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(54) **Cistern flush valve assembly.**

(57) A flush valve of the flapper type is arranged to provide either a low volume or a high volume flush. A float (8) is provided with two holes (22, 23) located below the level of an encircling seal (6) which is normally engaged with a valve seat (5) on the upper end of the cistern water outlet pipe (1) to prevent water flow. The float (8) is pivoted at (14) on a support (16). Prior to flushing the float is full of air, but after the float has been manually lifted to remove the seal (6) from the seat (5) and initiate flushing the float begins to fill with water until, if permitted by the user, the float will fall to terminate the flush and thereby give a low volume flush. Water then drains from the lower hole (22) and the float is replenished with air in readiness for the next operation.

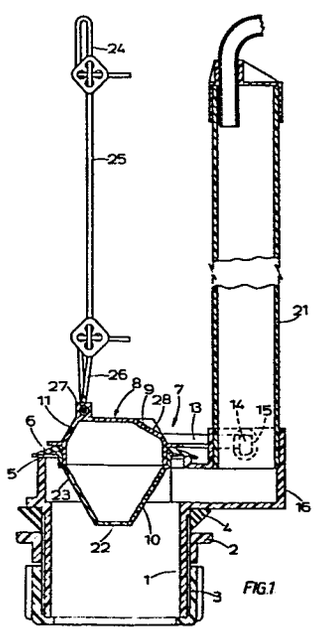

FIG.1

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CISTERN FLUSH VALVE ASSEMBLY

This invention relates to a cistern flush valve assembly.

In order to reduce water consumption the water authorities in some countries are encouraging the use of lavatory cisterns which are capable of delivering to the lavatory pan either a small volume of water or a large volume of water according to the flushing requirements. This avoids the use of a full tank of water when only urine is to be flushed away.

Various attempts have been made to design such a dual flushing cistern. Some of these designs require two flushing handles, and some incorporate complicated and expensive flushing valves. In general a complete new cistern is required to replace an existing constant output cistern, or at least the entire valve assembly and handle mechanism have to be replaced. This can be expensive in labour costs.

The present invention stems from attempts to produce a relatively uncomplicated yet reliable flush valve assembly of the dual flushing kind.

According to the invention a cistern flush valve assembly capable of permitting a low or a high volume flush incorporates a valve which is arranged to terminate flushing at least for a low volume flush, and a float associated with the valve, the arrangement being such that the float fills with air between flushes, but during flushing in the low volume mode loses air at a predetermined rate to reduce the buoyancy of the float which then closes the valve to arrest flushing before the cistern has been emptied.

The float may be held in a raised position to provide a high volume flush.

The invention is especially suitable for use in conjunction with valve assemblies of the 'flapper' kind which are widely used in U.S.A. and Canada. Such valve assemblies employ a pivoted valve flap carrying a float and a valve member which normally sealingly closes an outlet from the cistern. In use the valve flap is raised to initiate flushing and is retained in an upward position by its buoyancy, until the level of the water reaches the flap which then falls with the water level until the outlet is closed to allow the cistern to refill.

Such flapper valve assemblies may in accordance with the invention be given a dual flushing characteristic by arranging for progressive loss of air from the float during flushing.

We are aware that the float of the existing flapper valve assemblies is often provided in its base with a hole to enable a core to be removed during moulding, but this does not permit a sufficient quantity of water to enter the float substantially to affect its buoyancy.

When our invention is applied to a flapper valve assembly we prefer to provide the float with at least two holes which are both in communication with the outlet when the flap is in its closed position.

Preferably one of the holes is in the base of the float, the float being considered to be vertical when the flap is in its closed position.

Means is preferably provided to enable the timing of the closure of the valve in the low volume flush mode to be varied.

The flap may be provided with a movable weight which can be secured at different distances from the flap pivot. The weight may be located on an arm which depends from the flap.

Alternatively, means may be provided to enable the rate of air loss from the float to be adjusted. The position or size of a hole or holes in the float may be made adjustable for this purpose.

A cistern flapper valve assembly in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a vertical cross-section of the assembly with the flap being shown in its normal, closed position;

Figure 2 is a vertical cross-section of the flap of Figure 1 taken in the same plane as Figure 1 and on the line 2-2 of Figure 3;

Figure 3 is a view of the flap looking from the left in Figure 2.

With reference to Figure 1, the assembly comprises a tubular body 1 which is adapted to be sealingly secured in a hole in the base of a lavatory cistern by a nut 2 threadedly engaged with external screw threads 3 on body 1, the margin of the base surrounding the hole being clamped in use between the nut 2 and an annular resilient seal 4. The upper edge 5 of the body

provides a valve seat against which a resilient sealing ring 6 carried by a flap assembly 7 is normally seated.

Flap assembly 7 incorporates a float 8 and is made from upper and lower moulded plastics parts 9 and 10.

Figures 2 and 3 should now be consulted in addition to Figure 1. The upper part 9 comprises a bowl portion 11 having a cylindrical rim 12 and from opposite sides of the bowl portion 11 depend a pair of parallel arms 13 which carry at their free ends respective trunnion pins 14 directed inwardly towards each other. The trunnion pins 14 are received with substantial vertical play in respective tubular bosses 15 provided on opposite sides of a branch pipe 16 integral with body 1. The lower part 10 of the flap assembly 7 is of inverted frusto-conical shape with a cylindrical rim 17 into which rim 12 is received and sealingly secured by adhesive. A radially outwardly facing annular recess 18 is defined between an annular flange 19 on bowl portion 11 and the upper edge 20 of rim 17 into which the radially inner margin of sealing ring 6 is sealingly received.

Branch pipe 16 receives and is adhesively secured to a vertical overflow tube 21, and the interior of branch pipe 16 communicates freely with the bore of tubular body 1.

Float 8 is provided with two holes 22 and 23, the hole 22 being formed in the base of lower part 10, and the hole 23 being formed in the upper part of the inclined sidewall of part 10, just below rim 17, and on the opposite side of float 8 from the trunnion pins 14. As shown in Figure 1, the holes 22 and 23 are positioned such that when the flap assembly is in its normal position with sealing ring 6 in sealing engagement with

valve seat 5 the holes 22 and 23 both communicate with the bore of body 1. When the flap assembly 7 has just returned after flushing to its closed position water will drain from the interior of the float 8 through lower hole 22 and air will enter the float through hole 23 from the bore of body 1.

The cistern is provided with a single flushing handle, not shown, which is connected to a loop 24 at the upper end of a length of flexible plastics cord 25, the lower end of which is connected by a loop 26 to an eye 27 integrally formed on the top of bowl portion 11.

In order to produce a low volume flush the flushing handle is pulled and released. On pulling the handle the cord 25 is raised to lift flap assembly 7 and pivot it about the lugs 15 thereby to break the seal between ring 6 and valve seat 5 and allow water to flow from the cistern into the bore of body 1 which is connected to the lavatory pan. In the raised position an abutment face 28 on the bowl portion 11 engages with the overflow tube 21. When the float is raised it is full of air and its buoyancy maintains it in the raised position on release to the handle and the cord 25 going slack. With the float in the raised position both holes 22 and 23 are exposed to water in the cistern, and air begins to issue progressively from hole 23 as water enters through hole 22, the hole 23 being located substantially at the top of the float when the flap assembly is in its raised position. After a predetermined time the float 8, still immersed in water, loses sufficient buoyancy that it falls back to a closed position and terminates the flushing action.

The time at which the flushing action is terminated, and therefore the volume of water delivered in

the low volume mode of flushing is determined by the rate at which air is lost from the float, and this depends upon the dimensions of the holes and upon their positions. A suitable arrangement is most easily achieved by trial and error to ensure that when, say, half of the initial volume of water in the cistern has been delivered the flap assembly 7 closes.

Thus in the low volume flushing mode a predetermined volume of water is delivered merely by pulling and releasing the operating handle, and this volume does not depend upon how long the operating handle is held before it is released, providing of course that it is not held longer that the predetermined time at which the flap assembly 7 is ready to fall.

In order to obtain a high volume flush it is simply necessary for the user to operate the handle and hold it in the operated position, thereby holding the float in the raised position, until the flush has terminated. Although the float will lose buoyancy during flushing it is held against closing by the cord 25. When the handle is finally released the flap assembly will fall down to its closed position.

Of course, once the flap assembly has returned to its closed position after either a low or a high volume flush water will drain from the float 8 and the float will refill with air in readiness for the next flushing operation. The cistern refills with water in the usual way.

Thus, a dual flushing facility is obtained using only a single handle, and it will be appreciated that in most cases existing flapper valve assemblies may easily be replaced by the assembly described. In many cases it

would be possible for the householder to modify existing assemblies simply by replacing the existing flap assembly with a modified flap assembly in accordance with the invention.

CLAIMS

1. A cistern flush valve assembly comprising valve means (5, 6) for controlling flushing, and a float (8) operatively connected to the valve means for closing the valve means on downward movement of the float, characterised in that the walls of the float (8) are provided with fluid passage means (22, 23) communicating with the buoyancy chamber of the float to enable air to be expelled by water from the buoyancy chamber at a predetermined rate during flushing to enable the float to close the valve means (5, 6) for terminating a partial flush, and air inlet means (1) for communicating with the fluid passage means between flushes when the valve means is closed for replenishing the buoyancy chamber with air.

2. A valve assembly as claimed in claim 1 characterised in that the fluid passage means comprises two spaced-apart holes (22, 23).

3. A valve assembly as claimed in claim 1 or claim 2 characterised by a support (16) and a pivotal connection (14, 15) between the float and the support to enable the float to pivot about a substantially horizontal axis.

4. A valve assembly as claimed in claim 3 characterised in that the air inlet means comprises the cistern water outlet pipe (1), the valve means comprises a valve seat (5) provided on the upper end of the outlet pipe and an annular sealing member (6) carried by and encircling the float, and the fluid passage means opens to the exterior of the float in the region below the sealing member for communication with the water outlet when the sealing member is engaged with the valve seat.

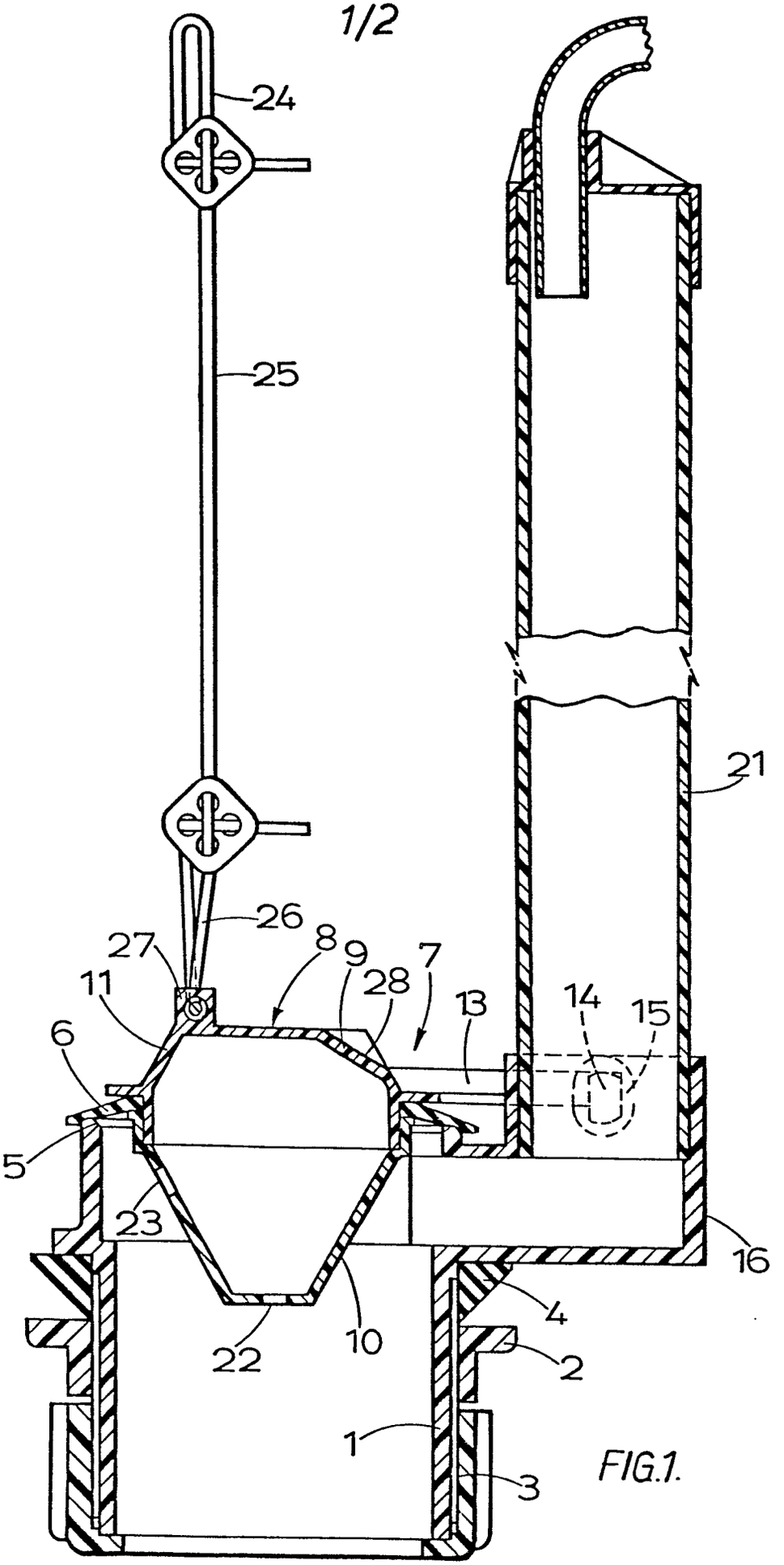

FIG.1.

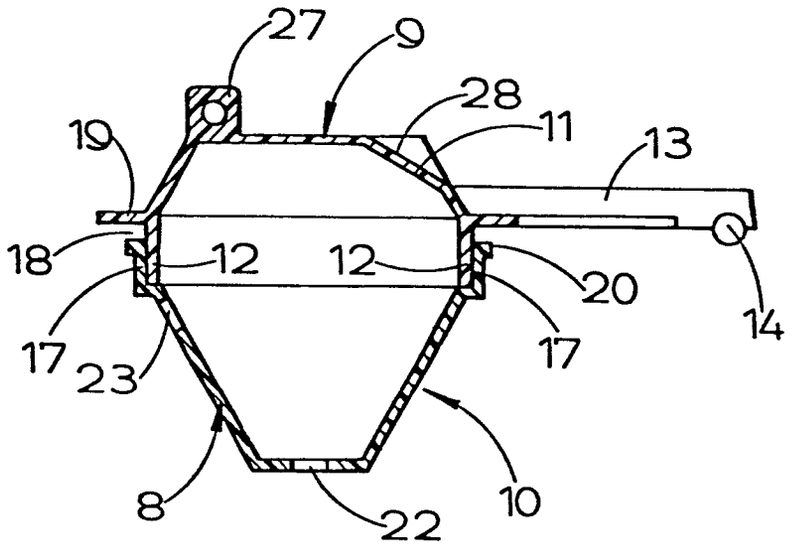
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FIG. 2.

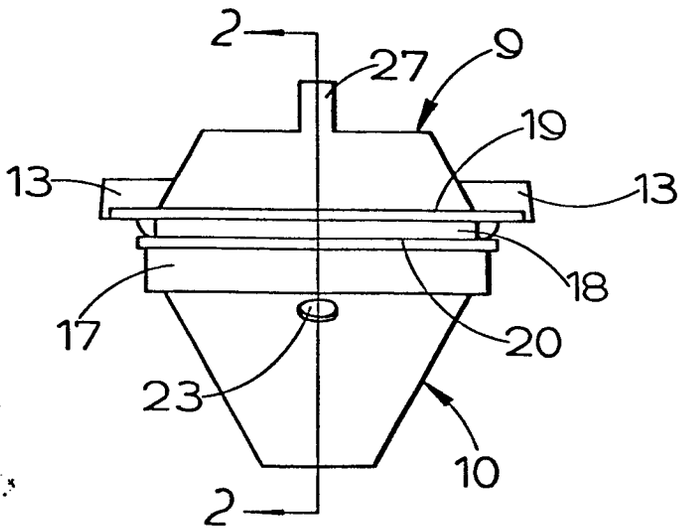
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FIG. 3.

European Patent Office

EUROPEAN SEARCH REPORT

0074262

Application number

EP 82 30 4660.2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 955 218 (RAMSEY) * column 2, line 14 to column 7, line 8; fig. 1 to 5 *	1-4
X	US - A - 4 189 795 (CONTI et al.) * column 3, line 21 to column 5, line 27; fig. 1 to 4 *	1-4
X	GB - A - 1 532 491 (A.L. SCHMIDT) * page 2, line 82 to page 3, line 96; fig. 1 to 6 *	1-4

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

E 03 D 1/14

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

E 03 D 1/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
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E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	23-11-1982	PAETZEL

EPO Form 1503.1 06.78