

CHEMICAL & OIL FREE WATERLESS URINAL VALVE



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Background Specifications

- 1) The invention relates to a flow check valve for use in waterless urinals, free of chemical or oil additives to achieve a completely environmentally clean and odourless urinal system. This valve utilizes a combination of the Bernoulli principle and venturi air flow to prevent malodorous gases from the sewer returning to the entry point of the urinal which is mainly the cause of foul smell in most conventional water-use urinal flushing systems.

The inventive solution of the problem leads to a device with the features described in the Section on Protective Claims in the later part of this submission.

- 2) The inventor has developed a valve that is distinctly different from certain applications of 'waterless urinals' today which essentially adopt either of the following claims in removing the smell of urine retained in the urinal bowl.
 - (I) The first type uses a fragrant chemical/oil based wax-like compound fitted to a cage and simply placed over the flow trap of an existing toilet bowl to mask the smell of urine retained in the trap and drain pipe. Such a system presents a combination of odour that is neither urine nor perfume and may be toxic, not least that the chemical or oil based material adds to the problem of polluted waste water discharged into the sewer system.
 - (II) The second type which may already have PUB WELS rating uses a cartridge system that contains a filter fitted with a chemical or oil based substance to 'alter' or 'neutralise' the chemistry of the urine discharged so as to change the odour to a more pleasant smell. Such a system, however disregards the possible toxicity of the resultant odour and the contamination of the waste discharged into the sewer system given its chemical or oil based filtration system.

The Invention

The attached drawings illustrate the inventive device and its functions:

Fig 1: Plan view of Screen Filter Part A1

Fig 2: Front view of Valve (Part A2), separated from A1

Fig 3: Sectional View of Valve (Part A2) with Cylinder Sleeve (Part B)



Fig 4: Plan view of Quick-Action 1/8-turn key

Fig 5: Pictorial View of Adaptor (Part C)

Fig 1. A plan view of the Screen Filter is shown. This part is dished shape with measured opening/slots to direct the flow of urine into the drain opening while serving to prevent rubbish (eg. cigarette butts) from entering the valve before it is cleared away by the cleaning staff. It is also designed to fit a 1/8-turn key for quick release and locking of the valve to the adaptor.

Fig 2. A Front view of the Valve separated from the Screen Filter A1 showing the membrane covering the entire vertical flat area and the inflow discharge channel and venturi holes.

Preferably, the screen filter A1 would be inextricably joined to the lower Part A2 of the valve.

It is conceivable that the membrane be permanently fastened to the Part A2 of the Valve at Point X by means of hot melt or other means.

Fig 3. A sectional view of the Valve (Part A2) revealing the large drain opening at the top of the valve directing flow of the urine through the semi-cycloidal section into the discharge channel. (It is conceivable that this channel be shaped differently and wider to achieve the same result).

The drain opening is in a plain and is perpendicular to the central axis. The drainage area narrows toward the central axis to form a flat vertical drainage plane on one side. The sealing membrane is inextricably connected to the lower part and covers the outer side of the vertical drainage plane, so that between the outer flat drainage area and the sealing membrane, the urinal flow wets the entire drainage surface giving effect to the Bernoulli principle. Coupled with the airflow through the venturi holes, the suction effect closes the discharge channel opening of the valve preventing the odour from rising upwards out of the valve back into the urinal bowl.

The Bernoulli effect over the entire surface of the drainage area also allows self-cleaning of the valve, giving the valve a longer odourless lifespan.

The valve is preferably inserted by a 2-start threaded connection into the Adaptor (Part C). It is conceivable there are other releasable connections, such as a snap-on fit.

The dotted lines illustrates a tube cylinder sleeve (Part B) designed to enclose the lower part of the valve (A2) inextricably to protect the main operative parts of the valve from damage or distortion in the process of installation. (See further description in Section on Protective Claims).

Fig 4. A Plan view of the 1/8-turn key is shown to illustrate the simplicity in design for quick action fastening and release of the valve from the Adaptor. This key is cheap to produce as part of the mould for the main valve components.

Fig 5. Pictorial View of the Adaptor (Part C) which is permanently fastened to the downpipe and sitting snugly in the urinal bowl opening to receive the said valve. The valve body is inserted into this Adaptor. The adaptor remains in the drain pipe of the urinal bowl permanently, even while changing the valve.

Description of Invention

- 3) This waterless urinal system intended for patent involves a specially invented valve that is attached to a direct discharged adaptor installed to the drain pipe allowing instant discharge of uncontaminated fresh urine into the sewer system. This valve prevents bad odours from the sewer escaping through the drain pipe back to the urinal bowl, thereby presenting no odour from the urinal.
- 4) This one way valve (Part A) is inserted into an Adaptor (Part C). The valve consists of a screen filter, a drain opening, a discharge channel and a sealing membrane. The valve body, designed in two parts, – an upper part (A1) and a lower part (A2), are inextricably joined by hot melt or force-fit. The lower part narrows on one side along the central axis, towards the inflow discharge channel opening. The discharge channel opening is semi-oval in design and is in line with the central axis, with its lower end joining a flat, vertical drain area complete with venturi holes. A sealing membrane (A3) is inextricably connected to the lower part (A2) and covers the opening of the discharge channel and the entire flat vertical drainage area allowing the liquid to flow between the vertical flat drainage surface and the membrane to wet the entire flat surface.
- 5) The arrangement of the sealing membrane covering the discharge channel opening and the flat vertical drain area optimizes the Bernoulli effect over the entire surface of the vertical drain area when liquid flows through it causing a self-closing action of the valve over the discharge channel opening. The additional venturi holes in the vertical flat re-inforces the suction effect of the membrane when air flows through the holes during urination, thereby ensuring complete adherence of the membrane to the vertical flat area.
- 6) Owing to the design of the flat vertical drainage area, complete sealing action with the likewise flat closing membrane will be guaranteed, ensuring that no odour pollution from the discharged urine is possible.
- 7) The vertical drain area is of higher material stability and rigidity than the sealing membrane. This means that the liquid, which always follows the path of least resistance, will be evenly distributed throughout the sealing surface of the vertical drain area thus maximizing the efficiency of the Bernoulli effect. This renders the valve self-cleaning as well.

- 8) The Lower part (A2) of the valve is further enclosed by a tube cylinder sleeve (Part B) to protect the principal elements from physical damage in the process of installation. Part B is further designed to locate and prevent the membrane from sticking to its inner surface in the event of heavy fluid flow. (See protrusion on the inside of cylinder sleeve).
- 9) Part A1 is designed as a screen filter over the drain opening preventing direct view into the drain opening and to keep debris away from the drain opening (especially cigarette butts) and therefore prevents clogging. A further advantage is that the screen is designed to fit a cartridge of fragrant mass, thus continuously refreshing the surroundings if so desired, though not often necessary.
- 10) Of particularly importance to the design of this screen filter is that it facilitates easy removal of the complete valve body for cleaning or speedy replacement of the complete valve when required. This is easily done by using a quick-action 1/8-turn key that comes with every new valve.
- 11) The preferred system of the valve consisting of an Upper and Lower part with an inextricable connection, designed as click-on quick fastening system is self-explanatory in that the two parts can be joined by force-fit or hot melt welding. The two part design allows for cheaper production compared with a one piece design as the two parts allow a geometrically simple design in mould making. The inextricable joining of the two parts allows a speedy replacement of the valve using a 1/8-turn key to remove the complete valve from the Adaptor (Part C).

Flow Advantage

- 12) In a preferred version, the upper part (Part A1) of the valve body shows a substantially concave or tapered surface, with inflow slots designed for fluid flow and fitting of the 1/8-turn key. The gradient on the surface allows the fluid to flow as fast as possible to the drain opening and into the valve body and therefore avoiding any fluid retention.
- 13) The drain opening in A2 features a cross-section semi-cycloid design that connects to the top, directing the fluid towards the discharge channel. This configuration of the lower part of the valve body accelerates the fluid discharge. Again this two-part design of the valve body allows an easy production of the complicated form of the semi-cycloid. Furthermore, the stresses in the HDPE material are reduced by the curvature compared to a sharp transition, thus resulting in a higher average life span of the valve.

The Membrane Structure/Design

- 14) The sealing membrane is preferably attached inextricably to the part A2 of the valve body at Point X in a manner that is flushed with the central axis of the



vertical drain area, covering both the discharge channel opening and the entire drainage area when closed.

- 15) The valve is primarily for use in sanitary installations although it is suitable for use in other applications requiring discharge of non corrosive fluids to achieve an odourless environment. The valve requires no sealing forces due to its one quick action double start locking. Gravitational forces drive the liquid through the discharge channel of the valve, channeling it between the membrane and the flat drainage area thus allowing the Bernoulli and venturi effect to seal the opening preventing gases passing back in the opposite direction.

Connection to Adaptor

- 16) The connection between the Valve and the Adaptor (Part C) is preferably gas-tight to prevent any malodorous gas escaping from the drain pipe through this connection, as it is not possible to pass through the closed membrane

PROTECTIVE CLAIMS

Claim 1: The said invention is a valve for installation as a urinal valve for waterless urinals which is distinct from other waterless urinals that uses chemical or oil based compounds to neutralise, filter or masked odour thereby polluting the air and waste water that flows into our sewers. This valve is oil and chemical free and is characterized by a valve body designed in at least two parts, one Upper Part (A1) and a Lower Part (A2) joined inextricably together. The Lower Part narrows downwards on one side towards the central axis forming a vertical flat drainage area with an inflow channel towards the drain pipe. The vertical flat drainage area has a membrane serving as a seal covering the outside of the discharge channel and the entire drainage area, so that between the drainage area and sealing membrane the draining effluent, owing to the Bernoulli effect, wets the entire surface of the drainage area thus achieving a self-cleaning and sealing action coupled with the effect of the venturi holes.

Claim 2: The valve according to Claim 1, is characterized in that the flat vertical drainage area which is dimensionally stable is integral to the design for the Bernoulli principle to be applied with the sealing membrane. It is conceivable however, that further design development would not preclude the use of twin vertical membrane flaps along the central axis (instead of the vertical drainage flat) to achieve this same effect.

Claim 3: The valve, further to Claim 1 & 2 is characterized by the presence of venture holes positioned strategically around the vertical flat drainage surface to complement the Bernoulli effect of bringing the membrane A3 to flush with the drainage surface, thereby shutting the discharge channel when there is no urinal flow.

Claim 4: The valve according to Claim 3, is further characterized in that the venturi holes can vary in number, size and location on the flat drainage surface to achieve the best effect.

Claim 5: The valve of the preceding claims, is characterized in that a cover screen filter with a concave surface is present, which covers the valve opening serving to filter debris as well as a locking and release mechanism of the valve.

Claim 6: The valve according to Claim 5, is further characterized in that the screen filter can be fitted with a pleasantly smelling fragrant if so desired.

Claim 7: The valve according to this claim is also characterized in that the upper part (A1) and the lower part (A2) are joined via a snap on connection.

Claim 8: The valve according to one of the preceding claims, is characterized in that the wall of the valve opening is cross-sectionally designed in a brachistochrone or semi-cycloid curve directing and accelerating the discharge of fluid through the discharge channel opening, pushing open the sealing membrane to effect the Bernoulli principle. It is conceivable that the discharge channel opening can vary in shape and size to achieve optimum flow effect.

Claim 9: The valve according to one of the preceding claims, is characterized in that the sealing membrane has 2 fixing holes that fits the location pins in the vertical drainage flat at Point X and permanently joined to ensure alignment of the membrane to the drainage flat area.

Claim 10: The valve is also further characterized in that the lower part (A2) is enclosed by a tube cylinder sleeve (Part B), located in a manner at Point Y (to prevent rotation) so that a protrusion on the underside of the sleeve will prevent the membrane from reverse-sticking to the cylinder sleeve in heavy discharge.

Claim 11: The Adaptor (Part C) is designed to snugly fit the valve by means of a quick action locator and 1/8-turn screw design to ensure gas-tightness.

ABSTRACT (SUMMARY)

This valve design intended for patent is a fluid valve principally for installation as a odour-preventive, waterless, chemical and oil free urinal valve for waterless urinals, which comprises 2 parts – an Upper and Lower part, the latter being a cylindrical valve body which narrows towards the central axis to form a flat vertical drainage area with a discharge-channel opening. A sealing membrane is inextricably linked to the Lower part covering the entire vertical drainage area so that the fluid/urine flowing between the sealing membrane and the vertical drainage area will wet the entire drainage area and effecting the self-cleaning

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and sealing principle of Bernoulli. This valve-system waterless urinal will therefore be odourless and will not emit any toxic gas or contaminate waste water discharged to the sewer.

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