

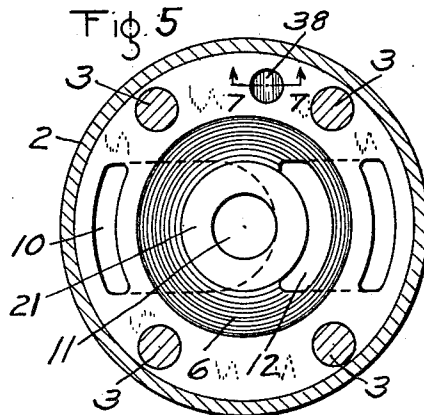
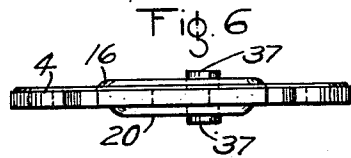
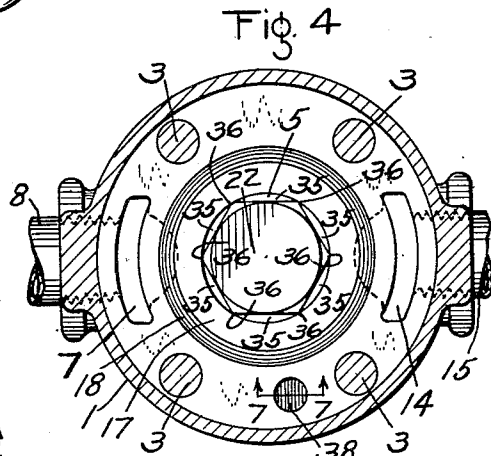
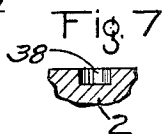
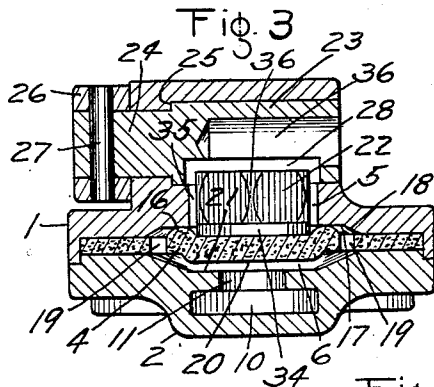
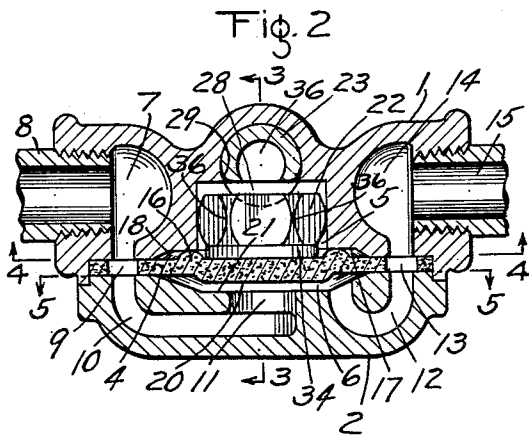
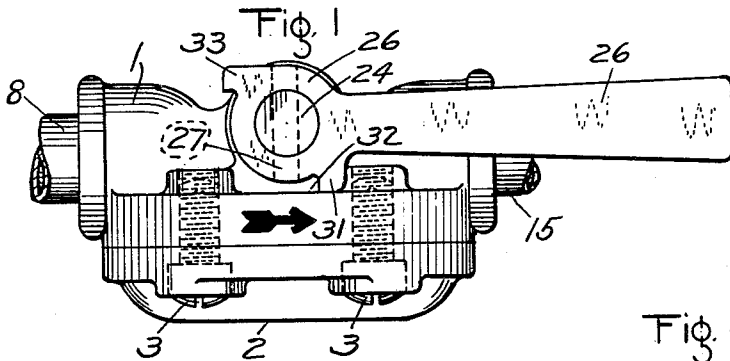
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DIAPHRAGM COCK

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UNITED STATES PATENT OFFICE

1,976,851

DIAPHRAGM COCK

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7 Claims. (Cl. 251—24)

This invention relates to hand operated valve devices of the type having a flexible diaphragm valve for controlling communication from an inlet pipe to an outlet pipe, and the principal object of the invention is to provide an improved valve device of this character.

In the accompanying drawing; Fig. 1 is a side elevation of a valve device embodying the invention; Fig. 2 is a longitudinal sectional view taken vertically through the valve device shown in Fig. 1; Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2; Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2; Fig. 6 is a side elevation of the flexible diaphragm valve employed in the valve device shown in Fig. 1; and Fig. 7 is a sectional view of a portion of the valve device shown in Fig. 1 and taken on the line 7—7 of Figs. 4 and 5.

As shown in the drawing, the valve device comprises a body 1, a cover 2 secured to said body by a plurality of screws 3, and a flexible diaphragm 4 clamped between said body and cover and separating a vent chamber 5 in the body from a pressure chamber 6 in the cover.

The body is provided with a chamber 7 open to a fluid pressure inlet pipe 8 and connected through an opening 9 in the clamped portion of the diaphragm valve 3 to a passage 10 in the cover leading to a passage 11 communicating with the pressure chamber 6. The pressure chamber 6 is open through a passage 12 in the cover, a port 13 in the clamped portion of the diaphragm valve 3 and a chamber 14 in the body 1 to a fluid pressure outlet pipe 15.

The flexible diaphragm valve 4 is provided on the vent chamber side with an annular bead 16 adapted to seal against a seat 17 provided in the body 1, so as to close communication from vent chamber 5 to a chamber 18 formed outside of said bead, the chamber 18 being at all times open to the pressure chamber 6 through a plurality of ports 19 provided through the diaphragm valve. The flexible diaphragm valve 4 is provided on the opposite side with a thickened disc or boss-like portion 20 adapted to engage a seat 21 formed in the cover 2, for closing communication from passage 11 to chamber 6.

A diaphragm follower 22 is guidably mounted in chamber 5 in the body 1 and is carried by the flexible diaphragm valve 4 within the bead 16. A shaft 23, for operating the diaphragm follower 22, is rotatably mounted in a suitable bore provided in the body directly over the follower 22. A portion 24 at one end of the shaft

23 is reduced in section to provide a shoulder 25 adapted to engage a corresponding shoulder in the body; the portion 24 extending beyond the exterior of the body. An operating handle 26 is secured to the portion 24 of the shaft 23, preferably by means of a rivet 27, and acts to hold the shaft 23 assembled in the body.

The shaft 23 is provided with a slot 28 through one side in alignment with the follower 22, said slot being of such width that the follower 22 may freely enter, and of such depth that when the follower is raised to the position defined by engagement of the diaphragm valve bead 16 with seat 17, there will be sufficient clearance between the top of the follower 22 and the bottom of the slot 28 to ensure sealing engagement of the bead 16 on the seat 17 even though the diaphragm valve may become swollen in use, due to the presence of oil or other materials which will cause swelling of a diaphragm made of rubber.

The chordal opposite edges of the slot 28 are slightly rounded and provide at one side an operating shoulder 29 adapted to be turned, by the handle 26, into operating engagement with the follower 22, for moving said follower and the diaphragm valve 4 downwardly until the periphery of the shaft 23 engages the follower 22, at which time the thickened portion 20 of said diaphragm valve is adapted to be pressed into sealing engagement with seat 21.

A lug 31 is provided on the handle 26 and is adapted to engage a surface 32 on the body 1 for defining the open position of the valve, and a lug 33 is provided on said handle and is adapted, upon rotation of handle 26 through an arc of substantially 90°, to engage the surface 32 for defining the closed position of the valve.

The diaphragm follower 22 is provided on one end with a cylindrical portion 34 which fits within the bead 16 on the diaphragm valve 4, the remainder of said follower being preferably hexagonal in shape to provide open spaces 35 between the guide portions 36, which may slidably engage the side wall of chamber 5. The open spaces 35 provide a venting communication between opposite sides of the follower 22. The shaft 23 is provided with a bore 36 opening into the slot 28 above the follower 22.

In order to ensure registration of openings 9 and 13 in the clamped portion of the diaphragm valve 4 with passages 10 and 12, respectively, in the body 1 and cover 2, the diaphragm valve 4 is provided on each side with a teat 37 adapted to engage in a corresponding recess 38 provided in the body 1 and cover 2.

When the operating handle 26 is in the open position, as shown in Fig. 1, the shaft 23 is in the position shown in Figs. 2 and 3, and if fluid under pressure is present in the inlet chamber 7 and consequently in passages 10 and 11, the pressure of said fluid acting on the diaphragm valve 4 will hold said diaphragm deflected to the position in which bead 16 seals against the seat 17, so that fluid under pressure will flow from passage 11 to chamber 6, and thence through passage 12, opening 13, and chamber 14 to the outlet pipe 15.

The ports 19 through the diaphragm valve 4 permit fluid under pressure to flow from the pressure chamber 6 to chamber 18 outside of the bead 16, but since the bead is at this time sealed against seat 17, fluid under pressure cannot leak from chamber 18 to the vent chamber 5.

When the handle 26 is in the open position, the shaft 23 does not engage the follower 22, as indicated in Fig. 2. The follower thus merely rests on the diaphragm valve which permits said diaphragm valve to be deflected by fluid under pressure in chamber 6, so as to ensure an effective seal between the bead 16 and seat 17. Under this condition, the central thickened portion of the diaphragm valve tends to prevent distortion of said diaphragm valve into the bore 5.

When the handle 26 is turned in a counterclockwise direction from the open position, as shown in Fig. 1, to the closed position defined by engagement of lug 33 on the handle 26 with surface 32 on the body 1, the shaft 23 is also turned. The shoulder 29 on shaft 23 is thereby turned into engagement with the follower 22, after which further rotation of shaft 23 causes the follower 22 to move downwardly until the periphery of shaft 23 engages the follower 22.

The downward movement of the follower 22 shifts the diaphragm valve downwardly and presses the thickened portion 20 of said diaphragm valve into sealing engagement with the seat 21, thereby preventing flow of fluid under pressure from passage 11 to chamber 6.

When the diaphragm valve 4 is moved to its closed position, the bead 16 is moved away from the seat 17. The outlet pipe 15, chamber 14, passage 12 and pressure chamber 6 below the diaphragm valve 4 are thus opened to the atmosphere through the ports 19 in said diaphragm valve to chamber 18, thence through chamber 5, through the spaces 35 around the follower 22, through slot 28 and from thence through bore 36 in the shaft 23, so that fluid under pressure is vented from the outlet pipe 15 when the supply of fluid under pressure from the inlet pipe is cut off.

It will be evident that the diaphragm valve is moved between the open and the closed positions by turning the handle 26 through substantially a 90° arc, and that in the open position communication is established between the inlet and outlet pipes, while in the closed position said communication is closed and the outlet pipe is vented to the atmosphere.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A valve device comprising a body having an inlet passage and an outlet passage, a cover se-

cured to said body having passages connecting said inlet and outlet passages, a flexible diaphragm valve clamped between said body and cover and having one position for opening communication between said inlet and outlet passages and another position for closing said communication, said body having a bore opening to one side of said diaphragm valve, a follower member guidably mounted in said bore and engaging one side of said diaphragm, a shaft rotatably mounted in said body, a shoulder on said shaft adapted upon rotation of the shaft in one direction to operate said follower and thereby shift said diaphragm valve to the second mentioned position, said shoulder being movable out of engagement with said follower upon rotation of said shaft in the opposite direction, and a handle mounted on said shaft for rotating said shaft.

2. A valve device comprising a body having an inlet passage and an outlet passage, a cover secured to said body having passages connecting said inlet and outlet passages, a flexible diaphragm valve clamped between said body and cover and having one position for opening communication between said inlet and outlet passages and another position for closing said communication, said body having a bore opening to one side of said diaphragm valve, a follower member guidably mounted in said bore and engaging one side of said diaphragm, a shaft rotatably mounted in said body, said shaft having a transverse groove adapted to freely receive said follower in the first mentioned position of said diaphragm valve, said groove providing a shoulder on said shaft adapted to move said follower and thereby said diaphragm valve to the second mentioned position, and a handle for rotating said shaft.

3. A valve device comprising a body having an inlet passage and an outlet passage, a cover secured to said body having passages connecting said inlet and outlet passages, a flexible diaphragm valve clamped between said body and cover and having one position for opening communication between said inlet and outlet passages and another position for closing said communication, said body having a bore opening to one side of said diaphragm valve, a follower member guidably mounted in said bore and having one face in engagement with said diaphragm valve, said body having another bore with its axis at right angles to the axis of the first mentioned bore, a shaft rotatably mounted in the last mentioned bore, said shaft being free from said follower in said first mentioned position of the diaphragm valve, means associated with said shaft and adapted upon rotation of said shaft to move said follower and thereby said diaphragm valve to the second mentioned position, and a handle for rotating said shaft.

4. A valve device comprising a body having an inlet passage and an outlet passage, a cover secured to said body having passages connecting said inlet and outlet passages, a flexible diaphragm valve clamped between said body and cover and having one position for opening communication between said inlet and outlet passages and another position for closing said communication, said body having a bore opening to one side of said diaphragm valve, a follower member guidably mounted in said bore and having one face in engagement with said diaphragm valve, said body having a second bore with its axis at right angles to the axis of the first mentioned bore, a section of the second bore being of re-

duced diameter, a shaft rotatably mounted in the second bore and having a portion extending through the section of reduced diameter, a handle secured to said portion for turning said shaft, said shaft being free from said follower in the first mentioned position of said diaphragm valve, and means associated with said shaft adapted upon rotation to move said follower and thereby said diaphragm valve to the second mentioned position.

said body and cover and adapted to engage the seat in the body when communication between said passages is open and adapted to engage the seat in the cover to close communication between said passages, said body having a bore opening to the body side of said diaphragm valve, a follower slidably mounted in said bore and engaging said diaphragm valve and forming passageways connecting the body side of said diaphragm valve to the outer face of said follower, a shaft rotatably mounted in said body at right angles to the axis of said follower and having a passageway connecting said outer side of said follower to the atmosphere, means associated with said shaft and adapted upon rotation thereof to move said follower and thereby said diaphragm valve into sealing engagement with the valve seat in the cover, said diaphragm valve having a plurality of through ports connecting one side to the other in the portion of the diaphragm valve outside of the valve seat in the body, and a handle secured to said shaft for rotating said shaft.

5. A valve device comprising a body having an inlet passage, and an outlet passage, a cover secured to said body having passages connecting said inlet and outlet passages and having a valve seat, a flexible diaphragm valve clamped between said body and cover and forming a chamber at one side open to the atmosphere, said diaphragm valve when disengaged from said seat opening communication between said inlet and outlet passages at the opposite side and being movable into engagement with said seat for closing communication between said inlet and outlet passages, said body having a bore opening into the atmospheric chamber, a follower slidably mounted in said bore and engaging one face of said diaphragm valve, said follower being polygonal in section with the corners of the section engaging the body within said bore and the spaces thereby formed between said corners establishing communication from the first mentioned chamber to the opposite side of said follower, a shaft rotatably mounted in said body at substantially right angles to the axis of said follower and having a passageway connecting said opposite side of said follower to the atmosphere, means associated with said shaft and adapted upon rotation thereof to move said follower and thereby said diaphragm valve into engagement with said seat, and a handle carried by said shaft for rotating said shaft.

7. A valve device comprising a body having a valve seat, a cover secured to said body and having a valve seat open at one side to an inlet passage and at the opposite side to an outlet passage, a flexible diaphragm valve clamped between said body and cover and having a central thickened portion adapted to engage the seat in the cover for closing communication between said passages, said body having a bore central with and of substantially the same area as the thickened portion of said diaphragm valve, a follower slidably mounted in said bore and resting on said diaphragm valve, and means, when moved to one position, for applying pressure to said follower for moving said diaphragm valve into engagement with the seat in the cover, said means when moved to another position and when the thickened portion of said diaphragm is in engagement with the seat in said body exerting no pressure on said follower.

6. A valve device comprising a body having a valve seat, a cover secured to said body and having a valve seat open at one side to an inlet passage and at the opposite side to an outlet passage, a flexible diaphragm valve clamped between

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