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"A drain valve"

THIS INVENTION relates to a drain valve and more particularly to a drain valve for use instead of a U-bend.

The use of U-bends is common place in draining systems such as in toilets, wet floor areas such as shower basins and the like. The problem with U-bends is that a certain amount of sediment can build-up in the U-bend which can eventually result in blockage of the U-bend which can cause flooding in the area to be drained. Additionally, especially in tropical climates, if the U-bends are not flushed or drained regularly, then water which remains in the U-bend becomes stagnant and is a prime area for the breeding of mosquitoes and the like.

Since U-bends are often located under a floor layer in high rise buildings, they are extremely difficult to gain access to and to effect repair and maintenance. An example of such an under-floor U-bend is shown in Figure 6 of the accompanying drawings. When U-bends become blocked and need replacing, it is a time-consuming exercise to fit a replacement given the inaccessibility of such U-bends.

It is an object of the present invention to provide a drain valve which overcomes the problems associated with U-bends.

Accordingly, one aspect of the present invention provides a drain valve for connecting an area to be drained to a waste pipe or the like, which drain valve comprises a first chamber having a chamber entrance into which, in use, a liquid drains, the first chamber including a baffle for directing a flow of liquid from the chamber entrance through the chamber to a free edge of the baffle adjacent

an exit mouth of the first chamber and a hinged flap having a closed condition in which the flap abuts the free edge of the baffle to close the exit mouth and an open condition in which a gap is provided between the baffle and the flap so as to open the exit mouth, the flap being biased into the closed condition to prevent, in use, fumes from below the drain valve rising into the area to be drained through the drain valve.

In order that the present invention may be more readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is an exploded view of a drain valve embodying the present invention, parts of the drain valve being cut away to improve clarity;

FIGURE 2 is a cross-section through the assembled drain valve of Figure 1;

FIGURE 3 is a view from below of the drain valve of Figure 2;

FIGURE 4 is a view from above of the drain valve of Figure 2;

FIGURE 5 is a detailed side view of a free edge of a baffle for use with the drain valve of Figures 1 and 2;

FIGURE 6 is a perspective view of a baffle insert for use with the drain valve of Figures 1 and 3;

FIGURE 7 is a schematic cross-section of two drain valves embodying the present invention linked to a drainage system in a high rise building; and

FIGURE 8 is a schematic cross-section of an under-floor conventional U-bend.

Referring to Figure 1, a drain valve embodying the present invention comprises a cylindrical sleeve 1 which receives three substantially identical inserts 2A, 2B, 2C and is capped with a drain cover 3.

The cylindrical sleeve 1 has a wall 4 which is formed with two diametrically opposed thickened portions 5,6 which define two opposite flat inner wall surfaces 7,8. When viewed from below, as in Figure 3, the inner surface of the wall 4 of the cylindrical sleeve 1 comprises two opposite concave arcuate portions 9,10 and the two diametrically opposite flat wall surfaces 7,8.

An elongate guide channel 11,12 extends down the centre line of each of the flat wall surfaces 7,8 along the length of the cylindrical sleeve 1. The guide channels 11,12 are, therefore, diametrically opposite one another.

Referring to Figure 2, the cylindrical sleeve 1 has an annular lip 1A formed around one edge. The lip 1A projects inwardly and forms a step. This lip 1A comprises the base of the cylindrical sleeve 1.

Referring to Figures 1, 2, 3 and 6, each of the inserts 2A,2B,2C comprises a substantially cylindrical thin walled structure having two opposite planar side walls 13,14 and two substantially arcuate walled portions 15,16 extending between the planar side walls 13,14 which enclose

a chamber. The top and bottom of the chamber are open. A sloped baffle 17 comprising a plate blocks one half of the chamber. A free edge 18 of the baffle is located along a line extending between the mid-points of the bottom edges of the planar side walls 13,14, the baffle sloping upwards from the free edge 18 towards the top of the insert and terminating against one of the arcuate walled portions 15 so as to block half the chamber and direct any flow towards the unblocked side of the chamber. Thus, the top of the chamber has an open entrance 19 and the bottom of the chamber has an exit mouth 20 bounded by the free edge 18 of the baffle 17, the planar side walls 13,14 and the other of the arcuate walled portions 16.

Referring to Figure 5, the underside of the free edge 18 of the baffle 17 is formed with an elongate groove 21 of substantially circular cross-section having a pair of jaws 22 which provide the entrance to the elongate groove 21.

Referring to Figures 3 and 6, on the outer surface of each insert 2, the planar side walls 13,14 are each provided with a slide block 23,24 (not shown in Figure 1) which extends from the bottom to the top of the planar side wall 13,14.

The bottom 25 of each slide block 23,24 is provided with a slot 26 of substantially circular cross-section which is co-aligned with the groove 21 extending beneath the free edge 17 of the baffle 18 so that, in combination, the slots 26 and the groove 21 are continuous with one another.

A number of flaps 27 are provided which each comprise a rectangular plate 28 having substantially the

same width as the distance between the planar side walls 13,14 of an insert 2 and substantially the same height as that of an insert 2. A longitudinal edge of each flap 24 is formed with an enlarged rib 29 which extends along the edge of the flap 27 and is circular in cross-section. The rib 29 is adapted to be received in the slots 26 and the groove 21 extending along the base of a baffle so that the flap 27 is hingedly held beneath the insert 2. Preferably, the flap 27 is slid into one of the slots 26 in a slide block 23,24 and thence the co-aligned groove 21 from one side of an insert 2.

A drain valve embodying the present invention is assembled as follows. A first insert 2A is dropped into the top of the cylindrical sleeve 1. The slide blocks 23,24 of a first insert 2A are registered with respective ones of the longitudinal channels 11,12 so as to guide the first insert 2A down the length of the cylindrical sleeve until the first insert 2A comes into contact with the annular lip 1A at the base of the cylindrical sleeve 1. The baffle 17A in the insert 2A blocks, in the embodiment shown in Figure 1, the left-hand side of the chamber.

A second insert 2B is provided which is fitted with a flap 27B hingedly held in the groove 21B on the underside of the free edge 18B of the baffle 17B. The slide blocks 23B,24B of the second insert 2B are registered with the guide channels 11,12 and the second insert 2B and the depending flap 27B are lowered into the cylindrical sleeve 1 such that the second insert 2B rests upon the first insert 2A and the depending flap 27B rests against the free edge 18A of the baffle 17A in the first insert 2A. In the embodiment shown in Figure 1, the baffle 17B in the second insert 2B blocks the right-hand side of that chamber.

A third insert 2C is provided which is fitted with a flap 27C hingedly held in the groove 27C on the underside of the free edge 18C of the baffle 17C. The slide blocks 23C,24C of the third insert 2C are registered with the guide channels 11,12 and the third insert 2C and the depending flap 27C are lowered into the cylindrical sleeve 1 such that the third insert 2C rests upon the second insert 2B and the depending flap 27C rests against the free edge 18B of the baffle 17B in the second insert 2B. In the embodiment shown in Figure 1, the baffle 17C in the third insert 2C blocks the left-hand side of that chamber.

The inserts 2A,2B,2C are thus aligned such that the grooves 21B,21C in the free edges 18B,18C lie directly above the free edge of the baffle below, the respective flap 27B,27C thereby being held against the free edge of the baffle below by gravity.

Lastly, the drain cover 3 is inserted on the top of the cylindrical sleeve. The bottom of the drain cover is provided with a slightly proud circular projection in which circular gratings 3A are formed. The proud projection acts as a plug in the top of the cylindrical sleeve 1.

The assembled drain valve can be incorporated in a floor (as shown in Figure 7) such that the drain cover 3 is at the same level or lower than the floor so that any water or other liquid on the floor surface drains into the drain cover 3 and down through the drain valve 1.

Since the flaps 27 are hingedly mounted to the free edges 18 of the baffles 17, the flaps 27 are hingeable between a closed condition in which the flap 27 abuts the free edge 18 of the baffle 17 below to close the exit mouth 20 of that chamber and an open condition in which the flap

27 is moved away from the free edge 18 of the baffle 17 below so as to create a gap through which a liquid may pass. Due to gravity, a flap 27 normally rests against the free edge 18 of the baffle 17 below in the closed condition and is only movable from the closed condition to the open condition if there is pressure on the flap 27 from the baffle side. Such pressure exists when a body of fluid is present on the baffle side of a flap 27.

As will best be appreciated from Figure 2 of the drawings, water or other liquids or waste materials passing through the gratings 3A in the drain cover 3 flows into the chamber defined by the top insert 2C, impinges against the top baffle 17C and is thence channelled toward the right-hand side of the top insert 2C and then through into the chamber defined by the middle insert 2B where it impinges against the middle baffle 17B and also against the flap 27C which is hingedly mounted from the free edge 18C of the top baffle 17C. As the liquid passes down into the space between the middle baffle 17B and the flap 27C, the pressure of the liquid forces the flap 27C from the normally closed condition to the open condition to allow the liquid to pass through the gap between the flap 27C and the middle baffle 17B and on into the chamber of the bottom insert 2A. There again, the liquid impinges on the lowest baffle 17A and against the flap 27B depending from the free edge 18B of the middle baffle 17B and forces the flap 27B open so that the flow can drain into a waste pipe 30 or the like connected below the drain valve as shown in Figure 7.

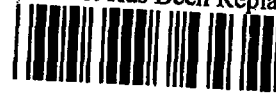
Since the force necessary to open the flaps is absolutely minimal, no liquid is left standing in the drain valve so that there is no possibility of any liquid remaining in the drain valve becoming stagnant. Further, since the flaps close against the baffles when the liquid

has been drained from the drain valve, no fumes or the like from the waste water or other liquid are able to pass back up the waste pipe past the drain valve.

Unlike conventional U-bends located as shown in Figure 8, a drain valve embodying the present invention is easily accessible by lifting the drain cover 3 to gain access to the cylindrical sleeve 1 and inserts 2A, 2B, 2C. Thus, these components can be readily replaced. In another embodiment, the entire sleeve 1 is slidably received in the floor so that the entire unit can be easily replaced.



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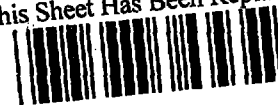


CLAIMS:

1. A drain valve for connecting an area to be drained to a waste pipe or the like, which drain valve comprises a first chamber having a chamber entrance into which, in use, a liquid drains, the first chamber including a baffle for directing a flow of liquid from the chamber entrance through the chamber to a free edge of the baffle adjacent an exit mouth of the first chamber and a hinged flap having a closed condition in which the flap abuts the free edge of the baffle to close the exit mouth and an open condition in which a gap is provided between the baffle and the flap so as to open the exit mouth, the flap being biased into the closed condition to prevent, in use, fumes from below the drain valve rising into the area to be drained through the drain valve.
2. A drain valve according to Claim 1, wherein the exit mouth of the first chamber leads to a chamber entrance of a second chamber, the second chamber having substantially the same construction as the first chamber and including a hinged flap.
3. A drain valve according to Claim 2, wherein the flap of the second chamber is hinged from the baffle of the first chamber.
4. A drain valve according to any preceding claim, wherein a drain cover is provided above the first chamber, the cover having a grating to allow liquid to drain into the first chamber but to prevent objects from falling into the first chamber.
5. A drain valve according to Claim 4, wherein a further chamber is provided between the drain cover and the



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first chamber, the further chamber having a chamber entrance into which a liquid drains from the drain cover and a baffle for directing a flow of liquid from the chamber entrance through an exit mouth of the further chamber and into the chamber entrance of the first chamber.

6. A drain valve according to Claim 5, wherein the flap of the first chamber is hinged from the baffle of the further chamber.

7. A drain valve according to any preceding claim, wherein the free edge of the or each baffle is provided with means for hingedly suspending a flap therefrom.

8. A drain valve according to Claim 7, wherein the means for hingedly suspending a flap comprises a groove formed in the free edge of a baffle and the flap comprises an elongate rib portion receivable in the grove.

9. A drain valve according to any preceding claim, wherein the or each means for hingedly suspending a flap is located substantially directly above the free edge of the baffle in the chamber below such that the flap is biased into the closed condition by gravity.

10. A drain valve according to any preceding claim, wherein a sleeve is provided to house the or each chamber.

11. A drain valve according to Claim 10, wherein the sleeve is provided with guide means to register the orientation of the or each chamber in the sleeve and the walls of the or each chamber are provided with means to engage with the guide means on the sleeve.



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12. A drain valve according to Claim 11, wherein one of the sleeve or the walls is provided with a channel and the other of the sleeve or the walls is provided with a projection to engage in the channel and thereby register the orientation of the chambers with respect to one another and the sleeve.

13. A drain valve according to Claim 11 or 12, wherein the guide means comprises a channel in the sleeve and the means to engage with the guide means comprises a slide block on an outer wall of a chamber.

14. A drain valve according to any preceding claim, wherein the or each baffle blocks off substantially one half of the or each chamber thereby defining the exit mouth of the or each chamber.

15. A drain valve according to Claim 14, wherein a plurality of chambers are provided of substantially the same construction and the baffles of adjacent chambers block off opposite halves of the chambers.

16. A drain valve substantially as hereinbefore described with reference to and as shown in Figures 1 to 6.

17. Any novel feature or combination of features disclosed herein.