

ODOUR TRAP WITH CHECK VALVE AND AIR ADMITTANCE VALVE

Field of the Invention

This invention relates to a trap for a waste outlet.

Background to the Invention

5 Water seal traps are widely used throughout the world in plumbing installations for buildings. A water trap is generally positioned between the outlet of a sink, basin, bath, shower etc., and the soil pipe to prevent odours, rodents and other undesirable entities which may be present in the soil pipe from entering the building through the outlet.

10 Various different types of trap exist and one well known and widely used trap is the bottle trap. Bottle traps are particularly popular because of their compact nature.

 However, bottle traps have drawbacks. For example where there are a large number of installations on the same plumbing system, a negative pressure
15 differential can exist between the inlet side of the bottle trap and the outlet side. If this pressure differential is large enough, the water forming the trap can get sucked away, exposing the environment surrounding the trap inlet to the contents of the soil pipe.

 This problem has been partially alleviated by use of a one way flow valve
20 in the valve inlet, the one way flow valve providing a barrier between the trap inlet and the trap outlet in the event of the trap seal being sucked away. Whilst this barrier has proven to be successful at preventing the ingress of insects and the like, the one way flow valve has been known to allow the ingress of odours.

Summary of the Invention

According to the first aspect of the present invention there is provided a trap for a waste outlet, the trap comprising:

5 a trap body defining an inlet and an outlet, the trap body further defining a convoluted flow path between the trap inlet and the trap outlet such that in use a water seal exists between the trap inlet and the trap outlet;

an inlet one way flow valve located adjacent the trap inlet and adapted to permit flow or fluid from the trap inlet to the trap outlet but prevents flow from the trap outlet to the trap inlet; and

10 an outlet one way pressure valve located adjacent the trap outlet;

wherein, in use, in the presence of a negative pressure differential across the outlet one-way pressure valve, air can pass through the one way pressure valve to relieve the pressure differential but in the event of a positive differential across the outlet one-way pressure valve, air is prevented from passing through
15 the one way pressure valve.

In at least one embodiment of the present invention, there is provided a trap which, when connected to a soil stack, allows air into the trap outlet to relieve a negative pressure differential across the one-way pressure valve, that is when the pressure within the soil stack is less than the environmental pressure at the
20 valve inlet. Generally for a trap, this environmental pressure will also be the pressure at the trap inlet. This arrangement therefore ensures the pressure differential does not reach a sufficient level to generate a force sufficient to suck the water seal out of the trap and into the soil stack. In the event of a positive pressure differential of sufficient magnitude, however, the water seal is prevented
25 from being pushed through the trap inlet by the inlet one way flow valve.

For the avoidance of doubt, the phase “negative pressure differential” in this context means a pressure differential which would apply a pulling force to the water seal in a trap, which, in use, is such that the water seal experiences a force which, if the pressure differential reaches a sufficient magnitude, is strong

5 enough to cause the water seal to flow through the trap outlet.

The trap inlet and the trap outlet may be perpendicular to one another.

The trap outlet and the trap inlet may define connecting portions adapted to permit the bottle trap to be connected, in use, to associated plumbing.

The connecting portions may define threaded connections.

10 The trap inlet and/or the trap outlet may be displaced from the trap body.

The trap inlet or the trap outlet may be displaced from the trap body by means of an inlet neck and/or an outlet neck.

The inlet neck or outlet neck may extend from the trap body.

15 The inlet neck or outlet neck may extend from the trap body in a direction perpendicular to the respective inlet or outlet.

The inlet neck or outlet neck may be a short length of tube extending from the trap body.

The one-way pressure valve may be in fluid communication with the outlet neck.

20 The one way pressure valve may be mounted to the outlet neck.

Mounting the one way pressure valve to the outlet neck ensures the one way pressure valve is located where the negative pressure differential which may exist between the trap inlet and trap outlet be strongest.

The one way pressure valve may comprise a pressure valve inlet and a pressure valve outlet, the pressure valve outlet being in communication with the trap body.

Particularly, the pressure valve outlet may be connected to the trap outlet's
5 neck.

The pressure valve may comprise a pressure valve passage.

The pressure valve passage may define the pressure valve outlet.

The pressure valve passage may provide fluid communication between the pressure valve inlet body and the pressure valve outlet.

10 The pressure valve inlet body may comprise a pressure valve member.

The pressure valve member may be positioned with respect to the pressure valve outlet such that the pressure valve member is located above the body outlet.

The pressure valve outlet may be located on a surface of the trap outlet
15 neck.

Particularly, the pressure valve outlet may be located on a side or upper surface of the trap outlet's neck.

In a preferred embodiment the pressure valve outlet is located on an upper surface of the trap outlet's neck. Such an arrangement permits the pressure
20 valve to stay substantially free of contamination from fluids or waste which may be flowing through the bottle trap at any given moment.

The pressure valve member may be adapted to move between a pressure valve open position and a pressure valve closed position. In the pressure valve open position air is permitted to flow from the air inlet through the pressure valve

body and the pressure valve passageway to the pressure valve outlet and, in use, into the bottle trap body.

The pressure valve member may be adapted to move from the pressure valve closed position to the pressure valve open position in the presence of a threshold pressure. In such an embodiment, the pressure valve member will not move until a level of negative pressure differential between the pressure valve inlet and the pressure valve outlet is reached.

The pressure valve member may be adapted to move between the pressure valve open position and the pressure valve closed position in the presence of a negative pressure differential across the pressure valve member.

In some embodiments the pressure valve member may only move from the pressure valve closed position to the pressure valve open position when the negative pressure differential is such that the pressure differential can be with the pressure valve member. The pressure valve member may be adapted to move vertically between the pressure valve open position and the pressure valve closed position. In such an embodiment the pressure valve member may be biased to the pressure valve closed position by gravity. In this embodiment, to move the pressure valve member from the pressure valve open position to the pressure valve closed position, the threshold pressure is defined by the pressure differential required to overcome the gravity biasing effect.

Air may flow into the pressure valve inlet in an inlet direction and through the pressure valve outlet in an outlet direction.

The inlet direction and the outlet direction may be different.

The inlet direction and the outlet direction may be perpendicular.

Additionally or alternatively, the inlet direction and the outlet direction are parallel.

In such an embodiment the pressure valve passage may be convoluted. A convoluted pressure valve passage allows for the pressure valve inlet and the pressure valve outlet to be offset from one another. In this way the pressure valve inlet size and the pressure valve outlet size can be maximised to allow for a large volume of air to pass through the pressure valve and into the trap body. Furthermore, an offset arrangement permits the height of the pressure valve to be minimised and allows for a larger pressure valve member to be utilised. Utilising a large pressure valve member allows for the threshold pressure to be adjusted to suit different circumstances and different installations.

10 The pressure valve inlet body may be located over the outlet connecting portion. Such an arrangement utilises redundant space, in use, underneath the sink or basin or the like. Additionally, the presence of the pressure valve inlet body may prevent the connection, in use, between the pressure valve outlet and the plumbing system from working loose.

15 The pressure valve inlet body may define a void between the pressure valve member and the passageway.

The void, in use, may contain an air pocket. The presence of the air pocket ensures that should the trap backup and water enter the pressure valve outlet, the presence of an air pocket in the void prevents the backup water or waste in the bottle trap from contaminating the seal member and preventing the pressure valve member from shutting properly.

The inlet flow valve may comprise a diaphragm valve.

The diaphragm valve may be a one way duck bill valve.

25 **Brief Description of the Drawings**

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

Figure 1 is a side view of a bottle trap for a waste outlet according to an embodiment of the present invention;

5 Figure 2 is a section view of the bottle trap of Figure 1 in an outlet pressure valve closed configuration;

Figure 3 is a section view through line A-A shown on Figure 2;

Figure 4 is a section of the bottle trap of Figure 1 shown in an outlet pressure valve open position;

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Detailed Description of the Drawings

Reference is first made to Figure 1, a side view of a bottle trap, generally indicated by reference numeral 10 for a waste outlet (not shown) and, Figure 2, a section of the bottle trap of Figure 1 shown in an outlet pressure valve 24 closed position.

The bottle trap 10 comprises a trap body 12, defining a trap inlet 14 and a trap outlet 16. The body further includes an insert 18 for creating a convoluted flow path 20 between the trap inlet 14 and the trap outlet 16, such that a water seal 22, in use, exists between the trap inlet 14 and the trap outlet 16. The bottle trap 10 further comprises an inlet one way flow valve 23 located adjacent the trap inlet 14 and an outlet one way pressure valve 24 located on a neck 26 connecting the valve outlet 16 to the trap upper body 28.

The trap body 12 comprises an upper portion 28 and a lower portion 30, the lower portion being threadedly connected to the upper portion 28 by means of a threaded connection 32.

The inlet one way flow valve 23 comprises a polymer diaphragm valve adapted to permit the flow of fluid from the trap inlet 14 to the trap outlet. 16.

The one way outlet pressure valve 24, comprises a pressure valve inlet 34, a pressure valve outlet 36 and a pressure valve member 38. The pressure
 5 valve inlet 34 and the pressure valve outlet 36 are connected by a flow path 40. The pressure valve member 38 rests on the pressure valve member support 42, a pressure valve member lower surface 44 forming a seal with a support upper surface 46.

The seal between the pressure valve member 38 and the pressure valve
 10 member support 44 is maintained, in the absence of a pressure differential, by gravity, gravity pulling on the pressure valve member 38 to pull it down to engagement with the pressure valve member support 44.

If a pressure differential is present across the pressure valve member 38, the pressure valve member 38 will, in the case where the pressure in the trap 16
 15 in the region indicated by "X" adjacent the trap outlet 16 is lower than the external environment, indicated by "Y" which is the environmental pressure present at the trap inlet 14 and the pressure valve inlet 34, lift away from the pressure valve member support 42, allowing air to flow through the passageway 40. This is shown more clearly in Figure 4, a section view of the bottle trap of Figure 1
 20 shown in a pressure valve 24 open position.

If the pressure differential across the pressure valve member 38 is a positive pressure differential, that is the pressure at region "X" is greater than the external environment "Y" then the pressure valve member 24 is pressed into engagement with the pressure valve member support 42. This prevents noxious
 25 fumes from escaping from the soil pipe (not shown) which will be connected to

the trap outlet 16. The pressure such a situation applies to push the water seal towards the inlet 14 is resisted by the one way inlet flow valve 23 which prevents the flow of fluid from the trap body 12 out of the trap inlet 14.

Relieving the negative pressure differential prevents a pulling force being
5 applied to the water seal 22, preventing it being sucked from the flow path 20 and down the soil pipe. This ensures the water seal is maintained preventing ingress of noxious fumes and the like from the soil pipe through the convoluted flow path 20 and out of the trap inlet 14.

As can be seen from Figures 1, 2 and 4, the pressure valve inlet 24 and
10 the pressure valve outlet 36 lie on different vertical planes. That is to say the direction of flow through the pressure valve inlet 34 and the direction of flow through the pressure valve outlet 36 are parallel but displaced apart.

This permits the inlet 34 and the outlet to 36 be arranged in a more complex formation and allows for the inlet 34 to have a gravity driven pressure
15 valve member 38 but be located above the trap outlet 16. Locating the pressure valve member 38 above the trap outlet 16 reduces the possibility of flow in the trap 10 which is flowing out of the trap outlet 16 from contaminating the pressure valve member 38. This possibility is further reduced by the inclusion of a void 44 immediately above the pressure valve member 38. The void 44 provides a
20 region in which air can be trapped providing a barrier between the pressure valve outlet 36 and the pressure valve inlet 34, such that if the soil pipe blocks and the trap 10 fills with fluid, the fluid will not be able to displace the air within the pressure valve passageway and flow over onto the pressure valve member 38.

Various modifications and improvements can be made to the above
25 described embodiments without departing from the scope of the invention. For

example, although the trap shown is a split trap, a single bodied trap could be used.

CLAIMS

1. A bottle trap for a waste outlet, the bottle trap comprising:

a trap body defining an inlet and an outlet, the trap body including an insert, inserted via the inlet and being arranged relative to the inlet and the outlet such that flow through the bottle trap is defined by a convoluted flow path between the trap inlet and the trap outlet such that in use a water seal exists between the trap inlet and the trap outlet, wherein a flow axis of the trap outlet is oriented substantially perpendicular to a flow axis of the trap inlet;

a duckbill one-way flow valve located adjacent the trap inlet and housed within the insert, wherein the duckbill one-way flow valve permits flow of fluid from the trap inlet to the trap outlet but prevents flow from the trap outlet to the trap inlet; and

an outlet one-way pressure valve located above and adjacent the trap outlet, wherein the outlet one-way pressure valve comprises a pressure valve inlet and a pressure valve outlet;

wherein the trap outlet is displaced from the trap body by means of an outlet neck and wherein the outlet neck extends from the trap body and wherein the pressure valve outlet is connected in fluid communication to an outlet passageway defined by the outlet neck,

wherein, in use, in the presence of a negative pressure differential across the outlet one-way pressure valve, the outlet one-way pressure valve is operable to allow air to pass through the outlet one-way pressure valve to relieve the pressure differential but in the presence of a positive differential across the outlet one-way pressure valve, the outlet one-way pressure valve is operable to prevent air passing through the outlet one-way pressure valve.

2. The bottle trap according to claim 1, wherein the pressure valve inlet comprises a pressure valve member.
3. The bottle trap according to claim 2, wherein the pressure valve member is positioned with respect to the pressure valve outlet such that the pressure valve member is located above the trap body outlet.
4. The bottle trap according to claim 2, wherein the pressure valve member is operable to move between a pressure valve open position and a pressure valve closed position and to move from a pressure valve closed position to a pressure valve open position in the presence of a threshold pressure.
5. The bottle trap according to claim 4, wherein the pressure valve member is operable to move between the pressure valve open position and the pressure valve closed position in the presence of a negative pressure differential across the pressure valve member.
6. The bottle trap according to claim 2, wherein, in use, the pressure valve inlet and the pressure valve outlet lie on different vertical planes, wherein the direction of flow through the pressure valve inlet and the direction of flow through the pressure valve outlet are parallel but displaced apart.
7. The bottle trap according to claim 6, comprising a gravity driven pressure valve member.
8. The bottle trap according to claim 2, further comprising a void above the pressure valve member, wherein the void defines an air pocket, which provides a barrier between the pressure valve outlet and the pressure valve inlet.