

Sept. 12, 1967

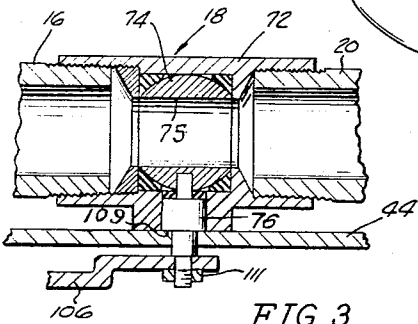
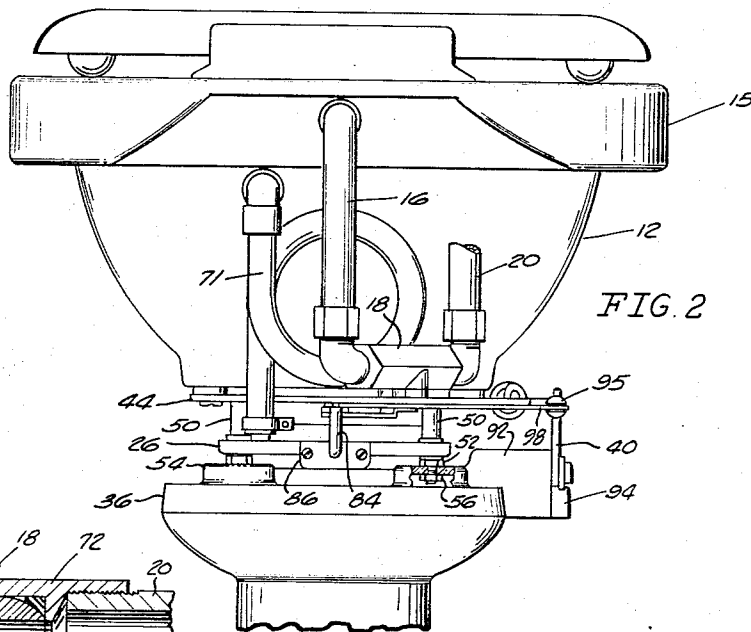
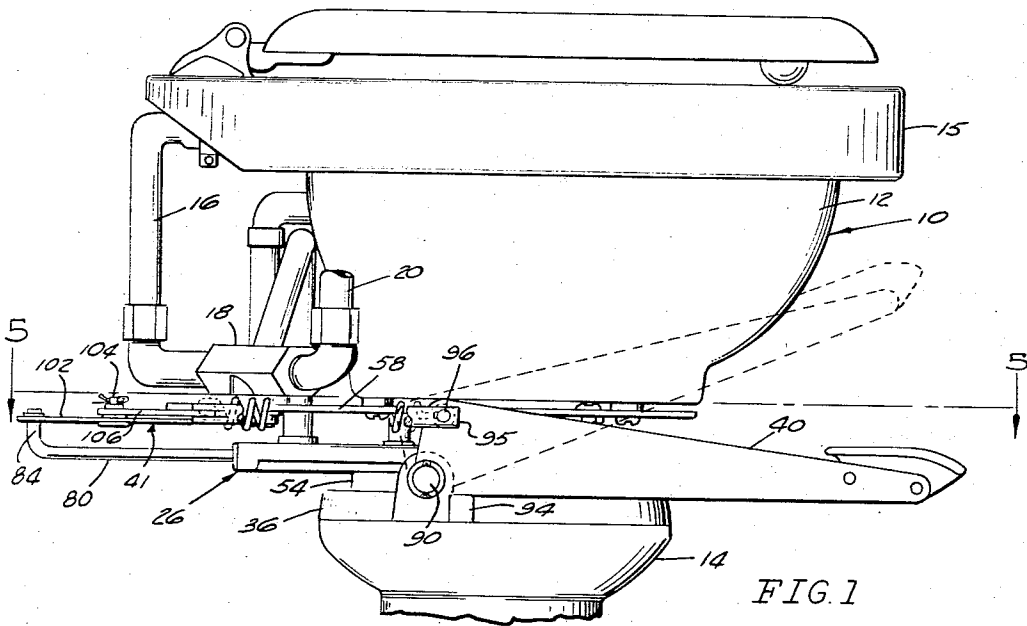
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3,340,545

WATER CLOSET

Filed April 2, 1965

2 Sheets-Sheet 1



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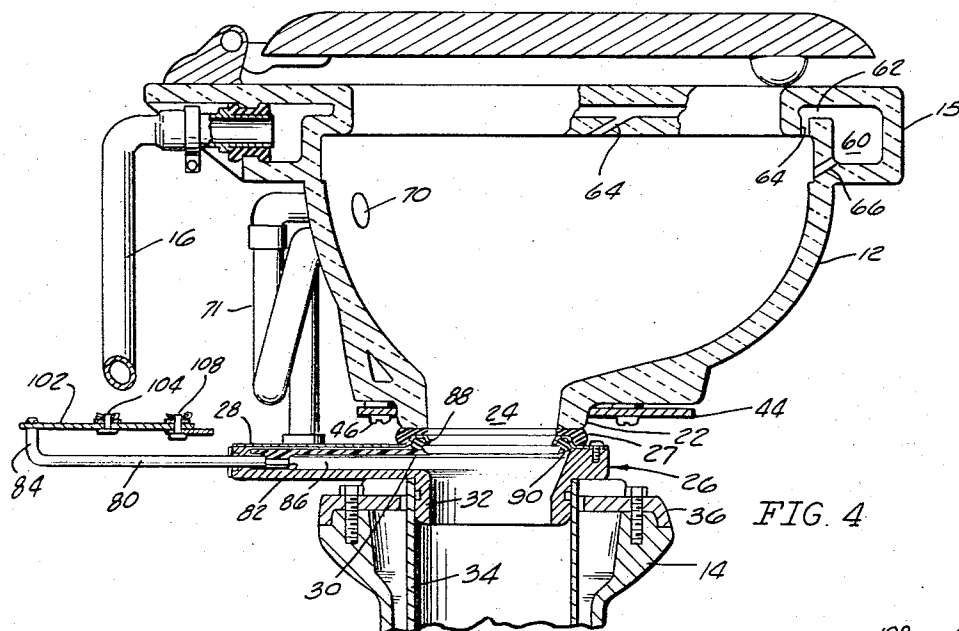


FIG. 4

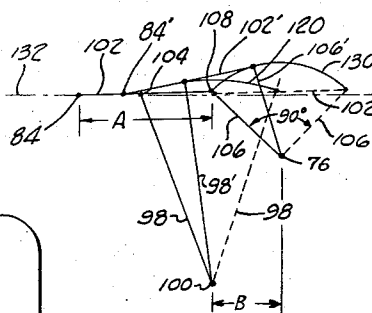


FIG. 6

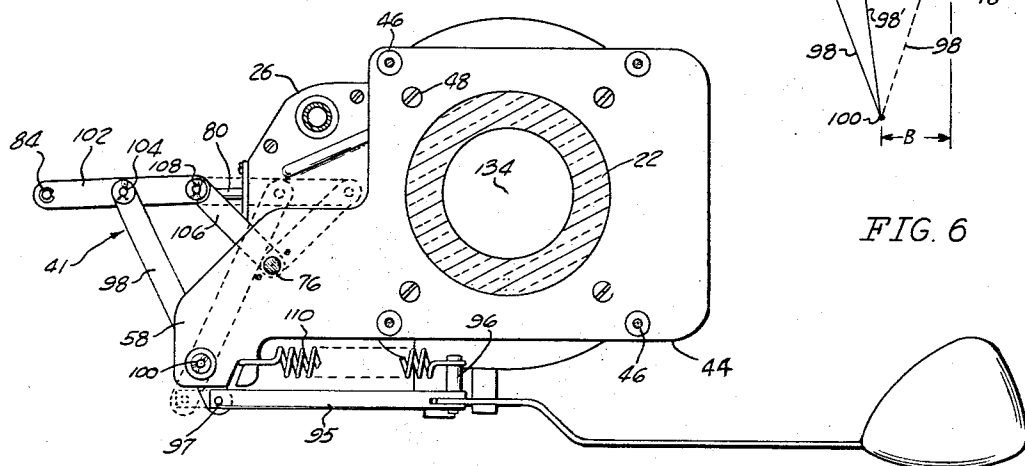


FIG. 5

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WATER CLOSET

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ABSTRACT OF THE DISCLOSURE

A flushing apparatus for a water closet having a gate valve slidably movable in a horizontal plane for opening and closing the outlet of the water closet bowl. Flushing water is introduced into the bowl through a rotary valve, and a mechanism is provided for simultaneously opening and closing the gate valve and the rotary valve. The bowl has a ring through which the water is discharged to the interior of the bowl for flushing purposes, and the ring functions after the valves are closed to discharge water into the bowl to provide a standing pool of water therein.

This invention relates generally to water closets which are used in vehicles such as trailers and the like. More particularly this invention relates to a flushing mechanism for such water closets.

One type of water closet used in trailers generally comprises a hopper or bowl formed with an open lower end which serves as a waste outlet. Flow of waste from the outlet is controlled by a large valve disposed in the outlet. The outlet valve is closed except during a flushing operation. Flushing water is introduced into the bowl through a flushing ring in the form of an annular chamber around the upper open end of the bowl. The flow of water into the flushing ring is controlled by a valve connected in a water line between the flushing ring and a water supply. To flush the water closet the waste outlet valve and the water inlet valve are opened by a single manual operation, for example by depressing a foot pedal. When the pedal is released the outlet and inlet valves close.

Where water closets of this type are used in trailers a very compact arrangement of the flushing mechanism, including the bowl, plumbing, and valve linkage, is highly desirable. It is also desirable that the flushing mechanism have a simple and substantially trouble free construction without impairing effective flushing.

The objects of this invention are to provide a water closet having a flushing mechanism that is compact and trouble free, that is constructed simply and economically without complicated and bulky linkages for operating the waste outlet valve and water inlet valve; and that provides fast, smooth and effective valve operation during a flushing operation.

Further objects, features and advantages of this invention will become apparent from a consideration of the following description, the appended claims, and the accompanying drawing in which:

FIGURE 1 is a side view of a water closet having a flushing mechanism constructed in accordance with the present invention and including a horizontally slideable outlet valve and a rotary inlet valve which are operated substantially simultaneously by a foot operated linkage illustrated in its operated position;

FIGURE 2 is a rear view of the water closet shown in FIG. 1 taken generally from the left of FIG. 1;

FIGURE 3 is a vertical section taken through the inlet valve to illustrate the construction of the valve and a direct connection between the valve and a link in the foot operated linkage;

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FIGURE 4 is a vertical section through the water closet illustrated in FIG. 1 with the outlet valve in its open position;

FIGURE 5 is a vertical sectional view taken on line 5-5 of FIG. 1 to illustrate the linkage between a foot pedal, the outlet valve and the inlet valve for moving the outlet valve along a generally rectilinear path to open and close the outlet valve while substantially simultaneously rotating the inlet valve to open and close the inlet valve during a flushing operation;

FIGURE 6 is a line diagram of the linkage shown in FIG. 5 to further illustrate the construction and operation of the linkage.

Referring to FIG. 1 a water closet 10 generally comprises a hopper or bowl 12 supported on a hollow base 14. Bowl 12 is preferably formed of vitreous china although other materials such as metal and molded plastic could also be used. The upper end of bowl 12 is fashioned with a flushing ring 15 which receives flushing water through an inlet pipe 16 fastened on the rear of bowl 12. Pipe 16 is connected to a rotary inlet valve 18 which in turn is connected to a supply pipe 20. Sometimes a vacuum breaker is placed in the water line between the rotary valve 18 and the flushing rim in inlet pipe 16. The lower portion of bowl 12 is fashioned with a downwardly depending neck 22 (FIG. 4) which is hollow and opens downwardly to serve as an outlet 24 for the bowl. A slide gate valve 26 is arranged below outlet 24 between bowl 12 and base 14 to control the discharge of waste through the outlet during a flushing operation. An annular gasket 27 is compressed between valve 26 and neck 22 to serve as a seal.

Valve 26 generally comprises a hollow two-piece valve body 28 in which a valve gate 30 is mounted for reciprocating movement. Body 28 is fashioned with a downwardly depending annular flange 32 which is nested and sealed in the upper open end of a discharge pipe 34. Pipe 34 is supported in base 14 and projects upwardly through a mounting ring 36 fastened on the upper end of base 14. A foot operated pedal 40 is pivotally mounted on ring 36 and connected to valves 26 and 18 by a mechanical linkage 41 constructed in accordance with one aspect of the present invention to substantially simultaneously retract valve gate 30 and rotate valve 18.

A bracket 44 surrounding neck 22 is fastened on the bottom of bowl 12 by five screws 46. Valve 26 is also fastened on bracket 44 by four screws 48, four spacers 50, and four nuts 52 (FIG. 2). The lower end of screws 48 extend through respective bosses 54 formed on the ring 36 and are fastened to bosses 54 by nuts 56 to retain bowl 12, bracket 44 and valve 26 in place. Bracket 44 is also fashioned with a dog leg portion 58 which extends rearwardly and laterally outwardly to support the linkage 41.

More particularly flushing ring 15 comprises an annular chamber 60 extending around the outer periphery of bowl 12. Chamber 60 has an enlarged generally horizontal portion 62 which projects radially inwardly of bowl 12 and also extends around the outer periphery of bowl 12. A plurality of generally vertical passageways 64 communicate between portion 62 and the interior of bowl 12 to serve as flushing water outlets. Each of the passageways 64 is inclined tangentially to the interior of bowl 12 to impart a swirling motion to the flushing water. The bottom of chamber 60 is connected to the interior of bowl 12 by a passageway 66 which drains chamber 60 after the water is turned off to provide standing water in bowl 12 when closet 10 is not in use. At the rear of bowl 12 is an overflow port 70 connected to the interior of body 28 by a pipe 71 and thence through the interior body 28 to the outlet pipe 34. Pipe 71 is looped in a fashion to serve as a

water trap to prevent odors from pipe 34 backing up into the room through port 70.

Valve 18 generally comprises a valve casing 72 (FIG. 3) fastened on bracket 44 and threadably connected to pipes 16, 20. A valve ball 74 is sealably seated in housing 72 for rotation in the housing. Ball 74 has a passageway 75 extending therethrough to connect pipe 16 to pipe 20. A shaft 76 is fastened in ball 74 and extends downwardly through housing 72 and bracket 44. Shaft 76 is journaled in bracket 44 for rotation by linkage 41. Valve 18 is illustrated in FIG. 3 in its open position with passageway 75 communicating between pipe 20 and pipe 16. Rotation of ball 74 ninety degrees from the position illustrated in FIG. 3 closes valve 72.

Referring to valve 26 in greater detail (FIG. 4), valve gate 30 is in the form of a flat blade that is slidable in a shallow upper portion of the valve body 28. An actuating rod 80 is fastened on the rear portion of valve gate 30 by prongs 82 that are formed on gate 30. Rod 80 extends rearwardly from gate 30 through body 28 and has its rear end bent upwardly to form a leg 84. Rod 80 is slidable in body 28 for reciprocating valve gate 30 to open and close outlet 24. Prongs 82 ride loosely in a guide 86 formed in a recessed lower portion of body 28. In the top of body 28 is a large aperture 88 in line and registering with outlet 24 of bowl 12. An annular sealing ring 90 is fastened in body 28 around the periphery of aperture 88 to seal with valve gate 30 when the valve gate is closed.

Valve 26 is substantially similar to the slide action gate valve disclosed in a copending application entitled "Valve Assembly," Ser. No. 411,759, filed Nov. 17, 1964, in the name of Ronald J. Sargent and assigned to the assignee of the present application. Reference is made to this application for further structural details that are not essential to the present invention. With this type of slide action gate valve, it is desirable that the actuating rod be moved in a nearly rectilinear path to reciprocate the valve gate between open and closed positions. Imparting a generally rectilinear motion to rod 80 provides a valve action that is fast and smooth and minimizes wear on the valve.

The linkage 41 for actuating valves 18, 26 generally comprises foot pedal 40 which is journaled at its lower rear end portion on a shaft 90 mounted in a boss 92 integral with ring 36. On the front of boss 92 is a block 94 disposed beneath a lower rear edge of pedal 40. Block 94 engages pedal 40 to stop the pedal when it is in a lowered or operated position illustrated in FIG. 1. The forward end of a rod 95 is pivotally connected to the end upper rear portion of pedal 40 by a pin 96. A pin 97 pivotally connects the rear end of rod 95 to one end of a pivoted link 98. Link 98 is pivoted on leg 58 of the bracket 44 by a pin 100. Link 98 extends laterally inwardly from pin 100 and has its inner end pivotally connected at the center of a link 102 by a pin 104. Link 102 in turn has its rear end pivotally connected to leg 84 on the rod 80. A third link 106 is pivotally connected to the forward end of link 102 by a pin 108. Link 106 extends laterally outwardly from link 102 and has its outer end keyed on the lower end of shaft 76 of the valve 72. Shaft 76 is rotatable in a leg 58 and serves as the pivot axis for leg 106. A shoulder 109 and a nut 111 threaded on shaft 76 to fix the shaft against vertical movement. A compression spring 110 is fastened between pin 96 and a slot 112 on the leg 58. Spring 110 urges pedal 40 toward its upper position which corresponds to closed positions of valves 18, 26.

The length of links 98, 102, and 106 together with the position of pins 100, 104, 108, shaft 76, and leg 84 are such that the rear end of link 102, leg 84, and rod 80, move in a generally rectilinear path when link 98 is pivoted by rod 95 about pin 100. Additionally, link 106 is pivoted by link 102 through ninety degrees while the link 102 shifts a distance equal to the travel of valve gate 30 between its open and closed positions. Link 106 in turn rotates shaft 76 and ball 74 to open and close valve 18.

In FIG. 5 linkage 41 is illustrated in full lines in its operated position corresponding to the open position of valves 18, 26. The position of the linkage is shown in dotted lines as it appears when valves 18, 26 are closed. When links 98, 106 are shifted to their closed positions, link 98 abuts link 106 adjacent shaft 76 to serve as a stop for the linkage when valve gate 30 is fully closed.

Referring to FIG. 6, the linkage 41 is shown diagrammatically to illustrate the motion of the links. Links 98, 102, and 106 are shown in full lines in a position corresponding to the open position illustrated in full lines in FIG. 5. When foot pedal 40 is released link 98 is pivoted clockwise as viewed in FIG. 6 about pin 100 by spring 110 and rod 95. Link 98 moves pin 104 on an arc designated by numeral 120. Pin 108 and the forward end of link 102 move outwardly and then inwardly on an arc designated by the numeral 130 as link 106 pivots about the axis of shaft 76. When link 106 has moved through an angle in the order of ninety degrees, links 98, 102, 106 are in a position corresponding to closed positions of valves 18, 26. Links 98, 102, 106 are also illustrated in a position designated by numerals 98', 102' and 106' intermediate open and closed positions. As illustrated in FIG. 6, the rear end of link 102 and thus arm 84 and rod 80 move rectilinearly along the longitudinal axis of the valve designated by numeral 132. The displacement of leg 84 by link 102 while link 106 pivots through ninety degrees is equal to the travel of valve gate 30 designated by the letter A in FIG. 6, between open and closed positions.

By way of example, in one linkage determined experimentally for three and one-eighth inches travel of valve gate 30 and ninety degrees rotation of ball 74, pin 104 was 1.71 inches from leg 84; pin 108 was 1.60 inches from pin 104, link 98 was 4.138 inches long between pins 104, 109; link 106 was 2.345 inches long between pin 108 and shaft 76; pin 100 was spaced laterally 3.710 inches from the axis 132 and rearwardly 6.72 inches from the valve center 134 (FIG. 5); shaft 76 was spaced laterally 1.50 inches from the axis 132 and rearwardly 5.13 inches from center 134. In general to achieve rectilinear motion of the leg 84, pin 108 may be spaced from pin 104 a distance equal to the spacing between pin 104 and leg 84. Link 98 may have a length substantially equal to twice the length of link 106, and pin 100 may be spaced rearwardly from shaft 76 a distance designated by the numeral B in FIG. 6 substantially equal to the dimension between pins 102, 104.

Normally pedal 40 will be in a raised position shown in dotted lines in FIG. 1, valve gate 30 will be disposed across outlet 24 to close the outlet, and ball 74 will be rotated ninety degrees from the position illustrated in FIG. 3 to disconnect pipe 20 from pipe 16. To flush the water closet 10, pedal 40 is depressed. Link 98 pivots in a counterclockwise direction as viewed in FIG. 5 to the position illustrated in full lines. Link 98 shifts link 102 which in turn pulls leg 84 rearwardly along a generally rectilinear path to retract valve gate 30 and open outlet 24 and thus discharge waste in bowl 12. Simultaneously link 102 pivots link 106 in a counterclockwise direction as viewed in FIG. 5, to the position illustrated in full lines. Link 102 pivots shaft 76 and ball 74 ninety degrees to connect pipe 20 to pipe 16 through passageway 75 and thus supply water to chamber 60 in the flushing ring 15. Water is discharged from chamber 60 through passageways 64 in a swirling motion to flush bowl 12. Flushing will continue as long as pedal 40 is depressed. When pedal 40 is released, spring 110 raises the pedal which in turn pivots link 98 in a clockwise direction as viewed in FIG. 5 to close valves 18, 26 simultaneously. After valves 18, 26 close, water drains from chamber 60 through passageway 66 into the bowl 12 to provide a standing pool in the bowl.

It will be understood that the water closet which is herein disclosed and described is presented for purposes of explanation and illustration and is not intended to

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indicate limits of the invention, the scope of which is defined by the following claims.

What is claimed is:

1. In a water closet a bowl having a waste outlet and a water inlet, a gate valve mounted on said closet below said outlet, said gate valve having a valve gate slidably supported for generally rectilinear motion to open and close said outlet, a rotary valve mounted on said closet rearwardly of said outlet for controlling flow of water through said inlet, and a manually operated mechanism for retracting said valve gate along a generally rectilinear path to open said outlet and for substantially simultaneously rotating said rotary valve to admit water into said closet.

2. In a water closet a bowl having a waste outlet and a water inlet, a gate valve mounted on said closet below said outlet, said gate valve having a hollow valve body defining a portion shallow in a vertical dimension for supporting a valve gate for sliding movement in a generally horizontal plane between positions to open and to close said outlet, a valve gate supported in said shallow portion in a normally closed position for controlling flow of waste through said outlet, a rotary valve for controlling flow of water through said inlet, and a manually operated mechanism connected to said valve gate and said rotary valve for slidably retracting said valve gate from its normally closed position to open said outlet and for substantially simultaneously rotating said rotary valve from its normally closed position to admit water into said closet, said mechanism being operable thereafter for returning said valve gate and said rotary valve to their normally closed positions.

3. In a water closet, the combination according to claim 2, wherein said bowl has an upper end formed with a peripheral flushing ring in communication with said water inlet, and a passageway for draining said flushing ring into the interior of said bowl after said valve gate and rotary valve are returned to their normally closed positions for providing a standing pool of water in said bowl.

4. In a water closet for vehicles and the like a bowl having a waste outlet and a flushing water inlet, a valve gate slidably supported on said closet for generally rectilinear motion along a horizontal axis to open and close said outlet, a rotary valve for controlling flow of flushing water through said inlet, said valve gate having an actuating member extending rearwardly from said outlet in a horizontal direction parallel to said axis, said rotary valve being rotatable about a vertical axis between open and closed positions, a manually operated linkage mechanism for retracting said gate to open said outlet while substantially simultaneously rotating said rotary valve to admit flushing water into said closet comprising a first link mounted for pivotal movement about a fixed vertical axis spaced laterally outwardly from said horizontal axis, a second link mounted for pivotal movement about a fixed vertical axis spaced laterally outwardly from said horizontal axis beyond said pivot axis of said first link, a third link shiftable in a direction generally parallel to said horizontal axis, said first link being pivotally connected to said third link adjacent a forward end of said third link, said second link being pivotally connected to said link rearwardly of said first link, means pivotally connecting the rear end of said actuating member to said third link rearwardly of said second link, said rotary valve being operatively connected to said first link to rotate in response to pivotal movement of said first link, and means operatively connected to one of said links for moving said one link to pivot said first and second links about said vertical axes and shift said third link.

5. The water closet set forth in claim 4 wherein said first link is keyed on a vertical shaft and said rotary valve has a rotatable member connected directly to said shaft.

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6. In a water closet for vehicles and the like a bowl having a waste outlet and a flushing water inlet, a gate valve supported on said closet below said outlet, said gate valve having a valve gate slidably supported therein for generally rectilinear motion along a horizontal axis to open and close said outlet, a rotary valve supported on said water closet rearwardly of said outlet for controlling flow of flushing water through said inlet, and a manually operated mechanism for retracting said gate to open said outlet and substantially simultaneously rotate said rotary valve to admit flushing water into said closet comprising an actuating rod mounted on said gate and extending rearwardly from said gate parallel to said axis, a first link, first means pivotally connecting a rear end of said first link and a rear end of said actuating member, a second link, second means pivotally connecting said second link to said first link forwardly of said first pivot means, said second link extending laterally outwardly from said first link, third means pivotally connecting said second link to said water closet laterally outwardly of said first link for pivotal movement about a first fixed vertical axis, a third link, fourth means pivotally connecting said third link to said first link forwardly of said second pivot means, said third link extending laterally outwardly from said first link, fifth means pivotally connecting said third link to said water closet laterally outwardly of said first link beyond said first axis for pivotal movement about a second fixed axis, said rotary valve being operatively connected to said third link to rotate in response to pivotal movement of said third link, and a foot operated linkage operatively connected to said second link for pivoting said second link about said first axis.

7. In a water closet a bowl having an open upper end formed with a peripheral flushing ring, said bowl further having an open lower end serving as a waste outlet, an outlet valve mounted on said closet below said outlet for controlling flow of waste through said outlet, a rotary valve connected in a water supply line for admitting water to said flushing ring, and a mechanical linkage operatively connected to said valves for operating said valves substantially simultaneously, said flushing ring comprising an annular chamber surrounding the periphery of said bowl, said chamber having an enlarged upper portion projecting radially inwardly of said bowl to overlie an interior wall of said bowl, a plurality of passageways in said ring communicating directly between said enlarged portion of said chamber and the interior of said bowl, said passageways being vertically inclined to impart a swirling motion to flushing water leaving said chamber when said valves are open during a flushing operation, and a separate passageway in said bowl opening at the bottom of said chamber and communicating directly between said chamber and the interior of said bowl for draining said chamber when said valves close at the termination of a flushing operation to provide a standing pool of water in said bowl.

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