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(54) **DUAL FLUSH TOILET VALVE**

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(57) **ABSTRACT**

A dual flush valve includes an outflow pipe, a lower seal, and an upwardly extending guide. A lower flush valve reciprocates on the guide between a lowered position sealing the lower seal and a full volume flush position unsealing the lower seal with respect to the outflow pipe. An upper flush valve reciprocates on the guide between a lower sealed position sealing the upper seal with respect to the lower flush valve, an intermediate partial volume flush position unsealing the upper seal and a higher full volume flush position unsealing the lower seal. An interconnecting lost motion member allows movement of the upper valve between the lower sealed position and the partial volume flush position without disturbing the lower valve, while transmitting additional upward movement of the upper valve to the lower valve to move the lower valve between the lowered position and the full volume flush position.

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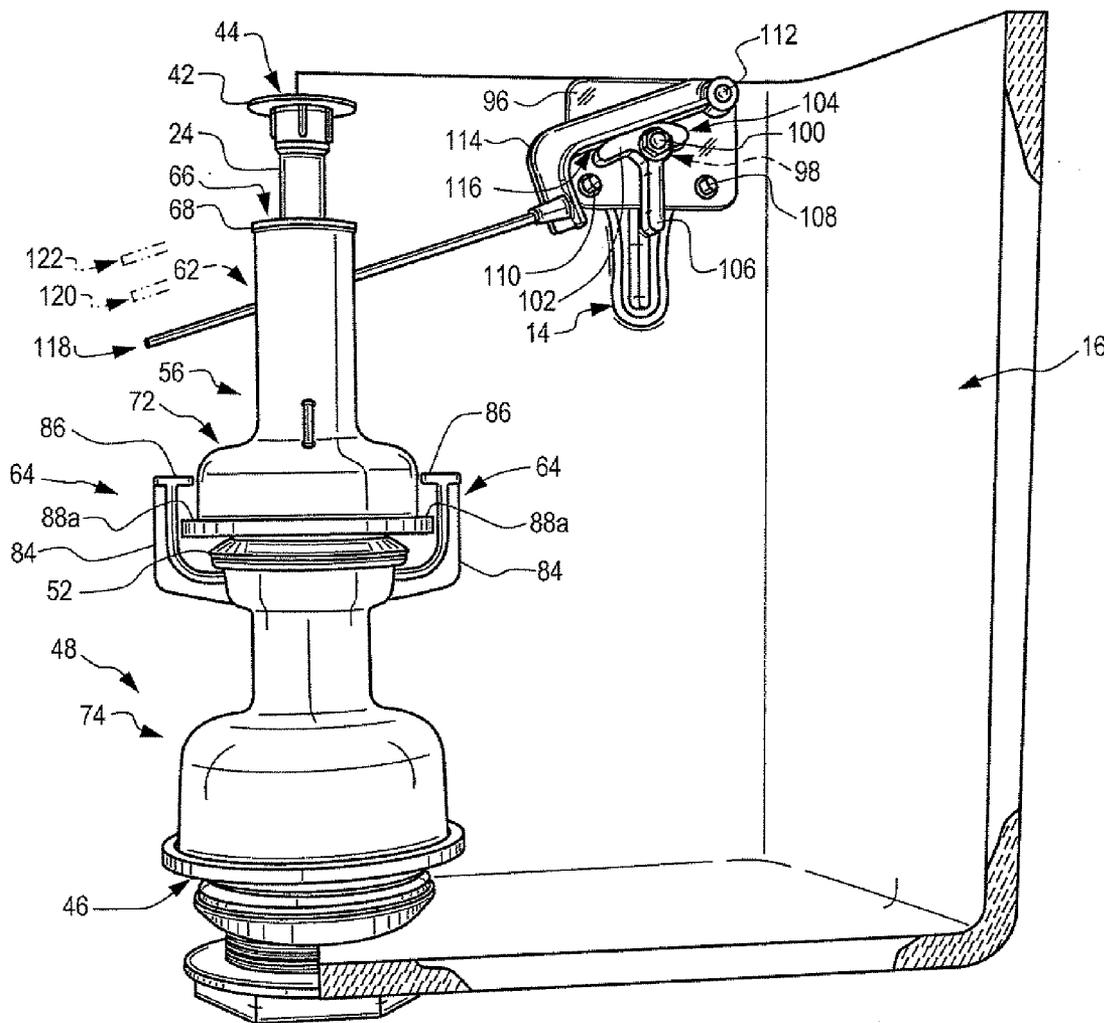
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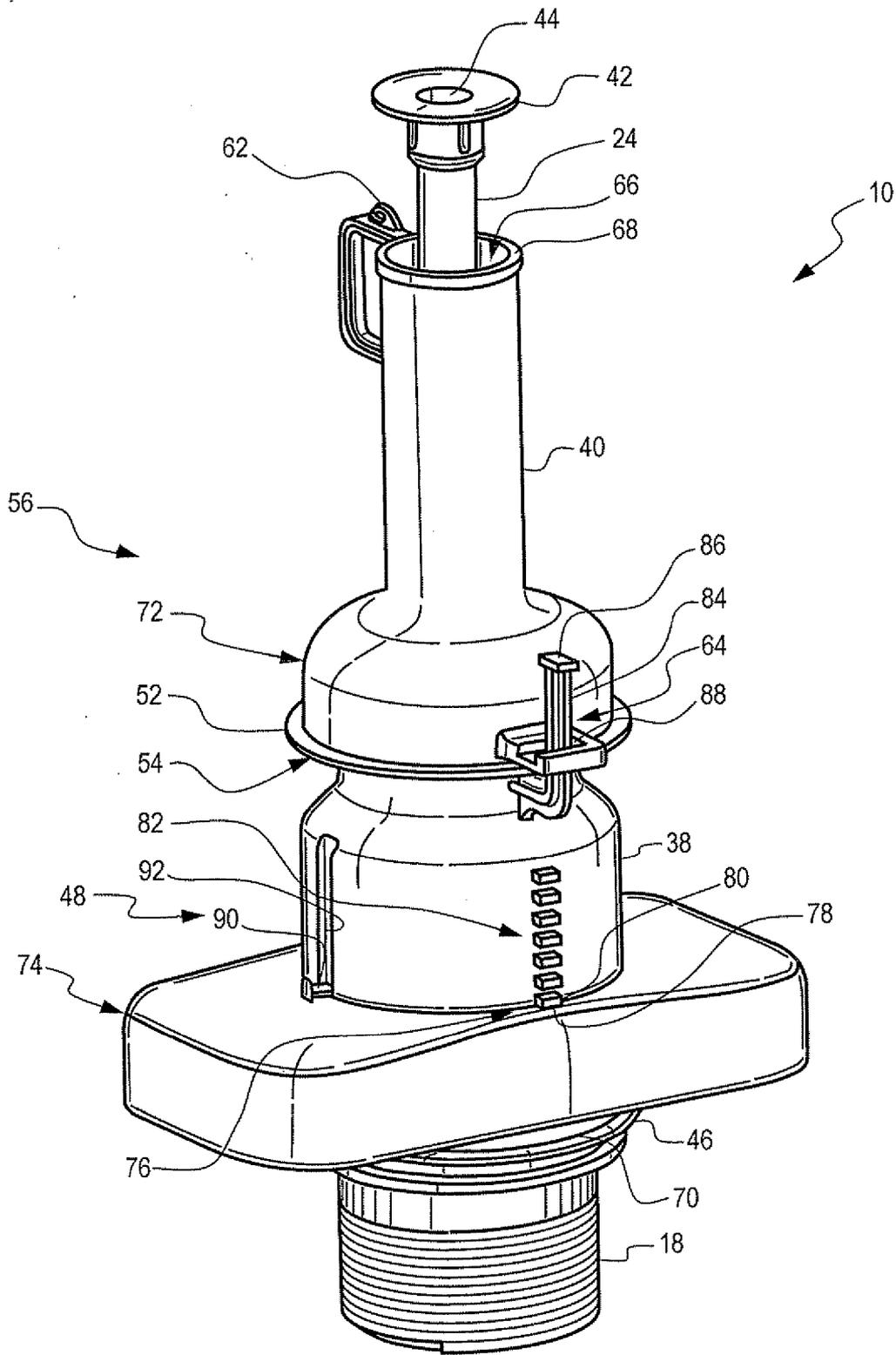


FIG. 1

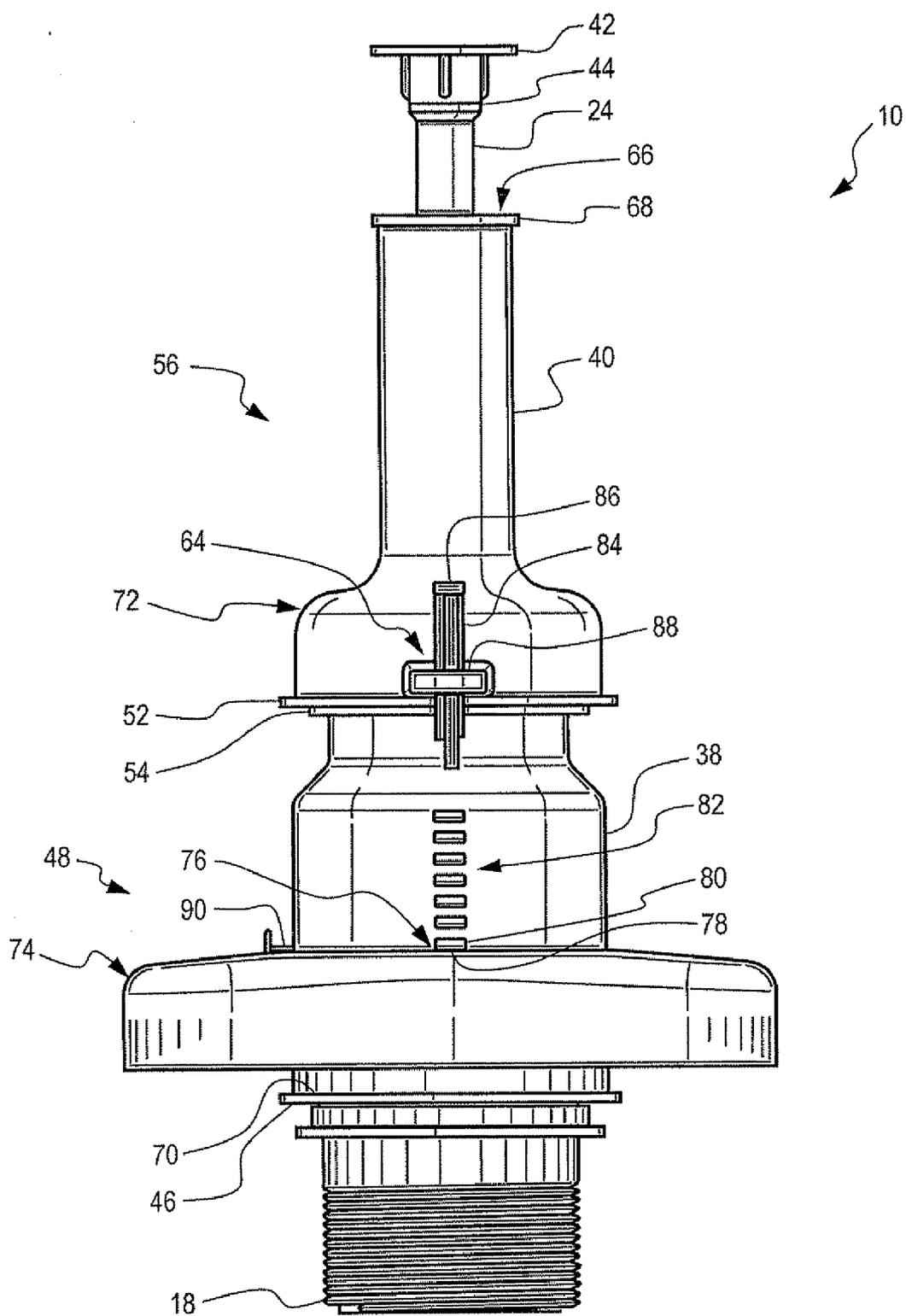


FIG. 2

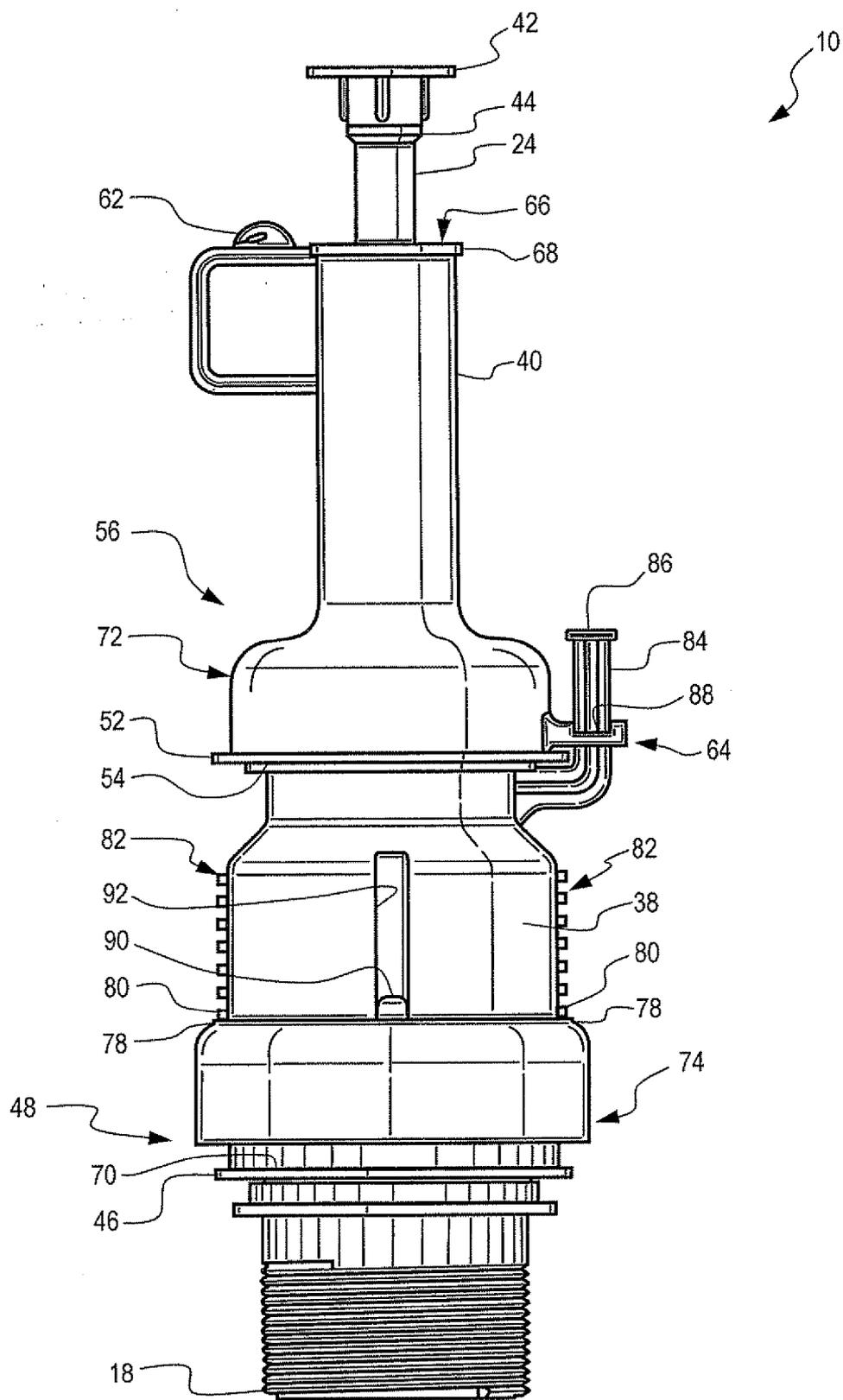


FIG. 3

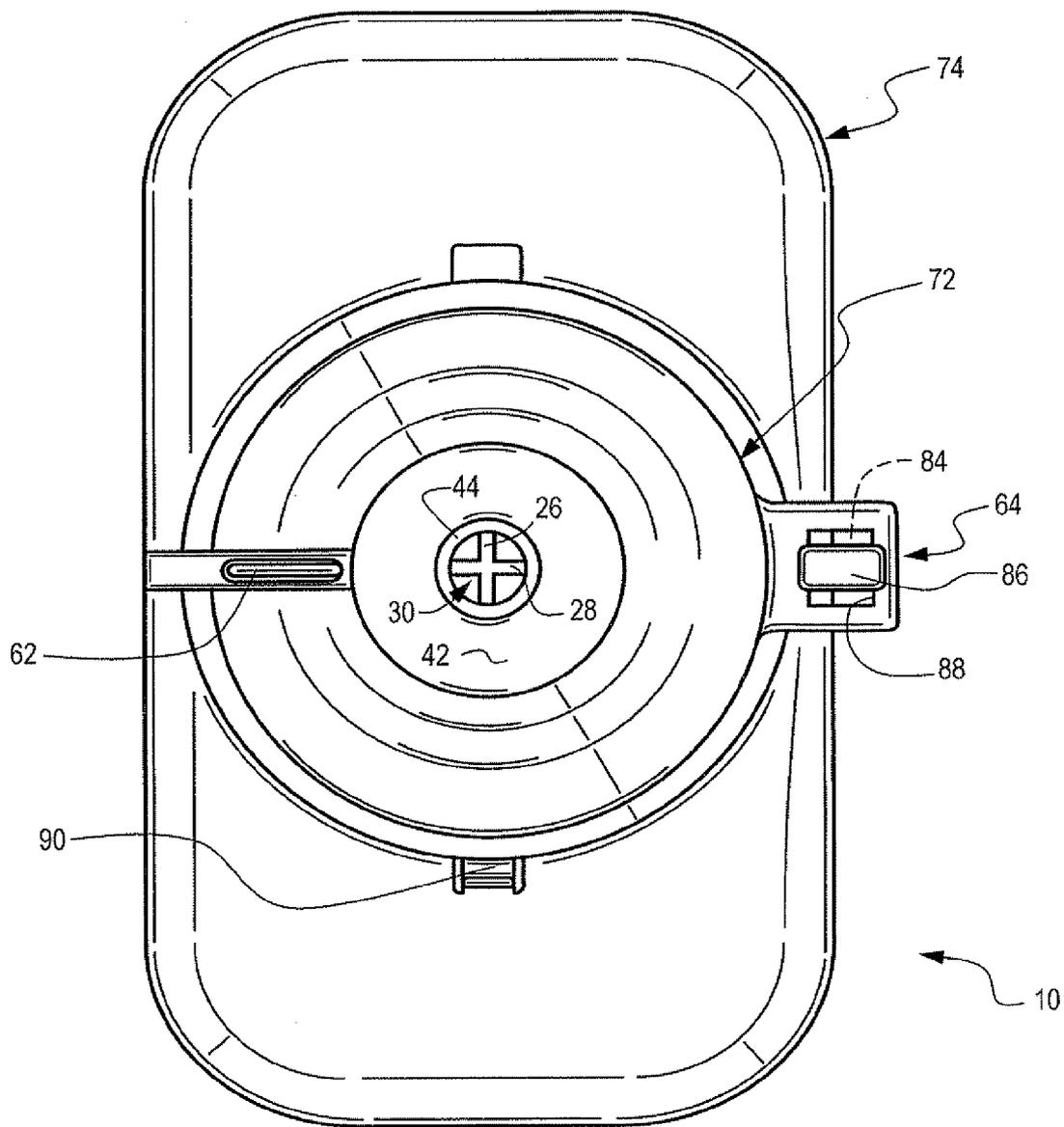


FIG. 4

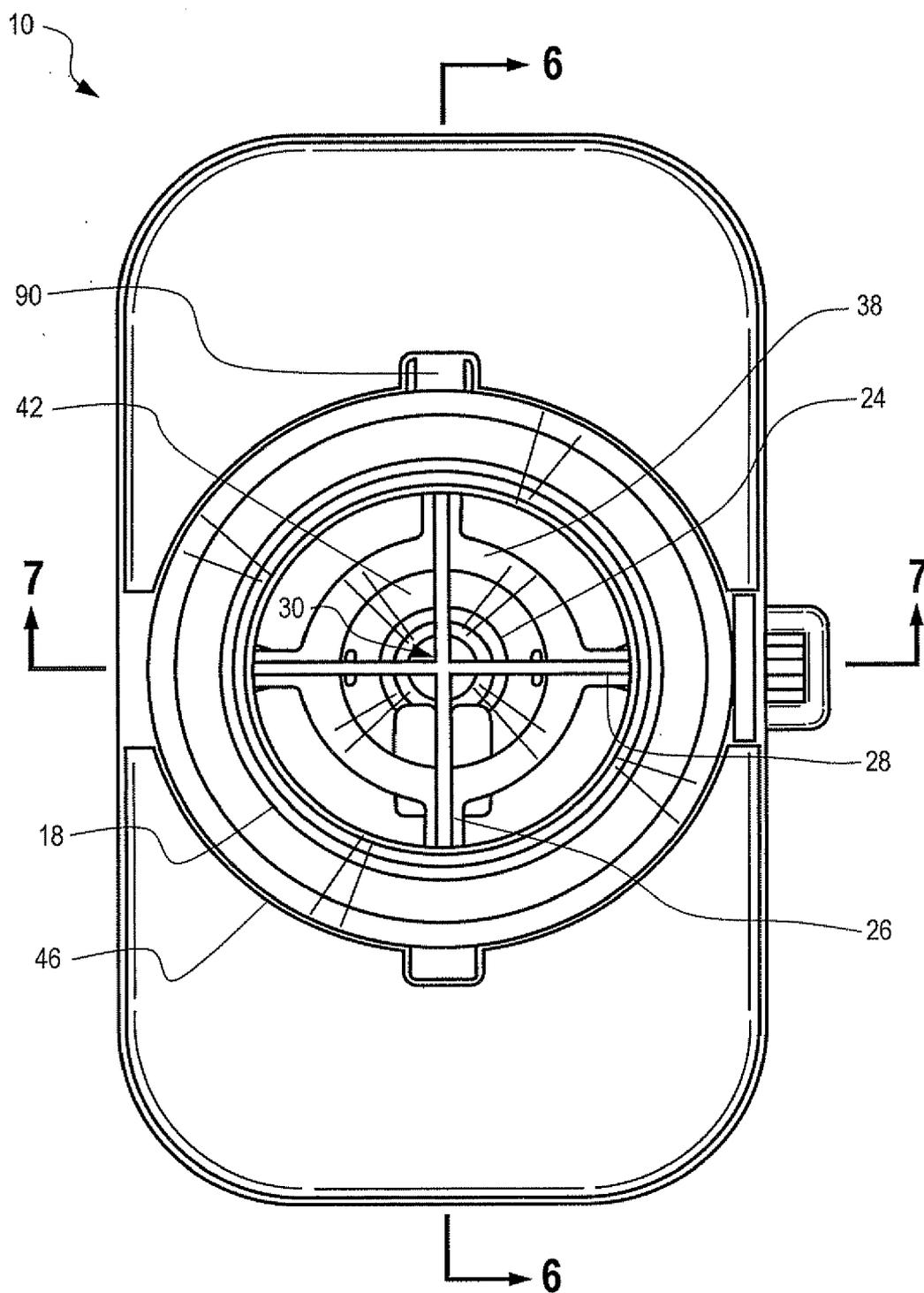


FIG. 5

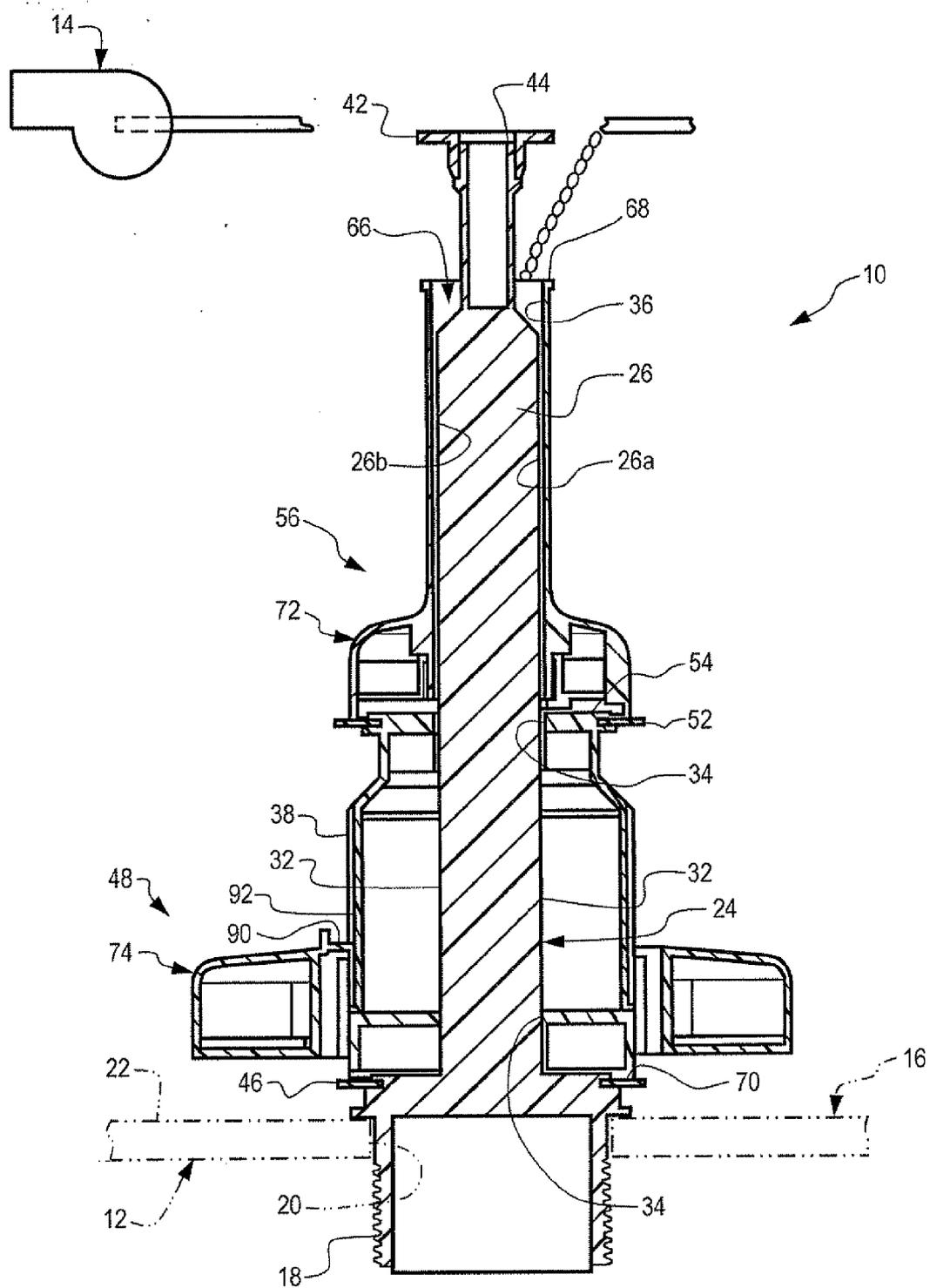


FIG. 6

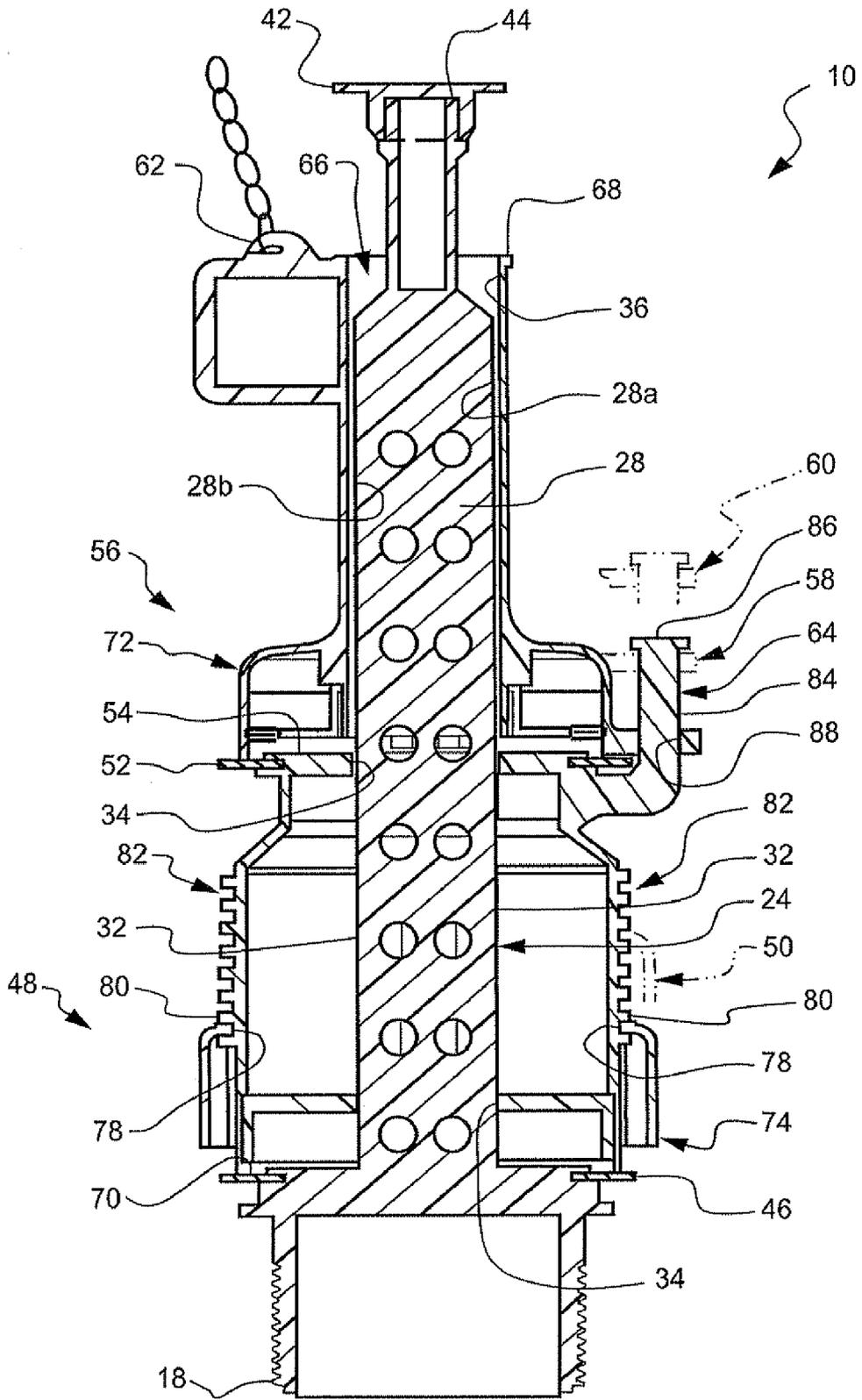


FIG. 7

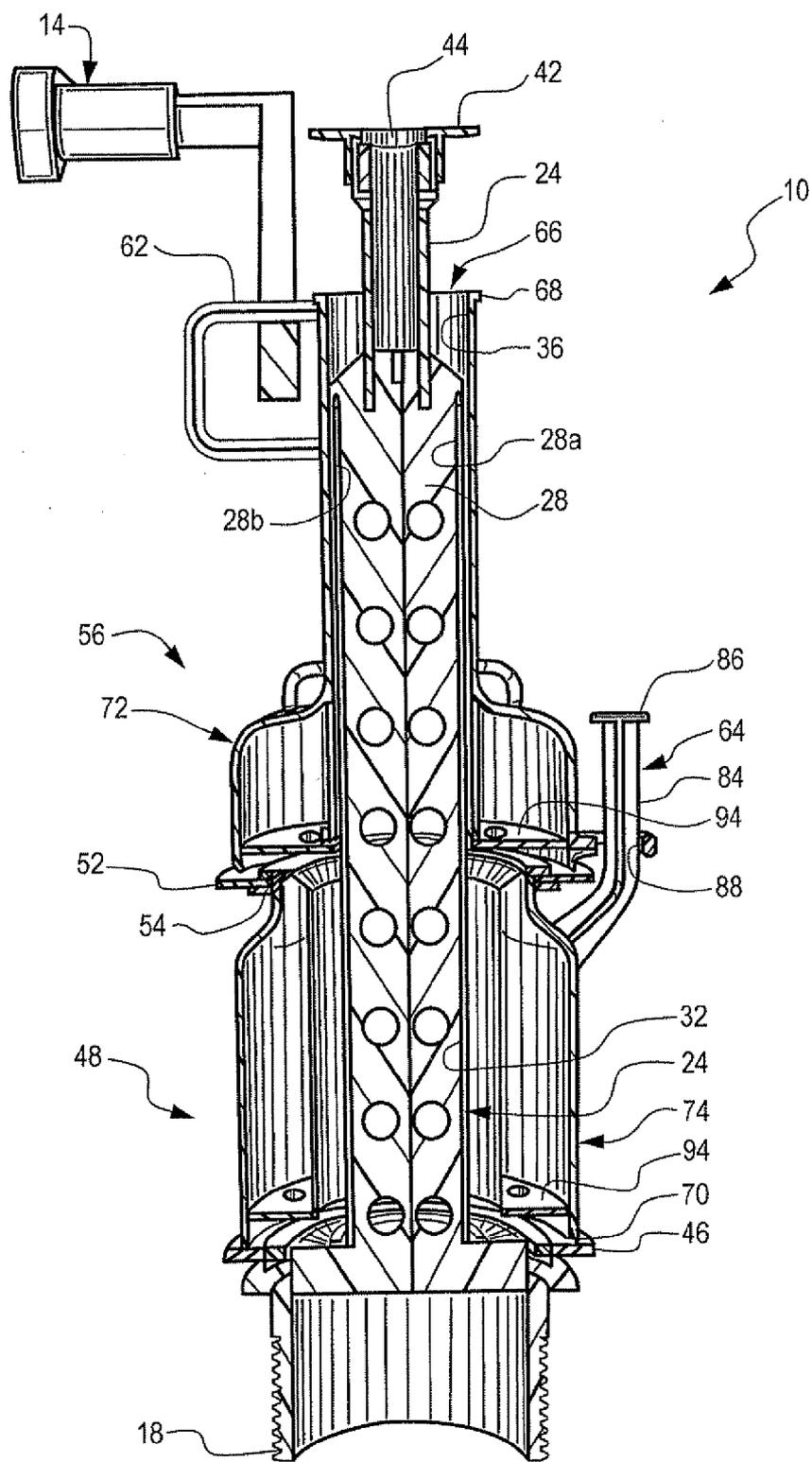


FIG. 8

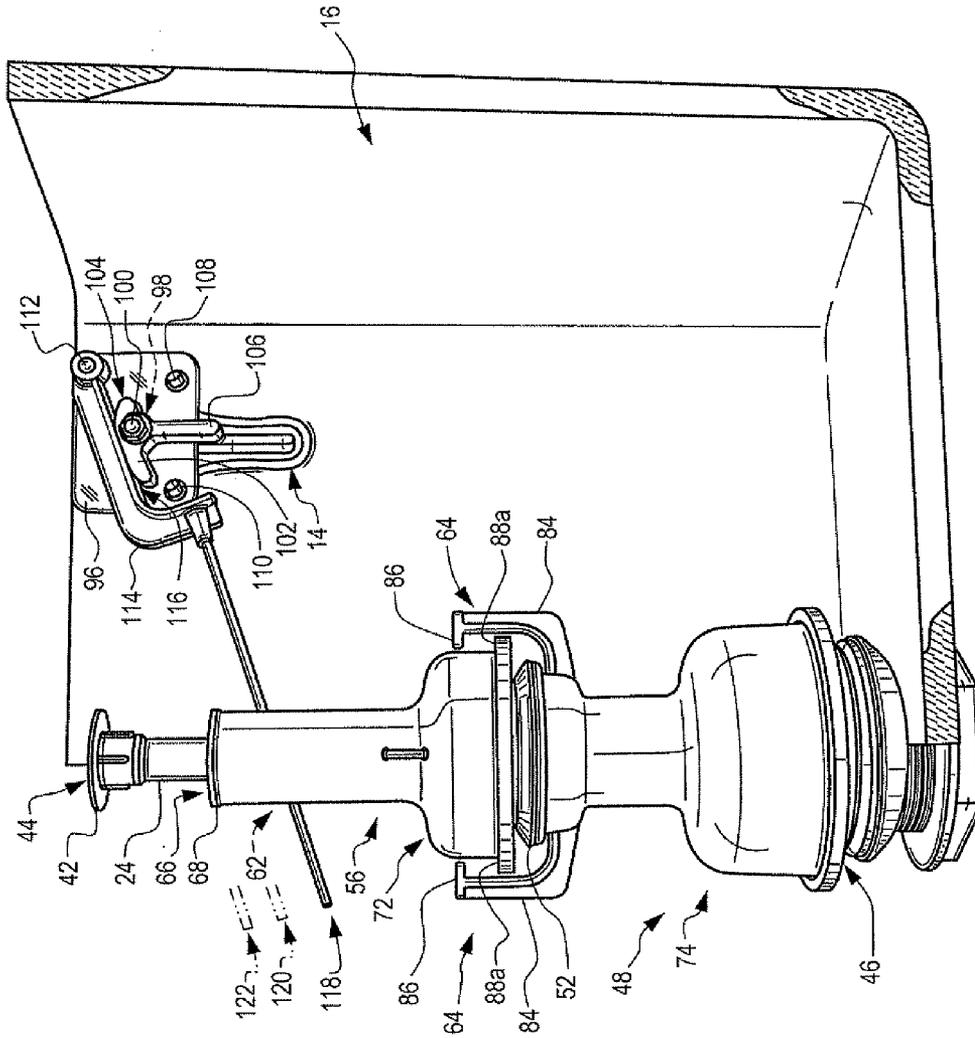


FIG. 9

## DUAL FLUSH TOILET VALVE

### FIELD OF THE INVENTION

**[0001]** The present invention relates to a dual flush valve for a water closet, wherein an operator can flush the water closet in a chosen operational mode using a manual lever provided for selectively controlling an operational flush mode between a first mode releasing a preselected volume, and a second mode releasing substantially all, of a quantity of liquid held in a flush tank, where each release completes an operator initiated flush cycle.

### BACKGROUND OF THE INVENTION

**[0002]** A significant amount of water is used with each flush of a conventional flushing toilet, which after certain uses is not required and is wasteful of water. Most toilets manufactured in the United States discharge approximately 3-5 gallons of water per flush. Concerns with water conservation, combined with Federal Law requiring new toilets to have a maximum discharge volume of 1.6 gallons per flush, has led to the development of new water-conserving toilet systems and various devices for reducing the water consumption of older toilets.

**[0003]** Dual flushing arrangements are available providing for low volume and high volume flushes, but these arrangements are generally of relatively complex configuration, for example see U.S. Pat. No. 7,219,375; U.S. Pat. No. 6,658,673; U.S. Pat. No. 6,637,042; U.S. Pat. No. 6,484,327; U.S. Pat. No. 5,794,278; U.S. Pat. No. 5,754,986; U.S. Pat. No. 5,713,086; U.S. Pat. No. 4,185,338; U.S. Pat. No. 4,175,295; U.S. Pat. No. 4,115,882; and U.S. Published Application No. 2005/0193483. Many of these arrangements are difficult to retrofit into existing conventional flushing toilets.

**[0004]** Known dual flush valve assemblies typically use separate flush valves that discharge different amounts of water for flushing solid and liquid waste. For example, one type of dual flush volume valve assembly includes a high-volume flush valve positioned near a bottom of a toilet tank to pass a higher volume of water for flushing solid waste, and a low-volume flush valve positioned higher in the toilet tank for passing a lower volume of water for flushing liquid waste.

**[0005]** A user can select a high-volume flush for flushing solid waste, or otherwise can select a low-volume flush for flushing liquid waste. The flushing frequency for an average individual is approximately 5 times per day for urination compared with approximately 1 time per day for solid waste. Therefore, a large amount of water can be conserved when disposing of liquid waste using a low-volume flush.

**[0006]** With droughts being experienced in the South and Western areas of the country, municipalities are desperately seeking additional ways to conserve water by retrofitting existing conventional flushing toilets. When retrofitting older toilet tanks, the volume of water discharging from the toilet tank drawing a low-volume flush can be dependent on the shape of the toilet tank. It would be desirable to provide a dual flush volume valve assembly to be retrofit into an existing conventional flushing toilet. In order to adapt to a larger number of existing conventional flushing toilet configurations, it would be desirable to provide some degree of adjustability for elevation of floats and/or valves in a dual flush volume assembly.

### SUMMARY

**[0007]** A dual volume flush valve for a water closet allows an operator to flush the water closet in a chosen operational

mode. A manual lever is provided for selectively controlling an operational flush mode between a first mode releasing a pre-selected volume of a quantity of liquid held in a flush tank, and a second mode releasing substantially all of a quantity of liquid held in the flush tank. Each release completes an operator initiated flush cycle for the water closet. The flush valve can include an outflow pipe sealingly attached to a flush tank to extend through an opening in the bottom of the flush tank. The outflow pipe has an upwardly extending guide member. A lower seal when sealed prevents fluid flow through the outflow pipe adjacent the bottom of the flush tank. A lower flush valve guidingly engages on the upwardly extending guide member for reciprocal movement between a lowered position sealing the lower seal and full volume flush position unsealing the lower seal. An upper seal when sealed prevents fluid flow through an upper end of the lower flush valve. An upper flush valve is guidingly engaged on the upwardly extending guide member for reciprocal movement between a lower sealed position sealing the upper seals a partial volume flush position unsealing the upper seal and a full volume flush position. An interconnecting lost motion member extends between the lower flush valve and the upper flush valve. The lost motion member allows movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transmitting additional vertical movement of the upper flush valve to the lower flush valve causing movement of the lower flush valve between the lowered position and the full volume flush position.

**[0008]** The flush valve can include an outflow pipe sealingly attachable to a flushed tank to extend through an opening in a bottom of the flush tank. The outflow pipe has an upwardly extending guide member. A lower seal when sealed prevents fluid flow through the outflow pipe adjacent the bottom of the flush tank. A lower flush valve guidingly engages on the upwardly extending guide member for reciprocal movement between a lowered position sealing the lower seal and a full volume flush position unsealing the lower seal. A lower float is operably associated with the lower flush valve. An upper seal when sealed prevents fluid flow through the lower flush valve adjacent to the upper end. An upper flush valve guidingly engages on the upperwardly extending guide member for reciprocal movement between a lower sealed position sealing the upper seal, a partial volume flush position unsealing the upper seal, and a full volume flush position. An upper float is operably associated with the upper flush valve.

**[0009]** Other applications of the present invention will become apparent to those skilled in the art when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein;

**[0011]** FIG. 1 is a perspective view of a dual flush valve according to an embodiment of the invention;

**[0012]** FIG. 2 is a front elevational view of the dual flush valve illustrated in FIG. 1;

**[0013]** FIG. 3 is a right side elevational view of the dual flush valve illustrated in FIGS. 1 and 2;

**[0014]** FIG. 4 is a top plan view of the dual flush valve illustrated in FIGS. 1-3;

[0015] FIG. 5 is a bottom view of the dual flush valve illustrated in FIGS. 1-4;

[0016] FIG. 6 is a cross-sectional view taken along cutting plane 6-6 as shown in FIG. 5;

[0017] FIG. 7 is a cross-sectional view taken along cutting plane 7-7 as shown in FIG. 5;

[0018] FIG. 8 is a cross-sectional view of a dual flush valve according to an embodiment of the invention having an integral lower float; and

[0019] FIG. 9 is a side elevational view of a dual flush valve according to an embodiment of the invention having an integral lower float and a modified flush lever assembly.

#### DETAILED DESCRIPTION

[0020] Referring now to FIGS. 1-7 a dual flush valve 10 for a water closet 12 is illustrated. An operator can flush the water closet 12 in a chosen operational mode by using a manual lever 14 provided for selectively controlling an operational flush mode between a first mode releasing a preselected portion or volume of a quantity of liquid held in a flush tank 16, and a second mode releasing substantially all of the volume of a quantity of liquid held in the flush tank 16. Each release completes an operator initiated flush cycle for the particular operational flush mode selected by the operator. The dual flush valve 10 includes an outflow pipe 18 that is sealingly attachable to the flush tank 16 to extend through an opening 20 in a bottom 22 of the flush tank 16. The outflow pipe 18 includes an upwardly extending guide member 24, best seen in FIGS. 6 and 7.

[0021] The upwardly extending guide member 24 can include two vertically extending walls 26, 28 having a horizontal cross section defining a generally X-shaped intersection 30, best seen in FIG. 5, with respect to one another adjacent a midpoint of each wall 26, 28. Each vertically extending outer end 26a, 26b, 28a, 28b of the two walls 26, 28 defining a guide surface 32 for engagement with complementary interior surfaces 34, 36 of the lower flush valve 38 and upper flush valve 40. A cap 42 can be attached to an upper end 44 of the upwardly extending guide member 24 to maintain an assembly of the lower and upper flush valves 38, 40 on the guide member 24.

[0022] A lower seal 46 can be supported from the outflow pipe 18 adjacent the bottom 22 of the flush tank 16, or can be supported from a lower portion of the lower flush valve 38. The lower flush valve 38 guidingly engages on the upwardly extending guide member 24 for reciprocal movement between a lowered position 48 sealingly the lower seal 46 and a full volume flush position 60, shown in phantom in FIG. 7, unsealing the lower seal 46. An upper seal 52 can be supported from the lower flush valve 38 adjacent an upper end 54 of the lower flush valve 38, or can be supported from a lower portion of the upper flush valve 40.

[0023] The upper flush valve 40 guidingly engages on the upwardly extending guide member 24 for reciprocal movement between a lower sealed position 56 sealing the upper seal 52, a partial volume flush position 58 (shown in phantom in FIG. 7) unsealing the upper seal 52, and a full volume flush position 60 (also shown in phantom in FIG. 7). The upper flush valve 40 includes an actuator attachment 62 for moving the upper flush valve 40 between the lower sealed position 56, the partial volume flush position 58, and the full volume flush position 60. The manual lever 14 can be directly connected or indirectly connected to the actuator attachment 62.

[0024] The manual lever 14 can be moved in a rotational direction about a pivot axis through a first angular arc to move the upper flush valve from the lower sealed position 56 to the partial volume flush position 58. Continued movement of the manual lever in the same rotational direction through an additional second angular arc, or in an opposite rotational direction as described with respect to FIG. 9, moves the upper flush valve 40 from the partial volume flush position 58 to the full volume flush position 60. Movement of the upper flush valve to the full volume flush position 60 transfers motion to the lower flush valve through an interconnecting lost motion member 64 to move the lower flush valve from the lowered position 48 to the full volume flush position 50. The lost motion member 64 allows initial motion of the upper flush valve 40 between the lower sealed position 56 to the partial volume flush position 60 to be "lost" with respect to the lower flush valve 38, while additional motion of the upper flush valve 40 to the full volume flush position 60 is transferred through lost motion member 64 to move the lower flush valve 38 from the sealed lowered position 48 to the full volume flush position 60.

[0025] The lower and upper flush valves 38, 40 are arranged in vertical alignment with respect to one another to move along a common central longitudinal axis. An overflow pipe 66 extends along the guide member 24 and is defined between an upper end 68 of the upper flush valve 40 and a lower end 70 of the lower flush valve 38 when sealingly engaged with respect to one another, i.e. with the lower flush valve 38 in the lowered position 48 and the upper flush valve 40 in the lower sealed position 56. An upper float 72 can be operably associated with the upper flush valve 40. By way of example and not limitation, the upper float 72 can be formed, at least in part, integrally in one piece as part of the upper flush valve 40 as illustrated in FIGS. 1-8, or as separate pieces assembled to the upper flush valve, such as in a manner similar to that illustrated for the lower float 74 illustrated in FIGS. 1-7 to allow adjustment of the elevation of the upper float 72 with respect to the upper flush valve 40 if desired, or any combination thereof.

[0026] A lower float 74 can be operably associated with the lower flush valve 38. An adjustable connection 76 can be provided between the lower float 74 and the lower flush valve 38. The adjustable connection 76 allows adjustable vertical positioning of the lower float 74 with respect to the lower flush valve 38 to accommodate different configurations of flush tank 16. The adjustable connection 76 can include at least one inwardly extending wall 78 associated with the lower float 74. The wall 78 can operably engage with respect to one of a plurality of complementary wall-receiving slots or apertures 80 formed in a vertically extending array 82 along the lower flush valve 38. The adjustment of the lower float 74 is made by rotating the float 74 through a sufficient angular arc with respect to a longitudinal centerline of the lower valve 38, moving the float 74 longitudinally along the centerline in a desired direction to align with another slot or aperture 80 at a different elevation, and rotating the float 74 back to engage the wall 78 within the slot or aperture 80 corresponding to the desired elevation of the lower float 74. A locking flexible tab 90 angularly locks the lower float 74 against rotation with respect to the lower valve 38 by engaging within vertically extending slot 92. By flexing the tab 90 out of the slot 92, the lower float 74 can be angularly rotated with respect to the lower valve 38 in order to adjust the elevation of the lower float 74 within the flush tank 16.

[0027] The lower and upper floats 74, 72 provide sufficient buoyancy to allow the desired flushing modes of operation of the lower and upper valves 38, 40, while maintaining sufficient sealing pressure for each of the lower and upper valves 38, 40 individually, when in the lowered positions 48, 56 engaged against the lower and upper seals 46, 52. By way of example and not limitation, the lower float 74 can be formed, at least in part, integrally in one piece as part of the lower flush valve 38 as illustrated in FIG. 8, or as separate pieces assembled to the lower flush valve, such as in the manner illustrated in FIGS. 1-7, or any combination thereof. If desired, a lower plate 94 can be operably associated with an open lower end of the upper float 40 and/or the lower float 38 (see FIG. 8). The lower plate 94 prevents turbulent water flow at the beginning of a flush cycle from displacing, or evacuating, the air providing the buoyancy within the float 38 or 40. The plate 94 can be supported from the corresponding flush valve 38 or 40. An airtight seal between the plate 94 and the float 38 or 40 is not required.

[0028] The interconnecting lost motion member 64 can extend between the lower flush valve 38 and the upper flush valve 40. The lost motion member 64 allows movement of the upper flush valve 40 between the lower sealed position 56 and the partial volume flush position 58 without disturbing, or moving, the lower flush valve 38. The lost motion member 64 can transmit additional vertical movement of the upper flush valve 40, from the partial volume flush position 58 to the full volume flush position 60, to the lower flush valve 38 to move the lower flush valve 38 from the lowered position 48 to the full volume flush position 50.

[0029] The lost motion member 64 can include an upwardly extending arm 84 associated with the lower flush valve 38. The arm 84 can include an enlarged upper end 86. A complementary aperture 88 can be associated with the upper flush valve 40 allowing sliding reciprocal movement of the arm 84 within the aperture 88 while the upper flush valve 40 moves between the lower sealed position 56 and the partial volume flush position 58 without disturbing or moving the lower flush valve 38. Additional vertical movement of the upper flush valve 40 from the partial volume flush position 58 to the full volume flush position 60 transfers vertical movement to the lower flush valve 38, since the enlarged upper end 86 of arm 84 is too large to pass through aperture 88 and effectively lifts lower flush valve 38 from the lowered position 48 so that the lower flush valve 38 moves to the full flush position 50. It should be recognized that the elements described can be reversed, i.e. the arm can be associated with the upper flush valve and extend downwardly to be slidably received within a complementary aperture associated with the lower flush valve without departing from the disclosed invention.

[0030] As illustrated in FIG. 9, the lost motion member 64 can include an upwardly extending arm 84 associated with opposite sides of the lower flush valve 38. Each arm 84 can include an enlarged inwardly extending upper end 86. An outwardly extending tab, ledge, ridge, or flange 88a can be associated with the upper flush valve 40 allowing movement of the upper flush valve 40 with respect to the lower flush valve 38 while the upper flush valve 40 moves between the lower sealed position 56 and the partial volume flush position 58 without disturbing or moving the lower flush valve 38. The outwardly extending flange 88a can be formed as part of the upper seal 52 and mounted on a lower end of the upper flush valve 40. Additional vertical movement of the upper flush

valve 40 from the partial volume flush position 58 to the full volume flush position 60 transfers vertical movement to the lower flush valve 38, since the enlarged inwardly extending upper end 86 of arm 84 engages with the outwardly extending flange 88a associated with the upper flush valve 40 and effectively lifts lower flush valve 38 from the lowered position 48 so that the lower flush valve 38 moves to the full flush position 50. It should be recognized that the elements described can be reversed, i.e. the arm can be associated with the upper flush valve and extend downwardly to engage with an outwardly extending flange associated with the lower flush valve without departing from the disclosed invention.

[0031] Still referring to FIG. 9, a manual flush lever 14 is illustrated mounted to a wall of the flush tank 16. The manually operated portion of the flush lever 14 is located on an external surface of the flush tank 16 with a support plate 96 located internally with respect to the flush tank 16. The support plate 96 includes an aperture 98 allowing passage of a rotatable shaft 100 fixedly associated with the manual flush lever 14 for pivoting movement in both clockwise and counterclockwise directions. The shaft 100 supports a cam member 102 having a cam surface 104 spaced from the shaft 100 and fixedly coupled for rotation with the shaft 100. The cam member 102 includes a rotation-limiting stop portion 106. The stop portion 106 of the cam member 102 operatively engages a first stop pin or member 108 supported by the support plate 96 to limit rotation of the manual lever 14 in a clockwise direction (looking at the manual lever 14 from outside the flush tank 16), and operatively engages a second stop pin or member 110 supported by the support plate 96 to limit rotation of the manual lever 14 in a counterclockwise direction. The support plate 96 can also include a pivot pin 112 generally located vertically above and horizontally offset from the aperture 98 for rotatably supporting a flush valve actuator arm 114. The actuator arm 114 includes a cam follower surface 116 engageable with the cam surface 104 for rotational movement between the normal dual valve closed position 118 (corresponding to the lowered position 48 of the lower flush valve 38 and the lower sealed position 56 of the upper flush valve 40), the partial volume flush position 120 (corresponding to the partial volume flush position 58 of the upper valve 40), and the full volume flush position 122 (corresponding to the full volume flush position 50 of the lower flush valve 38 and the full volume flush position 60 of the upper flush valve 40). The normal closed position 118 of the actuator arm 114 corresponds to the rest position of the manually operated lever 14. The partial volume flush position 120 of the actuator arm 114 corresponds to rotation of the manually operated lever 14 in a clockwise direction to engage the stop pin or member 108. The full volume flush position 122 of the actuator arm 114 corresponds to rotation of the manually operated lever 14 in a counterclockwise direction to engage the stop pin or member 110. It should be noted that the manually operated lever 14 can be in any desired angular rest position, and is not limited to a rest position extending vertically downward as illustrated in FIG. 9.

[0032] When a partial volume flush mode of operation has been selected by an operator turning the manual lever through a first angular arc, the upper valve 40 is lifted to break the sealing engagement of upper seal 52 and, as the seal is broken between the upper valve 40 and upper seal 52, hydrostatic force on the upper valve 40 is reduced and the upper float 72 provides sufficient buoyant force to assist in raising the upper valve 40 to the partial volume flush position 58. The upper

valve 40 is maintained in a buoyant floating condition until the water level of the tank 16 falls to a level where the buoyancy of upper float 72 is insufficient to continue to keep the upper valve 40 afloat and the upper valve 40 reseats and seals the upper seal 52. In the event of an operator only rotating the manual lever 14 through the first angular arc, to select a partial volume flush mode, when the predetermined volume of liquid in the flush tank 16 above the upper end 54 of the lower flush valve 38 has been evacuated from the flush tank 16, the upper flush valve 40 reseats the upper seal 52 allowing the flush tank 16 to be refilled by a conventional intake valve (not shown). A standard water refill tube (not shown) can be assembled to the cap 42 to permit refill water to pass through the open passage through the cap 42 and along intersecting walls 26, 28 to flow quietly into the bowl (not shown) of the water closet 12. In the partial volume flush mode of operation, if the intake valve allows excess liquid to enter the flush tank 16, the excess liquid escapes out of the flush tank 16 by flowing over the upper end 68 of upper valve 40 and through overflow pipe 66.

[0033] When a full volume flush mode of operation has been selected by an operator turning the manual lever through a second angular arc (either in an opposite direction or further rotation in the same direction, depending on the actuator being used), the upper valve 40 is lifted to the full volume flush position 60, and the lower valve 38 is lifted to break the lower seal 46 and, as the lower seal is broken, hydrostatic force on the lower valve 38 is reduced and the lower float 74 provides sufficient buoyant force to assist in raising the lower valve 38 to the full volume flush position 50. The upper end 68 of upper valve 40 can strike the cap 42, while in a buoyant floating condition, and the assembly of the upper valve 40 and lower valve 38 on the guide member 24 is maintained by the cap 42 on the upper end of the guide member 24. The lower valve 38 is maintained in a buoyant floating condition by the lower float 74 until the water level of the tank 16 falls to a level where the buoyancy of the lower float 74 is insufficient to continue to keep the lower valve 38 afloat, i.e. when substantially all of the liquid has been evacuated from the flush tank 16. The lower flush valve 38 then reseats and seals the lower seal 46 in the lowered position 48, and the upper flush valve 40 reseats and seals the upper seal 52, allowing the flush tank 16 to be refilled by a conventional intake valve (not shown). A standard water refill tube (not shown) can be assembled to the cap 42 to permit refill water to pass through the open passage through the cap 42 and along intersecting walls 26, 28 to flow quietly into the bowl (not shown) of the water closet 12. In the full volume flush mode of operation, if the intake valve allows excess liquid to enter the flush tank 16, the excess liquid escapes out of the flush tank 16 by flowing over the upper end 68 of upper flush valve 40 and through overflow pipe 66.

[0034] While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law.

1. A dual flush valve for a water closet, where an operator can flush the water closet in a chosen operational mode using a manual lever provided for selectively controlling an opera-

tional flush mode between a first mode releasing a preselected portion, and a second mode releasing substantially all, of a quantity of liquid held in a flush tank, each release completing an operator initiated flush cycle, the dual flush valve comprising:

- a outflow pipe sealingly attachable to a flush tank to extend through an opening in a bottom of the flush tank, the outflow pipe including an upwardly extending guide member;
  - a lower flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lowered sealingly engaged position and a full volume flush position spaced from the lowered position;
  - an upper flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lower sealed position engaged with the lower flush valve, a partial volume flush position spaced from the lower flush valve, and a full volume flush position; and
  - an interconnecting lost motion member extending between the lower flush valve and the upper flush valve, such that the lost motion member allows movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transmitting additional vertical movement of the upper flush valve to the lower flush valve to move the lower flush valve between the lowered sealingly engaged position and the full volume flush position.
2. The dual flush valve of claim 1 further comprising: the lower and upper valves arranged in vertical axial alignment with one another.
3. The dual flush valve of claim 1, wherein the interconnecting lost motion member further comprises:
- a vertically extending arm associated with one of the lower flush valves and having an enlarged outer end; and
  - a complementary engaging structure associated with the other of the flush valves and operably interacting with the vertically extending arm of the one flush valve, the complementary structure allowing movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transferring additional vertical movement of the upper flush valve beyond the partial volume flush position to the full volume flush position to the lower flush valve to move the lower flush valve from the lowered sealingly engaged position to the full volume flush position.
4. The dual flush valve of claim 1, wherein the upwardly extending guide member further comprises:
- two vertically extending walls having a horizontal cross section defining a generally X-shaped intersection with respect to one another adjacent a midpoint, each vertically extending outer end of the two walls defining a guide surface for engagement with complementary interior surfaces of the lower and upper flush valves; and
  - a cap attached to an upper end of the upwardly extending guide member to maintain an assembly of the lower and upper flush valves on the guide member.
5. The dual flush valve of claim 1 further comprising:
- an overflow pipe extending along the guide member and defined between an upper end of the upper flush valve and a lower end of the lower flush valve when sealingly engaged with respect to one another.

6. The dual flush valve of claim 1 further comprising:  
 a manually operated flush lever for driving pivoting movement of an associated cam surface; and  
 an actuator arm mounted at one end for rotation about a fixed axis spaced from the manually rotated lever, the actuator arm connected at an opposite end to the upper flush valve, the actuator arm having a cam follower surface engageable with the cam surface of the lever for movement between a dual flush valve closed position to a partial flush position and to a full flush position in response to rotation of the manually operated lever.
7. The dual flush valve of claim 1 further comprising:  
 an upper float operably associated with the upper flush valve.
8. The dual flush valve of claim 1 further comprising:  
 a lower float operably associated with the lower flush valve.
9. The dual flush valve of claim 8 further comprising:  
 an adjustable connection of the lower float to the lower flush valve, the adjustable connection allowing adjustable vertical positioning of the lower float with respect to the lower flush valve.
10. The dual flush valve of claim 9, wherein the adjustable connection further comprises:  
 at least one inwardly extending wall associated with the lower float and operably engageable with respect to one of a plurality of complementary wall-receiving apertures formed in a vertically extending array along the lower flush valve.
11. A dual flush valve for a water closet, where an operator can flush the water closet in a chosen operational mode using a manual lever provided for selectively controlling an operational flush mode between a first mode releasing a preselected portion, and a second mode releasing substantially all, of a quantity of liquid held in a flush tank, each release completing an operator initiated flush cycle, the dual flush valve comprising:  
 an outflow pipe sealingly attachable to a flush tank to extend through an opening in a bottom of the flush tank, the outflow pipe including an upwardly extending guide member;  
 a lower seal;  
 a lower flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lowered position sealingly engaged with respect to the outflow pipe and a full volume flush position spaced from the lowered position;  
 a lower float operably associated with the lower flush valve;  
 an upper seal;  
 an upper flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lower sealed position sealingly engaged with respect to the lower flush valve, a partial volume flush position spaced from the lower flush valve, and a full volume flush position; and  
 an upper float operably associated with the upper flush valve.
12. The dual flush valve of claim 11 further comprising:  
 the lower and upper valves arranged in vertical axial alignment with one another.
13. The dual flush valve of claim 11 further comprising:  
 an interconnecting lost motion member extending between the lower flush valve and the upper flush valve, such that the lost motion member allows movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transmitting additional vertical movement of the upper flush valve to the lower flush valve to move the lower flush valve between the lowered position and the full volume flush position.
14. The dual flush valve of claim 13, wherein the interconnecting lost motion member further comprises:  
 a vertically extending arm associated with one of the flush valves and having an enlarged outer end; and  
 a complementary engaging structure associated with the other of the flush valves and operably interacting with the enlarged outer end of the vertically extending arm of the one flush valve, the complementary engaging structure allowing movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transferring additional vertical movement of the upper flush valve beyond the partial volume flush position to the full volume flush position to the lower flush valve to move the lower flush valve from the lowered position to the full volume flush position.
15. The dual flush valve of claim 11, wherein the upwardly extending guide member further comprises:  
 two vertically extending walls having a horizontal cross section defining a generally X-shaped intersection with respect to one another adjacent a midpoint, each vertically extending outer end of the two walls defining a guide surface for engagement with complementary interior surfaces of the lower and upper flush valves; and  
 a cap attached to an upper end of the upwardly extending guide member to maintain an assembly of the lower and upper flush valves on the guide member.
16. The dual flush valve of claim 11 further comprising:  
 an overflow pipe extending along the guide member and defined between an upper end of the upper flush valve and a lower end of the lower flush valve when sealingly engaged with respect to one another.
17. The dual flush valve of claim 11 further comprising:  
 a manually operated flush lever for driving pivoting movement of an associated cam surface; and  
 an actuator arm mounted at one end for rotation about a fixed axis spaced from the manually rotated lever, the actuator arm connected at an opposite end to the upper flush valve, the actuator arm having a cam follower surface engageable with the cam surface of the lever for movement between a dual flush valve closed position to a partial flush position and to a full flush position in response to rotation of the manually operated lever.
18. The dual flush valve of claim 11 further comprising:  
 an adjustable connection of the lower float to the lower flush valve, the adjustable connection allowing adjustable vertical positioning of the lower float with respect to the lower flush valve.
19. The dual flush valve of claim 18, wherein the adjustable connection further comprises:  
 at least one inwardly extending wall associated with the lower float and operably engageable with respect to one of a plurality of complementary wall-receiving apertures formed in a vertically extending array along the lower flush valve.
20. A dual flush valve for a water closet, where an operator can flush the water closet in a chosen operational mode using a manual lever provided for selectively controlling an opera-

tional flush mode between a first mode releasing a preselected portion, and a second mode releasing substantially all, of a quantity of liquid held in a flush tank, each release completing an operator initiated flush cycle, the dual flush valve comprising:

- an outflow pipe sealingly attachable to a flush tank to extend through an opening in a bottom of the flush tank, the outflow pipe including an upwardly extending guide member;
- a lower seal;
- a lower flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lowered position sealingly engaged with respect to the outflow pipe and a full volume flush position spaced from the lowered position;
- a lower float operably associated with the lower flush valve;
- an upper seal;
- an upper flush valve guidingly engaged on the upwardly extending guide member for reciprocal movement between a lower sealed position engaged with respect to the lower flush valve, a partial volume flush position spaced from the lower flush valve, and a full volume

flush position, the lower and upper valves arranged in vertical axial alignment with one another and when sealingly engaged with respect to one another defining an overflow pipe extending along the guide member between an upper end of the upper flush valve and a lower end of the lower flush valve, the upper flush valve including an actuator attachment for moving the upper flush valve between the lower sealed position, the partial volume flush position, and the full volume flush position;

an upper float operably associated with the upper flush valve; and

an interconnecting lost motion member extending between the lower flush valve and the upper flush valve, such that the lost motion member allows movement of the upper flush valve between the lower sealed position and the partial volume flush position without disturbing the lower flush valve, while transmitting additional vertical movement of the upper flush valve to the lower flush valve to move the lower flush valve between the lowered position and the full volume flush position.

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