



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 428 945 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

16.06.2004 Bulletin 2004/25

(51) Int Cl.7: **E03D 1/14**

(21) Application number: **03257704.1**

(22) Date of filing: **08.12.2003**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

Designated Extension States:

AL LT LV MK

(72) Inventors:

- **Brooks, Peter**
Nuthall, Nottinghamshire NG16 1PR (GB)
- **Lang, John**
Scunthorpe, North Lincolnshire DN17 4EZ (GB)

(30) Priority: **12.12.2002 GB 0229013**

(71) Applicant: **Polypipe Bathroom & Kitchen
Products Ltd.**

Warmsworth, Doncaster DN4 9LS (GB)

(74) Representative: **Evans, Claire**

Edward Evans Barker
Clifford's Inn
Fetter Lane
London EC4A 1BZ (GB)

(54) Float valve assembly

(57) Valve assembly for discharging a cistern, the valve assembly comprising a valve member (2), first and second actuating means (3,4) for opening and closing the valve member (2), and first and second float elements (5,6) for delaying closure of the valve member, the first and second actuating means comprising means for selectively engaging either the first float element or the second float element with the valve member.

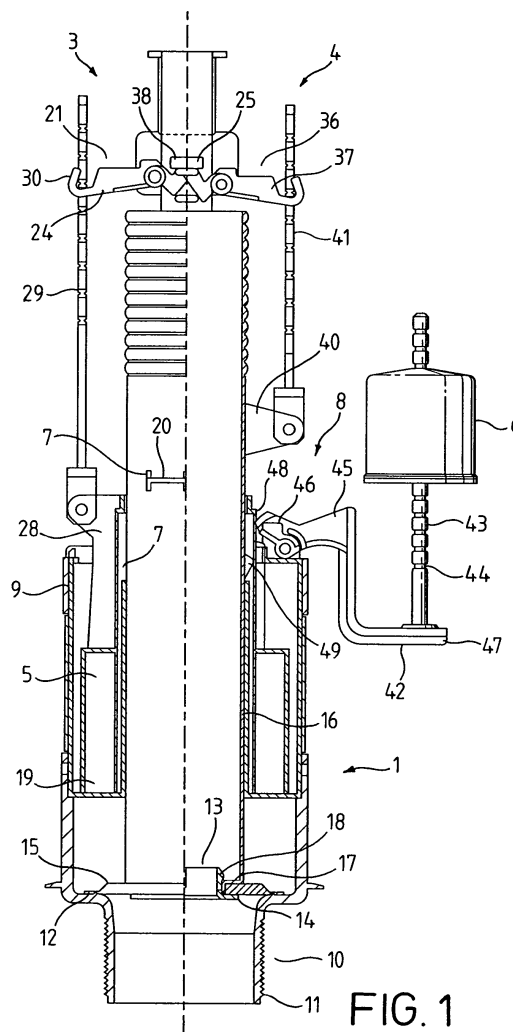


FIG. 1

EP 1 428 945 A2

Description

[0001] The invention relates to a valve assembly, more especially to a valve assembly for discharging a cistern such a lavatory cistern.

[0002] Water is conventionally discharged from lavatory cisterns by a siphon installed inside the cistern. However, United Kingdom water regulations have been changed so that they now allow water to be directly discharged from a lavatory cistern. Water conservation is considered to be of increasing importance in the United Kingdom, and so it is desirable to have a dual flush system in which the user can select either full discharge of the cistern or partial discharge of the cistern.

[0003] It is an object of the invention to provide a valve assembly which will allow water to be directly discharged from a cistern, and which will also allow the user to select either full discharge of the cistern or partial discharge of the cistern.

[0004] Accordingly, the present invention provides a valve assembly for discharging a cistern, the valve assembly comprising a valve member, first and second actuating means for opening and closing the valve member, and first and second float elements for delaying closure of the valve member, the first and second actuating means comprising means for selectively engaging either the first float element or the second float element with the valve member.

[0005] The valve member allows water to be directly discharged from the cistern. The float elements delay closure of the valve member, thereby ensuring that a sufficient volume of water is discharged from the cistern into the pan of the lavatory. By using two different float elements which are selectively engaged with the valve member, it is possible to control the amount of water that is discharged from the cistern on use of either the first or second actuating means. This means that it is possible to provide a system in which the user can select either a full or partial discharge of the cistern.

[0006] The first actuating means may comprise a first lever, the first float element being connected to the first arm of said first lever, whereby depressing the second arm of said first lever raises the first float element.

[0007] The valve assembly may comprise an elongate member, which is connected at one end to the valve member, and means for engaging the first float element with the elongate member, whereby the elongate member, and so the valve member, is raised when the first float element is raised.

[0008] The first float element may be annular, and may be slidably mounted on the elongate member, which extends through the centre of the first float element.

[0009] The means for engaging the first float element with the elongate member may comprise a projection on the elongate member.

[0010] The first lever may be mounted on an element of adjustable length, and the means for connecting the

first float element with the first arm of said first lever may be of adjustable length, whereby the valve assembly may be used with cisterns of different heights.

[0011] The second actuating means may comprise a second lever, the elongate member being connected to the first arm of said second lever, whereby depressing the second arm of said second lever raises the elongate member, and so the valve member.

[0012] The valve member may comprise means for engaging the second float element with the elongate member when the elongate member is raised.

[0013] The means for engaging the second float element with the elongate member may comprise a projection on the elongate member.

[0014] The second float element may be connected to the first arm of a third lever, the second arm of the third lever projecting through an opening in the first float element, whereby the projection on the elongate member engages with the second arm of the third lever when the elongate member is raised.

[0015] The third lever may pivot when the amount of water in the cistern is no longer sufficient to support the weight of the second float element, thereby releasing the elongate member.

[0016] The second lever may be mounted on an element of adjustable length, and the means for connecting the elongate member with the first arm of said second lever may be of adjustable length whereby the valve assembly may be used with cisterns of different heights.

[0017] The means for adjusting the length of the elements for mounting the first and second levers and/or the connecting means may comprise a number of space projections and means for engaging a selected projection.

[0018] The means for adjusting the length of the elements for mounting the first and second lever and/or the connecting means may comprise a number of spaced openings and means for engaging a selected opening.

[0019] The second lever arm of each of the first lever and second lever may be depressed by means of a push button.

[0020] The second lever arms may each have a curved profile to facilitate movement thereof.

[0021] The first lever and the second lever may be mounted on the same element.

[0022] The element for mounting the first and second levers may be flexible. This means that differences in alignment between the base of the valve assembly, and the push button, caused by manufacturing tolerances in ceramic cisterns, can be accommodated.

[0023] The elongate member may act as an overflow element.

[0024] The elongate member may comprise a tube, and the valve member may comprise a plug which is movably mounted and is biased towards the valve member, whereby if the water level reaches a level above that of the tube, water flows down the tube and depresses the plug.

[0025] The valve member may comprise a seal and the plug may comprise a flange which supports the seal, whereby the seal is raised when the elongate member is raised, but is not depressed when the plug is depressed.

[0026] The height of the second float element may be adjustable.

[0027] The second float element may be centrally mounted on a shaft, or it may be mounted to the side of a shaft.

The means for adjusting the height of the second float element may comprise a number of spaced recesses and means for engaging a selected recess.

[0028] The means for adjusting the height of the second float element may comprise a ratchet.

[0029] Two embodiments of the invention are now described by way of example with reference to the accompanying drawings.

Figure 1 is a part cross-sectional view of a first embodiment of a valve assembly according to the invention;

Figure 2 is a perspective view of the valve assembly;

Figure 3 is the opposing perspective view of the valve assembly of Figure 1;

Figure 4 is an exploded side cross-sectional view of a second embodiment of a valve assembly according to the invention;

Figure 5 is a side view of the valve assembly of Figure 4; and

Figure 6 is a perspective view of the valve assembly of Figure 4.

[0030] Referring to the drawings, there is shown a valve assembly 1 for discharging water from a cistern, the valve assembly comprising a valve member 2, first and second actuating means 3, 4 for opening and closing the valve member 2, and first and second float elements 5, 6 for delaying closure of the valve member 2, the first and second actuating means 3, 4 comprising means 7, 8 for selectively engaging either the first float element 5 or the second float element 6 with the valve member 2.

[0031] The valve assembly 1 shown in Figures 1 to 3 is made of plastics material, and comprises a cylindrical housing 9 having at its lower end a valve base 10 with an integral screw fitting 11, which allows the valve assembly 1 to be connected to a pipe external to the base of a cistern for discharging water into the pan of a lavatory. The connector 10 includes on its inner surface a projecting rim 12, which acts as a valve seat for the valve member 2.

[0032] The valve member 2 comprises a retainer 13 having at its base a circular flange 14, which supports an annular seal 15, which is seated on the projecting rim 12.

5 **[0033]** A tube 16 is supported on the seal 15 by means of a flange 17 at the base of the first tube 16. The retainer 13 is not connected to the seal 15, but is instead supported by the flange 17 by means of a projecting rim 18 on the retainer 13.

10 **[0034]** The tube 16 extends through the centre of the first float element 5, which is annular, and which has an opening 19 at its lower end, whereby air is trapped in the first float element 5.

[0035] The first float element 5 is slideably mounted on the tube 16. The tube 16 comprises two projections 20, which are positioned slightly above the first float element 5, and which engage with the leading edge of the first float element 5 when that element is raised, so that the tube 16 is raised shortly after the first float element 5 begins to rise.

[0036] A first lever 21 is pivotally mounted on a yoke 22, the two prongs 23 of which are mounted on either side of the housing 9. The first lever 21 comprises a first arm 24 and a second arm 25.

25 **[0037]** The yoke 22 includes a depression 26 for receiving a first push button 27 for depressing the second lever arm 25. The first lever arm 24 is connected to a projecting arm 28 on the first float element 5 by means of a connecting member 29, so that when the first push button 27 is depressed, the first float element 5 is raised.

30 **[0038]** The first lever arm 24 comprises a hook 30, and the connecting member 29 includes a number of spaced openings 31. The hook 30 may be passed through any one of the openings 31, whereby the length of the connecting member 29 may be adjusted.

35 **[0039]** The length of the yoke 22 may similarly be adjusted by means of a number of spaced projections 32 and means 33 for engaging a selected projection 32, the means 33 comprising a U-shaped clip 34, each prong of which may be inserted through two apertures 35 in two supports 35' mounted on either side of the housing 9. Each support 35' includes a U-shaped vertical channel.

[0040] A second lever 36 is pivotally mounted on the yoke 22. The second lever 36 comprises a first arm 37 and a second arm 38.

[0041] The depression 26 in the yoke 22 receives a second push button 39 for depressing the second lever arm 38. The first lever arm 37 is connected to a projecting arm 40 on the tube 16 by means of a second connecting member 41, so that when the second push button 39 is depressed, the tube 16 is raised.

[0042] The length of the second member 41 may be adjusted in the same way as the first connecting member 29.

55 **[0043]** The second float element 6 is bell-shaped and is connected to a third lever 42 by means of a connecting member 43, which extends through the centre of the second float element 6. The connecting member 43

comprises a plurality of notches 44 and the second float element 6 comprises means (not shown) for engaging any one of those notches 44, whereby the height of the second float element 6 may be adjusted.

[0044] The third lever 42 is pivotally mounted on the housing 9, and comprises a first arm 45, and a second arm 46. The first arm 45 has an L-shaped flange 47 at one end, which carries the connecting member 43. The second arm 46 projects through an opening 48 in the first float element 5. A projection 49 is positioned on the tube 16 just below where the second arm 46 projects through the opening 48 in the first float element.

[0045] The valve assembly 1 is connected to a pipe external to the base of a cistern by means of screw fitting 11. The cistern is then filled with water. The water enters the valve assembly 1 through windows 50 in the housing 9, but is prevented from entering the float elements 5, 6 by the air trapped therein.

[0046] Water is fully discharged from the cistern by depressing the first push button 27, which in turn depresses the second arm 25 of the first lever 21, and so raises the first arm 24 of that lever. Raising first lever arm 24 raises connecting member 29, and so first float element 5. The leading edge of first float element 5 then engages with the two projections 20, and so raises tube 16 shortly after the first float element 5 begins to rise. Raising tube 16 raises both the retainer 13 and the seal 15 of the valve member 2, thereby allowing water to be discharged through the pipe at the base of the cistern.

[0047] When the first push button 27 is released, the second lever arm 25 returns to its original position, as do the first lever arm 24, connecting member 29, first float element 5, tube 16 and both the retainer 13 and the seal 15 of the valve member 2. However, the return of those elements is delayed by the first float element 5, which floats until the level of the water in the cistern is no longer sufficient to support the combined weight of the elements, thereby ensuring that the valve member 2 is open for long enough to allow a sufficient volume of water to be discharged from the cistern into the pan of the lavatory.

[0048] The second float element 6 is not engaged when the first push button 27 is depressed, because raising the first float element 5 causes the leading edge of the opening 48 in the first float element 5 to knock the second arm 46 of the third lever 42, so causing the second arm 46 to pivot clockwise until it no longer projects through the opening 48 in the first float element 5. When the second arm 46 pivots anti-clockwise to return to its equilibrium position, the first float element 5 has been raised sufficiently that the opening 48 is no longer in line with the second arm 46 so that the second arm 46 cannot project through the opening 48, and so engage with the projection 49 on the tube 16 once that tube 16 is raised.

[0049] Water is partially discharged from the cistern by depressing the second push button 39, which in turn depresses the second arm 38 of the second lever 36,

and so raises the first arm 37 of that lever. Raising first lever arm 37 raises the tube 16, and so both the retainer 13 and the seal 15 of the valve member 2, thereby allowing water to be discharged through the pipe at the base of the cistern.

[0050] Raising the tube 16 causes the projection 49 to knock the second arm 46 of the third lever 42, so causing the second arm 46 to pivot clockwise until it no longer projects through the opening 48 in the first float element 5. The second arm 46 then pivots anti-clockwise to return to its equilibrium position in which it projects through the opening 48 in the first float element 5, this being possible as the first float element 5 is not raised by depressing the second push button 39. In the meantime, the tube 16 has continued to rise so that the projection 49 will be positioned above the second arm 46 once it returns to its equilibrium position.

[0051] When the second push button 39 is released, the return of the tube 16 to its original position is delayed by the projection 49 abutting the second arm 46 of the third lever 42. The return of the tube 16 will continue to be delayed until the level of water in the cistern is no longer sufficient to support the second float element 6, and the third lever 42 pivots until the second arm 46 of the third lever 42 no longer projects through the opening 48 in the first float element 5, and so no longer prevents the tube 16 from returning to its original position. The point at which the third lever 42 pivots can be adjusted by adjusting the height of the second float element 6, whereby the amount of water which is discharged from the cistern can be adjusted.

[0052] If the water level in the cistern reaches above the level of the tube 16, water will flow down the tube 16. Thus, the tube 16 acts as an internal overflow device.

[0053] The length of the valve assembly 1 can be adjusted by means of the projections 32 and means 33 for engaging a selected projection 32 on the yoke 22 and the hook 30 and openings 31 on the first and second levers 21, 36 and connecting members 29, 41. This means that the valve assembly 1 may be used with cisterns of different heights.

[0054] The yoke 22 is made from a flexible grade of polypropylene. This flexibility allows for differences in alignment between the push buttons 27, 39 and the base of the valve 10, caused by manufacturing tolerances in ceramic cisterns, to be accommodated.

[0055] The valve assembly 51 shown in Figures 4 to 6 is similar to that shown in Figures 1 to 3, but includes the following modifications:-

1. The depression 52 in yoke 53 is smaller in diameter. This allows the valve assembly 51 to be accommodated within cisterns having a wider range of hole diameters within the cistern lid.

2. The connecting members 54, 55 include projections 56, rather than openings.

3. The free end of the second arms 57, 58 of the first and second levers 59, 60 have a circular profile to facilitate movement when actuated by the push button.

4. The tube 61 includes a circular flange 62, rather than two projections.

5. The second float element 63 is positioned on an outboard shaft 64, rather than on a central connecting member. The shaft 64 includes a ratchet 65 for adjusting the height of the second float element 63.

6. The U-shaped channel of the support 66 is discontinued at the base of the support 66 where it connects with the housing 67. This discontinuity in the support 66 increases the flexibility of the yoke 53.

Claims

1. Valve assembly for discharging a cistern, the valve assembly comprising a valve member, first and second actuating means for opening and closing the valve member, and first and second float elements for delaying closure of the valve member, the first and second actuating means comprising means for selectively engaging either the first float element or the second float element with the valve member.
2. Valve assembly according to Claim 1, wherein the first actuating means comprises a first lever, the first float element being connected to the first arm of said first lever, whereby depressing the second arm of said first lever raises the first float element.
3. Valve assembly according to Claim 2, the valve assembly comprising an elongate member, which is connected at one end to the valve member, and means for engaging the first float element with the elongate member, whereby the elongate member, and so the valve member, is raised when the first float element is raised.
4. Valve assembly according to Claim 3, wherein the first float element is annular, and is slideably mounted on the elongate member, which extends through the centre of the first float element.
5. Valve assembly according to Claim 4, wherein the means for engaging the first float element with the elongate member comprises a projection on the elongate member.
6. Valve assembly according to any of Claims 2 to 5, wherein the first lever is mounted on an element of adjustable length, and the means for connecting the first float element with the first arm of said first lever

is of adjustable length, whereby the valve assembly may be used with cisterns of different heights.

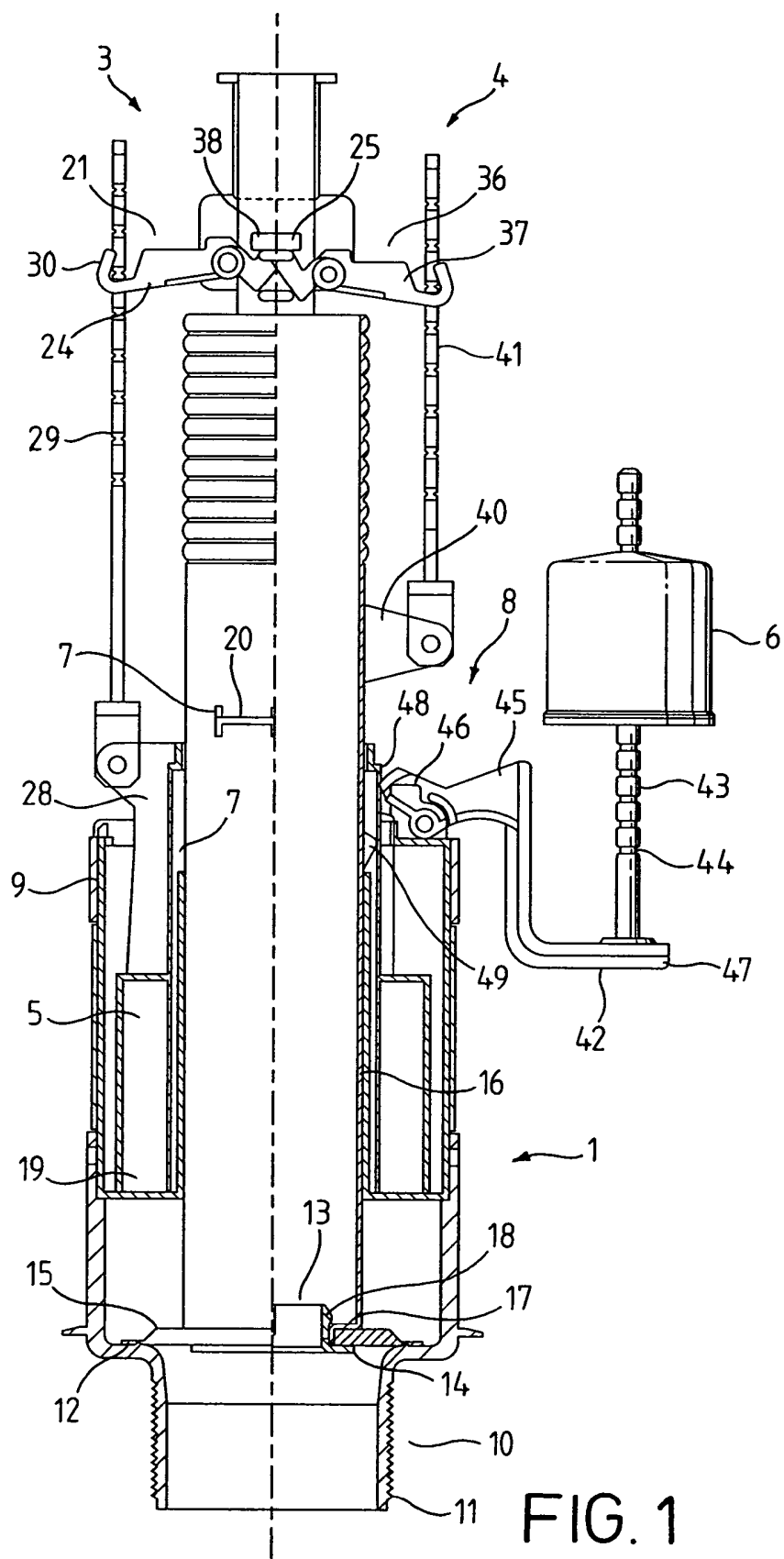
7. Valve assembly according to any of Claims 3 to 6, wherein the second actuating means comprises a second lever, the elongate member being connected to the first arm of said second lever, whereby depressing the second arm of said second lever raises the elongate member, and so the valve member.
8. Valve assembly according to Claim 7, the valve assembly comprising means for engaging the second float element with the elongate member when the elongate member is raised.
9. Valve assembly according to Claim 8, wherein the means for engaging the second float element with the elongate member comprises a projection on the elongate member.
10. Valve assembly according to Claim 9, wherein the second float element is connected to the first arm of a third lever, the second arm of the third lever projecting through an opening in the first float element, whereby the projection on the elongate member engages with the second arm of the third lever when the elongate member is raised.
11. Valve assembly according to Claim 10, wherein the third lever pivots when the amount of water in the cistern is no longer sufficient to support the weight of the second float element, thereby releasing the elongate member.
12. Valve assembly according to any of Claims 7 to 11, wherein the second lever is mounted on an element of adjustable length, and the means for connecting the elongate member with the first arm of said second lever is of adjustable length, whereby the valve assembly may be used with cisterns of different heights.
13. Valve assembly according to Claim 6 or Claim 12, wherein the means for adjusting the length of the elements for mounting the first and second levers and/or the connecting means comprise a number of spaced projections and means for engaging a selected projection.
14. Valve assembly according to Claim 6 or Claim 12, wherein the means for adjusting the length of the elements for mounting the first and second levers and/or the connecting means comprise a number of spaced openings and means for engaging a selected opening.
15. Valve assembly according to any of Claims 7 to 14, wherein the second lever arm of each of the first

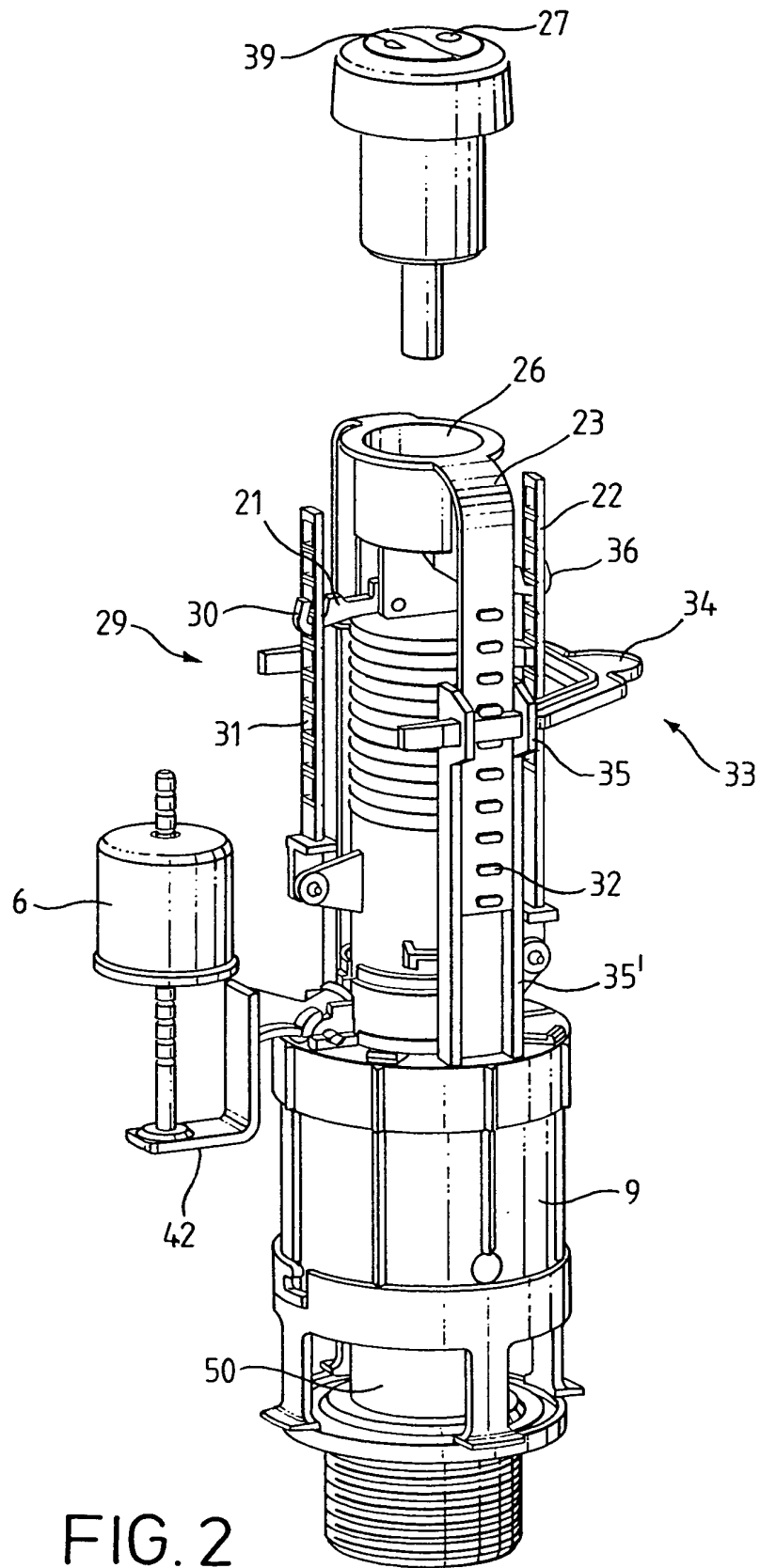
lever and second lever is depressed by means of a push button.

16. Valve assembly according to Claim 15, wherein the second lever arms each have a curved profile to facilitate movement thereof. 5
17. Valve assembly according to claim 15 or Claim 16, wherein the first lever and the second lever are mounted on the same element. 10
18. Valve assembly according to Claim 17, wherein the element for mounting the first and second levers is flexible, whereby differences in alignment between the second lever arms of said first and second levers and the push buttons can be accommodated. 15
19. Valve assembly according to any of Claim 3 to 18, wherein the elongate member acts as an overflow element. 20
20. Valve assembly according to any preceding claim, wherein the height of the second float element is adjustable. 25
21. Valve assembly according to Claim 20, wherein the second float element is centrally mounted on a shaft.
22. Valve assembly according to Claim 20, wherein the second float element is mounted to the side of a shaft. 30
23. Valve assembly according to any of Claims 20 to 22, wherein the means for adjusting the height of the second float element comprises a number of spaced recesses and means for engaging a selected recess. 35
24. Valve assembly according to Claim 23, wherein the means for adjusting the height of the second float element comprises a ratchet. 40
25. A cistern comprising a valve assembly according to any of Claims 1 to 24. 45

50

55





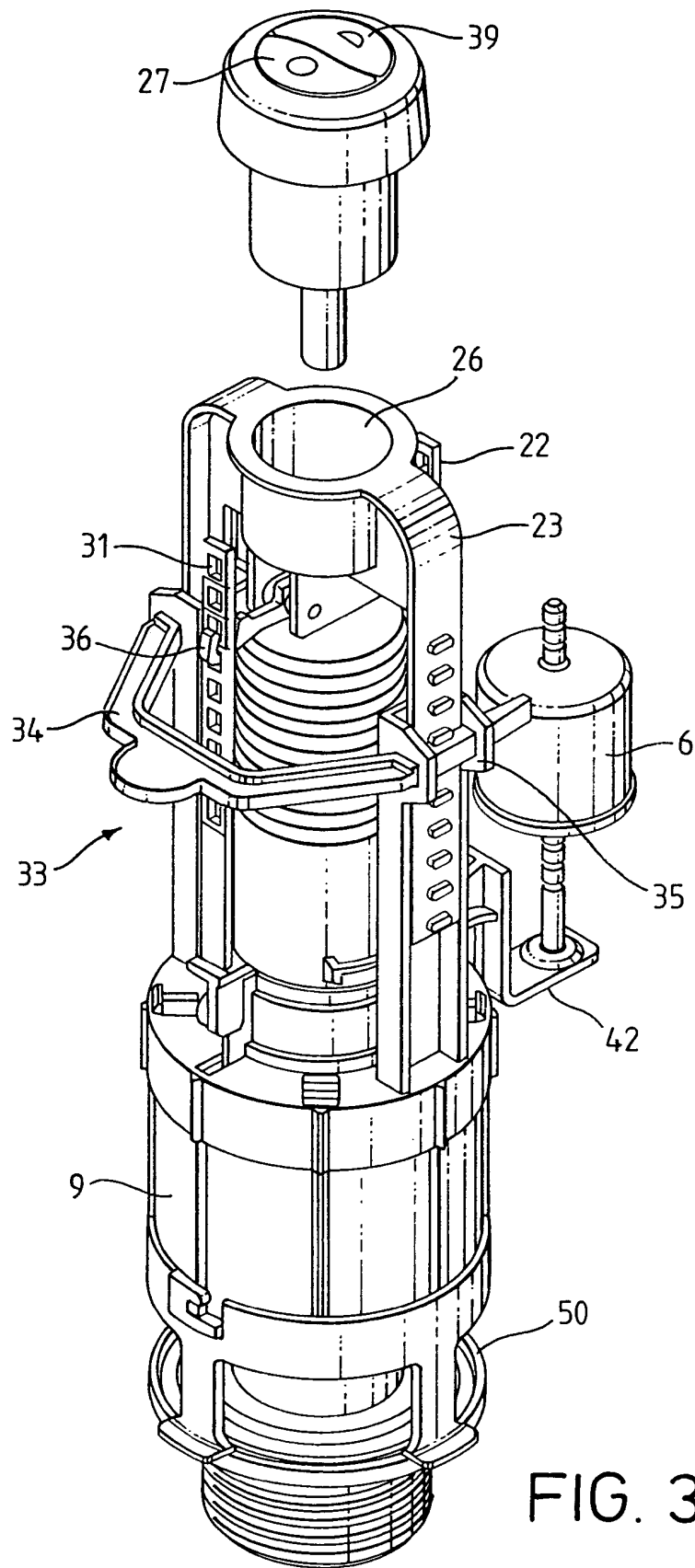
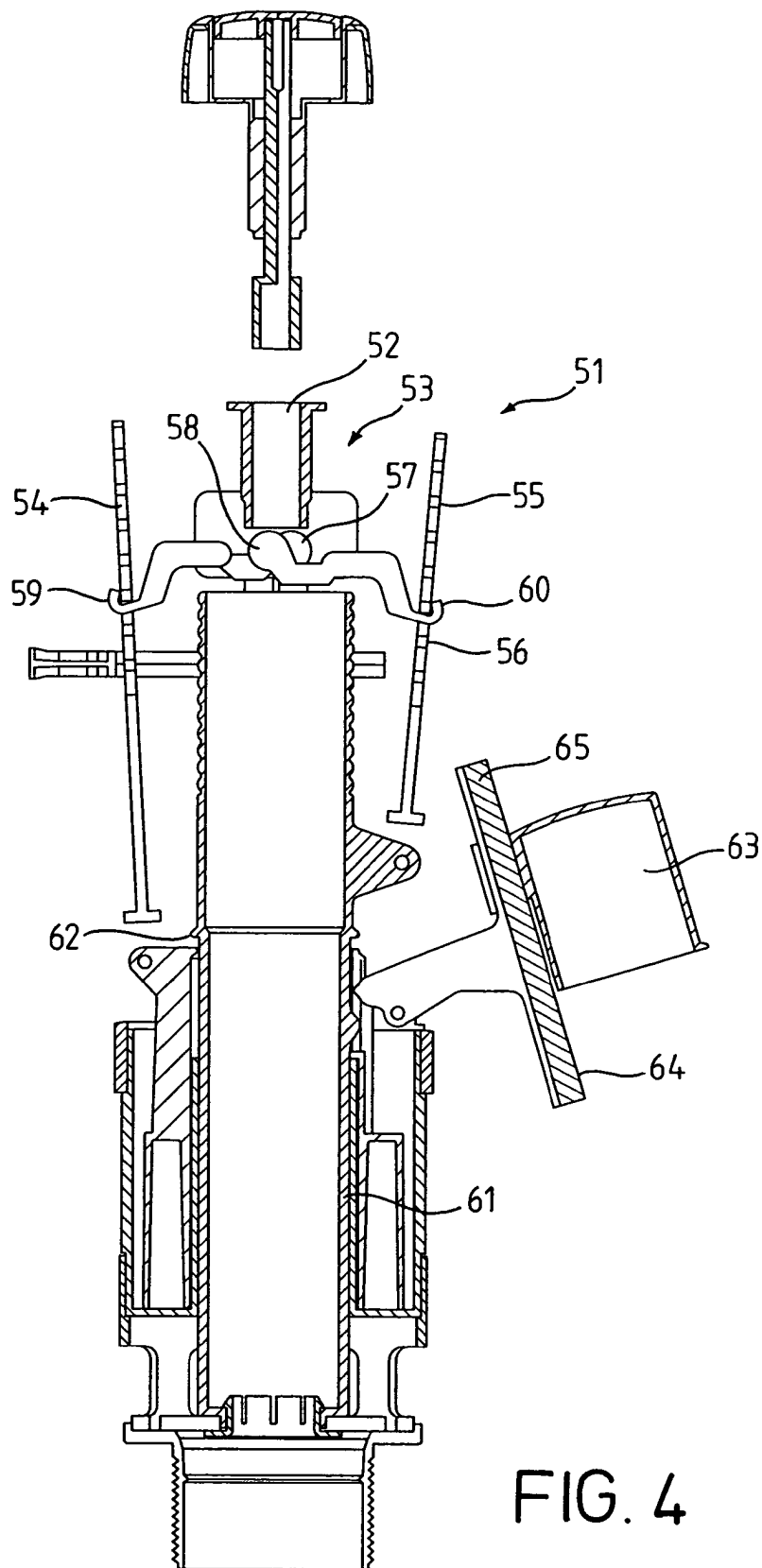
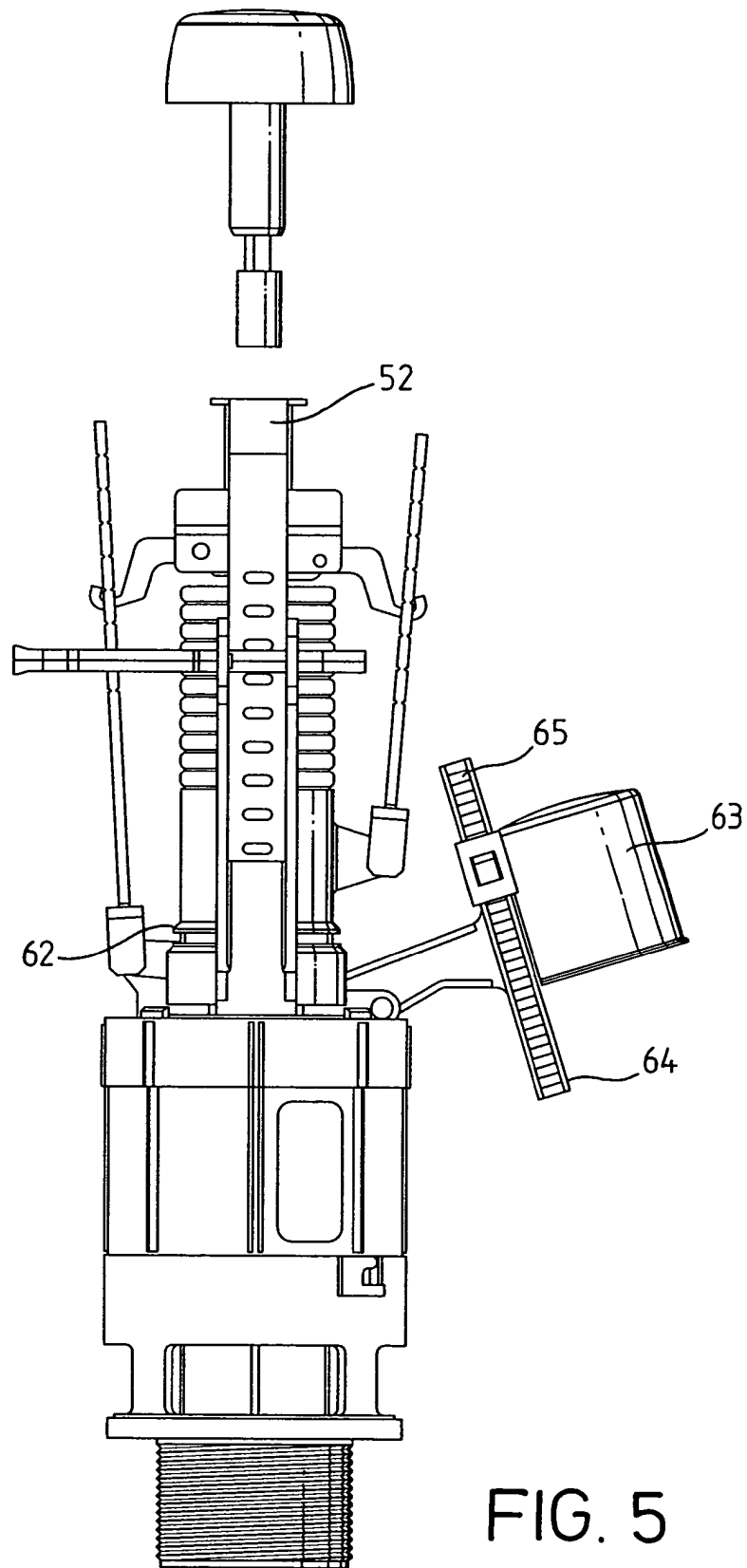


FIG. 3





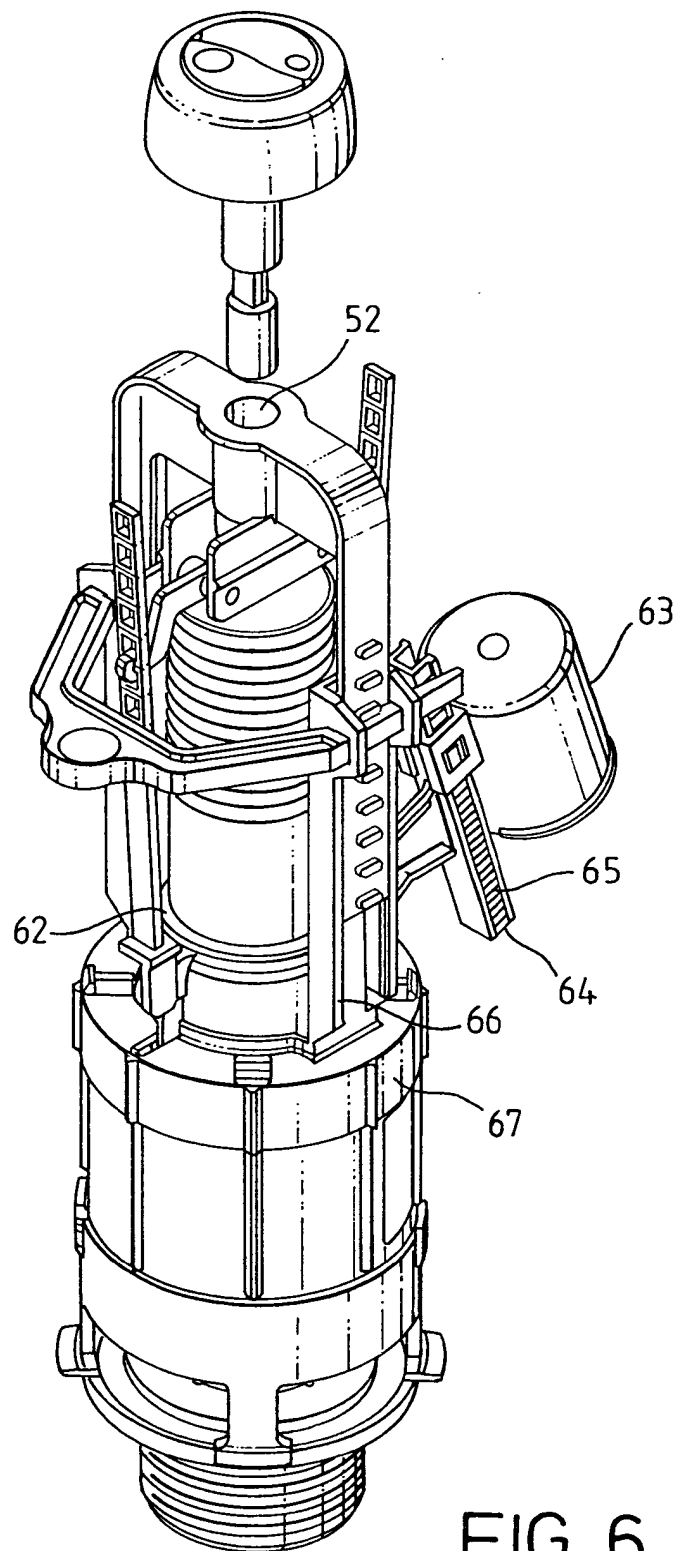


FIG. 6