United States Patent

[11] 3,608,579

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[21] Appl. No. **655,235**
[22] Filed **July 21, 1967**
[45] Patented **Sept. 28, 1971**

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[54] PIVOTED FLOAT ACTUATED VALVE

7 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **137/448,** 251/298, 251/367

[51] **Int. Cl.** **F16k 31/22,** F16k 1/16, G05d 9/02

[50] **Field of Search** 137/329.05, 425, 435, 443, 448; 119/78; 251/84, 298, 300, 303, 338, 367

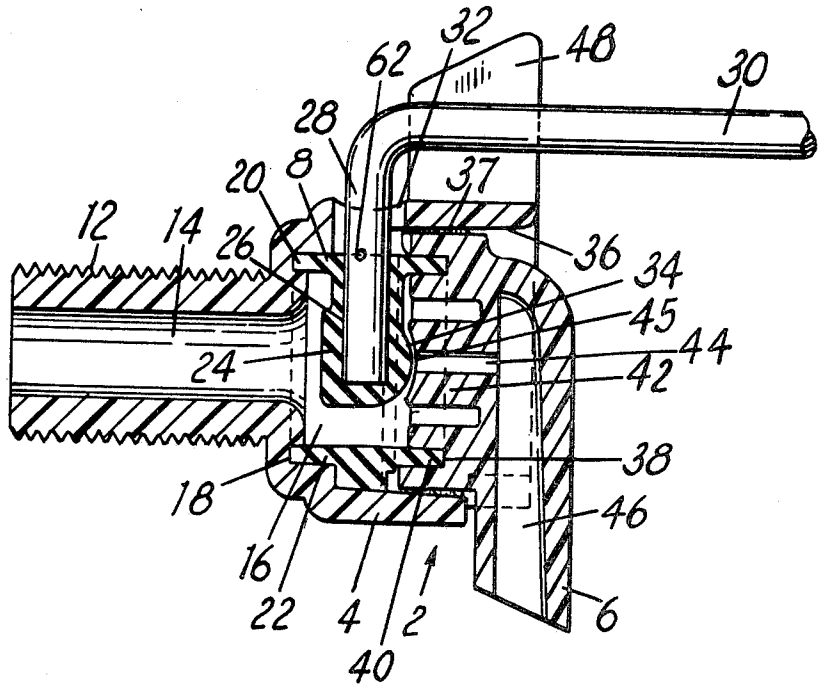
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ABSTRACT: A relatively rigid valve body adapted to be fixedly supported and have a source of fluid pressure connected thereto; a passage in the body connecting the source to an open-sided chamber in the body, the wall of the chamber having an annular groove around the inner end of the passage; a relatively rigid orifice body fixedly connected to the valve body and closing the open side of the chamber and having an annular groove in its inner face opposed to the groove in the wall of the chamber; an annular valve seat of relatively flexibly deformable material having its ends in sealed and supported engagement in the grooves of the valve body and orifice body, and having an integral flexible center member projecting into the interior of the annulus of the valve seat; the surface of the center member having a segmental convex spherical surface opposed to the inside of the orifice body, the orifice body having a concave surface located in coacting adjacent relation to the convex surface, with an orifice opening from the concave surface to a director passage formed in the orifice body and open to the exterior of the orifice body; and a relatively rigid actuating bar engaged in a hole extending from within the center member outwardly through the valve seat, the valve body having an opening formed therethrough passing the actuating bar in clearing relation and providing an unsupported, noncontacted, area on the outside of the valve seat surrounding the projecting end of the actuating bar; the outer end of the actuating bar being connected to a float arm having a float on its free end, and a biasing weight adjustable along its length.



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SHEET 1 OF 2

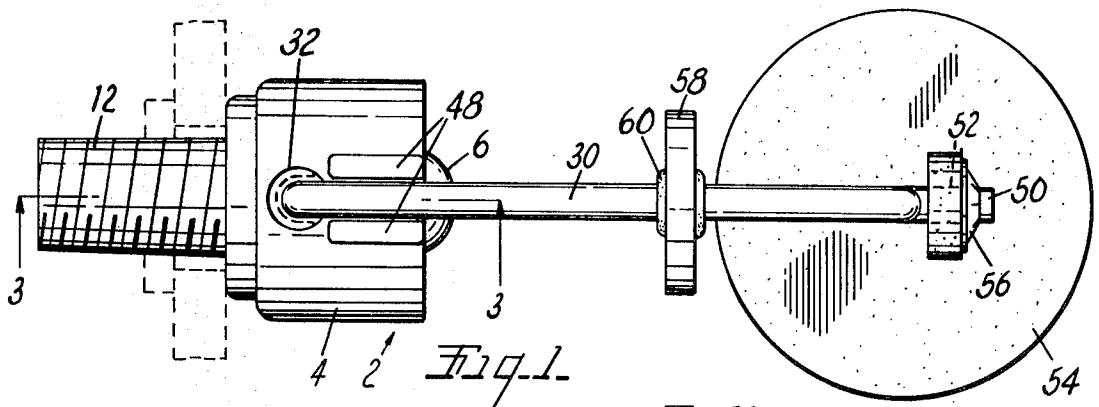


Fig. 1

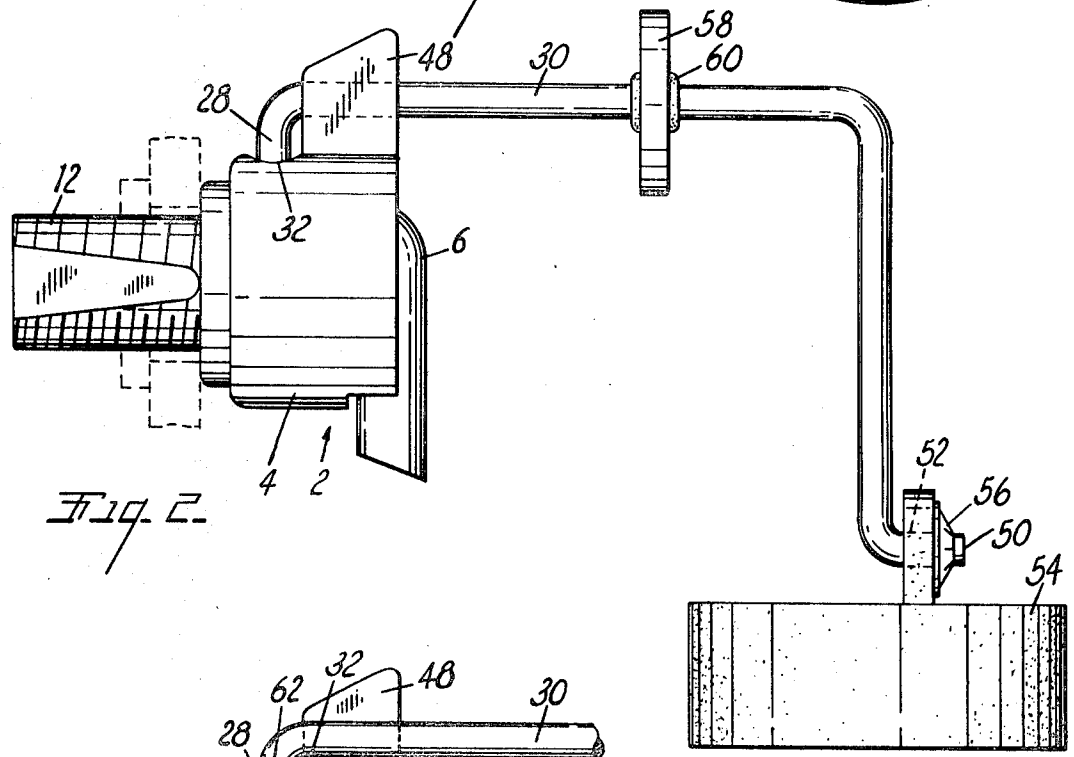


Fig. 2

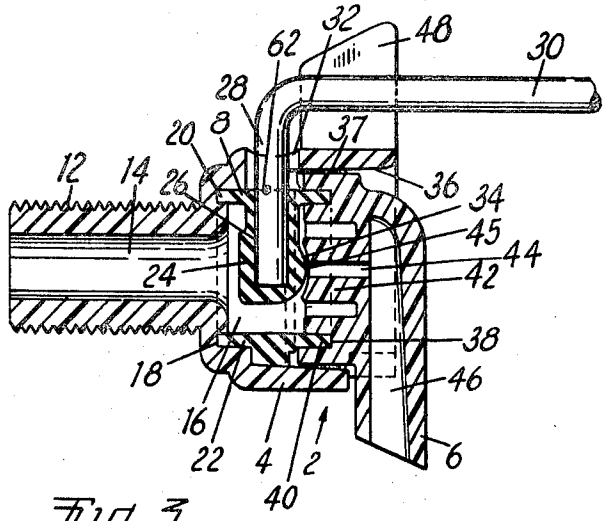


Fig. 3

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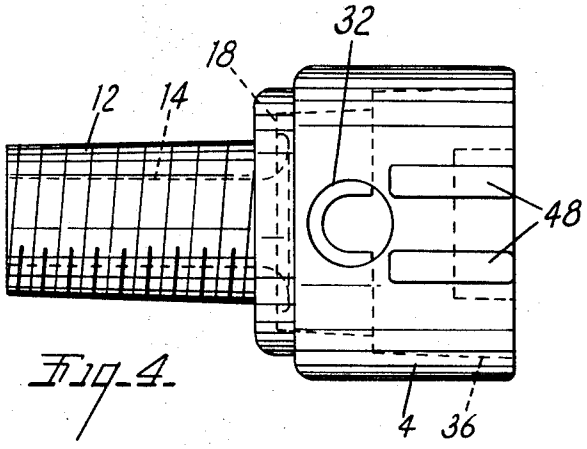


Fig. 4

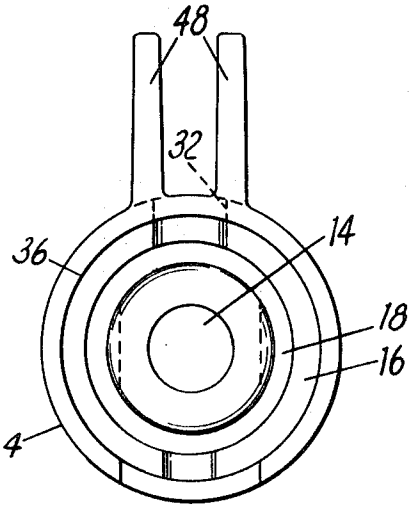


Fig. 5

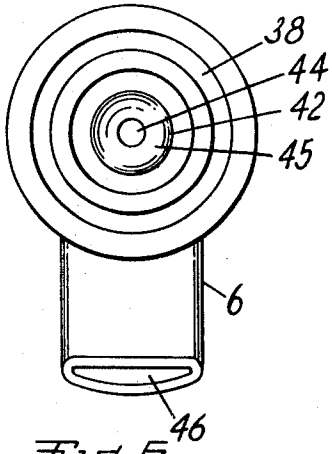


Fig. 6

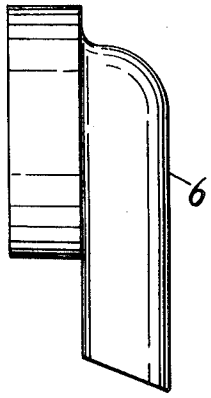


Fig. 7

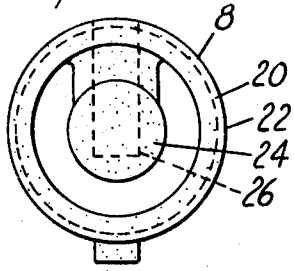


Fig. 8

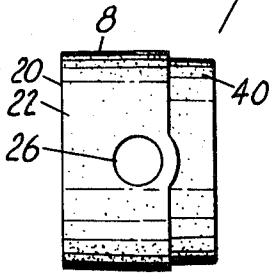


Fig. 9

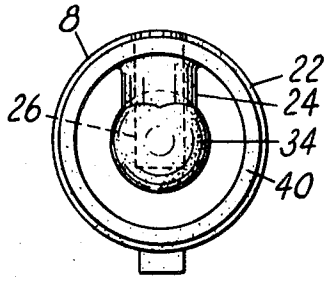


Fig. 10

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PIVOTED FLOAT ACTUATED VALVE

OUTLINE OF INVENTION

The valve is designed especially for use as a float-controlled valve for a liquid regulated and delivered by the valve. The fixed part of the valve is rigid, with an inlet opening and an outlet orifice opening to a chamber within the fixed part. The surface of the chamber around the outlet orifice is concave, and coacts with a convex surface on a movable seat or closure member that is yieldably supported within the chamber. The movable seat is connected to be moved toward and away from the outlet orifice by one end of a rigid actuating bar such as a float arm, that extends through a wall or fixed part of the valve and which is yieldably supported for movement about a point eccentric to the outlet orifice.

This construction first results in the coacting sealing or closing surfaces of the valve being located within the chamber of the valve; where they are not subjected to alternate wetting and drying. As a result, there is less tendency for the valve to fail by reason of accumulation of mineral deposits from the liquid on the closing parts of the valve.

Secondly, the inlet pressure in the chamber of the valve acts on the movable seat, and presses the movable seat into closing engagement. As a result, an increase in inlet pressure does not require a corresponding increase in the buoyant force of a float to hold the valve closed. The inlet pressure assists, rather than opposes, the action of the float tending to close the valve.

The particular form of the valve shown permits economical manufacture and assembly of the valve. By providing the interior movable seat or closure member as an integral part of a flexible and deformable annular seal member, the passage through which the actuating bar passes into the chamber of the valve body is effectively sealed. At the same time, the two rigid parts of the valve body are sealed, and the pivot point for the movable valve seat is effectively but yieldably supported.

The drawings, of which there are two sheets illustrate a preferred form of the valve adapted as a float-controlled valve.

FIG. 1 is a top plan view of the valve in installed position to control the level of liquid in a tank.

FIG. 2 is a side elevational view of the valve.

FIG. 3 is an enlarged, fragmentary, cross-sectional view taken along the plane of the line 3—3 in FIG. 1.

FIG. 4 is a top view of the valve body.

FIG. 5 is a front view of the valve body.

FIG. 6 is an inside face view of the orifice body.

FIG. 7 is a side elevation of the orifice body.

FIG. 8 is a view of the inner or high-pressure side of the flexible valve seat member.

FIG. 9 is a top view of the valve seat member.

FIG. 10 is a view of the opposite side of the valve seat of FIG. 8.

As shown in FIGS. 1, 2 and 3 the valve assembly indicated generally at 2 consists of three parts; the valve body 4, the orifice body 6 and the valve seat member 8. A strainer may or may not be used in the valve but is not shown as it constitutes no part of this invention. The valve body 4 as illustrated in FIG. 3 is molded of a high-temperature, high-performance plastic, however, it should be apparent that the valve body 4 could be of any suitable structural material including metal.

Valve body 4 has a threaded neck portion 12 to which a water pipe or tube may be attached. A bore 14 passes through the threaded portion 12 and forms a passage through which water flows from the source to the chamber 16 within valve body 4. A groove 18 is provided in chamber 16 and one edge 20 of the annular rim 22 of valve seat 8 fits into groove 18. In addition to the annular rim 22, the valve seat 4 has an integral cantilevered center member 24. A blind hole 26 passes through the rim 22 and into the center member 24. The purpose of the blind hole 26 is to receive the end 28 of the float arm 30. The forward face 34 of center member 24 is of spherical configuration. It should be understood that valve seat 4 is fabricated of a flexible, resilient material such as rubber,

neoprene, Buna N or any other suitable material. The spherical face 34 is offset from the fixedly supported rim 22 by the flexible center member 24.

The orifice body 6 fits inside bore 36 of valve body 4 and is held in place by an adhesive at the joint 37. Any one of several means of joining the orifice body 6 to valve body 4 may be used including mechanical fasteners. The orifice body thus forms a closure for the open side of the valve body to complete the chamber 16. Orifice body 6 has a groove 38 into which face 40 of the annular rim 18 fits. An inner projection 42 of orifice body 6 has an orifice 44 which serves as a passage between the chamber 16 and the director passage 46. The inner face 45 of the projection 42, around the inner end of the orifice 44, is spherically concave to receive and coact with the surface 34. The orifice body 6 is also made of high-temperature, high-performance plastic. However, it too can be made of other materials.

Two ears 48 project from valve body 4 and serve as guides for the float arm 30. The end 28 of the float arm projects through a hole 32 in the valve body. The other end 50 of the downturned float arm 30 passes through a hole 52 in float 54. The float 54 is held on the float arm by means of the push nut 56.

A metal disc 58 is slidably mounted on float arm 30 by means of rubber grommet 60. The friction between rubber grommet 60 and float arm 30 is such as to assure that disc 58 is held in a fixed position on arm 30 unless it is intentionally moved by the application of finger pressure. The purpose of disc 58 is to change the water level by changing the center of mass of the float arm 30 and float 54 combination about pivot point 62. The more distance between disc 58 and the pivot point indicated at 62 at the upper edge of the valve seat 8 in FIG. 3, the higher the water level.

Assuming valve 2 is mounted in the sidewall of a water pan, indicated by the dotted lines in FIGS. 1 and 2, and a source of water has been attached, the weight of float arm 30, disc 58, and float 54 acting about pivot point 62, causes the face 34 of center member 24 to move away from the inner face 45 and the orifice 44. Thus water flows from the source through bore 14, into chamber 16, around center member 24, through orifice 44 and out director passage 46.

As the water level in the pan increases, float 54 rises and thereby exerts a moment around pivot point 62. End 28 of float arm 30 moves the center member 24 of valve seat 8. When center member 24 is moved into contact with projection 42 of orifice body 6, the orifice 44 is sealed and the flow of water is interrupted. When the orifice 44 is sealed by center member 24 a differential pressure exists between chamber 16 and orifice 44. The pressure in chamber 16 is equal to the water source, line pressure and the pressure in orifice 44 is atmospheric pressure. This differential pressure creates a force against center member 24 of the valve seat 8 which in turn creates a tight seal or closure at orifice 44. If a leak should occur between the face 34 of center member 24 and the projection 42, due to irregularities in face 34 or perhaps due to a speck of dirt, the water level would continue to rise and the moment about pivot point 62 would increase. In other words, the shutoff force is a combination of the moment about pivot point 62 due to the force exerted by float 54 and the force exerted by the differential pressure. The coacting closure surfaces 34 and 45 are submerged at all times and not subjected to alternate wetting and drying.

As the line pressure of the water source increases, the differential pressure is increased and the center member 24 seals orifice 44 with greater force.

What is claimed as new is:

1. A valve comprising a body having a horizontal inlet passage and defining a chamber in aligned communication with said inlet passage,

a first vertical wall forming part of said chamber and defining an outlet passage therefrom with a laterally facing outlet orifice at the inner end of the outlet passage,

a laterally movable seat positioned in said chamber and having a closure surface opposed to said orifice,

a valve-actuating rod having a vertically extending inner end engaged with said seat and a portion extending externally of said body and said chamber,

a second upper wall of said valve body defining an opening that is larger than said actuating rod and through which said rod extends,

yieldably deformable means forming the sole support for said rod and said seat from said body and forming a closure for said opening in said upper wall around said rod,

said deformable means being offset above said orifice and the opposed closure surface on said seat,

and a laterally turned float supporting arm on the upper end of said actuating rod,

said inlet passage being formed in an externally threaded mounting neck on said body.

2. A valve as defined in claim 1 in which said seat and said deformable means are formed as an integral unit.

3. A valve as defined in claim 2 in which said first wall is formed separately from said body and secured in coacting relation thereto to complete said chamber.

4. A valve as defined in claim 3 in which said body and said first wall have opposed annular grooves formed therein opening into said chamber around said inlet and said outlet passage respectively,

the unit of said deformable means and said seat having oppositely extending annular flanges received in supported and sealing relation in said grooves.

5. A valve as defined in claim 4 in which said valve body is a cylindrical member which includes the upper wall,

and an integral end wall on said body in which said inlet passage is formed with one of said grooves opening inwardly of the chamber and extending around the inlet,

the unit of said deformable means being an annulus with its outer surface supported by the inside of the cylindrical member,

the seat portion of said unit being an integral projection extending from the interior surface of said annulus and having a hole formed vertically through the upper side of the annulus and into said seat portion and receiving said valve actuating rod.

6. A valve as defined in claim 5 in which said first wall has a concave surface formed thereon in surrounding relation to the end of said outlet orifice,

said seat being convexly shaped and receivable in the concavity of said concave surface.

7. A valve as defined in claim 6 in which said surface of said seat is formed on the yieldable material of said unit.