened or closed by means of gravity. The valves respectively include a toilet gravity conduction plate (42, 421), a connecting rod (43, 431), a spring (44, 441), a water inlet and outlet pipe, a valve plug (45, 451), and a valve cavity (46, 461). The two valve plugs are separately located in the cavity. The center of an upper portion of the valve plug is connected to the connecting rod. The connecting rod penetrates through an upper wall of the valve cavity. The top of the connecting rod is connected to the conduction plate. The spring is provided between the conduction plate and the upper wall of the cavity and is sleeved on the connecting rod. The valve plug has an outside surface that has a same angle, shape, and structure as an inner wall of the cavity and that corresponds to an inner wall surface of the cavity. When the valve plug is subject to a force of the spring or gravity of a human body, the surface of the valve plug corresponded to the cavity can cover and seal the water inlet pipe or the water outlet pipe of the valve or cover and seal the water inlet and outlet pipes at the same time, and then valve is closed. When the valve plug is far away from the inner wall of the cavity, the valve is opened.

[0016] Connection pipe ports between all water inlet and outlet pipes or all water inlet pipes or all water outlet pipes of the pressure valve and the valve cavity may be covered and sealed at the same time by the valve plug of the valve, so that the valve is closed. On the contrary, connection pipe ports between all water inlet and outlet pipes or all water inlet pipes or all water outlet pipes of the pressure valve and the valve cavity may be not covered and sealed at the same time by the valve plug of the valve, so that the valve is opened. The connection pipe ports between all the water inlet and outlet pipes or all the water inlet pipes or all the water outlet pipes of the pressure valve and the valve cavity are located within a range that can be covered and sealed by the valve plug of the valve. There may be one water inlet pipe and one water outlet pipe of the valve. If there are more than one water inlet pipe or water outlet pipe, each group of water inlet or outlet pipes need to be uniformly distributed around the valve plug and the cavity, so that the valve plug is subject to uniform surrounding water inlet and outlet pressure in a process of moving up and down of the valve plug.

[0017] Two side surfaces of the valve plug and the inner wall of the valve cavity covered and sealed by the valve plug may have a structure of a side surface of a circular table. Each side surface of the valve plug and an angle of its axle are the same as a side surface of the inner wall of the valve cavity and an angle of an axle of the inner wall. Therefore, the valve plug and the inner wall of the valve cavity can be sealed tightly under the effect of pressure, and can be sealed more tightly when pressure is higher. The valve plug and the inner wall of the cavity may also have a cylindrical, ellipsoid, trigonal pyramidal, or polygonal body structure or another structure of an irregularly shaped body. Piston rings or O-shaped rubber rings may also be installed at two ends of the valve plug, and a structure that is a little bit thin in the middle matches the cavity. Control on the valve of the toilet by means of gravity of a human body can be implemented as long as the valve plug can be driven, when the connecting rod connected to the valve plug moves up and down, to move up and down to make the valve plug cover and seal water inlet and outlet pipes on the inner wall of the valve cavity and open the valve for circulation of the water inlet and outlet pipes.

[0018] Through holes (47, 471) are provided on upper and lower surfaces of the valve plugs of the two pressure valves that are subject to gravity control. When there is more than one through hole, all the through holes are uniformly distributed around an axle of the valve plug. When the valve plug moves up and down, especially, at a moment when the valve plug (451) of the valve (461) starts to move down, the through holes can make water flows above and below the valve plug to easily pass through, greatly reducing resistance of movement of the valve plug.

[0019] Beyond a range between the valve plug that covers and seals the water inlet and outlet pipes of the valve and the corresponding inner wall of the cavity, a gap, a groove, or a dent can be provided to omit the through holes on the valve plug. When the valve plug is covered by and attached tightly to the inner wall, water above and below the valve plug can flow through the gap or the groove.

[0020] A shaft sleeve (49, 491) is provided at the bottom of the valve cavity. A small shaft (48, 481) is provided at a lower portion of the valve plug. A lower end of the shaft is located in the shaft sleeve, and an axle of the shaft and an axle of the valve plug are a same straight line or parallel to each other.

[0021] The shaft and the connecting rod of the valve plug together can achieve a function of increasing up and down movements of the valve plug to achieve concentricity at final upper and lower locations. In addition, the existence of the shaft can reduce an area, subject to water pressure, of a lower bottom of the piston by an area that is the same as an area of a cross-section of the shaft. When there is a pressurized water flow in the valve, an area of the valve plug in the valve cavity in a direction of the shaft, that is, an area, subject to water pressure, of a lower bottom of the valve plug can be reduced, that is, the valve plug can reduce water pressure upwards. The

valve shaft can reduce a force applied by a valve pressure conduction plate and the connecting rod on the valve to achieve a function of control the valve plug to move down. Compared with a pressure valve without a shaft, an effect of controlling the pressure valve can also be achieved by means of lower pressure. If a kid with a relatively low weight uses the toilet, control on the pressure valve of the toilet can also be well implemented.

[0022] The two gravity control valves of the toilet are not controlled by using a guy wire and have a simple structure. In addition, because the toilet in the present application is very water saving, an inner diameter of each of the water inlet and outlet pipes of the valve and pipe ports on the valve can be easily controlled within 5 millimeters, a maximum diameter of the valve plug can be controlled within 12 millimeters, and a height in the valve cavity can be controlled within 20 millimeters; therefore, the two valves have a simple structure and is small.

[0023] A flush water pressure control valve C is further provided on the water outlet pip of the toilet water tank. The valve includes a valve cavity (39), a third valve plug (36), water inlet pipes (29, 30, 31), a second water outlet pipe (2), a connecting rod (34), a horizontal bar (32), a spring (35), and a support (33). Two symmetrical water inlet pipes (29, 30) are provided outside the valve, and the water inlet pipe (31) is provided at the top of the valve. Two symmetrical water outlet pipes (2) are further provided outside the valve. Pipe ports of two groups of water inlet and outlet pipes outside the valve on the valve cavity are in a same horizontal plane. When the valve is idle and static and closed, two groups of pipe ports are covered and sealed at the same time by a side surface of the valve plug. The center of an upper portion of the valve plug is connected to the connecting rod (34). The connecting rod penetrates through the top of the valve cavity, and the connecting rod further penetrates through the top of the support (33). The horizontal bar (32) is further fixed on the connecting rod (34). The spring (35) is provided between an upper portion of the horizontal bar and a lower portion of the support and is sleeved on the connecting rod. The water inlet pipe (31) penetrates through the horizontal bar (32). The valve plug (36) further includes a water inlet channel (37) that horizontally penetrates through an axle of the valve plug and a water outlet channel (72) that horizontally penetrates through the axle of the valve plug. The two channels (37, 72) on the valve plug are in communication in a same horizontal plane. When the valve plug is located at a highest location of the cavity, channel ports of the two inlet and outlet channels are respectively and correspondingly in communication with water inlet and outlet pipe ports outside the valve. For each group of symmetrical water inlet and outlet pipes outside the valve, one water inlet pipe and one water outlet pipe may be remained, that is, for the two water outlet pipes (2) and the water inlet pipes (29, 30) that are covered and sealed by the valve plug outside the valve, one water outlet channel in two pipes of each group and one water inlet channel in the two pipes of each group can be remained. But when water enters the valve cavity, the valve plug is subject to water pressure of a water inlet port covered by the valve plug, which is adverse to movement of the valve plug. A through hole (38) that penetrates through upper and lower surfaces of the valve plug is further provided on the valve plug. When there is more than one through hole, the through holes are uniformly distributed around an axle of the valve plug. The through hole cannot cross and be in communication with water inlet and outlet channels on the valve plug. The through hole can achieve a function of making water above and below the valve plug flow through. For the valve, the through hole can be omitted. A gap or a groove is provided on two surfaces on which the valve plug is in contact with an inner wall of the valve cavity in a sliding manner, so that water above and below the valve plug can flow through.

[0024] The water inlet pipe (31) of the valve exactly penetrates through the horizontal bar (32) vertically. A part of the pipe (31) in the support (33) and a hole that the pipe (31) penetrates through on the horizontal bar are of a shaft sleeve structure. When the valve plug of the valve, the connecting rod, and the horizontal bar of the valve move up and down together, the pipe (31) can ensure that the valve plug cannot rotate in the valve cavity relative to the cavity, and ensure that when the valve plug is at the highest location, the water inlet and outlet channels on the valve plug are aligned with water inlet and outlet pipe ports outside the valve.

[0025] For the water flush water pressure control valve C on the water outlet pipe of the toilet water tank, the water inlet and outlet channels (37, 72) on the valve plug can be omitted, as long as the valve plug can be lifted by an enough height under the effect of water pressure to make the valve plug not cover and seal the water inlet and outlet pipes (29, 2). If the water inlet and outlet channels on the valve plug are omitted, a structural setting that the horizontal bar (32) penetrates through the pipe (31) can be omitted. In addition, for the control valve, the water inlet pipe (29) and the water inlet pipe (30) may be omitted at the same time, and the valve plug of the valve is controlled to be capable of being lifted by an enough height. When the valve works and the valve plug is located at the highest location of the cavity, the water outlet pipe (2) outside the valve is not covered and sealed by the valve plug, and the water inlet pipe (31) and the water outlet pipe (2) are in communication and are not covered and sealed by the valve plug.

[0026] The valve A controls to add water to the water tank, the valve B controls the water tank to spray water to flush the toilet, and the valve C controls a part of a flush order of the toilet.

[0027] A part of water that flows out of the pipe (40) of the water tank and passes through the valve B first passes through the branch water outlet pipe (27) to quickly flush the toilet, and then, a part of the water passes through the valve C and passes through the water outlet pipe (2) of the valve after a set period of time, to flush

the toilet. The valve C is opened in a delayed manner, to implement control on a part of a flush order of the toilet.

[0028] When the toilet is a toilet bowl, the pull rod of the valve plug of the gravity control valve is connected to a base (57) that is on a toilet seat, that is of a ring shape, and that can move up and down. The base (57) is equivalent to two combined gravity conduction plates of a squat toilet, and a cavity outside the two gravity control valves is fixedly connected to a toilet body (58).

[0029] When the toilet is a urinal stall, two gravity conduction plates of the two gravity control valves are connected together, and people directly or indirectly stand on the conduction plates, and can easily control the toilet for use.

[0030] Compared with technical solutions published before, the water tank and the gravity control valve in the present application have very simple structure, and have better control effects, and are easy to be installed and maintained. When compared with a common pressure valve, the flush water pressure control valve C can greatly reduce a potential energy loss of a water flow that passes through, the valve can very well control the sealed piston in the toilet to move down and flush, so that after the toilet is rotated, the toilet bowl starts to be flushed, so as to avoid, to the greatest extend, a large spray and splashing of urinary and fecal discharges caused because the toilet bowl is flushed too early, and when the piston of the toilet reaches below a toilet pipe, and flush water in the toilet bowl falls to the piston of the toilet from a toilet port, a falling point is very close to or reaches the center of the rotating piston, so as to more improve flush water using effect.

[0031] The toilet in the present application makes the pipes (27, 28) be in communication with steam, and the valve B is closed, and then, the toilet is sealed, to ensure that the steam can be safely sealed and is not leaked; and then, the toilet, the toilet pipe, and all locations that the steam passes through can be cleaned.

[0032] The present application further provides a second type of water tank, which is a water tank that is separated from a toilet body, and has a structure in which a groove is formed in the middle. The water tank of a structure having a groove can be steadily placed at a location very close to the bottom or a location having a height equivalent to that of a hand basin. The groove of the water tank can be used to place waste paper or used as a hand basin.

[0033] In the present application, a water inlet pipe and a pipe valve are installed above the groove of the water tank, and a water outlet pipe and a valve are installed on a lower bottom of the water tank.

[0034] An inner wall, an outer wall, and upper and lower bottoms of the water tank in the present application are of a sandwich structure, and the middle of the sandwich structure is filled with a poor heat conduction material or is vacuum.

[0035] The water tank in the present application is a sealed container. The groove of the water tank is more durable than a common plastic wastepaper basket and is not easy to be broken. If the groove is fixed, it is convenient to use a mop for cleaning. In addition, when the groove is cleaned, because the water inlet pipe is provided above the groove and the water outlet pipe is provided below the groove, it is very convenient for cleaning. Therefore, replacing a wastepaper basket with the groove of the water tank is advantageous to keep an environment in a washroom hygienic, can reduce costs of the wastepaper basket, and saves space of the washroom.

[0036] If the groove of the water tank is used as a hand basin, space can also be saved.

[0037] For a place with a low temperature, the inner wall and the outer wall of the toilet water tank and the upper and lower bottoms of the water tank use a sandwich structure, and the middle of the sandwich structure is filled with a poor heat conduction material or is vacuum, which can effectively prevent the water tank from freezing.

[0038] In addition, in the present application, a water tank of a toilet bowl is made to have an annular shape and is installed at a neck location of a toilet body between a bowl of a toilet body (200) of a toilet bowl and a toilet pipe, that is, the overall water tank is an annular sealed water tank. A difference from an annular water tank having a groove is that a lower bottom other than a sealed lower bottom of the annular water tank is removed. Alternatively, to save space and for installation, a neck of the toilet body is made to be a separated annular water tank or the annular toilet water tank may be made to be a separated water tank (220) having two parts or more than two parts. A location of a piston rod of the water tank needs to make an extending range do not touch any part of the toilet body.

[0039] A pressure valve in the present application also has a second type of structure. In the structure, for a valve plug, a through hole is omitted, a valve A is changed to a structure of (462), a valve B is changed to a structure of (463), and connecting rods (43, 431) on the valve plugs of the valves A and B and a shaft of the valve plug are changed to relatively long pull rods 432 and 433 on the valve plugs that together penetrate through the valve plug and is fixed with the valve plug. The pull rod still penetrates through the valve. A lower portion of the pull rod is a hollow shaft pipe in the valve cavity. Water inlet and outlet holes 482 and 483 are provided at locations, on a shaft pipe wall of the pull rod, close to upper and lower surfaces of the valve plug. The water inlet hole cannot be provided outside the sealed cavity of the valve. Embossments 412 and 413 are provided on the upper surface of the valve plug. A lower end of the pull rod can be sleeved on stabilizing shafts 492 and 493 at the bottom of the valve cavity. A gap that can make water flow through is provided between an inner wall of the pull rod and the stabilizing shaft. The valve plug moves up and down, and water above and below the valve plug can flow through the water inlet and outlet holes 482 and 483.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040]

FIG. 1 is a simplified structural diagram of a toilet water tank;

FIG. 2 is a simplified structural diagram of an open-type pressure valve of a toilet that is subject to gravity control;

FIG. 3 is a simplified structural diagram of a close-type pressure valve and a water outlet control valve of a toilet that are subject to gravity control;

FIG. 4 is a simplified structural diagram of a second type of open-type and close-type pressure valves;

FIG. 5 is a simplified structural diagram of a second type of water tank;

FIG. 6 is simplified cross-sectional view of a second type of toilet water tank;

FIG. 7 is a simplified structural diagram when an annular water tank is installed at a neck location of a toilet body (a pull rod is not within a range of an upper location of a toilet pipe); and

FIG. 8 is simplified top view when an annular water tank is divided into two parts and installed at a neck location of a toilet body.

DETAILED DESCRIPTION

[0041] A working process of a toilet is described by using an operation process from a time point before people use the toilet to a time point that people leave the toilet:

[0042] When no one uses a toilet, a valve plug of a gravity valve A of the toilet is sealed with an inner wall of a valve cavity, and the valve is closed; and a valve plug of a valve B is separated from the inner wall of the valve cavity, and the valve is opened. A toilet water tank piston (55) is located at the bottom of a water tank, and the top of the piston rod penetrates through the water tank.

[0043] When people use the toilet, gravity of a human body is applied on a conduction plate of the gravity control valve, a spring of the valve is compressed, the valve A is opened, and the valve B is closed. After the valve A is opened, two sides of the water tank piston (55) are subject to same water pressure from a pipe (52) and a pipe (50) at the same time. A piston rod (56) is provided above the piston, a force that the piston is subject to below the piston is higher than a force that is applied above the piston by water pressure that a cross sectional area of the piston rod is subject to, and a difference between water pressure that is applied above and below the piston is greater than gravity of the piston and a frictional force between the piston rod and the water tank. Therefore, in a state in which the valve A is opened and the valve B is closed, the piston (55) moves towards the top of the water tank, water above the piston flows out of the pipe (52), and water enters the water tank that is located below the piston at the same time, and an amount of water added to the water tank is different with different toilet time of people.

[0044] After people leave, gravity of a human body applied on the conduction plate of the gravity control valve of the toilet disappears, the spring of the valve restores, the valve B is opened, and the valve A is closed.

[0045] After people leaves, water starts to flow into the toilet, and high-pressure water first enters a pipe of the toilet through a pipe (27) to start to flush the toilet. After a set period of time, the water flows out of the toilet water tank, and a water flow that enters a valve C through a pipe also flows out of a second water outlet pipe 2, to start to flush the toilet.

[0046] A second type of toilet water tank in the present application includes a water tank upper bottom (73), a water tank lower bottom (74), a water tank outer wall (72), two water inlet pipes (79, 70), and a water outlet pipe (75). The water tank further includes a water tank inner wall (71), an annular piston (76), and a piston rod (78). The water tank upper bottom, the lower bottom, the water tank outer wall, and the inner wall form an annular sealed water tank cavity. The annular piston is located in the cavity. Two cylindrical vertical surfaces of the annular piston respectively form structures of a piston and a cylinder barrel with an inner wall surface and an outer wall surface of the water tank cavity. A lower surface of the annular piston is connected to the piston rod. The piston rod penetrates through the water tank lower bottom. The water inlet pipe (79) is provided on a lower bottom of the water tank cavity and is in communication with the water tank cavity. The water outlet pipe (75) is further provided on an upper bottom of the water tank cavity. The water inlet pipe (70) is in communication with the water tank cavity. The water tank lower bottom and the water tank inner wall (71) form a groove (94) with an upward opening.

[0047] To improve stability of a process in which the annular piston moves up and down, more than one piston rod is installed and is installed symmetrically. A location of the piston rod needs to make an extending range do not touch any part of a toilet body.

[0048] The water tank in the present application further includes a water inlet pipe (92) and a water outlet pipe (77). The water inlet pipe is located above the groove outside the sealed water tank cavity, and a pipe port is aligned with the groove (94) of the water tank. A valve (93) is provided on the pipe. The water outlet pipe (77) is located on a lower bottom of a groove beyond a range of the lower bottom of the water tank cavity, and is in communication with the groove of the water tank. A valve is provided on the pipe (77).

[0049] The inner wall, the outer wall, and the upper and

lower bottoms of the water tank in the present application are of a sandwich structure, and the middle of the sandwich structure is filled with a poor heat conduction material or is vacuum.

[0050] For a place with a low temperature, the inner wall and the outer wall of the toilet water tank and the upper and lower bottoms of the water tank use a sandwich structure, and the middle of the sandwich structure is filled with a poor heat conduction material or is vacuum. In addition, a toilet and an exposed pipe of the water tank are kept warm, to effectively prevent the toilet and the water tank from freezing.

Claims

1. A toilet water tank, **characterized by** comprising a sealed pressure cylinder barrel 54, a piston 55, a piston rod 56, a first water inlet pipe 52, a second water inlet pipe 50, a water outlet pipe 40, a pressure valve A, and a pressure valve B, wherein the piston 55 and a cylinder barrel wall form the sealed pressure cylinder barrel 54; the first water inlet pipe 52, the second water inlet pipe 50, and the water outlet pipe 40 are provided outside the cylinder barrel; the piston rod is connected to the piston and penetrates through one end of the cylinder barrel; the two water inlet pipes are located at two sides of the cylinder barrel piston; the first water inlet pipe 52 is also a cylinder barrel water outlet pipe, and inlet water and outlet water functions of the first water inlet pipe are alternatively applied; the pressure valve A is provided on the second water inlet pipe; the pressure valve B is also provided on the water outlet pipe; the first water inlet pipe is in communication with a pressurized water inlet main channel 53; the second water inlet pipe is in communication with the main channel 53 by using the first pressure control valve A; and the first and second water inlet pipes are in communication.

2. A toilet pipe pressure valve A, B, **characterized by** respectively comprising a toilet gravity conduction plate 42, 421, a connecting rod 43, 431, a spring 44, 441, a water inlet or outlet pipe, a valve plug 45, 451, and a valve cavity 46, 461, wherein the valve plug is located in the cavity; an upper portion of the valve plug is connected to the connecting rod; the connecting rod penetrates through an upper wall of the valve cavity; the top of the connecting rod is connected to the conduction plate; the spring is provided between the conduction plate and the upper wall of the cavity and is sleeved on the connecting rod; an outside surface of the valve plug and an inner wall of the cavity have a same angle, shape, and structure; and an outside surface of the valve corresponds to an inner wall surface of the cavity.

3. The toilet pipe pressure valve according to claim 2, **characterized in that** the valve plug of the valve further comprises a through hole 47, 471 that penetrates through upper and lower surfaces of the valve plug; the through hole on the valve plug can be omitted; the valve plug of the valve on which a through hole is omitted further comprises a gap or a groove or a dent; and beyond a range of a water inlet or outlet pipe port on the inner wall of the cavity that corresponds to the outside surface of the valve plug of the valve, a gap or a groove or a dent can be provided.

4. A toilet pipe valve, **characterized by** comprising a valve cavity 39 and a valve plug 36, wherein the valve further comprises a water inlet pipe 31, a water outlet pipe 2, a connecting rod 34, a horizontal bar 32, a spring 35, and a support 33; the water outlet pipe 2 is provided outside the valve, and the water inlet pipe 31 that is not covered and sealed by the valve plug is provided at the top of the valve; when the valve is idle and static, a port of the water outlet pipe 2 is covered and sealed by a side surface of the valve plug; an upper portion of the valve plug is connected to the connecting rod; the connecting rod penetrates through the top of the valve cavity, and the connecting rod further penetrates through the top of the support; the horizontal bar is further fixed on the connecting rod; the spring is provided between an upper portion of the horizontal bar and a lower portion of the support and is sleeved on the connecting rod; and when the valve works and the valve plug is located at a highest location of the cavity, the water outlet pipe outside the valve is not covered and sealed by the valve plug.

5. The toilet pipe valve according to claim 4, **characterized by** further comprising a through hole 38 that penetrates through upper and lower surfaces of the valve plug, wherein the valve further comprises a gap or a groove or a dent; and beyond a range of a water inlet or outlet pipe port between the valve plug of the valve and a corresponding inner wall of the cavity, a gap or a groove or a dent can be provided.

6. A toilet water tank, **characterized by** comprising a water tank upper bottom 73, a water tank lower bottom 74, a water tank outer wall 72, a water inlet pipe 79, a water inlet pipe 70, and a water outlet pipe 75, wherein the water tank further comprises a water tank inner wall 71, an annular piston 96, and a piston rod 78, wherein the water tank upper bottom, the lower bottom, the water tank outer wall, and the inner wall form an annular sealed water tank cavity; the annular piston is located in the cavity; two cylindrical vertical surfaces of the annular piston respectively form structures of a piston and a cylinder barrel with an inner wall surface and an outer wall surface of

the water tank cavity; a lower surface of the annular piston is connected to the piston rod; the piston rod penetrates through the water tank lower bottom; the water inlet pipe 79 is provided on a lower bottom of the water tank cavity and is in communication with the water tank cavity; the water outlet pipe 75 is further provided on an upper bottom of the water tank cavity; the water inlet pipe 70 is in communication with the water tank cavity; and the water tank lower bottom and the water tank inner wall 71 form a groove 94 with an upward opening.

7. The toilet water tank according to claim 6, **characterized in that** the water tank further comprises a water inlet pipe (92) and a water outlet pipe (77), wherein the water inlet pipe is located above the groove outside the sealed water tank cavity, and a pipe port is aligned with the groove (94) of the water tank; and the water outlet pipe is located on a lower bottom of a groove beyond a range of the lower bottom of the water tank cavity, and is in communication with the groove of the water tank.

8. The toilet water tank according to claim 6, **characterized in that** the inner wall, the outer wall, and the upper and lower bottoms of the water tank are of a sandwich structure, and the middle of the sandwich structure is filled with a poor heat conduction material or is vacuum.

9. A toilet pipe pressure valve (462, 463), **characterized by** respectively comprising a toilet gravity conduction plate (422, 423), a connecting rod, a spring (442, 443), a water inlet or outlet pipe, a valve plug (452, 453), and a valve cavity (462, 463), wherein the valve plug is located in the cavity; an upper portion of the valve plug is connected to the connecting rod; the connecting rod penetrates through an upper wall of the valve cavity; the top of the connecting rod is connected to the conduction plate; the spring is provided between the conduction plate and the upper wall of the cavity and is sleeved on the connecting rod; an outside surface of the valve plug and an inner wall of the cavity have a same angle, shape, and structure; and an outside surface of the valve corresponds to an inner wall surface of the cavity.

10. The toilet pipe pressure valve according to claim 9, **characterized in that** water inlet and outlet holes 482 and 483 are provided on a pull rod of the valve.

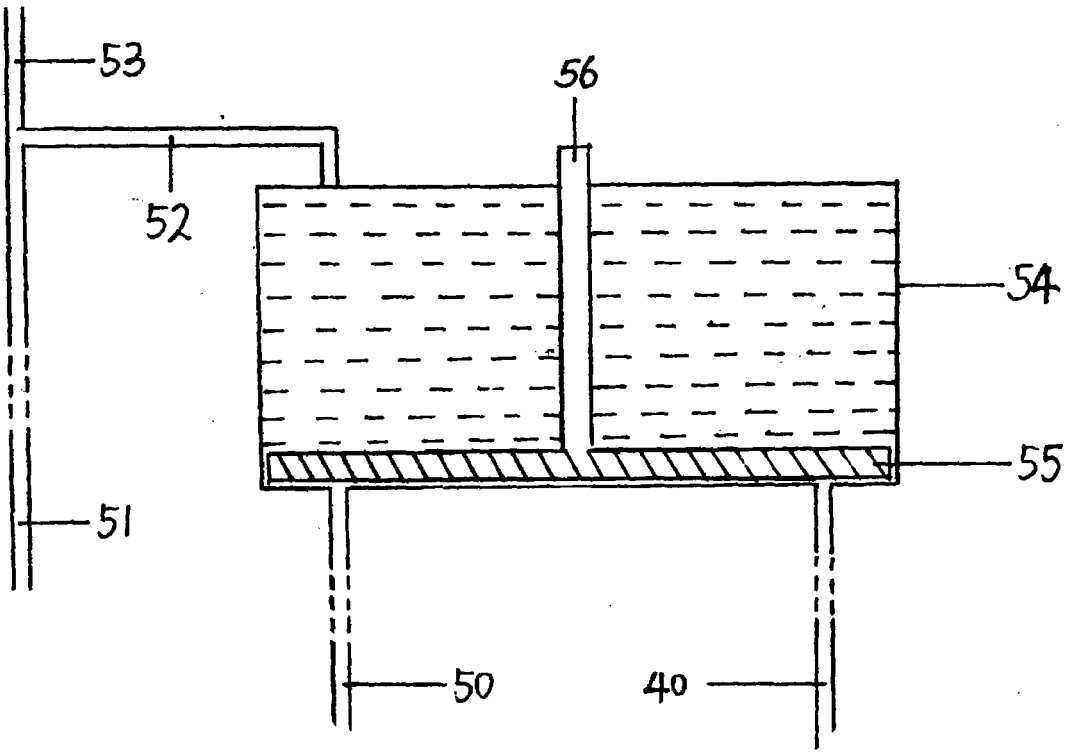

FIG. 1

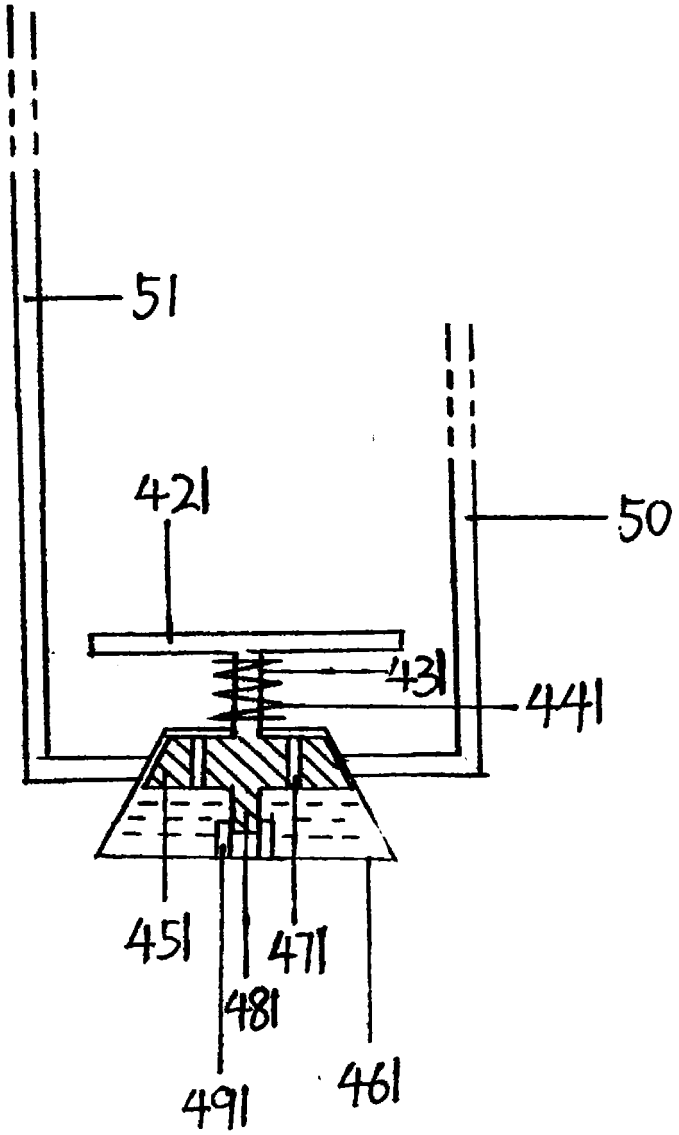

FIG. 2

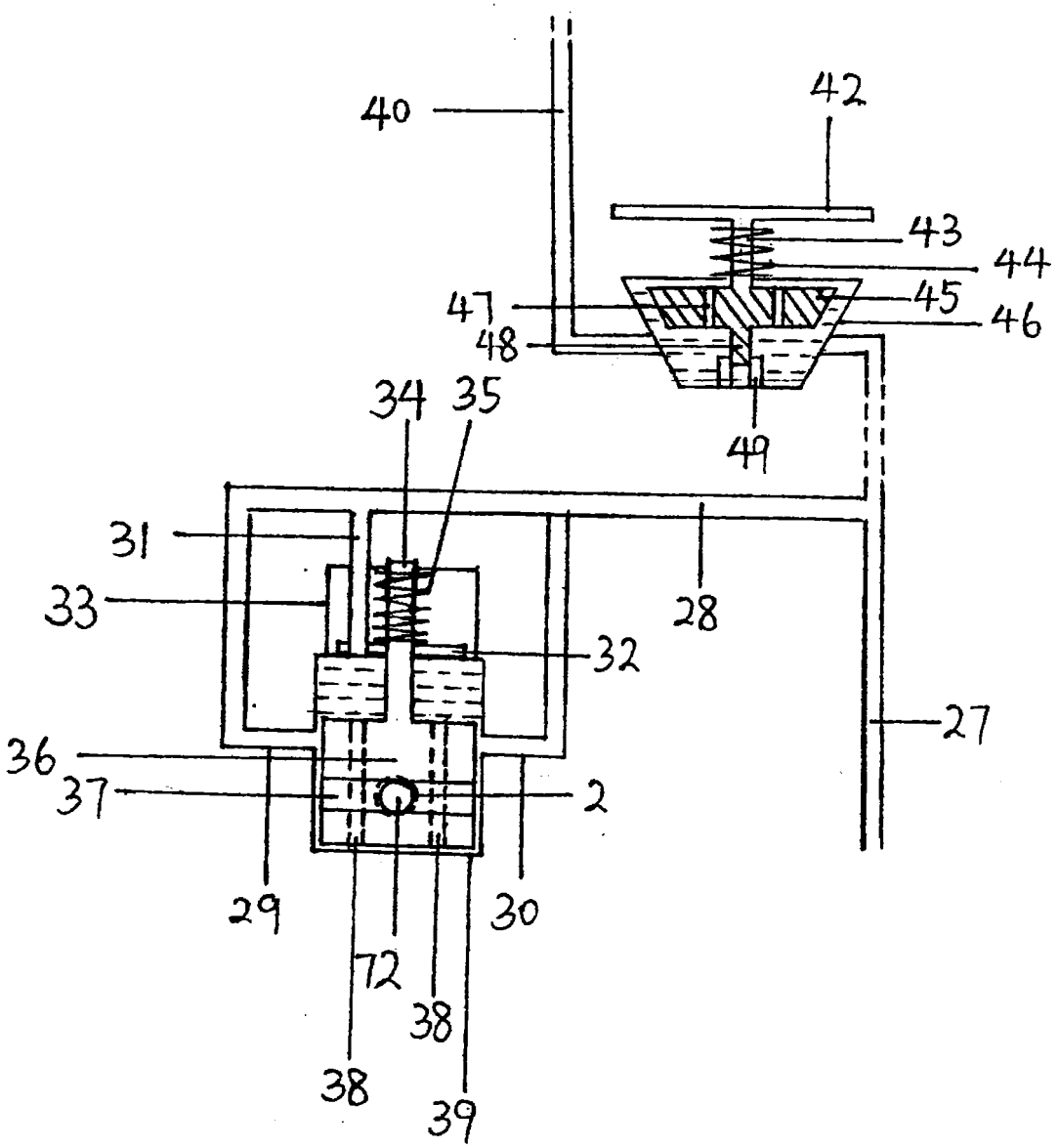

FIG. 3

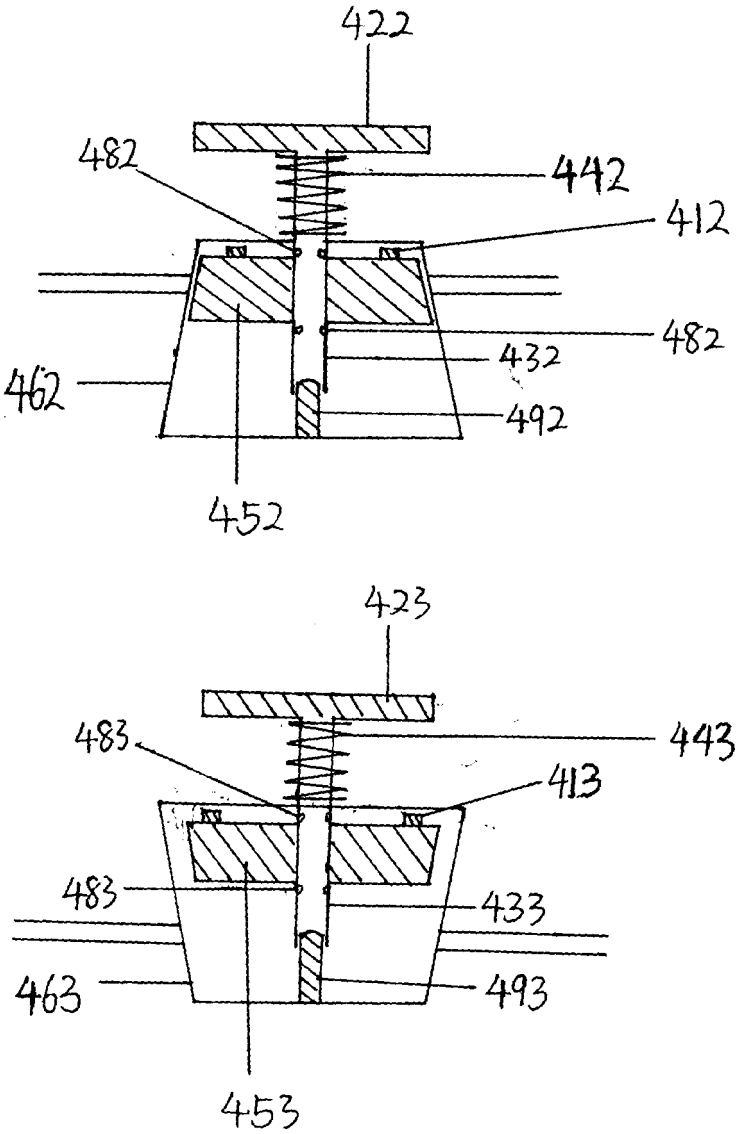
422
482
442
412
482
432
462
492
452
423
483
443
413
483
433
463
493
453

FIG. 4

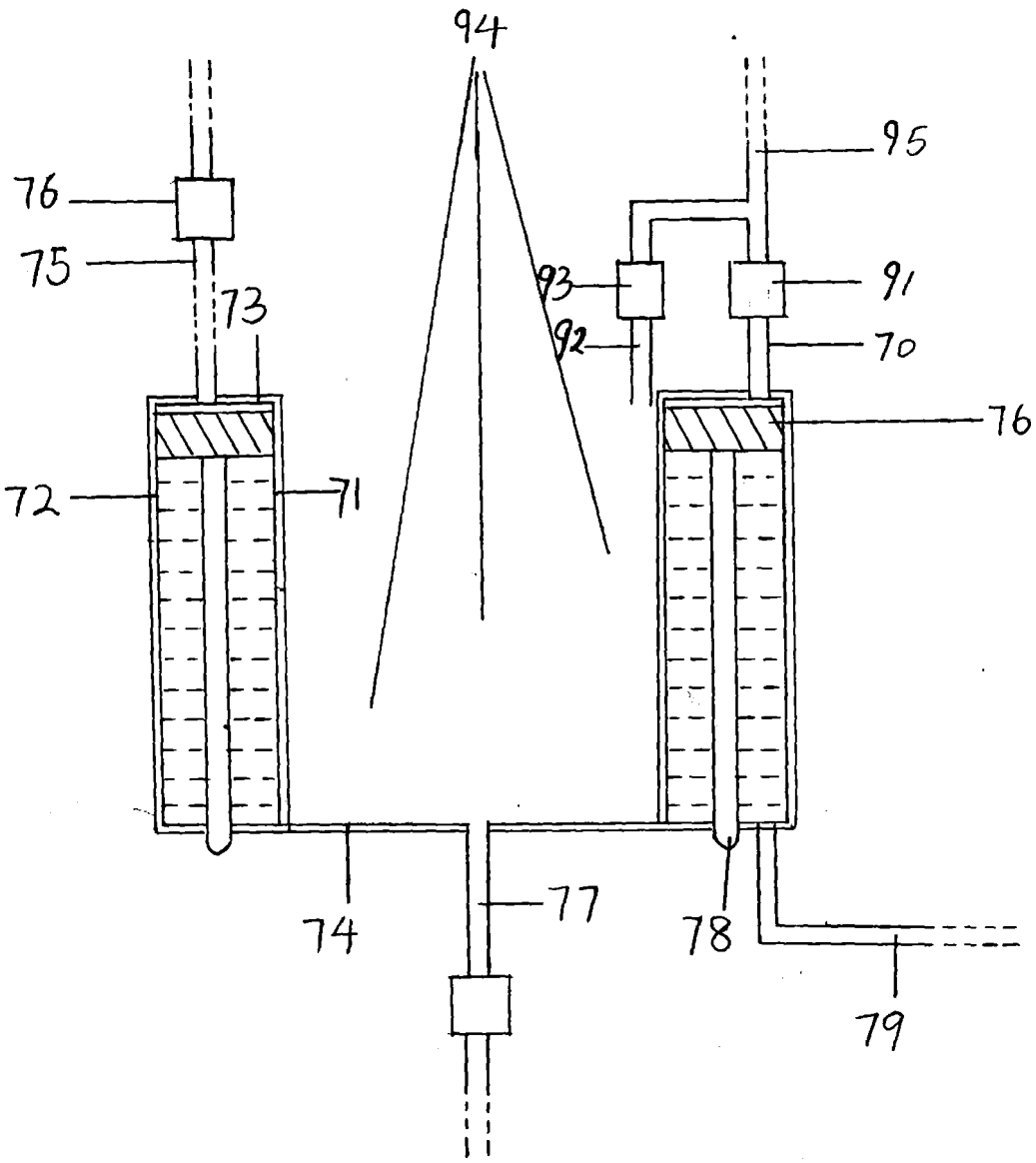

FIG. 5

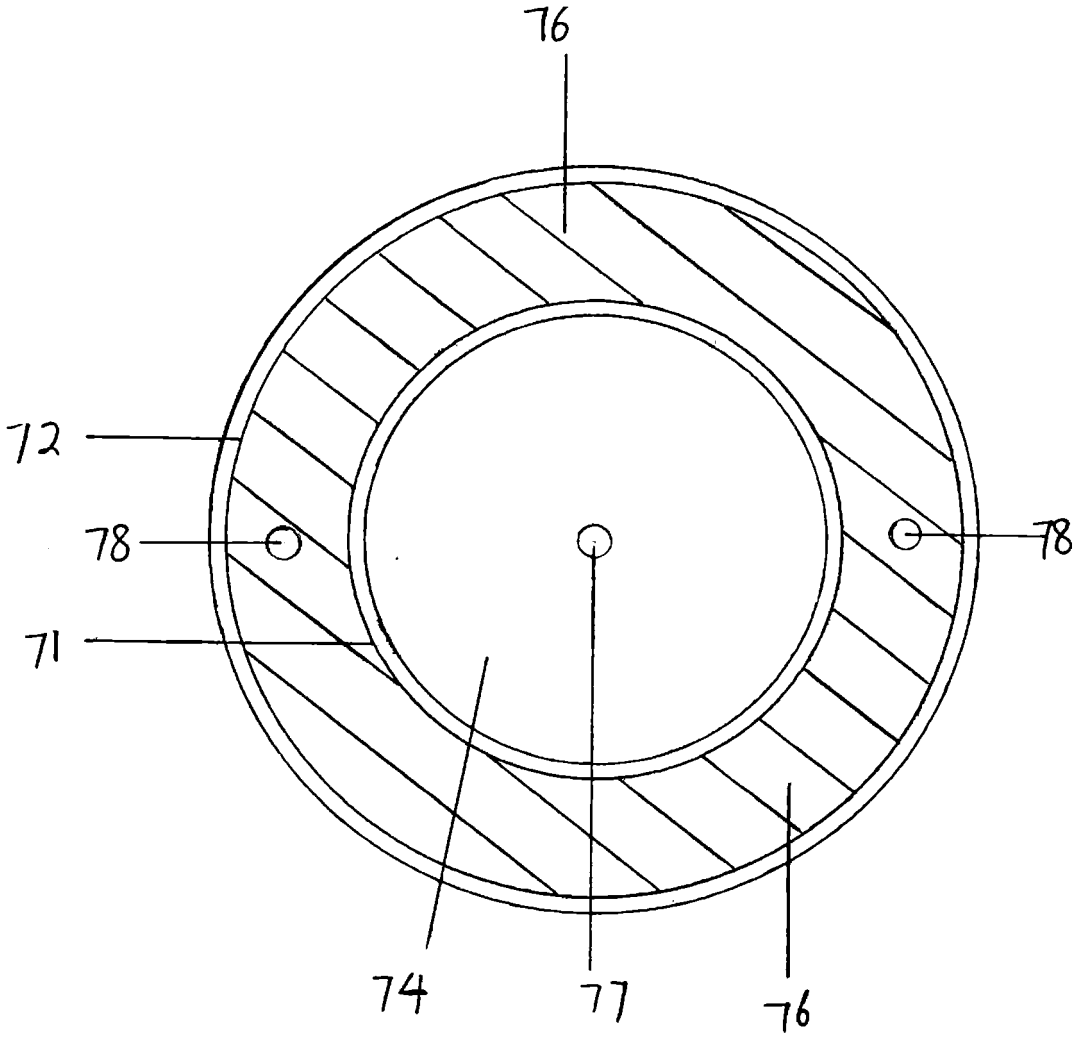

FIG. 6

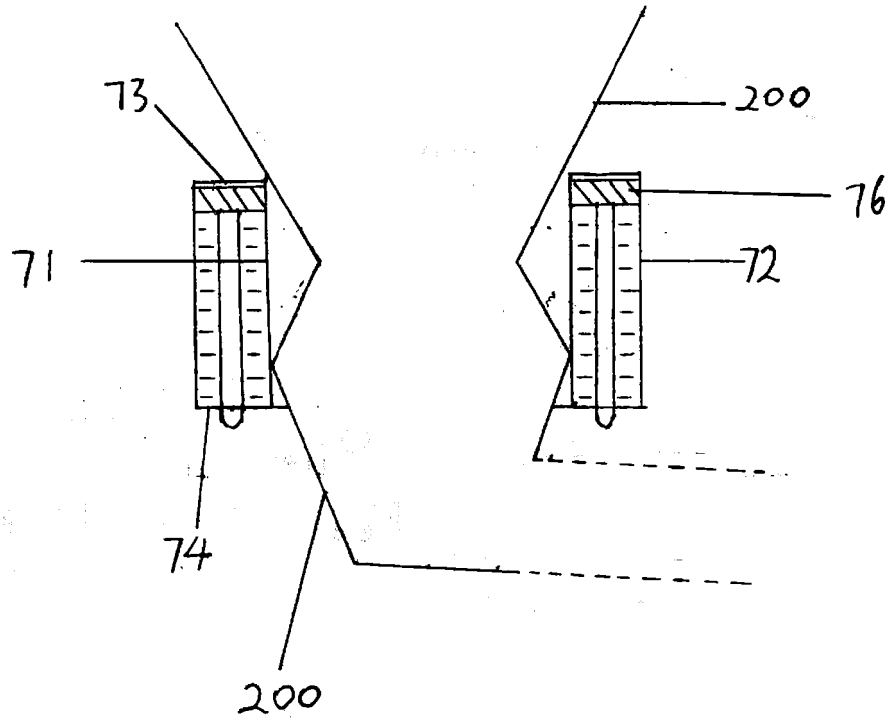

FIG. 7

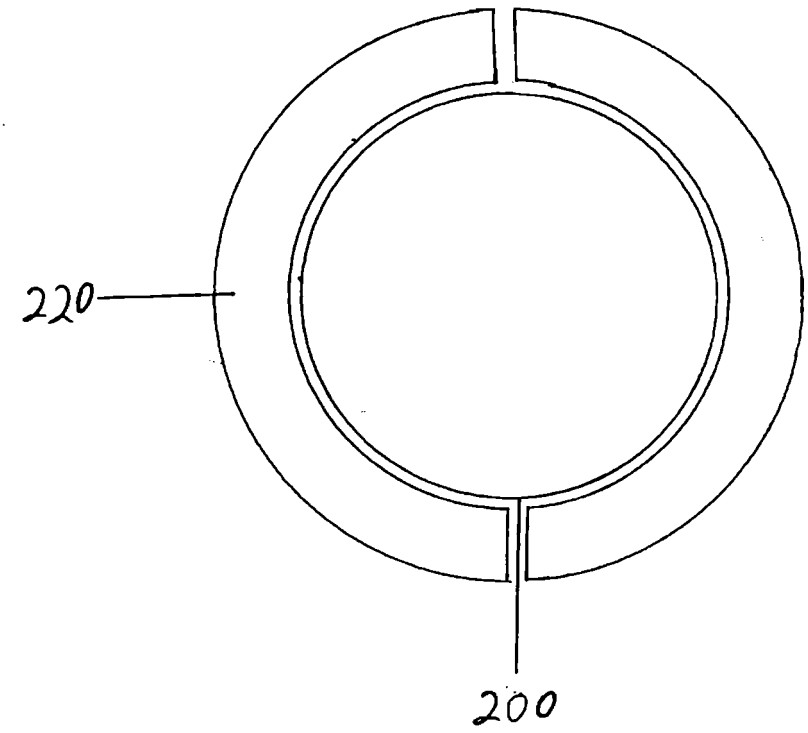

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/000536

A. CLASSIFICATION OF SUBJECT MATTER

E03D 3/10 (2006.01) i; E03D 1/34 (2006.01) i

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)

E03D 1; E03D 3; E03D 5; F16K 3

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)

CNABS; VEN; CNKI: stopper, pressure, hydraulic pressure, pressurize, spring, airproof, seal, sealing, tank, cistern, reservoir, sink, piston, plunger, stopcock

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 103775664 A (NINGBO TIANJILONG INTELLIGENT CONTROL TECHNOLOGY CO., LTD.), 07 May 2014 (07.05.2014), description, paragraphs [0016]-[0020], and figure 1	2, 3, 9, 10
PX	CN 104141337 A (WANG, Yongqiang), 12 November 2014 (12.11.2014), the whole document	1
PX	CN 104164908 A (WANG, Yongqiang), 26 November 2014 (26.11.2014), the whole document	1
PX	CN 104179228 A (WANG, Yongqiang), 03 December 2014 (03.12.2014), the whole document	1
PX	CN 104264756 A (WANG, Yongqiang), 07 January 2015 (07.01.2015), the whole document	2-4, 9
PX	CN 104234154 A (WANG, Yongqiang), 24 December 2014 (24.12.2014), the whole document	1
PX	CN 104343173 A (WANG, Yongqiang), 11 February 2015 (11.02.2015), the whole document	1-4, 9

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 September 2015 (15.09.2015)	**03 November 2015 (03.11.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **CHEN, Xiaoxia** Telephone No.: (86-10) **62085355**

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/000536

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204252237 U (TANGSHAN SIKEDELE MACHINERY TECHNOLOGY CO., LTD.), 08 April 2015 (08.04.2015), the whole document	1
A	CN 2434345 Y (WU, Weibo), 13 June 2001 (13.06.2001), the whole document	1-10
A	EP 1847655 A1 (FONTEVIVA SRL), 24 October 2007 (24.10.2007), the whole document	1-10
A	CN 101761124 A (XUE, Hua), 30 June 2010 (30.06.2010), the whole document	1-10
A	CN 202124908 U (LIANG, Changyi), 25 January 2012 (25.01.2012), the whole document	1-10

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/000536

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

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

[1] I independent claims 1 and 6 relate to the water tank of a toilet;

[2] II independent claims 2 and 9 relate to the pipeline pressure valve of a toilet;

[3] III independent claim 4 relates to the pipeline valve of a toilet; and

[4] the above-mentioned three inventions do not have the same or corresponding special technical features, which do not comply with the requirement of unity of invention under PCT Rule 13.1, 13.2 and 13.3.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/000536

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 103775664 A	07 May 2014	None	
CN 104141337 A	12 November 2014	None	
CN 104164908 A	26 November 2014	None	
CN 104179228 A	03 December 2014	None	
CN 104264756 A	07 January 2015	None	
CN 104234154 A	24 December 2014	None	
CN 104343173 A	11 February 2015	None	
CN 204252237 U	08 April 2015	None	
CN 2434345 Y	13 June 2001	None	
EP 1847655 A1	24 October 2007	None	
CN 101761124 A	30 June 2010	CN 101761124 B	07 December 2011
CN 202124908 U	25 January 2012	None	

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 102864830 A **[0002]**
- CN 102720256 A **[0002]**