

Description

The present invention relates to float valves which may, for example, be used domestically in water tanks, W.C. cisterns or the like and may be used industrially in a number of situations in which a liquid fills a tank.

The conventional type of ball valve which is used in the majority of domestic situations in Great Britain involves a cylindrical housing with a longitudinally removable solid cylinder which is urged longitudinally by the short arm of a pivotal lever the long arm of which carries a ball. The valve piston includes a resilient washer which is urged against a tubular valve seat through which the water enters. Such a structure is inherently rather complicated, relies on the upthrust of the ball to give the full valve closing force and is liable to jamming.

Further improvements have been suggested, for example, in British Patent Nos. 160949; 373476 and 523299 in which a closed chamber is defined by the valve housing and has an inlet port adapted to be connected to an inlet pipe to the cistern, an outlet port from the chamber having a valve seat surrounding the port. The valve member passes through the outlet port and has a valve head located within the chamber. A pivotally mounted lever having a float at one end has means connecting the other end of the lever to the valve member to raise the head from the seat when the water level falls below a certain value, to allow water to flow from the chamber via the outlet.

The constructions described in the above patents utilise the fluid pressure to assist in closing the valve but are very complicated and therefore expensive and are themselves liable to jamming.

It has also been proposed to form certain parts of valves of this general type from plastics material. Thus, the prior known structures may be considered to consist of a float valve mechanism for a cistern or tank, said mechanism comprising a valve housing defining a closed chamber having an inlet port adapted to be connected permanently to an inlet pipe to the cistern or tank, an outlet port from the chamber having a conical valve seat surrounding the port and having a cone axis; a plastics material valve member passing through the outlet port and having a conical valve head located within the chamber and a pivotally mounted lever pivotable about a horizontal axis, said lever having a float rigidly fixed thereto at a location laterally spaced from said horizontal axis, so as to be freely movable in the cistern or tank, and means connecting the lever directly and rigidly to the valve member and passing freely through said outlet port, to raise the head from the seat, when water or other liquid in the cistern or tank falls below a certain level to allow liquid to flow from the chamber via the outlet port.

According to the present invention, it is now proposed that the valve head should pivot as an integral unit with the lever, whereby the valve

head moves along a circular path passing through the outlet port from a closed position to an open position, the conical valve head sealingly engaging in the conical valve seat at said closed position of the valve, for the float to be a hollow float which is partly filled with water to render it relatively heavy, for the float to extend below the lever, whereby the pressure of the water in the chamber, acting on that portion of the valve within the chamber, is sufficient to maintain the valve in the closed position continuously until the pivoting moment of the weight of said partly filled float is sufficient to overcome the pivoting moment of the water pressure in said closed chamber acting on said valve head.

Such a structure can be made very cheaply and simply and yet is very effective in so far as it again utilizes water pressure within the chamber to provide the closing force on the valve member. The only movement is the pivotal movement and there is no necessity, as in the prior constructions, for there to be any sliding movement at all.

Preferably the valve head is formed actually integrally with the lever.

Advantageously the closed chamber is a wall inclined obliquely downwardly from the inlet port, the cone axis of the outlet port being inclined downwardly towards the adjacent wall of the cistern or tank, and the valve head is also inclined in an cooperating manner therewith. Thus fluid flowing into the inlet port is caused to flow against the adjacent side of the valve head to maintain the valve firmly in the open position until the float pivots the lever to a position nearly closing the valve, whereupon the water pressure within the chamber urges the valve head against the valve seat. Water pressure thus is used firstly to hold the valve open as the water flows into the chamber and secondly to hold the valve closed when the valve has moved to its closed position under the action of the float.

The housing may be formed in two parts including a generally channel-shaped member, having the outlet port formed in the web of the channel and a cover sealingly closing the space between the free ends of the arms of the channel, the cover, when removed, and during assembly of the valve, allowing the end of the lever remote from the valve member to be passed through the chamber and through the outlet port until the valve head is located within the chamber adjacent to the outlet port.

This facilitates the assembly of the valve which has the relatively large cross-section head mounted on the lever which must, therefore, be passed through the outlet port from the inside of the chamber. An alternative construction could involve the use of the screw top to the chamber.

The housing may be provided with a bleed passage which connects a portion of the valve seat, when the valve is closed to the interior of the chamber. The advantage of this is to reduce the possibility of water hammer.

The force required to close the valve under the upthrust of the float is really very small because it

is the water pressure which actually causes the closing. However, the force required to open the valve is quite considerable and it is advantageous, therefore, for the float to be relatively heavy and it is for this reason that the float is partly filled with water to render it relatively heavy.

To account for different pressures of water, means may be provided to allow the positions of float along the lever to be adjusted and to provide the necessary adjustment at a level at which the valve shuts off the flow of liquid, these may be provided to allow the vertical position of the float to be adjusted relative to the lever, for example in the form of a screw connection.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which;

Figure 1 is a cross-section through one embodiment of valve according to the invention shown positioned in the side wall of a tank, with the valve in the closed position;

Figure 2 is a view similar to a portion of Figure 1 with the valve in the open position;

Figure 3 is an end view of the valve of Figures 1 and 2; and

Figure 4 is a view similar to a portion of Figure 1 showing a modified construction.

Referring first to Figure 1 there is illustrated a tank 10 filled with water to a level 12 and having mounted, on the inner surface of the wall 10 above the water, a valve 14 according to the present invention. The valve is mounted on a threaded inlet pipe 16 provided with a sealing washer 17 and a locking nut 18. The inlet pipe 16 can be connected to a source of water (not shown).

Threaded onto the interior end of the pipe 16 is the body 20 of the housing of the valve. This body is formed from a plastic material and is of generally channel cross-section and is provided with a cover 22. It will be noted that the cover 22 and the lower surface of the body 20 are inclined downwardly away from the inner end of the pipe 16. The body 20 and cover 22 define a closed chamber 24 having an inlet port 26 which includes the internal screw thread 27 for connection to the inlet pipe 16. The housing is also provided with an outlet opening 28 having a conical valve seat 30 surrounding the opening. The axis 32 of the conical valve seat is inclined downwardly and towards the tank wall 10.

A valve member indicated by the general reference numeral 34 is again formed of plastics material and includes a conical valve head 36 which is formed integrally with a lever 38 from a plastics material. It shall be seen that the lower part of the body 20 is provided with a downwardly opening groove 40 defined by two horizontally spaced, generally vertically extending flanks. Extending between these flanks is a pivot pin 42 upon which the lever 38 is pivotally mounted.

The lever 38 has an arm 44 extending to the

right of the pivot 42 and slidable onto this arm 44 is a clamp 46 the position of which can be adjusted and thereafter fixed by a clamping screw 48. Vertically threaded into the clamp 46 is a rod 50 carried by a cap 52 of a bottle 54 forming a float which is filled to a particular level, indicated at 56, for example with water.

The chamber 24, as indicated, is fully closed to atmosphere and is subject to pressure from the water or other liquid flowing into the inlet port 26. The water pressure acting on the valve head 36 will maintain the valve in the closed position of Figure 1 even when the water level 12 falls somewhat. However, when the water level falls beyond a certain value, the weight of the float 54, with water in it, will be sufficient to pivot the lever 38 to the position illustrated in Figure 2. The inflow of water against the left-hand side of valve head 36 will maintain the pivotal arrangement of Figure 2 until the tank is nearly full and the upthrust from the float is sufficient to overcome this force. Thereupon the lever will pivot to the position of Figure 1 and it will snap into this position rapidly and thence shut off the flow. The level of the water at which the valve shuts off can be altered by screwing the rod 50 higher or lower into the clamp 46. The rod can be secured in the selected position by tightening the lock nut 53.

Figure 4 illustrates a modified arrangement in which a bleed passage 58 is provided adjacent the valve to allow some of the pressure within the chamber 24 to bear upwardly against a small portion of the conical surface of the valve thereby reducing any tendency for water hammer when the valve closes. One can adjust the position of the clamp 46 to suit any particular water pressure and one can adjust the vertical position of the rod 50 to give a desired level. The valve head shown here is again generally conical and is shown as being hollow so that the water pressure urges the valve head more firmly into the seat.

The inclined outflow from the inlet port along the axis 32 will project water against the wall of the tank and thereby reduce the noise of discharge of water from the chamber. Additionally a shroud may be added which is clamped between the wall of the tank and the body 20 of the housing and which has walls extending below the body, to reduce the noise of the discharging water still further.

Claims

1. A float valve mechanism for a cistern or tank (10), said mechanism comprising a valve housing (20, 22) defining a closed chamber (24) having an inlet port (26) adapted to be connected permanently to an inlet pipe (16) to the cistern or tank, an outlet port (28) from the chamber having a conical valve seat (30) surrounding the port and having a cone axis, a plastics material valve member (34) passing through the outlet port and having a conical valve head (36) located within the chamber (24) and a pivotally mounted lever (38) pivotable about a horizontal axis, said lever

is the water pressure which actually causes the closing. However, the force required to open the valve is quite considerable and it is advantageous, therefore, for the float to be relatively heavy and it is for this reason that the float is partly filled with water to render it relatively heavy.

To account for different pressures of water, means may be provided to allow the positions of float along the lever to be adjusted and to provide the necessary adjustment at a level at which the valve shuts off the flow of liquid, these may be provided to allow the vertical position of the float to be adjusted relative to the lever, for example in the form of a screw connection.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which:

Figure 1 is a cross-section through one embodiment of valve according to the invention shown positioned in the side wall of a tank, with the valve in the closed position;

Figure 2 is a view similar to a portion of Figure 1 with the valve in the open position;

Figure 3 is an end view of the valve of Figures 1 and 2; and

Figure 4 is a view similar to a portion of Figure 1 showing a modified construction.

Referring first to Figure 1 there is illustrated a tank 10 filled with water to a level 12 and having mounted, on the inner surface of the wall 10 above the water, a valve 14 according to the present invention. The valve is mounted on a threaded inlet pipe 16 provided with a sealing washer 17 and a locking nut 18. The inlet pipe 16 can be connected to a source of water (not shown).

Threaded onto the interior end of the pipe 16 is the body 20 of the housing of the valve. This body is formed from a plastic material and is of generally channel cross-section and is provided with a cover 22. It will be noted that the cover 22 and the lower surface of the body 20 are inclined downwardly away from the inner end of the pipe 16. The body 20 and cover 22 define a closed chamber 24 having an inlet port 26 which includes the internal screw thread 27 for connection to the inlet pipe 16. The housing is also provided with an outlet opening 28 having a conical valve seat 30 surrounding the opening. The axis 32 of the conical valve seat is inclined downwardly and towards the tank wall 10.

A valve member indicated by the general reference numeral 34 is again formed of plastics material and includes a conical valve head 36 which is formed integrally with a lever 38 from a plastics material. It shall be seen that the lower part of the body 20 is provided with a downwardly opening groove 40 defined by two horizontally spaced, generally vertically extending flanks. Extending between these flanks is a pivot pin 42 upon which the lever 38 is pivotally mounted.

The lever 38 has an arm 44 extending to the

right of the pivot 42 and slidable onto this arm 44 is a clamp 46 the position of which can be adjusted and thereafter fixed by a clamping screw 48. Vertically threaded into the clamp 46 is a rod 50 carried by a cap 52 of a bottle 54 forming a float which is filled to a particular level, indicated at 56, for example with water.

The chamber 24, as indicated, is fully closed to atmosphere and is subject to pressure from the water or other liquid flowing into the inlet port 26. The water pressure acting on the valve head 36 will maintain the valve in the closed position of Figure 1 even when the water level 12 falls somewhat. However, when the water level falls beyond a certain value, the weight of the float 54, with water in it, will be sufficient to pivot the lever 38 to the position illustrated in Figure 2. The inflow of water against the left-hand side of valve head 36 will maintain the pivotal arrangement of Figure 2 until the tank is nearly full and the upthrust from the float is sufficient to overcome this force. Thereupon the lever will pivot to the position of Figure 1 and it will snap into this position rapidly and thence shut off the flow. The level of the water at which the valve shuts off can be altered by screwing the rod 50 higher or lower into the clamp 46. The rod can be secured in the selected position by tightening the lock nut 53.

Figure 4 illustrates a modified arrangement in which a bleed passage 58 is provided adjacent the valve to allow some of the pressure within the chamber 24 to bear upwardly against a small portion of the conical surface of the valve thereby reducing any tendency for water hammer when the valve closes. One can adjust the position of the clamp 46 to suit any particular water pressure and one can adjust the vertical position of the rod 50 to give a desired level. The valve head shown here is again generally conical and is shown as being hollow so that the water pressure urges the valve head more firmly into the seat.

The inclined outflow from the inlet port along the axis 32 will project water against the wall of the tank and thereby reduce the noise of discharge of water from the chamber. Additionally a shroud may be added which is clamped between the wall of the tank and the body 20 of the housing and which has walls extending below the body, to reduce the noise of the discharging water still further.

Claims

1. A float valve mechanism for a cistern or tank (10), said mechanism comprising a valve housing (20, 22) defining a closed chamber (24) having an inlet port (26) adapted to be connected permanently to an inlet pipe (16) to the cistern or tank, an outlet port (28) from the chamber having a conical valve seat (30) surrounding the port and having a cone axis, a plastics material valve member (34) passing through the outlet port and having a conical valve head (36) located within the chamber (24) and a pivotally mounted lever (38) pivotable about a horizontal axis, said lever



having a float (54) rigidly fixed thereto at a location laterally spaced from said horizontal axis, so as to be freely movable in the cistern or tank, and means connecting the lever (38) directly and rigidly to the valve member (34) and passing freely through said outlet port, to raise the head (36) from the seat (30), when water or other liquid in the cistern or tank (10) falls below a certain level to allow liquid to flow from the chamber (24) via the outlet port (28), characterised in that the valve head (36) pivots as an integral unit with the lever, whereby the valve head (36) moves along a circular path passing through the outlet port (28) from a closed position to an open position, the conical valve head (36) sealingly engaging in the conical valve seat at said closed position of the valve, in that the float (54) is a hollow float which is partly filled with water to render it relatively heavy, in that said float is mounted to extend below the lever, in that the pressure of the water in the chamber (24), acting on that portion of the valve within said chamber, is sufficient to maintain the valve in the closed position continuously until the pivoting moment of the weight of said partly filled float is sufficient to overcome the pivoting moment of the water pressure in said closed chamber acting on said valve head.

2. A float valve according to claim 1, characterised in that the float chamber (24) has a wall (20) inclined obliquely downwardly from the inlet port (16), in that the cone axis (32) of the outlet port (28) is inclined downwardly towards the adjacent wall of the cistern or tank and in that the valve head is also inclined in a co-operating manner therewith.

3. A float valve according to claim 1 or 2, characterised in that the housing is formed of two parts including a generally channel shaped member (20), having the outlet port (28) formed in the web of the channel, and a cover (22) sealingly closing the space between the free ends of the arms of the channel, the cover, when removed and during assembly of the valve, allowing the end of the lever remote from the valve member to be passed through the chamber and the through the outlet port until the valve head is located within the chamber adjacent to the outlet port.

4. A float valve according to any preceding claim, characterised in that the housing is provided with a bleed passage (58) connecting a portion of the valve seat (30), when the valve is closed, to the interior of the chamber (24).

5. A float valve according to any preceding claims, characterised in that means (46, 48) are provided to allow the position of the float along the lever to be adjusted.

6. A float valve according to any preceding claim, characterised in that means (50, 52) are provided to allow the vertical position of the float relative to the lever to be adjusted.

Patentansprüche

1. Schwimmerventil für einen Spülkasten oder Tank (10) mit einem Ventilgehäuse (20, 22) mit

einer geschlossenen Kammer (24), die eine mit einer zu dem Spülkasten oder dem Tank führenden Einlaßleitung (16) permanent verbindbare Einlaßöffnung (26) und eine aus der Kammer führende Auslaßöffnung (28) mit einem die Öffnung umgebenden konischen Ventilsitz (30) aufweist, einem Ventilkörper (34) aus Kunststoff, der durch die Auslaßöffnung verläuft und einen innerhalb der Kammer (24) angeordneten konischen Ventilkörper (36) aufweist, und mit einem um eine Horizontalachse verschwenkbar befestigten Hebel (38), wobei am Hebel ein Schwimmer (54) an einem Ort starr befestigt ist, der seitlich von der horizontalen Achse beabstandet ist, so daß dieser sich in dem Spülkasten oder im Tank frei bewegen kann, und einer den Hebel (38) unmittelbar und starr mit dem Ventilkörper (34) verbindenden und frei durch die Auslaßöffnung verlaufenden Einrichtung zum Anheben des Kopfes (36) vom Sitz (30), wenn Wasser oder eine andere Flüssigkeit in dem Spülkasten oder im Tank unterhalb eines bestimmten Pegels fällt, so daß die Flüssigkeit über die Auslaßöffnung (28) aus der Kammer (24) fließen kann, dadurch gekennzeichnet, daß der Ventilkopf (36) als integrale Einheit mit dem Hebel verschwenkt, so daß der Ventilkopf (36) sich entlang einer durch die Auslaßöffnung (28) verlaufenden kreisförmigen Bahn aus der Schließstellung in eine Öffnungsstellung bewegt, wobei der konische Ventilkopf (36) in abdichtender Weise in dem konischen Ventilsitz in der Schließstellung des Ventils greift, daß der Schwimmer (54) hohl und teilweise mit Wasser gefüllt ist, um ihn relativ schwer zu machen, daß der Schwimmer derart befestigt ist, daß er sich unterhalb des Hebels erstreckt, daß der Wasserdruck in der Kammer (24), der auf diesen Abschnitt des Ventiles innerhalb der Kammer wirkt, ausreicht, um das Ventil kontinuierlich in der Schließstellung zu halten, bis die Schwenkbewegung aufgrund des Gewichtes des teilweise gefüllten Schwimmers (54) ausreicht, die Schwenkbewegung des auf den Ventilkopf wirkenden Wasserdruckes in der geschlossenen Kammer zu überwinden.

2. Schwimmerventil nach Anspruch 1, dadurch gekennzeichnet, daß die Schwimmerkammer (24) eine von der Einlaßöffnung (16) schräg nach unten geneigte Wandung (20) aufweist, daß die Kegelachse (32) der Auslaßöffnung (28) nach unten zu der angrenzenden Wandung des Spülkastens oder des Tanks hin geneigt ist und daß der Ventilkopf ebenfalls in einer damit zusammenwirkenden Weise geneigt ist.

3. Schwimmerventil nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Gehäuse aus zwei Teilen gebildet ist, nämlich aus einem im allgemeinen U-förmigen Teil (20), bei dem die Auslaßöffnung (28) im Boden des U-förmigen Kanals ausgebildet ist, und aus einer den Raum zwischen den freien Enden der Schenkel des U-förmigen Teils in dichter Weise verschließenden Abdeckung (22), wobei die Abdeckung in ihrem entfernten Zustand und während des Zusammenbaus des Ventils es erlaubt, daß das von dem



Ventilkörper entfernte Ende des Hebels durch die Kammer und durch die Auslaßöffnung geführt werden kann, bis der Ventilkopf innerhalb der Kammer und an der Auslaßöffnung angrenzend sitzt.

4. Schwimmerventil nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Gehäuse mit einem Abströmkanal (48) versehen ist, der einen Abschnitt des Ventilsitzes (30) bei geschlossenem Ventil mit dem Innenraum der Kammer (24) verbindet.

5. Schwimmerventil nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Einrichtung (46, 48) vorgesehen ist, die es ermöglicht, die Position des Schwimmers entlang des Hebels einzustellen.

6. Schwimmerventil nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Einrichtung (50, 52) vorgesehen ist, die es ermöglicht, die vertikale Position des Schwimmers relativ zum Hebel einzustellen.

Revendications

1. Mécanisme de clapet à flotteur pour un réservoir ou une cuve (10), ledit mécanisme comprenant un boîtier de clapet (20, 22) délimitant une chambre fermée (24) ayant une ouverture d'entrée (26) adaptée pour être reliée en permanence à un tuyau d'arrivée (16) dans le réservoir ou la cuve, une ouverture de sortie (28) de la chambre ayant un siège de soupape conique (30) entourant la sortie et ayant un axe de cône, un élément de clapet en matière plastique (34) traversant l'ouverture de sortie et ayant une tête de clapet conique (36) située à l'intérieur de la chambre (24) et un levier (38) fixé par un montage pivotant autour d'un axe horizontal, ledit levier portant un flotteur (54) fixé en une position latéralement écartée dudit axe horizontal, de façon à pouvoir se déplacer librement à l'intérieur de la cuve ou du réservoir, et un moyen reliant le levier (38) directement et de façon rigide à l'élément de clapet (34) et traversant librement ladite ouverture de sortie, afin de soulever la tête (36) par rapport au siège (30), quand l'eau ou autre liquide contenu dans la cuve ou le réservoir (10) descend au-dessous d'un certain niveau pour permettre au liquide de sortir de la chambre (24) par l'ouverture de sortie (28), caractérisé par le fait que la tête de clapet (36) pivote comme une unité intégrée avec le levier, de sorte que la tête de clapet (36) se déplace le long d'une trajectoire circulaire traversant l'ouverture de sortie (28) en passant d'une position fermée à une position

ouverte, la tête conique du clapet (36) s'emboîtant de façon étanche dans le siège de soupape conique dans ladite position fermée du clapet, en ce que le flotteur (54) est un flotteur creux qui est partiellement rempli d'eau ce qui le rend relativement lourd, en ce que ledit flotteur est monté de façon à dépasser sous le levier, en ce que la pression de l'eau à l'intérieur de la chambre (24) agissant sur la portion du clapet se trouvant à l'intérieur de la chambre est suffisante pour maintenir en permanence le clapet en position fermée jusqu'à ce que le moment pivotant du poids de flotteur (54) partiellement rempli soit suffisant pour vaincre le moment pivotant de la pression d'eau dans ladite chambre fermée qui agissant sur ladite tête de clapet.

2. Clapet à flotteur selon la revendication 1, caractérisé en ce que la chambre du flotteur (24) a une paroi (20) inclinée en oblique vers le bas à partir de l'ouverture d'entrée (16), en ce que l'axe du cône (32) de l'ouverture de sortie (28) est inclinée vers le bas en direction de la paroi adjacente de la cuve ou du réservoir, et en ce que la tête de clapet est également inclinée à coopérer avec ce dispositif.

3. Clapet à flotteur selon la revendication 1 ou 2, caractérisé en ce que le boîtier est formé de deux parties comprenant une pièce ayant généralement la forme d'une gouttière (20), l'ouverture de sortie (28) étant formée dans le corps de la gouttière et un couvercle (22) fermant de façon étanche l'espace compris entre les extrémités libres des morceaux de la gouttière, le couvercle, lorsqu'il est démonté et pendant l'assemblage du clapet, permettant à l'extrémité du levier éloignée de l'élément de clapet de traverser la chambre et l'ouverture de sortie de cette chambre jusqu'à ce que la tête du clapet soit située à l'intérieur de la chambre à côté de l'ouverture de sortie.

4. Clapet à flotteur selon l'une quelconque des revendications précédentes caractérisé en ce que le boîtier comprend un passage de drainage (58) reliant une partie du siège de soupape (30), quand le clapet est fermé, à l'intérieur de la chambre (24).

5. Clapet à flotteur selon l'une quelconque des revendications précédentes, caractérisé en ce que des moyens (46, 48) sont prévus pour permettre d'ajuster la position du flotteur le long du levier.

6. Clapet à flotteur selon l'une quelconque des revendications précédentes, caractérisé en ce que des moyens (50, 52) sont prévus pour permettre d'ajuster la position verticale de flotteur par rapport au levier.

