

DRY TRAP VALVE FOR USE IN A NON-
FLUSHING URINAL AND OTHER DRAINS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims benefit of provisional application 61/336,300 filed 20 January 2010.

REFERENCE REGARDING FEDERAL SPONSORSHIP

[0002] Not Applicable

REFERENCE TO MICROFICHE APPENDIX

[0003] Not Applicable

Field of the Invention

[0004] The present invention relates to a flow trap, such as a cartridge used in non-flushing urinals, and having an odor preventing mechanism and, in particular, to a improved trap that uses a dry trap valve that can be used without water or sealant, thereby resulting in improved flow trap life and usability, and eliminating the need for water to flush the trap.

Description of Related Art and Other Considerations

[0005] In any sort of plumbing trap, it is necessary to provide for the one-way flow of waste water into and through the trap to a drain line, while blocking sewer gas and other unpleasant odors from backing up from the drain line, through the trap and into the room. In traditional urinals, this is accomplished by an "S" shaped trap (or similar device) that has a curve that is flushed with fresh water after each use, and with fresh water providing an odor seal.

[0006] Non-flushing traps are advantageous where water is scarce or expensive, or when water conservation is desired. Prior art units include those described in United States Patent No. 6,053,197, in which a lighter than water sealant forms the odor barrier, and wherein the sealant remains in the trap.

[0007] Other prior art traps have employed one-way flapper style valves to form the odor barrier, such as is described in UK Published Application No. 2,296,309. Such flapper valves rely upon opposing pieces of elastomeric material having memory so that the tips are normally in a closed position. Such valves typically consist of a circular entry area which flattens out to two generally flattened abutting sides forming the exit area, in which shape memory urges the two sides against each other to seal out gasses and odors coming back up through the line. The force of the urine overcomes the elastomeric qualities and opens the two flattened parts of the exit side and allows wastewater to flow into the trap. The combination of the shape of the flattened exit, and the memory qualities of the materials used, urge the two sides against each other to prevent malodorous gasses from escaping into the room.

[0008] Unfortunately, after repeated use of such prior art flapper-style valves, the elastomer loses its shape memory, and may remain open and allow malodorous gas to back up through the trap into the room. Also, prior art flappers can dry out and remain open.

SUMMARY OF THE INVENTION

[0009] These and other problems are successfully addressed and overcome by the present invention, in which a dry trap valve, such as usable in a non-flushing urinal and other drains, is employed to transport a fluid, such as urine or other wastewater to a sewer line for receipt and disposal of the wastewater. The dry trap valve includes a holder (e.g., a band holder) having an entry for receipt of the wastewater, a drain for

disposal of the wastewater, a passageway (e.g., dent, depression or bypass) for conducting the wastewater from the entry to the drain, and an element e.g., a sealing band) for sealingly covering the passageway. The sealing band includes a hinged portion adjacent the lower end of the dent and is disposed to articulate upon flow of the wastewater from the dent and to permit the wastewater to flow to the drain and to close in the absence of the wastewater flow. Gases from the sewer line also press upon the sealing band in the absence of wastewater flow to further seal the dent.

[0010] Attendant advantages are that the memory of the elastomeric material is not essential but, rather, the forces of gravity and the force of the gas keeps the passage closed to sewer gasses that would otherwise back up through the valve.

[0011] Other aims and advantages, as well as a more complete understanding of the present invention, will appear from the following explanation of an exemplary embodiment and the accompanying drawings thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view of a trap or cartridge designed for use in a non-flushing urinal;

[0013] FIG. 2 is a cross-sectional view of the trap or cartridge as depicted in FIG. 1, and further illustrating its positioning in a urinal;

[0014] FIG. 3 is a cross-sectional view of the trap or cartridge as portrayed in FIG. 1, taken at a 90° view with respect to that shown in FIG. 2, and likewise illustrating its positioning in a urinal;

[0015] FIG. 4 is a top view of the trap or cartridge as depicted in FIGS. 1-3, with internal and bottom components thereof illustrated in phantom;

[0016] FIG. 5 is an exploded view in perspective of the trap or cartridge as depicted in FIGS. 1-4, with internal components thereof, including the dry trap valve;

[0017] FIG. 6 is a perspective view of the bottom portion of the trap or cartridge as depicted in FIGS. 1-5;

[0018] FIG. 7 is a perspective view of base or base portion of the trap or cartridge as depicted in FIGS. 1-5;

[0019] FIGS. 8 and 9 are differently angled perspective views of the dry valve;

[0020] FIGS. 10-13 are varying depictions of the band holder in differently angled perspective views (respectively FIGS. 10 and 11) and side and cross-sectional views (respectively FIGS. 12 and 13) of the band holder element of the dry valve illustrated in FIGS. 8 and 9;

[0021] FIGS. 14 and 15 are differently angled views of a clamp element of the dry valve which forms a component, along with the band holder of FIGS. 10-13, of a clamping arrangement;

[0022] FIGS. 16-18 are views of the sealing band employed in the dry valve, in which FIG. 16 illustrates the sealing band prior to its side elements being folded back and FIGS. 17 and 18 shows its side elements being folded back as clamped onto or otherwise coupled to the band holder; and

[0023] FIGS. 19 and 20 respectively are perspective and side elevational views of the upper or top portion of the trap or cartridge as engaged by a key for its being screwed or unscrewed into and from a urinal.

DETAILED DESCRIPTION

[0024] While the present invention is useful for drains which are used in odor blocking drain traps such as exist in shower, bath, sink, floor and other drains, for purposes of detailing its use, the following exposition is directed to its preferred employment in non-flushing urinals; therefore, it is intended that the present invention should not be so specifically limited.

[0025] Referring to FIGS. 1-7, a trap or cartridge 20 for a non-flushing urinal is shown as placed in a urinal (see FIGS. 2 and 3) as represented by portions thereof and designated by indicium 21, such as exemplified in patent No. 6,959,723 (specifically FIG. 15 thereof), whose contents are incorporated herein as if set forth in haec verba. Trap 20 comprises a top portion 22, which is disposed to support a dry valve 24 having an entry tube or dry valve entry 32, and a base portion 26. Top portion 22 includes a cover 28 which, in turn, includes an entry opening 30 for receipt of urine or other wastewater. An O-ring 23 within an annular slot in cover 28 provides a seal with urinal 21. As best shown in FIG. 3, a downwardly extending lip or brim 31 is formed on the underside of cover 28 and surrounds opening 30, thereby to enable dry valve 24 to be secured to entry tube 32. Wastewater is directed by cover 28 to opening 30 where it enters entry tube 32 of dry valve 24.

[0026] As depicted in FIGS. 2, 3, 5-7 and 19, a barrier 70 separates the cartridge into two compartments, a fluid inlet compartment and a fluid outlet compartment, for example as illustrated and described in patent No. 7,575,022 whose contents are incorporated herein as if set forth in haec verba. The fluid outlet compartment terminates in a drain 40 (see FIGS. 2, 3-5 and 7), from whence it passes to a sewer line (as symbolized by enclosure 41) or similar outlet. Barrier 70 terminates in a toothed comb 72 and, when top portion is coupled together with base or bottom portion 26, slips into guiding slots 74 thereof. The base portion is further provided with teeth 76 which cooperate with the teeth of comb 72 to strain or otherwise catch debris and the like.

[0027] Referring also to FIGS. 8-15, dry valve 24 comprises a band holder or rigid portion 34 formed generally as a planar ramp having a front side 34A and a back side 34B (shown in isolation in FIGS. 10-13), a clamp 38 (shown in isolation in FIGS. 14 and 15) and a sealing band or movable portion 50 (shown in isolation in FIGS. 16-18).

Entry tube 32 is on an upper portion of band holder 34 and is adapted to receive wastewater from opening 30 in cover 28. A dent, depression or bypass 36 (see FIGS. 3, 5, 10 and 11) is formed in band holder 34 and extends or protrudes from its back side 34B. Dent 36 includes lower and upper ends 36A and 36B in which lower end 36A is distanced from entry 32 and upper end 36B is positioned adjacent to entry 32. As can be best seen in FIGS. 3, 5 and 10, a fluid passage for the wastewater passes from entry tube 32 to dent 36, along a flattened portion 39 of band holder 34, and into base 26 of trap 20, where it can flow out of the trap or cartridge through drain 40 (see FIGS. 2, 3-5 and 7), from whence it passes to sewer line 41 or similar outlet.

[0028] Band holder 34 and clamp 38 can be made of any number of materials, such as plastic, metal, sintered ceramic, or any material that can be molded into the desired shape and is reasonably rugged. It has been found that acrylonitrile butadiene styrene (ABS) or polypropylene (PP) work well in this application.

[0029] Sealing band 50 can be made of any flexible material like rubber, silicon rubber or any thermoplastic elastomer. A synthetic rubber sheet with a thickness in the range of 0.2mm-0.4mm has been found to work well.

[0030] Although band holder 34 can be attached to trap 20 in any number of ways, it has been found that glueing, compression fit, snap fit and ultrasonic welding all yield satisfactory results. The attachment preferably is such that flattened portion 39 forms a downward slope at an angle of about 10° to 50° from the vertical and, in a preferred embodiment, is about 30° (as generally seen in FIGS. 11 and 12); however, it is to be understood that, at least as presently formulated, dry valve 24 is capable of functioning between the horizontal to close to the vertical, that is, within the angle ranges of 0° to less than 90° .

[0031] Referring to FIGS. 9-13, band holder 34 has two upper slots, to wit, right upper slot 42A and left upper slot 42B, and two lower slots, right lower slot 44A and left lower

slot 44B. As further shown in FIGS. 14 and 15, clamp 38 has corresponding prongs, namely right upper prong 46A, left upper prong 46B, left lower prong 48B and right lower prong 48A. As also depicted particularly in FIGS. 8 and 9, the respective prongs of clamp 38 fit and snap into the slots in band holder 34 to provide a clamping arrangement, viz., prong 46A into slot 42A, prong 46B into slot 42B, prong 48A into slot 44A, and prong 48B into slot 44B.

[0032] Referring to FIGS. 16-18, sealing band 50 has an upper portion 56, a lower portion 58, a right projection wing 54A and a left projection wing 54B. Upper portion 56 is positioned generally atop dent upper end 36B and lower portion 58 is positioned generally below dent lower end 36A. As more fully discussed below, projection wings 54A and 54B are folded back upon themselves as illustrated in FIGS. 17 and 18, generally along dashed fold lines 55, as shown in FIG. 16, which also illustrates how the sealing band projection bands would be bent or folded over when the sealing band is secured to band holder 34.

[0033] With reference to FIGS. 8 and 9, sealing band 50 is placed onto front side 34A of band holder 34, such that it completely blocks entry tube 32, that is, sealing band upper portion 56 extends from at least as high as upper slots 42A and 42B, and lower portion 58 at least covers dent 36. Projection wings 54A and 54B extend beyond the width of band holder 34, and are folded back around band holder 34, and secured thereto at its back side 34B preferably by affixing mechanisms 35, or by any other mechanical implementation or bonding agent that ensures a complete securing between the sealing band and the band holder so as to hold sealing band 50 in position. As illustrated herein, affixing mechanism 35 comprises arrow-headed punch-throughs extending outwardly from holder back side 34A for piercing through projection wings 54A and 54B of sealing band 50. Other fixation/anchorage technology known

in the art may be used, particularly when overmolding (e.g., multiple molding techniques) technology is utilized.

[0034] As shown in FIGS. 8 and 9, lower portion 58 of sealing band 50 is capable of or otherwise disposed to flip or hinge upwards along line A-A' in response to urine flow. Line A-A' is located just beneath projection wings 54A and 54B toward the lower end of the sealing band 50, such that most of dent 36 is always covered by sealing band 50 even when wastewater is flowing, and most of the portion of the sealing band that does flip upwards, from line A-A' to the lower end of the band 50, lays beyond the lower end of dent 36, utilizing sealing band 50 as a hinge. This organization results in an articulated or hinged movement that allows valve 24 to open and to close. The wastewater flow lifts the sealing band up to open and, after the liquid flow, gravity closes the opening again.

[0035] Sealing band 50 is coupled to band holder 34 to cover dent 36. In the preferred embodiment of the present invention, the sealing band is held in place by wrapping both wing portions 54A and 54B about sides 34A and 34B of the band holder, by utilizing arrow-headed punch-throughs to pierce wing portions 54A and 54B, and by placing clamp 38 over sealing band 50 to clamp it to band holder 34. While a frictional engagement is employable, the preferred clamping is to make use of a press fitting of right upper prong 46A into right upper slot 42A, left upper prong 46B into left upper slot 42B, right lower prong 48A into right lower slot 44A, and left lower prong 48B into left lower slot 44B.

[0036] Clamp 38 also has a pair of curved flanges, right flange 52A and left flange 52B. The flanges are spaced far enough apart so as not to cover dent 36, for urging or pressing sealing band 50 against band holder 34.

[0037] In a preferred embodiment, such as depicted in FIGS. 8 and 9 (see also FIGS. 10-13), sealing band projection wings 54A and 54B at their lower edges

terminate before lower end 36A of dent 36, while upper portion 56 of sealing band 50 extends beyond upper end 36B of dent 36, which is fully covered by sealing band 50 in combination with and compressed by clamp 38 to form a seal.

[0038] The dimensions of the above parts are generally based upon the size of the urinal trap. The size and shape (curvature or otherwise) of dent 36 can be adjusted depending upon the anticipated liquid flow.

[0039] In operation, between uses of trap 20, sealing band 50 is held in place, blocking dent 36 and entry tube 32, in large part by the force of gravity, due to the angle of flattened portion 39. The primary purpose of the elastomeric qualities of sealing band 50 is to use it as a hinge. Because sealing band 50 is lying flat and sealed against dent 36 and entry tube 32, sewer gasses and unpleasant odors from sewer line 41 are blocked from entering the room. It has been found that pressure from the sewer gasses from sewer line 41 are able to urge sealing band 50 more firmly against dent 36 and entry tube 32.

[0040] When the urinal is utilized, wastewater will be directed to entry opening 30 of the trap, and therethrough to entry tube 32 of dry valve 24. The force of the wastewater through entry tube 32 and dent 36 provides adequate pressure to overcome the force of gravity that is holding sealing band 50 in place, and urges the sealing band upwards, allowing the wastewater to flow past, along flattened portion 39, and to drain 40. When the flow of wastewater ceases, gravity again urges sealing band 50 downward against dent 36 and entry tube 32, again providing a seal against gas and odor. Thus, wastewater or other fluids are transported from opening 30, through drain 40 and to sewer line 41.

[0041] As depicted in FIGS. 5, 19 and 20, cartridge 20 can be inserted or removed, such as by being screwed into or removed from a urinal by use of a key 62. Key 62 includes a bent tip 64 and a stop angled part 66 at one end and a handle 68 at its other

end. Bent tip 64 is disposed to fit within entry opening 30 of top portion 22 and to be canted therein. Part 66 contacts cover 28 to aid in the attachment of tip 64 within opening 30.

[0042] Although the present invention has been described as used in a trap for a non-flushing urinal and as indicated above, it can be employed in any situation requiring an odor blocking drain trap, such as shower, bath, sink, floor and other drains. Thus, although its operation was described above with reference to a non-flushing urinal, it should be kept in mind that this is only for ease of example, and that many other such applications are possible.

What is Claimed is:

1. A dry trap valve for transport of a fluid for receipt and disposal of the fluid, and having:

an entry for receipt of the fluid;

a drain for disposal of the fluid;

a band holder including a generally planar ramp, having a front side and back side;

a passageway on said planer ramp, for conducting the fluid from said entry to said drain; and

an element for sealingly covering said passageway;

whereby flow of the fluid flow lifts said sealing element up to open and, after cease of the liquid flow, the sealing element returns to a closed position.

2. The dry trap valve according to claim 1 in which:

said passageway comprises a dent protruding from said back side and having an upper end adjacent said entry and a lower end distanced from said entry; and

said sealing element comprises a sealing band located on said front side.

3. The dry trap valve according claim 2 wherein said sealing band includes a hinged portion adjacent said dent lower end and disposed to articulate upon flow of the fluid from said dent and to permit the fluid flow to said drain and to close in the absence of the fluid flow.

4. The dry trap valve according to any of claims 1, claim 2 or 3 wherein:

said band holder includes a flattened portion extending beyond said dent lower end; and said sealing band includes an upper portion positioned generally atop said dent upper end and a lower portion positioned generally below said dent lower end.

5. The dry trap valve according to claim 4 wherein said sealing band lower portion has a structure which is disposed to articulate along a line located essentially (a) beneath said sealing band lower portion and (b) below said dent lower end such that most of said dent is always covered by said sealing band even during flow of the fluid, thus imparting said sealing band with a hinged movement that allows valve opening and closing whereby flow of the fluid flow lifts said sealing band up to open and, after cease of the liquid flow, to permit gravity to effect the valve closing.

6. The dry trap valve according to any of claims 2, 3, 4 or 5 further comprising a clamp arrangement coupling said sealing band to said band holder.

7. The dry trap valve according to claims 6 for enabling the enablement of said clamp arrangement, wherein:

said band holder includes spaced upper slots and spaced lower slots;

said clamp includes a pair of spaced upper prongs and a pair of spaced lower prongs, respectively equal in number to said spaced upper and lower slots; and said clamp arrangement includes a snapping engagement of said clamp prongs respectively into said band holder slots.

8. The dry trap valve according to any of claims 2, 3, 4, 5, 6 or 7 wherein:

said band holder includes a flattened portion extending beyond said dent lower end; and said sealing band includes an upper portion positioned generally atop said dent upper end, a lower portion positioned generally below said dent lower end, and projection wings located between said sealing band upper and lower portions.

9. The dry trap valve according to claim 8 wherein said sealing band lower portion has a structure which is disposed to articulate along a line located essentially (a) beneath said projection wings toward said sealing band lower portion and (b) below said dent lower end such that most of said dent is always covered by said sealing band even during flow of the fluid, thus imparting said sealing band with a hinged movement that allows valve opening and closing whereby flow of the fluid flow lifts said sealing band up to open and, after cease of the liquid flow, to permit gravity to effect the valve closing.

10. A dry trap valve having a flow guide for transport of a fluid comprising:

a rigid portion having a generally planar ramp forming a path for enabling flow of the fluid; and a movable portion which is coupled to said rigid portion and positioned gravitationally above said rigid portion path and which has a construction that is made to open when in the presence of and against the force of the fluid and, when the fluid force is not present, to effect closure of said rigid portion path under the force of gravity.

11. The dry trap valve according to claim 10 in which said rigid portion path is coupled to an outlet for receiving the fluid and in which the outlet contains gases whereby, when the fluid force is not present, the gases apply pressure against said movable portion to enhance the closure.

12. The dry trap valve according to any of claims 10 or 11 wherein said movable portion is positioned gravitationally above said rigid portion path and, when the fluid force is not present, the closure is augmented by the force of gravity.

13. The dry trap valve according to any of claims 1-9, in which said valve is adapted for use in a non-flushing urinal.

14. The dry trap valve according to any of claims 10-12, in which said flow guide is adapted for use in a non-flushing urinal.