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VALVE

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This invention relates to valve assemblies more particularly designed for use in connection with liquid fuel burners for automatically controlling the flow of fuel from the fluid supply to the burner. It is one of the objects of this invention to cheapen the cost of manufacture and facilitate assembly by simplifying the several parts involved and by reducing the number of such parts to a minimum.

In the installation of fluid burner systems it is essential to the efficient operation and commercial value of the system that means be provided for positively and automatically closing communication between the fluid supply and burner when the power to the burner motor is shut off. In order to accomplish the above result, it has been the practice to provide a series of independent valve units in the fluid supply line and a series of electro-magnets corresponding in number to the valve units and controlled by the motor circuit for automatically actuating the valve units. The arrangement being such that if for any reason one of the valves fails to seat properly, the fluid escaping past the same will be prevented from flowing to the burners by the remaining valve or valves in the line. While the above arrangement has met with a certain degree of success in the trade for preventing the escape of fluid from the supply to the distributing side of the burner system when the power to the electric motor is cut off, it is objectionable due to the expense involved in providing a series of valve units and independent actuating mechanism therefor.

To overcome the foregoing objection I have devised a valve assembly wherein all of the valve units are disposed within a single casing and wherein common actuating means is provided for said valves. By virtue of this latter arrangement a more compact and cheaper construction is obtained without interfering in any way with the efficiency of the system.

With the foregoing as well as other objects in view the invention resides in the peculiar construction of the valve assembly and the manner in which the various valves are simultaneously actuated to control the flow of fluid from the supply to the distributing line. These objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a diagrammatic view showing a portion of a liquid fuel burner system equipped with a valve assembly constructed in accordance with this invention.

Figure 2 is a central sectional view through the valve assembly, and

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Referring now to the drawing it will be noted that there is illustrated diagrammatically in Figure 1 a liquid fuel burner system of the gravity feed type including a burner 10 driven by a suitable electric motor 11 connected to a suitable source of power by means of a circuit 9 and communicating with a fluid supply reservoir 12 by means of a supply conduit 13 and a distributing conduit 14. The passage of fluid from the supply to the delivery conduits is accurately controlled by a valve assembly 15 having electrically operated valves therein operable when the power to the motor is shut off to close communication between the reservoir and burner and prevent flooding the system.

Thus it will be observed that the valve assembly 15 is designed to control communication between the fluid supply and distributing conduits 13 and 14, respectively, in accordance with the operation of the electric motor 11 and comprises a casing 16 having a body portion 17 preferably cast in one piece and having inlet and outlet openings 18 and 19, respectively, formed therein and communicating with the fluid supply and distributing conduits 13 and 14, respectively. The body portion 17 is further formed with a pair of spaced chambers 20 and 21 communicating with the inlet and outlet passages 18 and 19, respectively, and with each other by means of a passage 22 also formed in the body portion 17. Each of the chambers 20 and 21 are formed with restricted apertures 23 intermediate the ends thereof for receiving the valve seat members 24 and 25 having restricted openings 26 therethrough establishing communication between the lower portions of the chambers and the upper portions thereof. The members 24 and 25 are further provided with enlarged flanges 27 engageable with the shoulders formed by the reduced openings 23 in the chambers and are clamped against the shoulders by means of suitable nuts 29. The nuts 29 threadedly engage the side walls of the chambers beneath the members 27 and are provided with openings 30 therethrough adapted to register with the restricted openings 26 in the seat members 24 and 25.

As will be apparent from Figure 2 of the drawing, the valve seat 24 is arranged within the chamber 20 above the inlet opening 18 and below one end of the passage 22 while the valve member 25 is arranged within the chamber 21 below the out-

let opening 19 and above the opposite end of the passage 22. The arrangement is such as to compel the fluid flowing into the valve assembly to pass upwardly through both of the valve seat members permitting any foreign matter carried by the fluid to deposit upon the bottom walls of the chambers and thereby minimize the tendency of foreign matter to accumulate upon the valve seats. The bottom walls of the chambers are in the form of plugs 31 and 32 threadedly engaging the side walls of the chambers 20 and 21 so as to be readily detachable for cleansing purposes. One or both of the plugs 31 and 32 may be provided with a suitable filtering device such as shown by the reference character 33 in Figure 2 for cleansing the fluid prior to its flow through the valve seats into the distributing conduit.

In order to control the flow of fluid through the valve assembly from the supply to the distributing conduit, I provide a pair of gravity seating valve members 34 and 35 having the lower portions thereof arranged within the chambers 20 and 21, respectively, and having tapered seat engaging portions or members 36 engageable with the seat members 24 and 25 to seal the restricted opening therethrough. The body portions of the valve members constitute valve actuating elements, are of sufficient weight to insure a tight sealing engagement between the tapered seat engaging portions 36 and the cooperating seat members 24 and 25 without the assistance of springs or similar devices.

In order to accurately guide the seat engaging portions 36 of the valve members into engagement with the valve seat members 27 and 28, I provide a pair of tubular casings 37 and 38 having the lower ends thereof sleeved within the upper portions of the chambers 20 and 21, respectively, concentric with the axes of the restricted openings 26. The valve casings 37 and 38 are of sufficient cross-sectional dimension to slidably receive the valve members 34 and 35 and project upwardly beyond the chambers 20 and 21 a distance sufficient to permit the required movement of the valve members. In this connection it is to be noted that only portions of the valve members 34 and 35 slidably engage the inner walls of the casings 37 and 38 with the result that the frictional resistance between these parts upon relative sliding movement thereof is reduced to the minimum.

As stated above the flow of fluid through the valve assembly is controlled in accordance with the operation of the electric motor 11. To accomplish this result I provide an electromagnet 39 comprising a single coil 40 connected in parallel to the motor circuit 9 arranged within the casing 16 and surrounding the valve member 34. Projecting into the coil is a core member 41 recessed as at 42 to receive the upper portion of the casing 37 and connected by means of the plate 43 to a similar member 44 adapted to receive the upper portions of the casing 38. The members 41, 43 and 44, as well as the plate 45 upon which the lower end of the coil 40 rests, are formed of a material of relatively high magnetic permeability. When the circuit 9 to the motor 11 is closed, the coil 40 will be energized establishing magnetic flux through a magnetic circuit, shown by the arrows in Figure 2, common to both of the valve members 34 and 35, in which the valve member 35 forms a magnetic return, causing the flux to magnetically couple the two valve members together so that they

move upwardly as a unit away from the valve seats 24 and 25, permitting the fluid to flow from the supply line 13 to the delivery line 14. The valve members 34 and 35 remain in their upper positions until the motor circuit 9 is opened, at which time the electromagnet is de-energized permitting the valve members 34 and 35 to descend and engage their valve seats as shown in Figure 2 by the action of gravity.

Since the valve members 34 and 35 are mechanically independent of each other, upon de-energization of the electromagnetic means the valve members are free to close independently and if a foreign particle should get between either valve and its respective valve seat the other valve will not be held open.

As either valve member is lifted from its valve seat the effective air gap in the path of the common magnetic circuit is decreased thereby decreasing the magnetic reluctance. The decrease in the magnetic reluctance will increase the magnetic force on each of the valve members. This is a very desirable feature as it insures reliable operation of both valves. For instance, should one of the valves stick, when the magnet 39 is energized, the free valve will move upwardly, which reduces the total air gap in the common magnetic circuit and thereby increases the magnetic force applied to the valve which may be stuck, with the result that the latter is positively opened.

It is to be noted that the lower end plate 45, having a higher magnetic permeability than the valve body 17, shunts the magnetic flux from the valve members and reduces the flux which might otherwise leak through the valve tips causing magnetic particles to adhere thereto and interfere with the proper operation of the valves.

It should be understood from the foregoing description that the valve members 34 and 35 do not function to regulate the quantity of fluid flowing from the supply to the distributing line and in order to accomplish this result, I provide a third valve unit 46 illustrated more particularly in Figure 3 of the drawing. This valve unit is manually controlled and is mounted within the body portion 17 of the casing intermediate the chambers 20 and 21 and is adapted to project into the passage 22 for regulating the quantity of fluid flowing from the chamber 20 to the chamber 21. Thus it will be observed that the valve unit 46 functions to accurately regulate the quantity of fluid discharged into the distributing line.

Thus from the foregoing it will be observed that I have provided a multiple valve arrangement for controlling the passage of fluid from the supply to the distributing conduit wherein all of the valves including a regulating valve for accurately governing the quantity of fluid passed are arranged within a single casing. It will further be apparent that I have provided a single actuating unit within the casing for automatically operating all of the control valves as a unit permitting the entire construction to be formed of comparatively few parts and economically manufactured.

What I claim as my invention is:

1. A valve assembly comprising a casing having laterally spaced chambers therein communicating with each other and respectively with a fluid supply and distributing line, valve means arranged within each of said chambers for controlling the flow of fluid from the supply to the

distributing line, means arranged within the casing intermediate the chambers aforesaid and manually operable to regulate the quantity of fluid flowing from the supply line to the distributing line and means located entirely within said casing for actuating the valve means aforesaid.

2. A valve assembly comprising a casing having a body portion formed with laterally spaced chambers therein respectively communicating with a fluid supply line and a fluid distributing line, said body portion further having a passage therein establishing communication between said chambers, a valve unit arranged within each of said chambers and cooperating to control the flow of fluid from the supply to the distributing line, and means arranged within said body portion and extending into said passage intermediate the chambers aforesaid for independently regulating the quantity of fluid flowing from the fluid supply line to the fluid distributing line and common means for actuating the valve units in said chambers.

3. A valve assembly comprising a casing having a body portion formed in one piece and provided with laterally spaced chambers therein respectively communicating with a fluid supply line and a fluid distributing line, said body portion further having a passage therein establishing communication between said chambers, valve units arranged within each of said chambers and cooperating to control the flow of fluid from the supply to the distributing line, another valve unit arranged within the body portion intermediate the chambers aforesaid and associated with said passage for regulating the quantity of fluid flowing from the supply to the distributing line and a single operating device operatively associated with said first-mentioned valve units for automatically actuating the latter.

4. In a valve mechanism, means providing a pair of valve seats; a pair of laterally spaced, mechanically independent valve members mounted for movement toward and away from said valve seats; a pair of valve actuating elements operably connected to said valve members and mounted for synchronous movement therewith; and means for causing said elements to undergo valve-member-actuating movements, comprising electromagnetic means having a common, series, magnetic circuit linking said actuating elements, for causing them to operate substantially simultaneously.

5. The device described in claim 4, wherein magnetic flux is adapted to pass through one of said actuating elements in a direction opposite to the direction of flux flow in said other actuating element.

6. The device described in claim 4, wherein said electromagnetic means comprises at least one coil surrounding one of said valve actuating elements.

7. In a valve mechanism, means providing a pair of valve seats; a pair of laterally spaced valve members mounted for movement independently toward and away from said valve seats; a pair of elongated, magnetic, valve actuating elements operably connected to said valve members and mounted for synchronous movement therewith; means for causing said elements to undergo valve-member-actuating movements, comprising a magnetizable member which is normally spaced from the ends of said actuating elements when said valve members are disposed in contact with their seats, said elements being adapted to ap-

proach said magnetizable member when they undergo valve opening movements; and means for causing magnetic flux to take a path which is common to both of said actuating elements and said magnetizable member, whereby valve-opening-movements of either one of said actuating elements reduces the reluctance of said flux path.

8. In a valve mechanism, a casing; a pair of laterally spaced chambers provided in said casing and having substantially horizontally disposed valve seats associated therewith; means provided in said casing for placing said chambers in fluid communication; means for placing one of said chambers in communication with an inlet port provided in said casing; means for placing the other of said chambers in communication with an outlet port provided in said casing; a pair of mechanically independent valve members disposed in said casing and mounted for substantially vertical movement toward and away from said valve seats for cutting off fluid communication between said inlet and outlet ports; a pair of valve actuators operably connected to said valve members and operable to lift the latter off of their seats; and means for substantially simultaneously lifting said actuators, said last-named means comprising at least one magnetic coil which completely surrounds one of said actuators for a substantial portion of its length.

9. In a valve mechanism, a casing having a fluid passage traversing the interior thereof, said passage terminating in inlet and outlet ports; said passage having a pair of spaced vertically extending portions located between said inlet and outlet ports; said spaced portions defining a pair of substantially horizontally disposed valve seats; a pair of mechanically independent valve members mounted for substantially vertical movement in said casing and adapted to engage said valve seats and cut off fluid communication between said inlet and outlet ports; a pair of valve actuators operably connected to said valve members; means located exteriorly of said casing, for effecting substantially simultaneous operation of said valve actuators; and a metering valve mechanism operably disposed in said passage intermediate said inlet and outlet ports and adapted to regulate the flow of fluid through said passage when said valve members are disposed out of contact with their seats.

10. In a valve mechanism, a casing having a fluid passage therein traversing the interior thereof, said passage terminating in inlet and outlet ports and having a pair of laterally spaced, vertically extending portions disposed therein between said inlet and outlet ports; said spaced portions defining a pair of substantially horizontally disposed valve seats; a pair of mechanically independent valve members mounted for vertical movement in said casing and adapted to engage said valve seats and cut off communication between said inlet and outlet ports; a pair of valve actuators operably connected to said valve members; electromagnetic means for effecting substantially simultaneous operation of said valve actuators, said passage also having a horizontal portion terminating in a substantially, vertically disposed valve seat; and a metering valve member mounted in said casing for substantially horizontal movement toward and away from said last mentioned valve seat.

11. The device described in claim 10, wherein the horizontal portion of said passage and said metering valve member are disposed intermedi-

ate the vertical portions of said passage, and said metering valve member is operable to regulate the flow of fluid between the latter.

12. In a valve mechanism, in sub-combination, a valve casing, a pair of spaced, substantially parallel magnetic valve actuating members mounted for valve actuating movements in said casing, said actuating members extending outwardly of said casing and operably associated with means for causing magnetic flux to flow therethrough; and flux conducting means

having a magnetic permeability substantially greater than that of said casing, for conducting magnetic flux from said magnetic-flux-producing means to one of said actuating members and thence to said other actuating member, said last-named means comprising at least one highly magnetically permeable member extending from a region closely adjacent one of said actuating members to a region closely adjacent the other of said actuating members. 80 85

MILTON A. POWERS.

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