FLUID CONTROL VALVE

This invention relates to a fluid control valve and more particularly to a valve suitable to permit gravitationally induced flow only.

Valves of this kind find particular application in permitting liquid flow in one direction and preventing gaseous flow in the opposite direction. A prime application for such a valve is in urinal installations. Here it is necessary to permit urine flow through the valve into a sewerage system while preventing reverse flow of malodorous gas in the reverse direction.

Valves for the above purpose have been designed which include some or other liquid trap but these suffer well known disadvantages such as loss of liquid or contamination of the liquids and precipitation of solids with consequent blocking.

Later developments have brought about the use of a flattened flexible and preferably resilient tube extending from a wide inlet section. Those were developed from drain-tube valves used in watercraft especially power boats.

The valves known to the applicant have been described in US Patent No US 6,401,266 and Netherlands Patent No. NL 1015745C.

Both of these valves suffer from the build-up of deposits in the bends along the edges of the flattened tube where they are least resilient. This build-up is also difficult to remove because of this lack of resilience. Further as the build-up develops it opens the tube until a stage is reached where the valve no longer seals against a backflow of gas.

<—>

This is highly undesirable in urinal applications of the valve. In any event they are difficult to manufacture.

The known valve also suffers from an inward longitudinal collapse under too high pressure differentials which cannot easily be designed against while maintaining a desired sensitivity for operation.

It is the object of the present invention to provide a valve of the kind above generally described which will at least to some extent overcome the disadvantages set forth.

The object of this invention is solved by the ~~According to this invention there is provided a non return valve characterized in~~ that it has a component (4) having a flat strip (6) of ~~highly~~ flowable resilient material terminating at one end in a ~~self-supporting~~ trough-shaped section (5) and a ~~complementary~~ component providing a surface against which the other ~~end of the strip (6) may seal.~~ features of claim 1.

(according to dependent claim)

Further features of the invention provide for the complementary component to be a mirror image of an identical construction and for the self-supporting ends of those components to be secured together.

< Further valves of this type are known from the documents EP 1174549, JP 4900543 4B and JP 5090063 U. >

~~Still further features of the invention provide for the self-supporting ends of the components to carry an outwardly extending supporting flange and for the components to be controlled against inward longitudinal collapse.~~

The invention also provides for the control to be effected by a comparatively rigid member providing outwardly projecting ribs down the junction of the trough shaped section to the flat strip or by a rigid flat member providing the surface or surfaces against which at least part of the components can seal.

These and other features of the invention will become apparent from the following description with reference to the accompanying drawings.

In the drawings

Fig 1 shows a perspective view of one component of the valve.

Fig 2 shows a pair of components secured together and located in a supporting table.

Fig 3 shows details of the valve located in a urinal outlet with controls against inward collapse.

Fig 4 shows the valve as in Fig 3 with different control means.

As illustrated a urinal (1) has an outlet (2) connected to a sewerage system (not shown). In the outlet is fitted non-return valve (3).

The valve (3) includes a component (4) moulded from suitable plastics or elastomeric material to have one end trough-shaped at (5) and the other as a flexible resilient strip (6) with a high inherent degree of flexibility.

An example of the valve which is not to be considered as limiting the scope of the invention could have the trough (5) starting at a thickness of 0.8 mm blending into a strip 0.2 mm thick.

In use this strip (6) must close against an opposing surface to seal the outlet from the urinal against a reverse flow of gas from the sewerage system.

While a single component (4) can be used it is preferred that the valve consist of two such components (4) secured together along at least the trough-shaped sections (5) which will be sufficiently rigid to be self-supporting.

The securing of the two components can be effected either during the moulding operations in their manufacture or alternatively the edges of the trough-shaped section can be secured using an appropriate adhesive.

A peripheral outwardly extending supporting flange (7) is provided around the outer ends of the trough sections (5). This flange (7) is used to locate the valve (3) in the urinal outlet. This is shown in Fig. 4.

The necessary sensitivity of the valve for its operation as described below is imparted by strips (6) and because of this the valve (3) is preferably supported in a tube (8). This is shown in Fig. 4 and it will be noted that the tube has slots (9) partway along its length extending from the outlet end (10). The slots (9) are in general alignment with the edges of the strips (6) to facilitate, in use, lateral flow between the strips (6) having a free flow to the outlet. This availability for lateral flow is important to ensure there is no build-up of urine solid materials as has occurred with the earlier kinds of valve. The construction becomes self-flushing in use.

Shown in Figs. 3a and 3b is a modification which is preferably incorporated into the construction of the valve to prevent any sudden or large change in pressure

across the valve (6) resulting from an increase in the pressure at the outlet causing the strips to collapse longitudinally inwardly. This again has been a problem with earlier designs of urinal valves.

A pair of supporting ribs (11) is provided diametrically opposed to each other at the junction between the trough-shaped sections (5) and the strips (6) and this can form a part of the locating means for the valve (3) in the urinal outlet. The assembly will be an alternative to the slotted tube (8) referred to above.

Where the trough (5) carries diametrically opposed ribs the use of adhesive can also be avoided by making the ribs (11) a friction fit within the tube (8) referred to below. Here the ribs (11) will retain the valve components firmly together.

A further alternative is to have a pin from the outlet cover grid (12) engage inside the valve (3) as indicated in Fig 3c and 3d.

The valve is simple to install by removing the outlet cover grid (12) from the outlet; inserting the valve (3) to position the flange (7) on the inner shoulder (13) of the outlet (12). Preferably an appropriate sealant will be used between flange (7) and shoulder (13). The grid (12) is then refitted into the outlet to complete the assembly.

In use urine flows by gravity between the strips (6) into the sewerage system. The flow of this liquid forms a small pressure difference on each side of the strips which has been found in practice to give a positive seal upstream of fluid as it passes through the valve. This seal prevents any malodorous gas escaping by reverse flow through the valve regardless of whether any lateral flow takes place.

The valve is inexpensive to manufacture and trials have shown it to be self-cleaning and consequently having a long operative life.

While the valve has particular application to urinals it will be appreciated that it can have other similar applications and the components can be made of varying materials and more robust to meet such applications without departing from the scope of the invention <as defined in the appended claims>

Claims ~~(amended)~~

<in the form of a self-supporting trough-shaped section>

1. A non-return valve (3), comprising an inlet section (5) <-> and an outlet section, the outlet section being made of a flexible resilient material connected to the inlet section (5), ~~characterised in that~~ whereby the outlet section comprises ~~ing~~ a flat flexible resilient strip (6) with a high inherent degree of flexibility, the strip (6) being connected with the inlet section (5) at its upper edge; and further comprising a component <<->> providing a complementary surface against which <<<->>> the flexible strip (6) may seal. ~~and in use, to facilitate free lateral flow of fluid to the outlet.~~

<< that is separate from the strip (6) >>

<<< the lower end of >>>

~~CLAIMS~~ ~~Amended~~

~~Amended claim 1 see page 6~~

1. A non-return valve (3) characterized in that it has a component (4) having a flat strip (6) of flexible resilient material terminating at one end in a self-supporting trough-shaped section (5) and a complementary component providing a surface against which the other end of the strip (6) may seal.

2. A non-return valve (3) as claimed in claim 1 characterised in that the complementary component is made as a mirror image to an identical construction.

3. A non-return valve (3) as claimed in claim 2 characterised in that the self-supporting ~~ends~~ (5) are secured together.
inlet sections

4. A non-return valve (3) as claimed in claim 3 characterised in that the inlet sections ~~ends~~ (5) are secured together by adhesive.

5. A non-return valve (3) as claimed in claim 2 characterised in that the self-supporting ~~ends~~ (5) of the component (4) carry an outwardly extending flange (7). inlet sections

~~6. A non-return valve (3) as claimed in claim 2 characterised in that means preventing inward longitudinal collapse of the strips (6) is included.~~

7. A non-return valve (3) as claimed in claim 6 characterised in that the control means comprises a tube (8) flanged at one end and having slots (9) extending partway along its length extending from the free end (10).

8. A non-return valve (3) as claimed in claim 7 characterised in that the ~~control means comprises oppositely located outwardly directed ribs (11)~~

~~CLAIMS~~

~~1 A non-return valve (3) characterized in that it has a component (4)~~ having a flat strip (6) of flexible resilient material terminating at one end in a self-supporting trough-shaped section (5) and a complementary component providing a surface against which the other end of the strip (6) may seal.

2. A non-return valve (3) as claimed in claim 1 characterised in that the complementary component is made as a mirror image to an identical construction.

3. A non-return valve (3) as claimed in claim 2 characterised in that the self-supporting ends (5) are secured together.

4. A non-return valve (3) as claimed in claim 3 characterised in that the ends (5) are secured together by adhesive.

5. A non-return valve (3) as claimed in claim 2 characterised in that the self-supporting ends (5) of the component (4) carry an outwardly extending ~~flange (7).~~

6. A non-return valve (3) as claimed in claim 2 characterised in that control means preventing inward longitudinal collapse of the strips (6) is included.

7. A non-return valve (3) as claimed in claim 6 characterised in that the control means comprises a tube (8) flanged at one end and having slots (9) extending partway along its length extending from the free end (10).

8. A non-return valve (3) as claimed in claim 7 characterised in that the control means comprises oppositely located outwardly directed ribs (11)

from the junction between the trough-shaped section (5) to the flange (7) with the ribs (11) a friction fit into the tube (8).

9. A urinal valve (3) as claimed in claim 2.

10. A urinal including a valve (3) as claimed in claim 2.

FIG 1

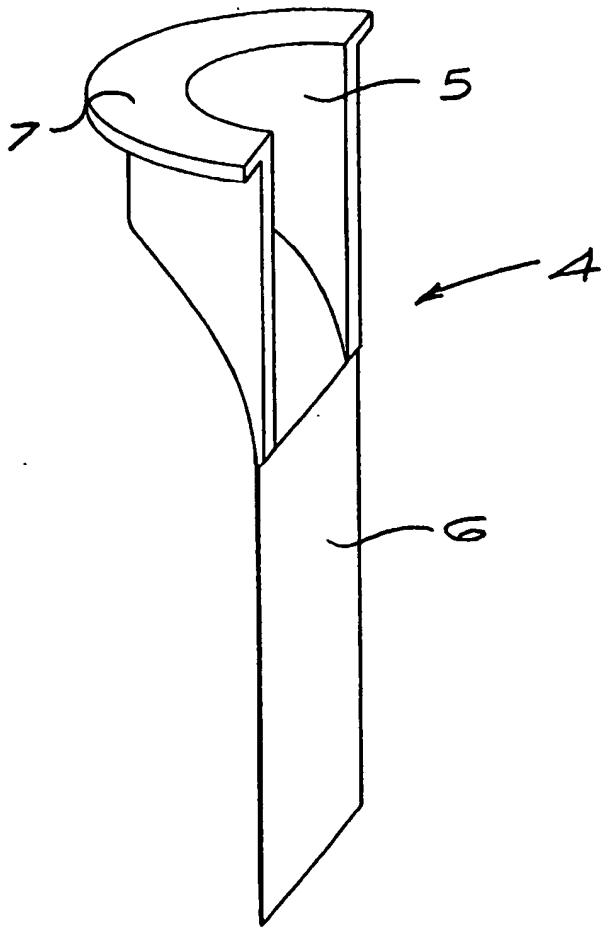

FIG 2

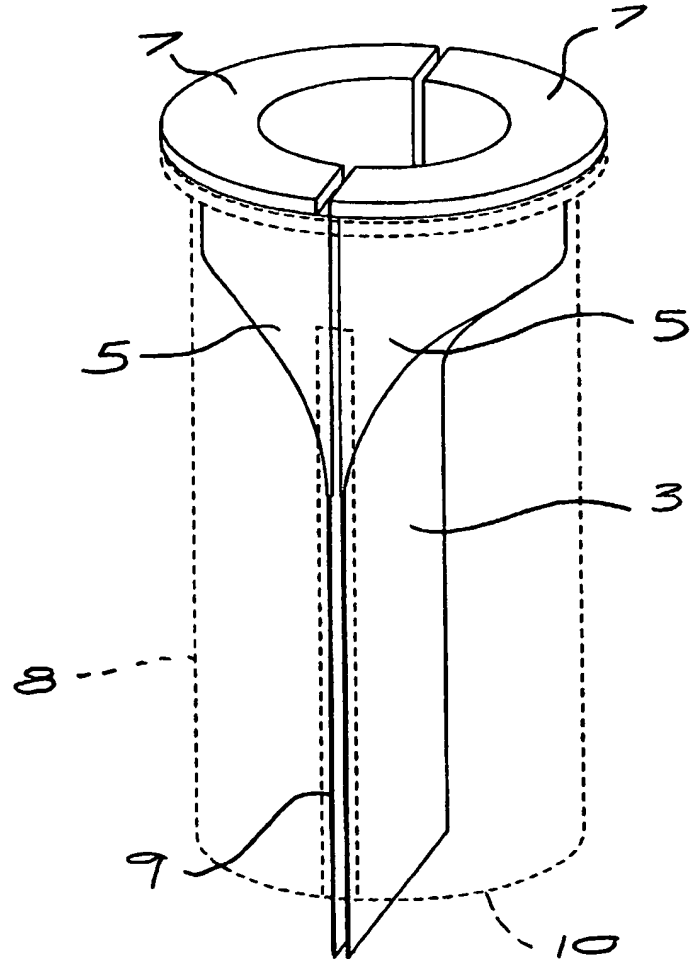

FIG 3A

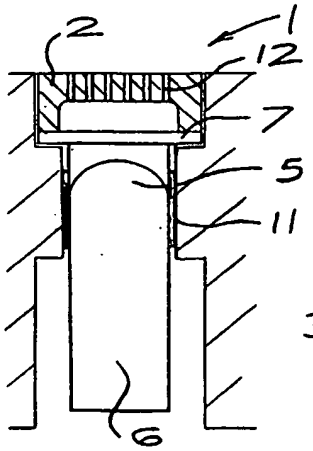

FIG 3B

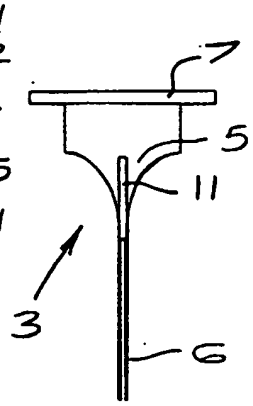

FIG 3C

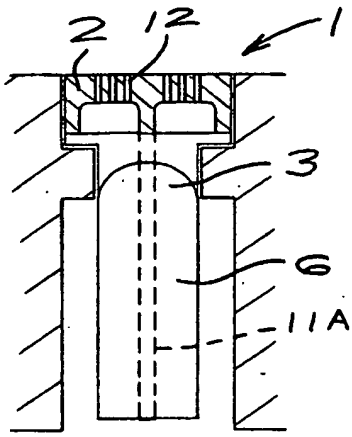

FIG 3D

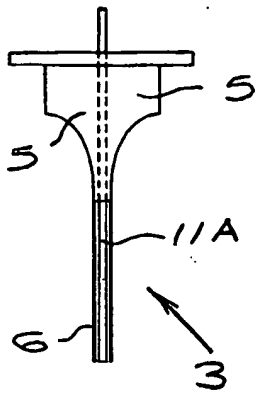

FIG 4