

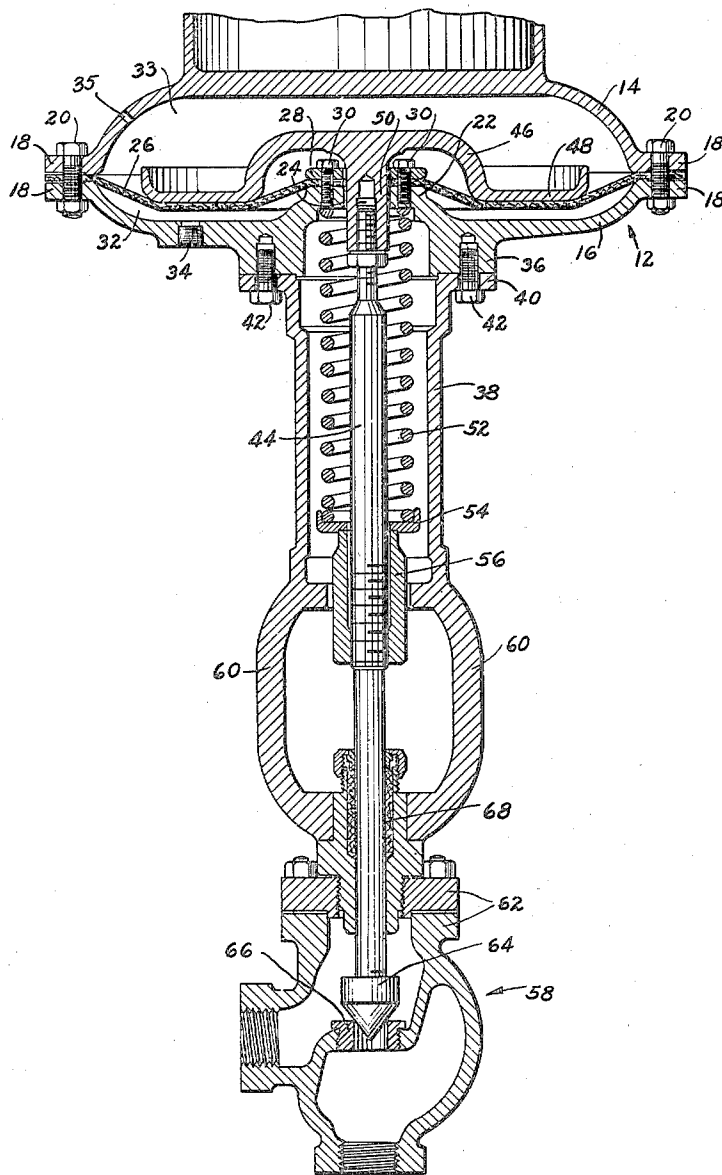
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DIAPHRAGM MOTOR FOR VALVES

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DIAPHRAGM MOTOR FOR VALVES

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This invention relates to diaphragm motors for valves.

The invention is particularly adapted to valves of the push-down-to-close type and which are opened by air pressure operating upwardly on a diaphragm.

Since the air pressure chamber in such valves is on the same side of the diaphragm as the valve stem, it became necessary in old type valves to provide a packing for the valve stem to seal the air pressure chamber from atmosphere. This packing impeded the action of the valve, slowing it down considerably.

In my invention the diaphragm itself seals the air pressure chamber from atmosphere.

It is therefore an object of the present invention to provide a diaphragm motor valve of the push-down-to-close type which obviates the necessity of a packing for the valve stem.

Another object of the invention is the provision of a valve in which the diaphragm seals the air pressure chamber from atmosphere.

Another object is the provision of a diaphragm having a central opening for the projection of the valve stem and having the marginal edge of the central opening secured to the valve body.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in the claims, and illustrated in the accompanying drawings, wherein:

The single figure shows my new valve motor in vertical cross section attached to a valve which is also in vertical section.

Referring in detail to the drawing, the valve motor includes a diaphragm housing 12 having an upper diaphragm casing 14 and a lower diaphragm casing 16. These diaphragm casings are each formed with registering flanges 18 provided with openings therein for bolts 20 for securing the diaphragm casings together. The lower diaphragm casing 16 is provided with a central boss 22 which extends upwardly to approximately the plane of the flange 18 on the lower diaphragm casing. The boss 22 is formed with a central vertically extending circular opening 24 therein.

A diaphragm 26 provided with a central opening is secured in the diaphragm housing, its outer marginal edge secured between the flanges 18, and its inner marginal edge secured to the upwardly extending boss 22 by means of a circular ring 28 and bolts 30 threaded therethrough and into the marginal edge of the boss 22. The diaphragm 26 forms an air pressure chamber 32 with the lower diaphragm casing 16, and a chamber 33 with the upper diaphragm casing 14. A threaded opening 34 is formed in the lower

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diaphragm casing 16 for supplying air pressure to the chamber 32. A vent 35 is formed in the upper diaphragm casing 14 to vent the diaphragm chamber 33 to atmosphere.

Formed on the lower surface of the lower diaphragm casing 16 is a hollow circular projection 36 by which the diaphragm housing 12 is mounted on a circular supporting housing 38, the housing 38 having a flange 40 at its upper end. Bolts 42 are threaded through the flange 40 into projection 36 for securing them together.

Mounted for vertical reciprocation in the circular housing 38 is a valve stem 44 which extends upwardly through the opening 24 in the boss 22 and into the upper chamber 33. Secured to the upper end of the valve stem 44 in the chamber 33 is a shoe 46, which has a downwardly facing central concave portion and an annular, substantially flat bearing surface 48, the latter having a considerable radial area for engaging the upper side of the diaphragm 26. The diaphragm 26 can be flexed between its points of securement, or between the outer edge of the diaphragm housing 12 and the boss 22. The concave shape of the shoe 46 is such that the bearing surface 48 thereof is adapted to extend below the upper surface of the boss 22 and be in engagement with the diaphragm 26 in its lowermost position of flexing. This position is shown in the drawing. The shoe 46 is therefore adapted to have constant engagement with the diaphragm. The opening 24 is large enough for free reciprocation therein of the shank 50 of the shoe 46.

A compression spring 52 encircles the valve stem 44 and is biased between the under surface of the boss 22 and a ring 54 secured to the lower end of valve stem 44 by an adjusting nut 56 threaded on the valve stem. The spring 52 normally biases the valve stem 44 downwardly, the adjusting nut 56 being utilized to adjust the initial load of the spring 52 to determine the air pressure at which the diaphragm begins to move.

The valve 58 which is operated by the diaphragm motor is a conventional valve of the type that closes when pushed down. It is secured to the arms 60 of the circular housing 38 by cooperating flanges 62. The lower end of the valve stem 44 is provided with a valve closer 64 which seats on valve seat 66 when pushed down. The valve is sealed by packing means 68 in a conventional manner.

This valve motor eliminates the necessity for having a packing for sealing off the air pressure diaphragm chamber from atmosphere. Such packing impedes the operation of the valve due to friction, and the only packing necessary in the valve of the present invention is that for sealing the valve proper from atmosphere.

The diaphragm chamber 32 is annular in form

and is completely sealed to form an air pressure chamber. Upon increase of air pressure in the chamber 32, the diaphragm is flexed upwardly, carrying the shoe 46 and the valve stem 44 upwardly also and opening the valve. On decrease of the pressure the valve is closed by the compression spring 52 which normally biases the valve to closed position. Herein is a safety feature—that is, on failure of the source of air pressure, the valve will close. It is the first time that a push-down-to-close type valve that is opened by air pressure was made in which a packing means was not necessary for sealing off the air pressure chamber from atmosphere.

While I have herein shown and described a preferred embodiment of my invention, manifestly it is susceptible of modifications and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise form herein disclosed, except as I may be so limited by the appended claims.

I claim as follows:

1. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, a diaphragm having a central opening and being rigidly secured at its outer and inner marginal edges in the diaphragm housing, the diaphragm forming an air pressure chamber with the diaphragm housing, and a valve stem reciprocable in the supporting housing and extending into the diaphragm housing through the central opening in the diaphragm and having an operative connection with the diaphragm.

2. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, a diaphragm having a central opening and being rigidly secured at its outer and inner marginal edges in the diaphragm housing, the diaphragm forming an air pressure chamber with the diaphragm housing, and a valve stem reciprocable in the supporting housing and extending into the diaphragm housing through the central opening in the diaphragm, said valve stem having a shoe secured thereto for engaging the diaphragm, said shoe having a substantial area with respect to the diaphragm.

3. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, the diaphragm housing including an upper and lower diaphragm casing, the lower diaphragm casing having a central opening formed therein, a diaphragm having a central opening formed therein, the outer marginal edge of the diaphragm being rigidly secured between the outer marginal edges of the diaphragm casings, the inner marginal edge of the diaphragm being rigidly secured at the marginal edge of the central opening in the lower diaphragm casing, and a valve stem reciprocable in the supporting housing, the valve stem extending through the central openings in the lower diaphragm casing and the diaphragm and having an operative connection with the diaphragm.

4. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, an annular diaphragm rigidly secured at its outer and inner marginal edges in the diaphragm housing and forming an annular diaphragm chamber therein, said diaphragm chamber having a central opening and a valve stem reciprocable in the supporting housing, the valve stem extending into the diaphragm housing through the central opening in the annular diaphragm chamber and having an operative con-

nection with the diaphragm on the side thereof opposite the supporting housing.

5. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, the diaphragm housing including upper and lower concave diaphragm casings, a central boss having an opening therein formed in the lower diaphragm casing and extending upwardly to substantially the plane of the meeting edges of the diaphragm casings, a diaphragm having a central opening therein, the outer marginal edge of the diaphragm being rigidly secured between the outer marginal edges of the diaphragm casings, the inner marginal edge of the diaphragm being rigidly secured to the central boss around the opening therein, a valve stem reciprocable in the supporting housing and extending into the diaphragm housing through the openings in the central boss and diaphragm, and means operatively connecting the valve stem with the diaphragm.

6. A valve motor comprising, in combination, a supporting housing, a diaphragm housing secured thereto, the diaphragm housing including upper and lower concave diaphragm casings, a central boss having an opening therein formed in the lower diaphragm casing and extending upwardly to substantially the plane of the meeting edges of the diaphragm casings, a diaphragm having a central opening therein, the outer marginal edge of the diaphragm being rigidly secured between the outer marginal edges of the diaphragm casings, the inner marginal edge of the diaphragm being rigidly secured to the central boss around the opening therein, the diaphragm capable of being flexed below the upper surface of the central boss, a valve stem reciprocable in the supporting housing and extending into the diaphragm housing through the openings in the central boss and diaphragm, and a downwardly concave shoe secured to the upper end of the valve stem and engaging the upper surface of the diaphragm, said concave shoe adapted to be in engagement with the diaphragm in the lowermost point of flexing of the diaphragm.

7. A valve motor comprising, in combination, a supporting housing, a valve stem reciprocable therein, a diaphragm housing secured to the upper end of the supporting housing, the diaphragm housing including an upper and lower casing, the lower casing having a central opening therein, a diaphragm having a central opening therein and being rigidly secured at its outer and inner marginal edges to the lower casing so as to form an annular air pressure chamber with the lower casing, said air pressure chamber having an opening for connection with a source of compressed air, means operatively connecting the valve stem with the diaphragm through the center of the annular air pressure chamber and engaging the upper surface of the diaphragm, and means biasing the valve stem downwardly.

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