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CONTROLLING MEANS AND SYSTEM

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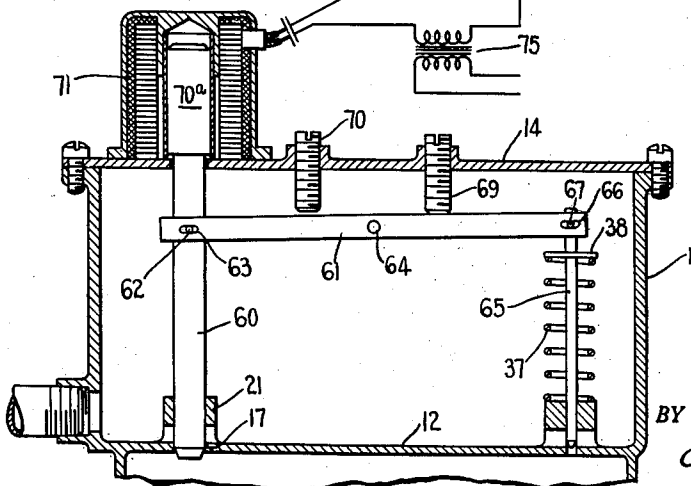
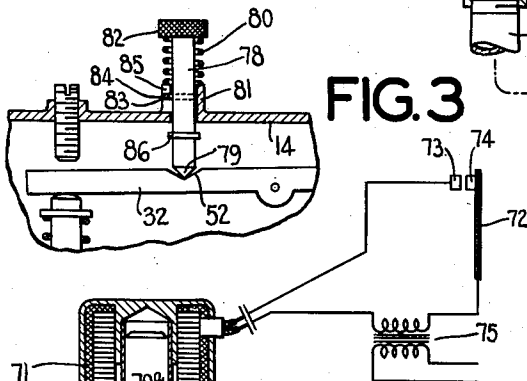
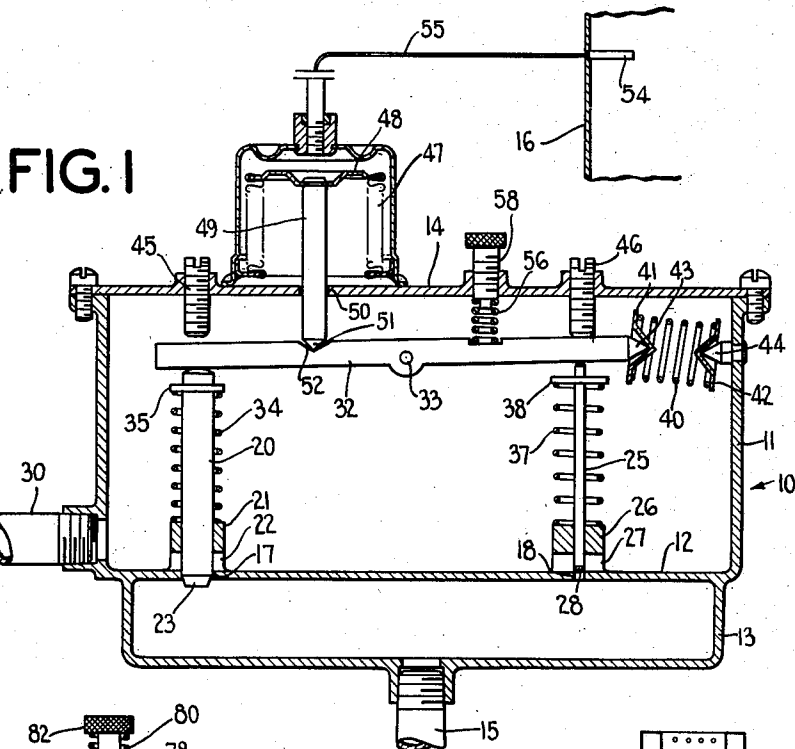


FIG. 2

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CONTROLLING MEANS AND SYSTEM

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The invention relates to valves and it has particular relation to a valve arrangement for controlling the flow of fuel to a fuel burning device.

With reference to a particular application of the present invention, oil burner mechanisms are in use wherein the oil burner operates normally in two stages, namely: a high fire stage and a low fire stage. This means that when more heat is required, the valve controlling means allows more oil to flow to the burner and after the required temperature is reached, a smaller quantity of oil is supplied to the burner in order to continue the fire until the high fire is again required. While systems of this character have been and are operated successfully, some difficulty is encountered in maintaining or continuing the proper flow characteristics of the valve device due to the collection of wax and other matter present in the oil and this is especially true in connection with metering types of valves having small openings. While the collection of wax or the like impedes the flow of oil through the valve device, it is apt to become particularly undesirable in the low fire stage since in this case the opening through which the oil must flow is of diminished size compared with the opening at the high fire stage. The reduction in oil flow in any event changes the quantity of oil being supplied and this lowers and may even extinguish the fire.

One object of the present invention is to provide an improved type of valve arrangement for controlling the flow of fluid which is more efficient in operation and wherein the valve opening may be maintained in a substantially clear condition so as to avoid the disadvantages of a reduced flow.

Another object of the invention is to provide an improved type of valve arrangement controlling the flow of fuel to a fuel burner adapted for different stages of operation, wherein the rate of flow of fuel to the burner in either stage is maintained generally uniform.

Another object of the invention is to provide a valve arrangement for controlling the flow of fluid which includes a plurality of valves which so function that as one valve ceases to operate it is cleaned preparatory to its next stage of operation.

Another object of the invention is to provide an improved valve arrangement for controlling the flow of fluid including a plurality of valves wherein one valve is closed and simultaneously

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cleaned, while another valve is opened for operating purposes.

And in general, it is an object of the invention to provide a valve arrangement for controlling the flow of fuel oil to a burner having high and low fire stages wherein different valves are used for controlling the two stages and wherein the valves are maintained in a substantially clean condition so as to insure continued and efficient operation of the burner over a long period of time without impedance of fuel oil flow through the valves.

Other objects of the invention will become apparent from the following description, from the drawing to which it relates and from the claims hereinafter set forth.

For a better understanding of the invention reference may be had to the accompanying drawing wherein:

Figure 1 is a cross-sectional view, partly diagrammatic, of a valve arrangement and heat controlling system constructed in accordance with one form of the invention;

Figure 2 is a view similar to Figure 1 illustrating another form of the invention having an electrical control;

Figure 3 is a fragmentary view similar to Figure 1 illustrating a manually operating means for moving the valves;

Figure 4 is a fragmentary view on the order of Figure 1 illustrating a valve arrangement employing a bi-metallic means for operating the valves; and

Figure 5 is a similar view illustrating an arrangement wherein the valves are controlled by separate solenoids.

Referring to Figure 1, a casing is provided as indicated at 10 and comprises principally a side wall 11, a bottom wall 12, a lower chamber 13, and a cover 14. A conduit 15 connected to the chamber 13 serves to conduct fuel oil to a burner which may be located in a furnace, a fragment of which is shown at 16. While the invention has additional applications, it is particularly useful in connection with a heating plant having a pot type burner wherein the oil flows by gravity into the pot with the amount of combustion depending upon the amount of oil supplied. Usually it is desired to operate the burner so it will have a high fire stage wherein a larger quantity of oil is supplied and a low fire stage wherein a small quantity of oil is supplied to keep the fire burning between the times when a higher fire is present.

In order to supply oil at the two different rates, the lower wall 12 has a larger opening 17 through which the larger quantity of oil flows and a

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smaller opening 18 through which the smaller quantity of oil flows. Each of these openings, as shown, is of cylindrical character. The flow of oil through the opening 17 is governed by a metering pin 20 slidably mounted in a boss 21 integral with the bottom wall 12 and this boss has a laterally extending opening 22 so that oil may flow from within the casing through the boss and through the opening 17. The lower end of the pin is conical as indicated at 23 and movement of the pin downwardly from its upper and open position causes metering of the flow of oil until the cylindrical part of the pin enters the opening 17 when the flow ceases. Particularly, it should be noted that continued movement of the metering pin through the opening 17 acts to clear the opening and pin of any wax or other matter which may collect and tend to interfere with the flow of oil.

The flow of oil through the opening 18 is similarly controlled by a smaller metering pin 25 slidable in a boss 26 integral with the bottom wall 12 and the latter has a lateral opening 27 through which the oil may flow into the opening 18. The lower end of the pin 25 is conical as indicated at 28 and metering of the oil occurs until the cylindrical part of the pin enters the opening 18. In this case, also continued movement of the pin 25 through the opening 18 acts to clear the opening and pin of wax or other matter which may tend to collect.

Oil is supplied to the casing 10 by means of a conduit 30 and this conduit may be connected to a float chamber having a float therein for maintaining a desired head of oil. It follows from this that oil in casing 10 may normally have the same level as the oil in the float chamber and therefore that oil constantly will flow through either the opening 17 or the opening 18.

For operating the two metering pins 20 and 25 simultaneously, a lever 32 is provided within the casing and is pivoted substantially at its center on a stationary cross pin 33. Opposite ends of this lever engage the upper ends of the pins 20 and 25. The pin 20 is urged upwardly against the lever by means of a coil spring 34 encircling the pin and abutting the boss 21 at its lower end and abutting a collar 35 on the pin at its upper end. A similar coil spring 37 around the pin 25 abuts the boss 26 at its lower end and a collar 38 at its upper end. Consequently, the springs urge the metering pins towards valve open positions but as the lever is moved about its pivot 33 one or the other of the pins will be moved into closing and valve cleaning position depending upon the direction of pivotal movement. Normally, the lever is held in one position or the other by means of a coil spring 40 disposed between spring seats 41 and 42 which respectively have point engagement with a pointed end 43 on the lever 32 and a pointed pin 44 riveted to the side wall 11 of the casing. The lever and spring device are so arranged that the spring acts to quickly throw the lever from one position to another at opposite sides of a dead center position and hence the metering pin which is moving to valve closing and cleaning position is quickly moved into closing and cleaning position which is desirable in order to facilitate clearing of the valve.

Movement of the lever 32 in one direction is adjustably controlled by a screw 45 threaded downwardly through the cover 14 and movement of the lever in the other direction is similarly and adjustably controlled by a set screw 46

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adapted to engage the other end of the lever. Hence, throwing of the lever from one position to the other is limited in an adjustable manner.

For moving the lever in accordance with temperature changes in the furnace 16, a bellows 47 is provided on the cover 14 and this bellows includes an inner movable wall 48 having a pin 49 extending downwardly through an opening 50 in the cover. The lower end of the pin 49 is conical as indicated at 51 and engages in a conical seat 52 in the lever. Movement of the wall 48 through the action of the bellows is governed by a bulb 54 which may be located at a desired point on the furnace and this bulb in turn is connected by a conduit 55 to the bellows. It should be understood that the bulb and bellows casing will contain a fluid which expands and contracts according to temperature variations; and this in turn will cause the wall 48 to move upwardly and downwardly. Movement of the wall 48 downwardly will move the lever 32 counter-clockwise about its pivot 33 and when the wall moves upwardly the lever is permitted to move clockwise. Movement of the lever clockwise is initiated by a coil spring 56 engaging the upper side of the lever between the pivot 33 and the metering pin 25 and such spring may be adjustably loaded by a screw 58 threaded through the cover.

The arrangement and design of springs, weights of parts and bellows action are such that once the bellows begins to function to shift the lever and to overcome the opposing forces, the latter decrease faster than the forces tending to move the lever and as a result, movement of the lever continues on and to the opposite limit once its movement is initiated. Conversely, when the temperature decreases sufficiently, the spring forces act to initiate a reverse movement of the lever, after the force exerted by the bellows decreases sufficiently, and then the lever moves through dead center position to its other limit. When the lever moves in a direction to move either valve, the metering pin is quickly moved through the valve opening and this acts to dislodge and remove any foreign matter that may tend to collect in the valve opening. Accordingly, at the end of any stage of furnace operation, that is, at the end of the high fire stage and at the end of the low fire stage, one valve or the other is cleaned.

The construction shown by Figure 2, provides a metering pin 60 of the same type as the pin 20, but in this case the pin is pivotally connected to a lever 61 by means of a pin 62 on the metering pin which projects through an elongated opening 63 in the lever. This lever is pivoted intermediate its ends on a pin 64 extending through the casing wall and the opposite end of the lever is pivotally connected to a smaller metering pin 65 by means of an elongated opening 66 in the lever and a pin 67. This metering pin is otherwise the same as the pin 25 and includes the spring 37 and collar 38.

Movement of the lever 61 in one direction about the pivot 64 is limited adjustably by a screw 69 extending downwardly through the cover 14 and movement in the other direction is adjustably limited by a second screw 70 at the opposite side of the pivot. In this design, movement of the lever is effected by means of an armature 70a on the upper end of the pin 60 and this armature forms part of a solenoid 71 mounted on the cover. The solenoid is adapted to be energized by a bi-metallic element 72 which acts to close and break

a circuit through contacts 73 and 74 and the circuit may include a transformer 75 as will be readily understood. The bi-metallic element may be located on or in the furnace or in a space to be heated and upon reduction in temperature, the metering pin 60 will be opened the amount allowed through adjustment of screw 70 and upon breaking of the electric circuit when the temperature rises sufficiently, the spring 37 acts to move the lever in such manner as to close the large valve and to open the low fire valve. In this case, closing of the valve at the end of each stage of operation serves to clean the valve in the manner previously mentioned.

The construction shown in Figure 3 is like that shown by Figure 1, with the exception that instead of using a bellows, a manually operated plunger or pin 78 is provided which has a conical lower end 79 engaging a seat 52 in the lever 32. A spring 80 pressing at its lower end against a boss 81 on the cover and at its upper end against a head 82 on the pin acts normally to urge the pin upwardly but this movement is limited by projection 83 engaging under a shoulder 84 on the boss. The shoulder 84 has a slot 85 at one point so that by turning the pin 78 a certain amount the projection 83 may be brought into alignment with the slot 85 and when this occurs, the pin 78 may be moved upwardly an additional distance, although entire removal is prevented by a collar 86 on the pin at the underside of the cover. The lever 32 may be held downwardly to maintain a low fire condition but when desired, the pin 78 may be turned sufficiently to permit its upward movement and then the springs will cause clockwise turning of the lever so as to open the high fire metering pin and to close the low fire metering pin. Cleaning of the valves occurs in substantially the same way as previously mentioned.

In the design shown by Figure 4, the valves and metering pins are on the same order as shown by Figure 1, and are identified by the same numerals 20 and 25. The lever in this case is indicated at 88 and is pivoted on a pin 89 projecting through the casing wall and in order to adjustably limit movement of the lever, set screws identified by the same numerals 45 and 46 are provided on the cover. The springs for urging the lever 88 upwardly, are different in this structure in that a stronger spring 90 is provided around the metering pin 20 as compared to a weaker spring 91 around the pin 25. For moving the lever 88 so as to close the metering pin 20, a bi-metallic element 92 is fastened to the casing wall as indicated at 93 and this element has direct engagement with the upper side of the lever 88 at the end thereof adjacent the pin 20. A heating coil 94 encircling the bi-metallic element is included in a circuit having contacts 95 and 96 adapted to be closed and separated by a temperature control in the form of a bi-metallic element 97. When the contacts are closed the bi-metallic element 92 acts to move the lever against the stronger spring 90 and conversely, when the bi-metallic element moves upon opening of the circuit the spring 90 moves the lever in the opposite direction. In this way, the valves are opened and closed for high and low fire at the ends of the respective heating stages.

In the arrangement shown by Figure 5, metering pins indicated at 99 and 100 are mounted independently and each at its upper end projects through the cover 14 and has an armature thereon. These armatures indicated at 101 and 102

form parts of solenoids 103 and 104 mounted on the cover. Springs 105 and 106 abutting the underside of the cover and against collars 107 and 108 on the metering pins, urge such pins to valve closing positions and downward movement of the pins is limited by stop pins 109 and 110 respectively on the casing side wall. In order to adjustably limit upward movement of the pin 99 through solenoid operation a stop lever 111 is pivotally mounted on a pin 112 projecting inwardly from the casing side wall and this lever contacts the upper side of the collar 107. The lever 111, at the same side of the pivot is engageable with the lower end of an adjustment screw 113 extending downwardly through the cover. A similar adjusting stop is provided for the metering pin 100.

The solenoid 103 is located in a circuit having a transformer 116 and a pair of contacts 117 and 118 with the contact 118 mounted on one end and on one side of a bi-metallic element 119, while the solenoid 104 is located in a circuit including the transformer 116 and a pair of contacts 121 and 122 with the contact 122 also mounted on the bi-metallic element 119, but at the side opposite the contact 118. The bi-metallic element has its end opposite the contacts 118 and 122 suitably mounted for flexing movement so that the contacts may swing between contacts 117 and 121 and thus close the circuit through one solenoid or the other. In order to obtain a rapid movement of the bi-metallic element, from one contact to the other, permanent magnets 123 and 124, may be provided at opposite sides thereof and these are adapted to co-operate with armature elements 125 and 126 on the element. Such magnets are so related that as soon as the bi-metallic element, through a change in temperature, leaves one contact, the element rapidly continues its movement to the other contact. In this way, one solenoid is energized substantially simultaneously to the de-energizing of the other and hence one valve opens when the other closes and vice versa. In each instance, spring action moves the metering pin through the valve opening so as to clean it and the pin. It should be understood that the bi-metallic element is to be located in a space to be heated as has been stated in connection with the other temperature controls.

It will be clear from the foregoing description taken in connection with the drawings, that the valves of Figs. 2 and 5, as well as the valve of Fig. 1, are of the quick-acting type in which spring forces aid the solenoids to punch the valve members through their valve ports.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. in a seatless metering valve, a wall having a cylindrical outlet passageway therethrough, a valve member cooperable with said passageway and having passageway-closing and stem portions of a cross-section to pass completely through said passageway, said stem portion terminating at one end in said passageway-closing portion and at its other end in an operating portion, said passageway-closing portion having an unbroken continuous cylindrical surface of a diameter to fit slidably and tightly in said passageway to close off flow therethrough, said passageway-closing portion terminating at its end opposite

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said stem portion in a conical flow metering portion cooperable with the upper edge of the cylindrical surface of said outlet passageway to meter flow through said passageway, and means to stop opening movement of said valve member in a position in which said metering portion is in the plane of the upper edge of the cylindrical surface of said outlet passageway.

2. A flow control device, comprising a casing having a bottom wall with spaced cylindrical outlet passageways therethrough each having an inlet edge, valve members cooperable one with each of said passageways and each having passageway-closing and stem portions of diameters to pass completely through their respective passageways, each of said stem portions terminating at one of its ends in its passageway-closing portion and at its other end in an operating portion, each of said passageway-closing portions having an unbroken continuous cylindrical surface of a diameter to fit slidably and tightly in its passageway to close off flow therethrough, each of said passageway-closing portions terminating, at its end opposite its stem portion, in a conical flow metering portion cooperable with its passageway inlet edge to meter flow through its passageway, means to stop opening movement of each of said valve members in a position in which its metering portion is in the plane of its passageway inlet edge, and means cooperable with said operating portions to close one and to open the other of said valve members.

3. A flow control device, comprising a casing having a bottom wall with spaced cylindrical outlet passageways therethrough each having an inlet edge, valve members cooperable one with each of said passageways and each having passageway-closing and stem portions of diameters to pass completely through their respective passageways, each of said stem portions terminating at one of its ends in its passageway-closing portion and at its other end in an operating portion, each of said passageway-closing portions having an unbroken continuous cylindrical surface of a diameter to fit slidably and tightly in its passageway to close off flow therethrough, each of said passageway-closing portions terminating, at its end opposite its stem portion, in a conical flow metering portion cooperable with its passageway inlet edge to meter flow through its passageway, a lever having its end portions cooperable respectively with said operating portions and fulcrumed between its end portions so as alternately to close one and to open the other of said valve members, and adjustment screws cooperable with said lever to stop opening movement of each of said valve members in a position in which its metering portion is in the plane of its passageway inlet edge.

4. A flow controlling device comprising a casing having a bottom wall, at least two guide members carried by said wall, aligned substantially vertical passageways extending through each of said members and said wall, transverse passageways extending through each of said members and intersecting said aligned passageways, a valve member slidably positioned in the aligned passageways of each guide member and having a cylindrical plug closure portion cooperable with the wall passageway to close off flow therethrough, each plug portion having a range of

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movement in full passageway closing position and terminating in a conical flow metering tip portion cooperable with its passageway to meter flow therethrough upon withdrawal of its plug portion, each conical tip portion being operable to meter flow when positioned in the plane of the intersection of said aligned passageways and said transverse passageway of the respective guide members, lever operating means cooperable with said valve members so that upon movement it is operable to position one of said conical tip portions in the plane of the intersecting passageways of its guide member and to move the plug portion of the other of said valve members into its passageway, and means to adjust each of said valve members within the full closed range of movement of the other of said valve members so that the extent of opening of each valve member may be varied while the other valve member is maintained closed.

5. A flow controlling device comprising a casing having at least two cylindrical outlet passageways, valve members cooperable one with each of said passageways and each having a cylindrical plug closure portion slidably fitting its passageway, each plug portion having a range of movement in full passageway closing position and terminating in a conical flow metering portion cooperable with its passageway to meter flow therethrough upon withdrawal of its plug portion, lever operating means cooperable with said valve members and fulcrumed intermediate said valve members so that upon movement it is operable alternately to position one of said conical portions in metering relation to its passageway to move the plug portion of the other of said valve members into its passageway, and means to adjust each of said valve members within the full closed range of movement of the other of said valve members so that the extent of opening of each valve member may be varied while the other valve member is maintained closed.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
151,580	Eversol	June 2, 1874
368,674	Kent	Aug. 23, 1887
964,486	Bowser	July 19, 1910
1,177,718	Merten	Apr. 4, 1916
1,507,139	Pike	Sept. 2, 1924
1,607,363	Prescott	Nov. 16, 1926
1,686,965	Engels	Oct. 9, 1928
1,786,234	Forman	Dec. 23, 1930
1,999,964	Gustafson	Apr. 30, 1935
2,008,151	Nest et al.	July 16, 1935
2,134,778	Clarke	Nov. 1, 1938
2,218,446	Wright	Oct. 15, 1940
2,226,705	Card	Dec. 31, 1940
2,232,038	Stone	Feb. 18, 1941
2,314,860	Lenin	Mar. 23, 1943
2,333,913	Beam	Nov. 9, 1943

FOREIGN PATENTS

Number	Country	Date
279,951	Italy	Nov. 26, 1930