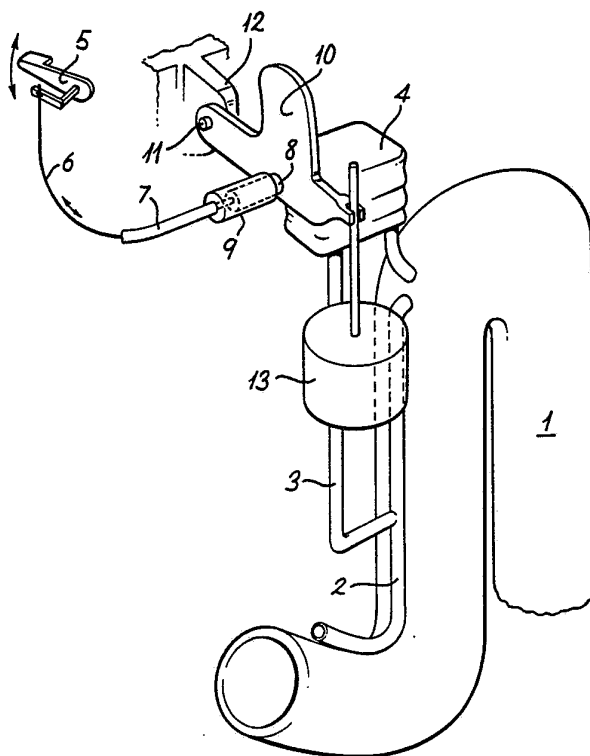




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(54) Title: IMPROVEMENTS IN OR RELATING TO CISTERNS



(57) Abstract

A cistern for a water closet or the like in which the device that initiates a flush or other discharge of liquid is connected to a handle (5) or other operating member by a mechanical linkage, and in which means (13) responsive to the liquid level within the cistern disconnect or otherwise disable the linkage so as to prevent a discharge unless the cistern is substantially full.

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IMPROVEMENTS IN OR RELATING TO CISTERNS

This invention relates to cisterns, of the kind comprising vessels which are adapted to be repeatedly filled with liquid to a predetermined high level, and then caused to discharge by the action of a human operator or automatic mechanism. It relates especially to cisterns for water closets and in particular, but not exclusively, to the kind of cistern described in Patent Specification GB-B-2205595.

10 The discharge of water closets throughout the world accounts for huge quantities of water, and it is the common aim of water authorities in this country and elsewhere to promote the design and use of WC cisterns that flush efficiently and hygienically, but use the minimum amount of water in doing so. If a cistern
15 can be caused to discharge before it is substantially full, the flush will tend to be inefficient, so wasting the water that has been used. The importance of ensuring a full flush is increased by current regulatory trends to restrict the volumes of WC cisterns. For example, from the beginning of 1993 the volume of
20 all new cisterns in UK is to be 7.5 litres, compared with 9 litres as previously. Whereas 75% of 9 litres often sufficed to flush a pan clean, 75% of 7.5 litres would be less likely to suffice.

Specification GB-B-2205595 describes means which help to
25 prevent initiating a flush unless the cistern is substantially full. However, that method was closely linked to the particular type of cistern described in that specification, in which discharge was initiated by an operator squeezing an air bulb and so venting an air lock. Also, it was not proof against air being
30 drawn into the system during flushing, thus impairing system efficiency.

The present invention arises from appreciating the need for a device which prevents premature flushing more effectively, is less subject to the impairment of system efficiency just
35 mentioned, and is both more robust, less capable of abuse, and

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applicable to a wide range of cisterns. The invention is defined by the claims, the contents of which are to be read as included within the disclosure of this specification, and includes devices as described with reference to the accompanying simplified and diagrammatic drawings. The invention will now be described by way of example with reference to those drawings, in which:-

Figure 1 is a perspective view of one embodiment;

Figures 2 and 3 are perspective views of parts of another embodiment, in two different positions;

Figure 4 is a section through part of a third embodiment;

Figure 5 is a perspective view of a fourth embodiment, and

Figure 6 is a simplified section through certain parts shown in Figure 5.

In the cistern of Figure 1, in which the structure of the vessel is omitted for simplicity only, the syphon conduit 1, vent tube 2 and air tube 3 function similarly to the corresponding items referenced 10, 25 and 29 in GB-B-2205595, and squeeze bulb 4 is connected to air tube 3 and functions similarly to item 32 of the previous specification. However, squeeze bulb 4 is now fixed within the cistern, close to parts 1-3, instead of outside where it could be grasped and so used - and possibly abused - by an operator. An operator now initiates a discharge of the cistern by turning a handle 5, located outside the cistern. This handle is connected by way of a flexible cable 6, mounted within a tubular casing 7, to a piston 8 working within a cylinder 9. A gate 10 is pivoted at 11 to the fixed structure 12 of the cistern, and carries a float 13. Alternatively these parts could easily be rearranged, if desired, so that the pivot 11 was mounted on structure integral with or fixed to the structure of the syphon conduit 1, rather than the structure of the cistern.

By turning handle 5, an operator can cause piston 8 to contact the bulb 4 and squeeze it. When float 13 is in a low position, because water level within the cistern is low, gate 10 is down and physically prevents piston 8 from contacting bulb 4. Only when the water rises to a level at which the cistern is full

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enough to promote an efficient flush does the float 13 cause the gate 10 to pivot upwards enough to allow piston 8 to pass under it, and so contact the bulb 4. In this embodiment, therefore, the linkage (6 - 9) between the operating member (5) and the flush-initiating device (4) is disabled adjacent the device 4 itself.

In the alternative embodiment of Figures 2 and 3 the interruption takes place further from the bulb 4, and when the linkage is uninterrupted a piston 14, movable within a cylinder 14a and connected to cable 6 and so to handle 5, can bear against a "receiving" piston 15 which is in turn movable within a cylinder 15a, connected to a cable 16 and so to the final piston 8 which bears against the bulb 4. The gate 10 is now mounted on a moving arm 17, one end of which carries the float 13. In this embodiment float 13 also acts as the operating member of the float valve 18 which controls the entry of water to the cistern. Figure 2 shows float 13 and arm 17 in the raised position they will occupy when valve 18 is shut and the cistern is full enough to deliver an effective flush, so that gate 10 is raised too allowing pistons 14 and 15 to contact. Adjacent mechanical components within the linkage between handle 5 and bulb 4 are therefore uninterrupted. Figure 3 shows arm 17 in the lower position it occupies when the cistern water level and the float 13 have fallen, and gate 10 prevents contact between pistons 14 and 15 and so interrupts and disables the linkage. It would of course also be possible for the downstream end of the mechanical linkage shown in Figures 2 and 3 to be attached to a bell valve or other conventional flush-initiating device, as shown for instance associated with an alternative linkage in Figures 5 and 6, instead of co-operating with a squeeze bulb in the manner more appropriate for the particular kind of cistern shown in Figure 1 and described in more detail in Specification GB-B-2205595. In the position shown in Figure 3, valve 18 will be open and admitting water to re-fill the cistern. For compactness, and ease of construction and packaging, it could be advantageous, as

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shown in outline, if valve 18 and cylinders 14a and 15a were all mounted on the surface of the structure of syphon conduit 1, or even were moulded or otherwise formed integrally with that conduit.

5 In the further embodiment shown in Figure 4 pistons 14 and 15, as shown in Figures 2 and 3, are mounted within a common cylinder 20, mounted with its axis 21 horizontal, and formed with small holes 22 and 23 in its side wall 24. The cylinder 20 may again be mounted on the structure of syphon conduit 1 and should
10 be in such a location that the upper hole 22 lies just below the water level when the cistern is full enough to deliver an effective flush. Cylinder 20 will then be full of water, and when piston 14 is operated by handle 5, the force exerted by 14 is transmitted to 15 by the water between them, because the water
15 is substantially incompressible and cannot escape from the cylinder so as to leave gas-filled voids behind. That force is then transmitted to the bulb 4 or other flush initiating device by the cable 16. However when a flush begins and the cistern water level falls, first hole 22 and then hole 23 become open to
20 atmosphere, and the water within cylinder 20 drains out by way of hole 23. If handle 5 is now turned, so moving the piston 14, the air within the cylinder exits readily through holes 22 and 23 as 14 advances, and no substantial force is transferred to piston 15.

The further embodiment of the invention shown in Figures 5
25 and 6 includes a traditional heavy syphon piston (or "bell") 30 movable within a bell housing 31. A piston shaft 32 makes a pivoted connection at 33 to a first member 34 of the linkage (indicated generally at 35) connecting the piston to the operating handle 5. A second linkage member 36, which slides
30 telescopically within the first member 34, is pivoted at 37 to a lever 38, which is in turn connected to the handle 5 (not shown in Figure 5 or 6) by a square-section rod 39 or similar conventional means. A latch 40 is pivoted to member 34 at 41 and carries a float 42. As Figure 6 shows best, latch 40 also
35 presents a catch 43, and member 36 is formed with a co-operating notch 44.

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In Figure 5 line 46 indicates the full cistern water level. If the cistern is full, float 42 is well below the water surface, thus holding catch 43 and notch 44 firmly engaged. High water level 46 should be chosen so that when handle 5 starts to turn to raise piston 30 fully, and so initiate a flush, float 42 will still be below the water level. Once the flush begins, and handle 5 is still held turned, the water level will fall and leave the float in air, but the considerable weight of the piston will ensure that catch 43 and notch 44 remain engaged by friction, thus maintaining linkage members 34 and 36 in their operative relationship. Once the handle is released, and the piston comes to rest at the bottom of the cistern and the cistern is empty, float 42 will be in air and will pivot latch 40 clockwise (as shown in Figures 5, 6) so that catch 43 disengages from notch 44, and the linkage 35 is inoperative. If handle 5 is now turned, member 36 will simply slide freely and telescopically within member 34. The linkage will become operable again when the water level within the cistern rises high enough to reach the float 42 and so pivot latch 40 anti-clockwise, so that the catch and notch re-engage. Care should of course be taken, in the design of the linkage, to ensure that linkage members 36, 35 inter-engage far enough to prevent 36 escaping from 34 if handle 5 is turned fully when the catch and notch are disengaged.

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CLAIMS

1. A cistern for a water closet or the like, comprising a vessel adapted to be filled with liquid to a predetermined high level, an initiating device within the vessel to initiate a discharge of
5 that liquid, an operating member for that device accessible from outside the vessel, and in which the operating member and initiating device are connected by a linkage including interconnecting mechanical members, and in which means responsive to the level of liquid within the vessel operate so as to disable
10 the linkage unless the vessel is at least substantially full.
2. A cistern according to Claim 1 in which the disabling means are in the form of a float-operated gate operable to interrupt the linkage between the operating member and the initiating device.
- 15 3. A cistern according to Claim 2 in which the gate when operative physically prevents engagement between an adjacent pair of the mechanical members of the linkage.
4. A cistern according to Claim 3 in which the gate is associated with a float within the vessel.
- 20 5. A cistern according to Claim 4 in which the float also controls the valve through which liquid enters the vessel to fill it.
6. A cistern according to Claim 1 in which the initiating device is a flexible bulb and the linkage, when uninterrupted, squeezes
25 that bulb when the operating member is actuated.
7. A cistern according to Claim 1 in which the means for disabling the linkage is a device of dashpot type, capable of transmitting substantial force when submerged and filled with liquid, but not so capable when the liquid level falls within the
30 vessel, so leaving the dashpot above that level and allowing the liquid within it to drain out leaving air in its place.
8. A cistern according to Claim 5 including a syphon-type conduit to contain the liquid to be discharged, and in which the valve is fixed relative to the structure of that conduit.

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9. A cistern according to Claim 1 in which a float-operated first component, mounted on one of the interconnecting mechanical members of the linkage, is engageable with a second component mounted on another such member whereby to hold the linkage operative.
10. A cistern according to Claim 9 in which the first and second engageable components are a pivoted latch mounted on one of the linkage members, engageable with a recess on the other such member.
- 10 11. A cistern according to Claim 9 in which the two linkage members, associated with the inter-engaging components, are arranged to slide relative to each other.
12. A cistern according to Claim 11 in which one of the two said linkage members slides telescopically within the other.
- 15 13. A cistern according to Claim 9 in which the initiating device is the piston of a traditional bell-type syphon.

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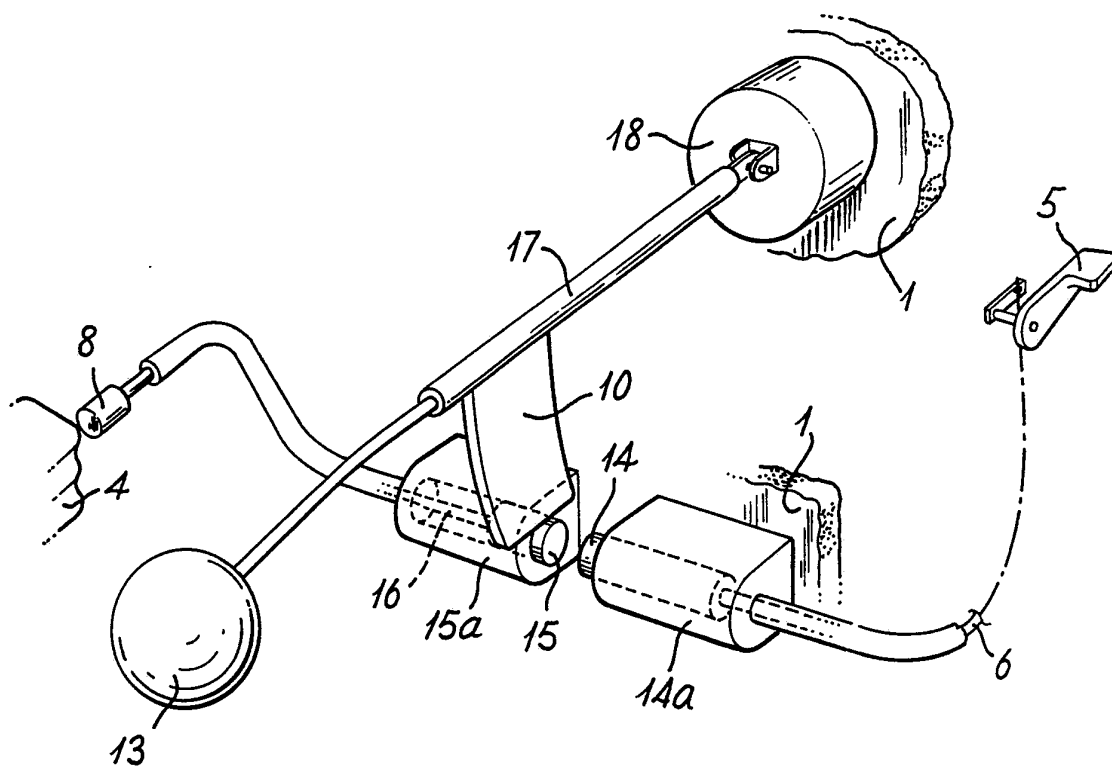


Fig. 2

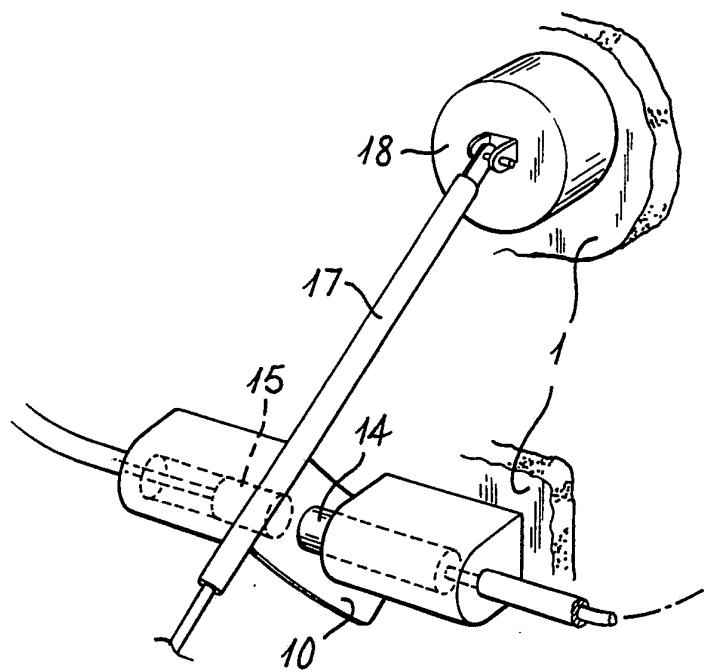


Fig. 3

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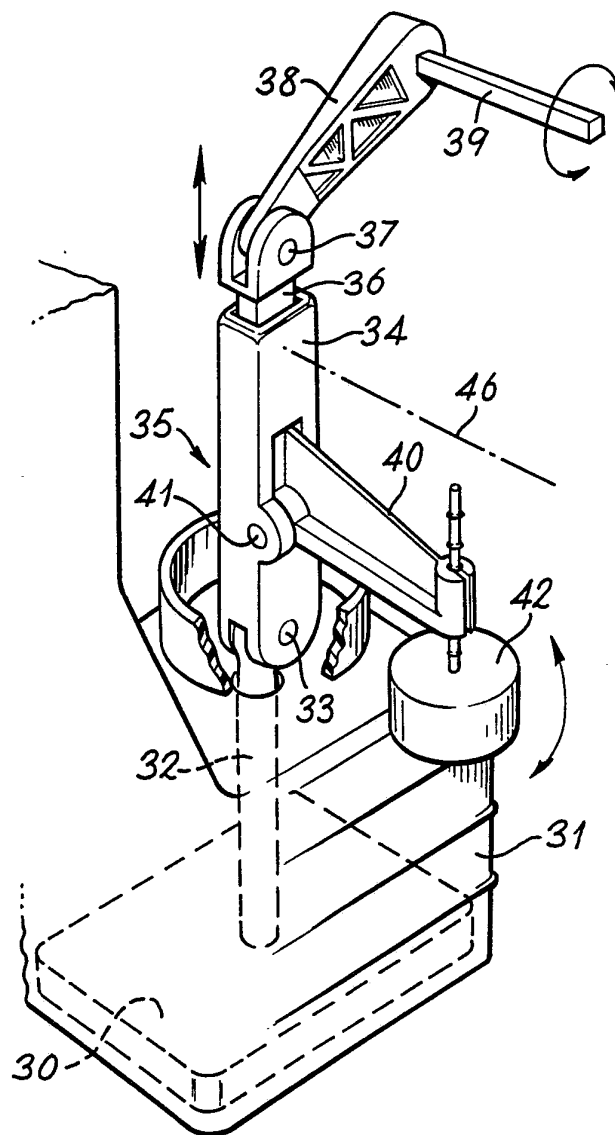


Fig. 5

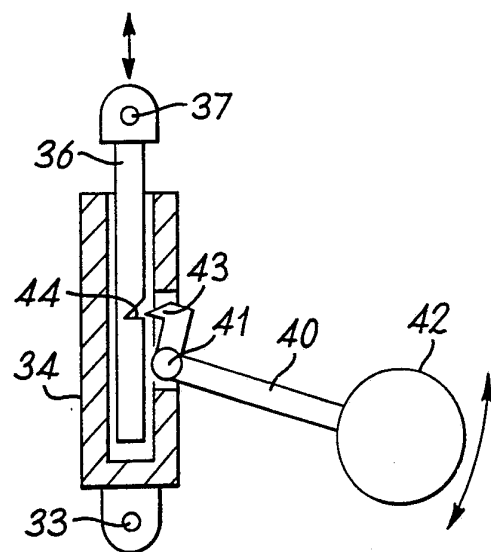


Fig. 6

INTERNATIONAL SEARCH REPORT

PCT/GB 92/02354

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 E03D1/30		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	E03D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US,A,4 230 145 (BADDERS) 28 October 1980 see column 6, last paragraph - column 7, paragraph 1; figure 2 ---	1,4,5
A	US,A,2 803 833 (CHAREST) 27 August 1957 see figure 2 ---	1,3,9,10
A	US,A,2 322 123 (GARRATT) 15 June 1943 see page 2, left column, line 23 - line 27; figures ---	1,2,4
A	DE,A,3 729 569 (SCHWAB SANITÄR-PLASTIC GMBH) 16 March 1989 see figure 1 ---	6
-/--		
¹⁰ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
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III. DOCUMENTS CONSIDERED TO BE RELEVANT

(CONTINUED FROM THE SECOND SHEET)

Category ^a	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claims No.
A	US,A,4 312 083 (IMLER) 26 January 1982 see the whole document -----	1,4,5,8

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 9202354
SA 67859

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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22/03/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4230145	28-10-80	None	
US-A-2803833		None	
US-A-2322123		None	
DE-A-3729569	16-03-89	None	
US-A-4312083	26-01-82	None	