

Non-Return Device

Field of the Invention

The present invention relates to a non-return device. Particularly but not exclusively the present invention relates to a non-return device for use in
5 liquid seal traps.

Background to the Invention

Traps, such as bottle traps or convoluted pipes, are widely used throughout the world to connect waste fluid outlets from sinks, baths or
10 showers or the like to a soil stack. A conventional trap comprises an inlet and an outlet, and defines a passageway for liquid to flow from the inlet to the outlet. A conventional trap is designed such that, in use, liquid is retained in the passageway to provide a barrier between the inlet and the outlet, preventing odours and gases from the soil stack passing through the trap into
15 the surrounding environment.

Whilst conventional traps are fairly effective, there are drawbacks associated with them. It is known, for example, for the liquid seal to evaporate over a period of time, such that the gases in the soil stack are no longer prevented from escaping through the waste outlet. This is particularly a
20 problem where the waste outlet is not used regularly and/or the trap is located in a hot or low humidity environment in which the rate of evaporation is increased.

It is also known for a siphon effect to be established in a trap causing the liquid in the trap to be sucked out of the trap, thereby breaking the liquid
25 seal.

Non-return devices have been used in conjunction with soil traps to prevent odours from the soil stack passing through the trap in the event of the liquid seal being broken. One such device is described in GB2296309. However this device has drawbacks. For example the incorporation of such a
5 non-return device may restrict the flow through the waste outlet and causing a build up of fluid in the vessel. This can be unsightly and prompt concern of a blockage in a user.

It is also known for conventional non-return devices to turn inside out when there is a pressure differential across the device resulting in a higher
10 pressure on soil stack side of the non-return device, thereby negating the effect of the non-return device.

Summary of the Invention

According to a first aspect of the present invention there is provided a
15 non-return device for use with a waste trap, the non-return device comprising:
a sealing portion having first and second sheet members;
a device inlet;
a device outlet; and
a transition portion providing fluid communication between the device
20 inlet and the sealing portion, the transition portion having a convex section of wall.

In one embodiment, providing a non-return device with a transition portion having a convex section of wall, allows fluid to build up in the immediate vicinity of the sealing portion, permitting a larger volume of fluid to
25 be held by the device, resulting in a greater flow rate through the device. The

convex shape is also resistant to turning inside out in response to a pressure differential across the device, as the pressure has to overcome the bias of the transition portion which is to a bowed out configuration.

5 The sheet members may be moveable from a sealed position, in which the members are at least partially in surface contact, to an open position, in which the members are forced apart by a flow of fluid flowing from the device inlet to the device outlet, the sheet members being biased to return to the sealed position from the open position such that fluid is prevented from flowing from the device outlet to the device inlet.

10 The non-return device may be moulded, for example injection moulded. Alternatively, the non-return device may be compression moulded.

The inlet may be circular. A circular inlet facilitates installing the non-return device in pipes and other conventional fittings.

15 The inlet may be biased to an open position. Biasing the inlet to an open position ensures optimum performance of the device.

In one embodiment, the inlet may be stiffened. Stiffening the inlet assists in biasing the inlet to the open position.

The inlet may be a circular flange. Providing a circular flange stiffens the non-return device inlet, ensuring optimum performance.

20 The sheet members may define a flow path from the transition portion to the device outlet.

The sheet members may define the device outlet.

In one embodiment the flow path may be non-linear.

25 In this embodiment the sheet members may define at least one bend or kink.

In this embodiment the bend or kink may extend across the sheet members in direction perpendicular to the direction of the flow path. Such an arrangement provides a contact seal along the length of the bend or kink between the first and second sheet members.

5 In one embodiment there may be one kink.

The sealing portion may comprise a plurality of sealing portion sections, each sealing portion section being adjacent, a bend or kink.

Each sealing portion section may be linear.

10 In an embodiment where there is one kink, the angle between the sealing portion sections adjacent the kink may be between 110° or 170°.

In this embodiment, the angle may be between 120° to 160°.

In this embodiment the angle may be 135°.

At least a portion of each sheet member may be less than 0.5mm thick

At least a portion of each sheet member may be less than 0.3mm thick.

15 At least a portion of each sheet member may be 0.1 millimetres thick.

Thinner sheet members provide improved sealing performance and reduce material costs.

The sheet member portion may be adjacent a sealing portion section.

In supplements, the sheet members may be a variable thickness.

20 Thicker sections in the sheet members help avoid distortion.

The non-return device may comprise silicon.

The non-return device may, most preferably, comprise liquid silicon.

Each sheet member may comprise a first edge and a second edge, the edges being parallel to the flow path.

In one embodiment, the first sheet member first edge may be joined to the second sheet member first edge and the first sheet member second edge may be joined to the second sheet member second edge.

The sheet members may be biased to the sealed position by resilience.

5 In one embodiment the first and second sheet members may comprise at least one biasing member. Biasing members are provided to bring the sheet members together and assist in maintaining a seal.

Additionally or alternatively, the first and second sheet members may comprise at least one stiffening member. Stiffening members permit thinner
10 material to be used for the sheet members and help resist the device turning inside out when exposed to a pressure differential, the higher pressure being on the outlet side of the non-return device.

In an embodiment, the biasing members and the stiffening members may be the same.

15 The biasing members and/or the stiffening members may be first and second ribs.

The first rib may connect the sheet member first edges and the second rib may connect the sheet member second edges.

The ribs may extend the full length of the sheet members.

20 The ribs may bias the first and second sheet members to the sealed position.

Each rib may be more than 50% of the thickness of each sheet member.

Each rib may be more than 50% thicker than the sheet members
25 combined.

The ribs may extend up to the transition portion. The ribs also add stiffness to the transition portion and help resist the device turning inside out when exposed to a pressure differential, the higher pressure being on the outlet side of the non-return device.

5 In an embodiment where the device is injection moulded, the sealing portion may be moulded in a tool comprising a shell and a core.

The core may be 0.2mm thick.

The core may include a highly polished surface portion.

The internal surface of the sealing portion may be formed against the
10 highly polished surface portion. A highly polished core surface will provide a very smooth sealing portion internal surface. The smoother the surface, the more the surface material will "stick" to one another and improve the sealing properties of the seal.

In this embodiment, the moulding tool shell may also comprise a
15 polished surface portion. The polished surface portion may also be in the region of the sealing portion.

According to a second aspect of the present invention, there is provided a non-return device for use with a waste trap, the non-return device comprising:

20 a sealing portion having first and second sheet members at least one sheet member comprising at least one stiffening member;

a device inlet;

a device outlet; and

a transition portion providing fluid communication between the device
25 inlet and the sealing portion.

In one embodiment, providing a stiffening member permits a thinner material to be used for the sheet members, which in turn improves the sealing properties of the sheet members. The stiffening members additionally help resist the device turning inside out when exposed to pressure differential, the higher pressure being on the outlet side of the non-return device.

The transition portion may have a convex section of wall.

According to a third aspect of the present invention, there is provided a non-return device for use with a waste trap, the non-return device comprising:

- a sealing portion having first and second sheet members, at least one sheet member comprising at least one biasing member;
- a device inlet;
- a device outlet; and
- a transition portion providing fluid communication between the device inlet and the sealing portion.

In one embodiment, providing a biasing member to bias the sheet members together further improves the sealing properties of the non-return device.

The transition portion may have a convex section of wall.

It will be understood that features listed as non-essential in respect of the first aspect may also be applicable to the second and third aspects and are not repeated for brevity.

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 perspective view of a non-return device according to a first embodiment of the present invention;

Figure 2 is a side section view through the device of Figure 1;

Figure 3 is a cut away perspective view of the device of Figure 1;

5 Figure 4 is a cut away perspective view of part of the device of Figure 1;

Figure 5 is a partially cut away front view of the device of Figure 1;

Figure 6 is part of the section view marked 6-6 on Figure 5;

Figure 7 is a plan view of the device of Figure 1; and

10 Figure 8 is a close up section view of part of the device of Figure 1.

Detailed Description of the Drawings

Referring to the Figures and particularly to Figures 1, 2, 3, 6 and 8, a non-return device, generally indicated by reference numeral 10 for use with a waste trap is shown. The non-return device 10 comprises a sealing portion 12, having first and second sheet members 14, 16, a device inlet 18, a device outlet 20 and the transition portion 22 providing fluid communication between the device inlet 18 and the sealing portion 12, the transition portion 22 having a convex wall section 24 (best seen in Figure 2). The sheet numbers 14, 16 are moveable from a sealed position, as shown in Figures 1-8, to an open position (not shown) in which the members 14, 16 are forced apart by a flow of fluid flowing from the device inlet 18 to the device outlet 20, the sheet members 14, 16 being biased by resilience from the open position to the sealed position such that fluid in the opposite direction is prevented.

Providing a device 10 in which a section of the wall 24 of the transition portion 22 is convex, allows for a build up of fluid in the transition portion 22, in the immediate vicinity of the sealing portion 12. This facilitates the opening of the sealing portion 12, by forcing the sheet members 14, 16 apart because
5 the bowed-out nature of the transition portion 22 facilitates opening of the sealed portion 12. If, for example, the transition portion wall section 24 had a concave profile, that is it is curved inwards, the weight of fluid has to overcome the natural bias of such a shape before fluid can flow through the device 10. Furthermore, the greater the volume of fluid which is contained
10 within the transition portion 22, the lower the volume of fluid which remains within, for example, the urinal, with the result that when used, there is less possibility of a user thinking the urinal is blocked. Furthermore the convex wall section 24 has a natural bias away from the direction of flow through the device 10 which has to be overcome by a pressure from below the device 10
15 which may be acting to turn the device 10 inside out in the event of a pressure differential existing across the device 10.

The first and second sheet members 14, 16 are joined at their edges by the first and second ribs 26, 28. Referring to Figure 6, each rib 26 has a square cross section 1mm x 1mm. Figure 6 also most clearly shows the
20 sheet members 14, 16 which are 0.1mm thick.

The device 10 is injection moulded and a tool (not shown) comprising two shells and a central core. The central core is 0.2mm thick indicated by letter "A" on Figures 6 and 8. The provision of the ribs 26, 28 stiffen the sealing portion 12, permitting a thin material to be used for the sheet
25 members 14, 16. A thin material provides improved sealing properties,

reduces cost and has less resistance to the fluid flowing through the device 10 from the inlet 18 to the outlet 20. The ribs 26 also act to bias the sheet members 14, 16 together.

5 The sealing portion 12 also incorporates a kink 30 transverse to the direction of fluid flow through the device 18. The kink 30 forces a contact seal between the sheet members 14, 16. Referring to Figure 2, there are three main contact points between the sheet members 14, 16; at the kink 30, at the outlet 20, and at the entry 32 to the sealing portion 12.

10 The kink 30 is located between a first sealing portion section 34 and a second sealing portion section 36, the first and second sealing portion sections 34, 36 being linear and arranged at an angle indicated by letter "B" on Figure 2 of 135°.

15 The device inlet 18 is defined by an inlet flange 38. The inlet flange 38 acts to hold the device 10 open and provides an engagement portion for engaging the device 10 with a trap (not shown).

Various modifications and improvements could be made to the above described embodiment without departing from the scope of the invention. For example, although the device 10 is shown with only one kink, two or more kinks could be incorporated, a two kink device having a flow path through the
20 sealing portion which could be S-shaped or could be U-shape.

CLAIMS

1. A non-return device for use with a waste trap or a urinal, the non-return device comprising:
 - 5 a tubular portion comprising a device inlet, wherein the tubular portion comprises a non-constant tubular length that depends on circumferential position around the tubular portion;
 - a sealing portion having first and second sheet members biased to a sealed position in which the first and second sheet members are at least partially in surface contact, the sealing portion defining a device outlet; and
 - 10 a transition portion extending between the tubular portion and the sealing portion and providing fluid communication between the tubular portion and the sealing portion, the transition portion having a convex section of wall biased to a bowed-out configuration for allowing fluid to open the sealing portion by forcing the first and second sheet members to an open position for allowing fluid
 - 15 flowing into the non-return device from the device inlet to flow out of the device outlet.
2. The non-return device of claim 1, wherein the sheet members are biased to return to the sealed position from the open position such that fluid is prevented from flowing from the device outlet to the device inlet.
- 20 3. The non-return device of either of claims 1 or 2, wherein the non-return device is injection moulded.
- 25 4. The non-return device of claim 3, wherein the sealing portion is moulded in a tool comprising a shell and a core.
5. The non-return device of either of claims 1 or 2, wherein the non-return device is compression moulded.
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6. The non-return device of any one of claims 1 to 5, wherein the device inlet is circular.

5 7. The non-return device of any one of claims 1 to 6, wherein the device inlet is biased to an open position.

8. The non-return device of any one of claims 1 to 7, wherein the device inlet is stiffened.

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9. The non-return device of any one of claims 1 to 8, wherein the device inlet is a circular flange.

10. The non-return device of any one of claims 1 to 9, wherein the sheet
15 members define a flow path from the transition portion to the device outlet.

11. The non-return device of claim 10, wherein each sheet member comprises a first edge and a second edge, the edges being parallel to the flow path.

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12. The non-return device of claim 11, wherein the first sheet member first edge is joined to the second sheet member first edge and the first sheet member second edge is joined to the second sheet member second edge.

25 13. The non-return device of any one of claims 1 to 12, wherein the flow path is non-linear.

14. The non-return device of any one of claims 1 to 13, wherein the sheet members define at least one bend or kink.

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15. The non-return device of claim 14, wherein the bend or kink extends across the sheet members in direction perpendicular to the direction of the flow path.
- 5 16. The non-return device of either of claims 14 or 15, wherein there is one kink.
17. The non-return device of any one of claims 14 to 16, wherein the sealing portion comprises a plurality of sealing portion sections, each sealing portion
10 section being adjacent, a bend or kink.
18. The non-return device of claim 17, wherein the angle between the sealing portion sections adjacent the kink is between 110° and 170°.
- 15 19. The non-return device of claim 18, wherein the angle is between 120° to 160°.
20. The non-return device of claim 18 or 19, wherein the angle is 135°.
- 20 21. The non-return device of any one of claims 17 to 20, wherein each sealing portion section is linear.
22. The non-return device of any one of claims 1 to 21, wherein at least a portion of each sheet member is less than 0.5mm thick
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23. The non-return device of claim 22, wherein at least a portion of each sheet member is less than 0.3mm thick.
24. The non-return device of claim 23, wherein at least a portion of each
30 sheet member is 0.1 millimetres thick.

25. The non-return device of any one of claims 22 to 24, wherein the sheet member portion is adjacent a sealing portion section.
- 5 26. The non-return device of any one of claims 1 to 25, wherein the sheet members are a variable thickness.
27. The non-return device of any one of claims 1 to 26, wherein the non-return device comprises silicon.
- 10 28. The non-return device of claim 27, wherein the non-return device comprises liquid silicon.
29. The non-return device of any one of claims 1 to 28, wherein the sheet members are biased to the sealed position by resilience.
- 15 30. The non-return device of any one of claims 1 to 29, wherein the first and second sheet members comprise at least one biasing member.
31. The non-return device of claim 30, wherein the first and second sheet members comprise at least one stiffening member.
- 20 32. The non-return device of claim 31, wherein the biasing members and the stiffening members are the same.
- 25 33. The non-return device of claim 31 or 32, wherein the at least one biasing member and/or the at least one stiffening member are first and second ribs.

34. The non-return device of claim 33, wherein the first rib connects first edges of the first and second sheet members and the second rib connects second edges of the first and second sheet members.

5 35. The non-return device of claim 34, wherein the ribs extend the full length of the sheet members.

36. The non-return device of any one of claims 33 to 35, wherein the ribs bias the first and second sheet members to the sealed position.

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37. The non-return device of any one of claims 33 to 36, wherein each rib is more than 50% of the thickness of each sheet member.

15 38. The non-return device of any one of claims 33 to 36, wherein each rib is more than 50% thicker than the sheet members combined.

39. The non-return device of any one of claims 33 to 38, wherein the ribs extend up to the transition portion.

20 40. A non-return device for use with a waste trap or a urinal, the non-return device comprising:

a tubular portion comprising a device inlet, wherein the tubular portion comprises a non-constant tubular length that depends on circumferential position around the tubular portion;

25 a sealing portion having first and second sheet members biased to a sealed position in which the first and second sheet members are at least partially in surface contact, the sealing portion defining a device outlet; and at least one sheet member comprising at least one stiffening member; and

a transition portion extending between the tubular portion and the sealing portion and providing fluid communication between the tubular portion and the sealing portion,

the transition portion being biased to a bowed-out configuration for allowing fluid to open the sealing portion by forcing the first and second sheet members to an open position for allowing fluid flowing into the non-return device from the device inlet to flow out of the device outlet.

41. The non-return device of claim 40, wherein the transition portion has a convex section of wall.

42. A non-return device for use with a waste trap or a urinal, the non-return device comprising:

a tubular portion comprising a device inlet, wherein the tubular portion comprises a non-constant tubular length that depends on circumferential position around the tubular portion;

a sealing portion having first and second sheet members biased to a sealed position in which the first and second sheet members are at least partially in surface contact, the sealing portion defining a device outlet; and at least one sheet member comprising at least one biasing member; and

a transition portion extending between the tubular portion and the sealing portion and providing fluid communication between the tubular portion and the sealing portion,

the transition portion being biased to a bowed-out configuration for allowing fluid to open the sealing portion by forcing the first and second sheet members to an open position for allowing fluid flowing into the non-return device from the device inlet to flow out of the device outlet.

43. The non-return device of claim 42, wherein the transition portion has a convex section of wall.