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FLUID CONTROL APPARATUS

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Fig. 1

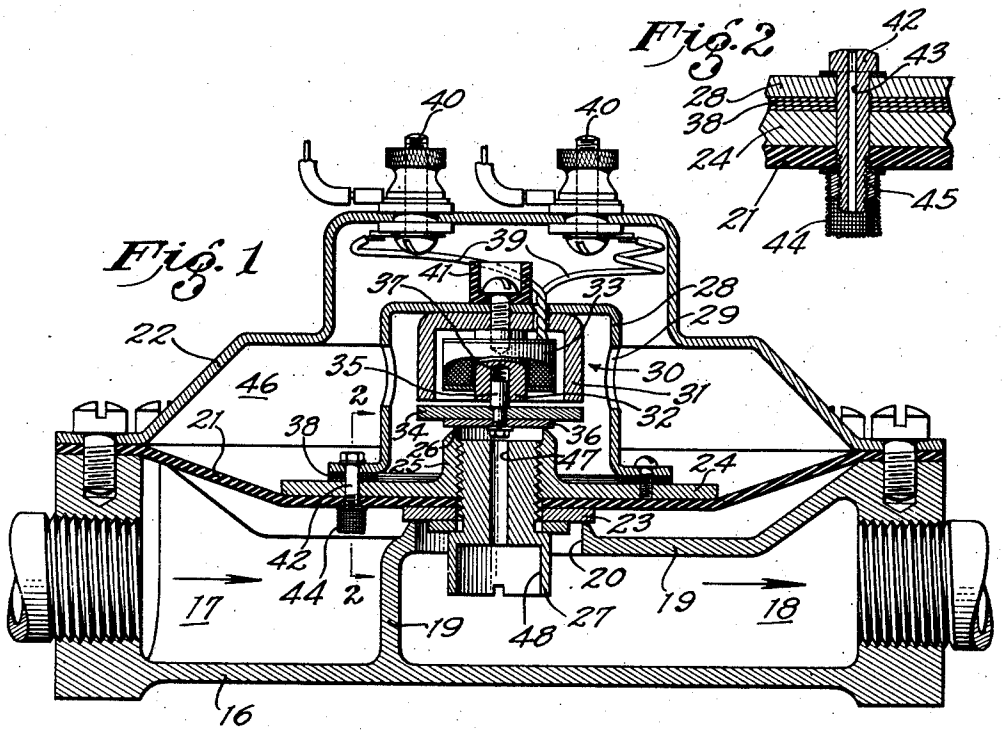


Fig. 2

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FLUID CONTROL APPARATUS

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3 Claims. (Cl. 137—139)

My present invention relates to automatic fluid control apparatus, and has for its main object the provision of a pilot-valve-controlled fluid-pressure-operated valve, comprising a movable partition upon which the pilot-valve structure is supported.

Another object of this invention is the provision of a valve, of the character described in the preceding object, wherein the pilot-valve structure also serves as a main closure member for the valve.

Other objects and advantages of my invention will be found in the description, the drawing and the appended claims.

For complete understanding of the invention, reference may be had to the following detailed description and accompanying drawing, wherein:

Figure 1 is a sectional view of a fluid control valve embodying my invention; and

Figure 2 is an enlarged fragmentary section taken along the line 2—2 of Fig. 1.

In the drawing, the numeral 16 indicates a casing having an inlet 17 and an outlet 18 separated by a partition 19 which is provided with a main valve port 20. A flexible diaphragm 21, secured at its margin between the upper surface of the casing 16 and the flange of a housing or valve cover 22, is provided on its bottom surface with a main valve member 23, cooperable with the valve port 20. On the upper surface of the diaphragm 21 is a disk 24 having an upwardly extending internally threaded central portion 25 which provides at its upper end an annular pilot valve seat 26. A hollow screw 27, threaded in the portion 25, secures the disk 24 and the main valve member 23 to the diaphragm.

Secured by screws to the plate 24 is an inverted cup-shaped housing 28 having openings 29 formed in its side wall. This housing serves to support an electromagnetic device, generally indicated at 30, and comprising an inverted cup-shaped outer core 31, a cylindrical inner core 32, and an energizing coil 33.

Arranged to be attracted by said cores when the same are energized is a disk-shaped armature 34, to the bottom surface of which is secured, by a threaded rod 35, a pilot valve member 36 cooperable with the seat 26. Guiding means for the armature is provided by the enlarged upper end portion of rod 35, preferably of non-magnetic material, which is freely slidable in a concentric cylindrical opening formed in core 32. A spring 37, compressed against the upper end of rod 35, urges the armature away from the cores. The position of the cores with respect to the armature, when the same is in its normal or unattracted position, may be adjusted by variation of the thickness of the pile of shims 38. Means for externally connecting a source of current to the coil 30 are provided by leads 39 and terminals 40, insulating secured in the upper wall of the housing 22. A stop member 41, by engagement with the upper wall of the valve housing, limits the upward movement of the electromagnet housing and thus prevents possible shorting of the inner ends of terminals 40.

Constant fluid communication between the main valve inlet 17 and pressure chamber 46, which is defined by the upper surface of the diaphragm and the walls of valve housing 22, is provided by a screw 42 having a restricted opening 43 therethrough. Dependent on the character of the fluid which the valve is intended to control, this opening may be in the order of that formed by a No. 60 to No. 80 drill. A screen 44, soldered to nut 45, prevents possible clogging of the opening by foreign matter present in the fluid controlled by the valve.

Passageway 47 in screw 27 permits fluid communication between the chamber 46 and the main valve outlet 18 when the pilot valve member 36 is out of engagement with its seat 26. The lower end of screw 27 is extended below the main valve port 20 and also is provided with an enlarged bore 48. When the main valve is open, fluid flowing past the lower end of screw 27 produces an aspirating effect which tends to reduce the fluid pressure in chamber 46.

Assuming that the inlet 17 of the valve is connected to a source of fluid under pressure, when the electromagnet 30 is unenergized, the pressure above and below the diaphragm will be equalized by fluid flow from the main valve inlet into chamber 46 through the opening 43. The diaphragm being downwardly biased by the weight of the pilot valve assembly carried by it, the main valve remains closed. When the electromagnet 30 is now energized, the pilot valve is opened and the compressed fluid escapes from chamber 46 through passageway 47 more rapidly than it can enter through the restricted opening 43, permitting the fluid pressure below the diaphragm to move the same upward to open the main valve. When the electromagnet is now de-energized, the pilot valve closes and the resulting equalization of fluid pressure on either side of the diaphragm closes the main valve.

While I have herein shown and described a specific embodiment of my invention by way of illustration, I wish it to be understood that

modifications may be made without departing from the spirit of my invention. I intend therefore that my invention be limited only by the scope of the appended claims.

I claim as my invention:

1. In a fluid pressure operated valve: a main valve casing having a passage therethrough including a main valve port, a flexible diaphragm closing an opening in an upper wall of said casing, an imperforate housing secured to said casing and encompassing the upper side of said diaphragm, a structure secured in an opening in said diaphragm and extending on opposite sides thereof, the lower portion of said structure providing a main closure member cooperable with said port to control flow through said passage, said structure having a central opening therethrough interconnecting the areas at the surfaces of the structure on opposite sides of the diaphragm, means providing constant restricted fluid communication between the areas at opposite sides of the diaphragm, the upper portion of said structure providing a pilot valve seat surrounding said central opening, a closure member for said seat, and electrically operated means within said housing and mounted on the upper portion of said structure for actuating said pilot closure member.

2. In a fluid pressure operated valve: a main valve casing having a passage therethrough including a main valve port, a flexible diaphragm closing an opening in an upper wall of said casing, an imperforate housing secured to said casing above said diaphragm to form with the same a pressure chamber, a structure secured in an opening in said diaphragm and extending on opposite sides thereof, the lower portion of said structure providing a main closure member cooperable with said port to control flow through said passage, said structure having a central opening therethrough interconnecting the areas at the surfaces of the structure on opposite sides of the diaphragm, means providing constant restricted fluid communication between the areas at opposite sides of the diaphragm, the upper portion of said structure providing a pilot valve seat surrounding said central opening and in a plane parallel to the plane of said diaphragm, a disk-like closure member cooperable with said seat and constructed at least in part of magnetic material, and an electromagnet in said pressure chamber and mounted on and above said structure for actuating said pilot closure member.

3. In a fluid pressure operated valve: a main valve casing having an inlet and an outlet, a ported partition separating said inlet and said outlet and having a main valve seat in a horizontal plane at the inlet side of the partition, a flexible diaphragm closing an opening in the top wall of said casing, an imperforate housing secured to said casing above said diaphragm and defining with the diaphragm a pressure chamber, a structure secured in an opening in said diaphragm and extending on opposite sides thereof, the lower portion of said structure providing a main closure member cooperable with said main valve seat, said structure having a central opening therethrough interconnecting said outlet and said pressure chamber, means providing constant restricted fluid communication between the areas at opposite sides of the diaphragm, the upper portion of said structure providing a pilot valve seat surrounding the upper end of said central opening and in a plane parallel to said main valve seat, a closure member cooperable with said pilot valve seat, and electrically operated means entirely within said pressure chamber and mounted on the upper portion of said structure for actuating said pilot closure member.

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