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The present invention relates to cisterns or flush tanks and, in particular, to a cistern mechanism which is able to be used with a wide variety of cisterns.

Most cistern manufacturers have a wide variety of cisterns which are intended to be used with different types of lavatory pans. Some cisterns are moulded from plastics material whilst others are fabricated from vitreous china. In particular, with vitreous china cisterns it is difficult to secure a cistern mechanism to the internal surface of the cistern. For this reason it is desirable that the cistern mechanism be able to be mounted by means of a connection with the flush pipe or flush aperture of a cistern.

Furthermore, it is also desirable for reasons of reduction of stock volumes, reduction in stock lines, and economies of scale to be achieved from large volume production, if a single cistern mechanism can be used throughout the entire range of cisterns. In this connection it will be appreciated that because different models of cisterns have different shapes in order to achieve different appearances, such cisterns have different volume to depth profiles. The volume to depth profile of a cistern is the way in which the available volume of water contained within the interior of the cistern varies with increasing depth above the minimum water height within the cistern. Clearly a cistern with a large internal cross sectional area will have a greater volume to depth profile than a relatively slim cistern of relatively small cross sectional area.

It is the object of the present invention to provide a cistern mechanism which can cater for a wide variety of cisterns notwithstanding the different volume to depth profile of such cisterns.

According to one aspect of the present invention there is disclosed a cistern mechanism for a wide variety of cisterns each of which has a different volume to depth profile, said mechanism comprising a frame mountable within the cistern by connection with the flush pipe and/or flush aperture, a flush valve mounted in said frame, a weir surrounding said valve and extending above said valve to a predetermined height, a flush valve lifting mechanism mounted on said frame above said flush valve, and means to select the height of at least a portion of said weir relative to said flush valve to set said predetermined height.

It is also desirable in catering for the different variety of cisterns if the mechanical linkage between the manually operable flush actuator and the flush valve lifting mechanism can be adjusted in order

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to accommodate the different dimensions inherent in different styles of cisterns: Also vitreous china cisterns of the same model or style may vary by as much as 10% in shrinkage from batch to batch. It is therefore a preferred feature of the present invention to provide a cistern
5 adjustment mechanism which addresses these problems.

According to a second, and preferred, aspect of the present invention there is disclosed a cistern adjustment mechanism for a linkage interconnecting a manually operable flush actuator and a flush valve
10 lifting mechanism, said adjustment mechanism comprising a screw adjustment interconnecting that portion of the flush valve lifting mechanism which comes into contact with said manually operable flush actuator and the remainder of said flush valve lifting mechanism, whereby
any difference in spacing between said manually operable flush actuator and said flush valve lifting mechanism after installation of the flush
15 valve lifting mechanism within the cistern, can be compensated for by adjustment of said screw adjustment.

One embodiment of the present invention will now be described with reference to the drawings in which:

Fig. 1 is an exploded perspective view of a cistern incorporating
20 the cistern mechanism of the preferred embodiment,

Fig. 2 is a side-to-side vertical cross-sectional view of the cistern mechanism of Fig. 1 illustrating different water heights for different types of cisterns, and

Fig. 3 is a front to rear cross-sectional view through the cistern
25 mechanism of Figs. 1 and 2.

As seen in Fig. 1, a cistern 1 takes the form of a cistern body 2 and a lid 3. The lid 3 is provided with two push button actuators 4, one of which is intended to activate a reduced volume flush whilst the other of which activates a full volume flush. Located within the cistern body
30 2 is a self contained cistern mechanism 6 having a generally rectangular frame 7 and a threaded spigot 8 which passes through a central opening 9 in the base of the cistern body 2. The frame 7 is able to be secured within the cistern body by means of engagement of a threaded nut 10 with the spigot 8. A sealing washer 11 completes the arrangement and forms a
35 water tight seal between the exterior of the frame 7 and the cistern body 2. The spigot 8 further connects with a flush pipe 20 (Fig. 2) in conventional fashion.



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It will be seen that the above described arrangement has the advantage that the entire cistern mechanism 6 is able to be mounted within the interior of the cistern 1 without any engagement with the interior walls of the cistern.

5 Depending from each of the push button actuators 4 is a corresponding push rod 14 the lower end of which, when the cistern lid 3 is in position, abuts the upper surface of a corresponding L-shaped lift actuator 15. As will be described in more detail in relation to Fig. 3, each of the lift actuators 15 is coupled to a flush valve lifting
10 mechanism.

Located at the lower end of the frame 7, and illustrated in Figs. 2 and 3, is a flush valve 17 which is connected to the lower end of a stem 18 on which a float 19 is slidably mounted.

In order to flush the cistern, the stem 18 is raised thereby
15 opening the flush valve 17 and allowing water stored within the cistern to pass through the flush valve 17 and into the flush pipe 20 (Fig. 2). For a reduced volume flush, the float 19 is used to knock the stem 18 down, thereby prematurely ending the flushing action. For a full volume flush the stem 18 drops when both the volume and rate of water flowing
20 through the flush valve 17 is insufficient to support the weight of the stem 18 and float 19.

As best seen in both Figs. 1 and 2, the flush valve 17 is surrounded on all four sides by a cup-shaped weir 22. For a reduced volume flush, the flushing action is brought to a close well before the
25 level of water in the cistern drops to the height of the weir 22. However, for a full volume flush, the flushing action is brought to a close when the water level within the cistern drops to the height of the weir.

Referring now to Fig. 2, it will be appreciated that the maximum
30 level of water within the cistern is determined by the inlet arrangements. A conventional float arm (not illustrated) is used to control the maximum height of water within the cistern. In particular, it must be below any overflow arrangement, typically the upper end of the hollow stem 18. Furthermore, for arrangements in which a cistern and
35 lavatory pan are close coupled, the static head of the water within the cistern must not be unnecessarily reduced. For these reasons, within limits, the maximum height of water within the cistern may be regarded as being substantially fixed.



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In recent times, in order to conserve water and thereby avoid the need for additional capital expenditure on dams, water supply authorities in many jurisdictions have begun to specify a maximum volume of water permitted in a flush, as well as the universal minimum permissible volume regarded as necessary to achieve a satisfactory flush of the lavatory pan and transport of the contents thereof along branch sewerage lines. It will be appreciated from Fig. 2, however, that different sizes and shapes of cisterns, because of their differing volume to depth profiles, require the water level to drop to different heights in order to flush the same volume of water.

In Fig. 2 the level M represents the maximum water height within a cistern. The level U represents the upper limit for the lowest level of water within the cistern indicated by dotted lines having a larger cross sectional area in Fig. 2, whilst the level L represents the lower limit for the lowest level of water for the cistern having a smaller cross sectional area and illustrated by solid lines in Fig. 2.

In order to have a single cistern mechanism able to operate at a set full-flush volume with both cisterns, it is necessary to arrange for the full volume flush for the larger cistern to stop at level U whilst for the smaller cistern it is necessary that the full volume flush continue until the level L is reached. In accordance with the preferred embodiment this change in cessation level is accommodated by means of the weir 22.

As seen in both Figs. 1 and 2, each of the four walls of the weir 22 is provided with a number (preferably three) of panels 24 which are of reduced thickness. Therefore if the frame 7 is to be used with the larger cistern (illustrated by broken lines in Fig. 2) then the weir 22 is used as illustrated in Fig. 1 and the cessation level for flushing for a full volume flush is the level U illustrated in Fig. 2. However, if the frame 7 is to be used with the smaller cross sectional area cistern illustrated by full lines in Fig. 2, then all the panels 24 of reduced thickness are removed by being broken away. Under these circumstances the full volume flush continues until the cessation level L is reached. In this way the desired maximum flush volume is reached but not exceeded with the cistern of smaller cross sectional area. Clearly, if a cistern having a volume to depth profile which dictates a cessation level somewhere between the levels U and L of Fig. 2 is required, then only one or two of the panels 24 is/are removed. If necessary, a portion of a

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panel 24 can be removed. Similarly, each wall of the weir need not be of the same height and, say, one or two of the walls can be lower.

The above described arrangement enables the flush cessation level to be adjusted within relatively wide limits. The levels for different types of cisterns can be easily indicated by horizontal lines (not illustrated) moulded across the panels 24. This enables the cistern mechanism to be retrofitted to existing cisterns if required. Alternatively, during the manufacture of the cistern mechanism, an insert (not illustrated) can be placed in the mould in known fashion so as to alter the height of the weir 22 relative to the threaded spigot 8. Either of these two stratagems constitutes a means to adjust or select the height of at least a portion of the weir relative to the flush valve.

Turning now to Fig. 3, the flush valve lifting mechanism illustrated therein is substantially conventional, being illustrated in more detail in applicant's Australian Patent No. 597438 the disclosure of which is hereby incorporated by cross reference.

As seen in Fig. 3, one, interior, surface of each lift actuator 15 is provided with a threaded profile which is engaged with a grub screw 26 rotatably mounted in an internally threaded housing 27 which is itself movable relative to the frame 7 and biased into its uppermost, rest, position illustrated by means of a spring 28.

It will be apparent to those skilled in the art that turning the grub screw 26 by means of a slot 29 in its upper end, enables the rest position of the corresponding lift actuator 15 to be adjusted relative to the frame 7. As a consequence, any variation in the dome height of the cistern lid 3, for example, can be accommodated in order to ensure that the lower end of the push rods 14 in their rest position abut against the upper surface of lift actuators 15 in their rest position. This adjustment mechanism ensures that variations between different models of cisterns can be easily accommodated thereby enabling the cistern mechanism to be used throughout a wide range of cisterns and, in particular, throughout the entire range of cisterns produced by a given cistern manufacturer.

The foregoing describes only one embodiment of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention.





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CLAIMS

1. A cistern mechanism for a wide variety of cisterns each of which has a different volume to depth profile, said mechanism comprising a frame (7) mountable within the cistern (1) by connection with the flush pipe (20) and/or flush aperture (9), a flush valve (18) mounted in said frame, and a flush valve lifting mechanism (15) mounted on said frame above said flush valve, characterised by a weir (22) which surrounds said valve and extends above said valve to a predetermined height, and means to select the height of at least a portion (24) of said weir relative to said flush valve to set said predetermined height.
2. A cistern mechanism as claimed in claim 1 wherein said weir (22) forms part of said frame (7).
3. A cistern mechanism as claimed in claim 1 or 2 wherein said weir comprises a generally cup-shaped receptacle (22) having an upper rim (24) from which a plurality of supports (7) extend.
4. A cistern mechanism as claimed in claim 3 wherein said flush valve comprises a hollow stem (18) the upper end of which constitutes an overflow arrangement and the lower end of which includes a sealing means, and wherein said cup-shaped receptacle has an opening therein leading to a spigot (8) adapted to be received in a said flush aperture (9) or connected to said flush pipe (20), said opening being closed by said sealing means and the upper end of said hollow stem being supported by said supports.
5. A cistern mechanism as claimed in claim 3^{or 4} wherein said weir height selection means comprises at least one rupturable panel (24) formed in the rim of said receptacle.
6. A cistern mechanism as claimed in claim 3^{or 4} wherein said weir height selection means comprises forming said rim at said predetermined height above said flush valve.

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7. A cistern incorporating the cistern mechanism as claimed in any one of claims 1-6.

8. A cistern adjustment mechanism for a linkage interconnecting a manually operable flush actuator (14) and a flush valve lifting mechanism (15), said adjustment mechanism comprising a screw adjustment (26, 27) interconnecting that portion of the flush valve lifting mechanism (15) which comes into contact with said manually operable flush actuator (14) and the remainder of said flush valve lifting mechanism, whereby any difference in spacing between said manually operable flush actuator (14) and said flush valve lifting mechanism (15) after installation of the flush valve lifting mechanism within the cistern (1), can be compensated for by adjustment of said screw adjustment (26, 27).

9. A cistern adjustment mechanism as claimed in claim 8 wherein said screw adjustment (26, 27) includes a spring biasing means (28) to urge said portion of said flush valve lifting mechanism towards said actuator.

10. A cistern incorporating the cistern adjustment mechanism as claimed in claim 8 or 9.

