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ELECTRICAL FUEL FEED CONTROL

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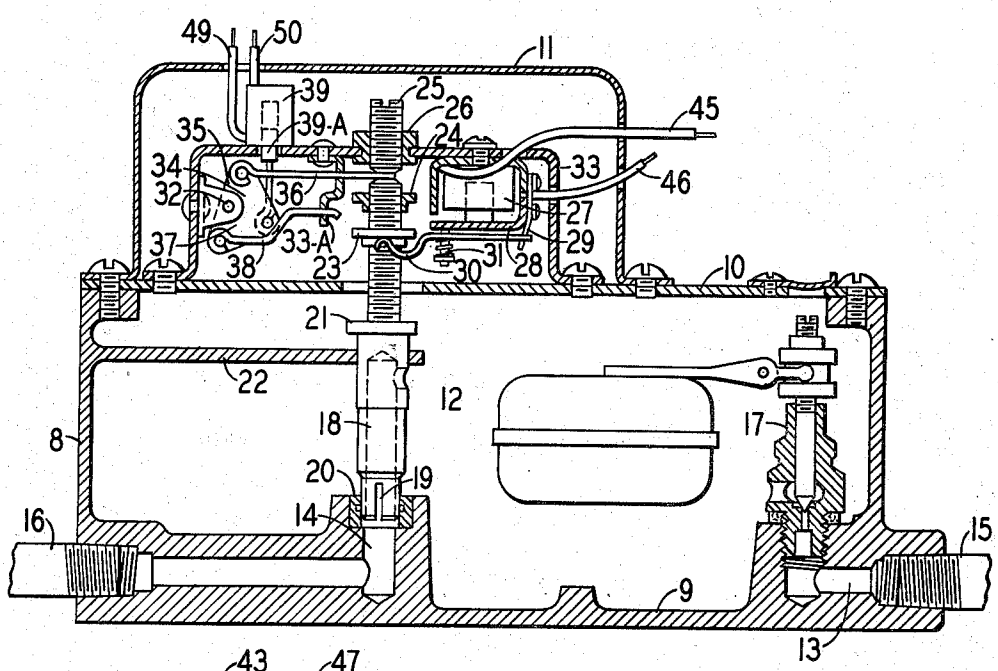


FIG. 1.

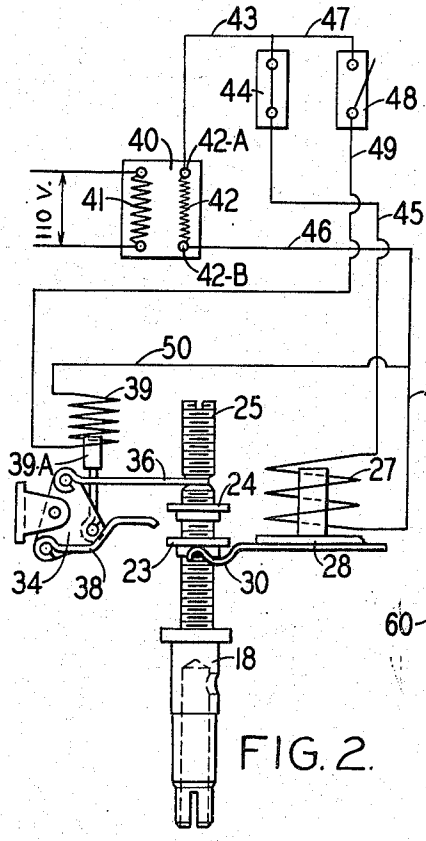


FIG. 2.

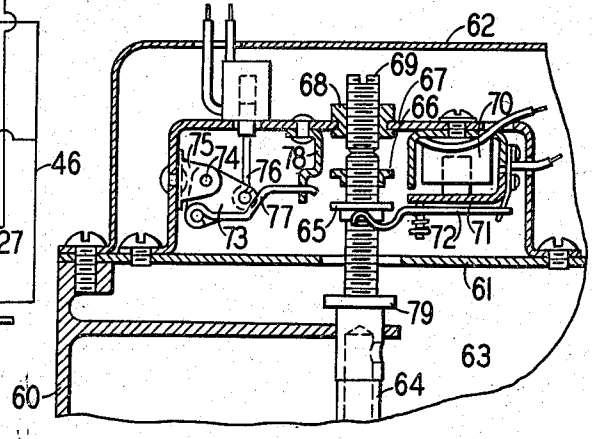


FIG. 3.

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ELECTRICAL FUEL FEED CONTROL

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2 Claims. (Cl. 137—728)

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This invention relates to fuel feed control devices of a character suitable for use with oil burners of the vaporizing pot type.

The present application is a continuation in part of my copending application Serial No. 414,409, filed October 10, 1941 now abandoned, which application is a division of my application Serial No. 223,181, filed August 5, 1938 now abandoned.

The principal object of this invention is the provision of a fuel feed control device including novel means for regulating the flow of fuel therethrough whereby to provide a variable fuel feed. This object is attained, according to the preferred embodiment of the invention, by providing: a fuel supply chamber having an outlet opening, a metering valve associated with the outlet opening and shiftable to regulate the valve, a movable stop for limiting the movement of the valve under the influence of said motor, and a second motor for moving the stop between operative and inoperative positions.

The foregoing and other objects will become more fully apparent from an examination of the following specification when read in connection with the accompanying drawings, wherein:

Figure 1 is a sectional view of the fuel feed control mechanism;

Figure 2 is a schematic illustration of the electrical circuit employed for operating the feed control mechanism; and

Figure 3 is a fragmentary sectional view of a modified form of the invention.

The structure shown in Figure 1 includes a housing 8 having a bottom wall 9 and a top wall 10 upon which is mounted a cover 11. The housing is formed to provide a fuel supply chamber 12 having an inlet opening 13 and an outlet opening 14. Fuel is supplied to the chamber 12 through a supply pipe 15 connected to any suitable source of supply, not shown. Fuel is discharged from the supply chamber 12 by gravity through a discharge pipe 16. A conventional float and needle valve assembly 17 serves in a well known manner to maintain a substantially constant level of fuel within the chamber 12.

The outflow of fuel through the outlet opening 14 is regulated by a metering valve 18. Valve 18 has its lower end inserted in the outlet opening 14 and is so mounted as to be moved vertically. The lower end of the metering valve 18 is slotted at 19 to provide for the passage of fuel. That is to say, the opening for the passage of fuel is defined by the sides and top edges of the slot 19 and the top surface 20 of the annulus

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surrounding outlet opening 14. The size of the opening thus formed may be varied by moving the metering valve 18 up or down.

A collar 21 is threaded on to the metering valve 18 whereby the collar may be adjusted axially of the valve. Normally it is so arranged that when the collar 21 rests against the upper surface of guide bracket 22, the fuel opening through slot 19 is substantially closed. Another collar 23 is also threaded on the valve 18 somewhat above the collar 21. Still another collar 24 is threaded on valve 18 adjacent its upper end.

An adjustable set screw 25 is threaded into a bushing 26 on a supporting bracket 33 directly above the upper end of the metering valve 18, providing a stop for the upward movement of the metering valve.

An electro-magnet 27 of conventional closed circuit construction is mounted on bracket 33. A metallic arm 28, comprising the armature, is secured by means of a flexible strip 29 to the electro-magnet whereby the arm may move up or down in response to the energization of the magnet. An operating lever 30 is secured to the under surface of arm 28 by means including a spring 31. The free end of lever 30 engages the under surface of the collar 23 whereby when the electromagnet is energized the metering valve 18 is raised against its upper abutment, thereby opening the slot 19 therein. When the current is cut off from the magnet 27 the arm 28, lever 30 and metering valve 18 drop by gravity, closing the slot 19.

Pivotally mounted at 32 on a support 33 is a triangular shaped bell crank 34. The upper arm 35 of the bell crank is pivotally connected to a thin metallic strip or stop 36 which is so located that at certain times it is placed between the upper end of metering valve 18 and the set screw 25, as shown in Figure 1, and at other times it is moved from between these two parts. The lower arm 37 of the bell crank 34 is pivotally connected to a stop 38 which is movable from a position shown in Figure 1 to a position where it is below the shoulder of the collar 24. The bell crank 34 is rocked about its pivot 32 by means of a conventional open circuit electro-magnet 39, having an armature 39a connected to bell crank 34. Stops 36 and 38 are supported against vertical movement by a depending guide bracket 33a.

In Figure 1 the electro-magnet 39 and associated parts, including the stops 36 and 38, are shown in a position which they occupy when the magnet is de-energized. When the magnet is

energized the armature 39*a* is raised, rocking bell crank 34 about its pivot 32, withdrawing stop 36 from between the upper end of valve 18 and the lower end of set screw 25; and at the same time moving stop 38 to the right to a position where it will engage the under surface of collar 24 to limit the downward movement of valve 18.

When magnet 39 is de-energized, armature 39*a* drops by gravity thus rocking the bell crank 34 in a clockwise direction to withdraw stop 38 from engagement with collar 24 and to position stop 36 between the upper end of valve 18 and the lower end of set screw 25, as shown in Figure 1.

Thus, when the electro-magnet 39 is energized the stop 38 serves to limit the downward or closing movement of the valve 18; and when electro-magnet 39 is de-energized stop 36 serves to limit the upward or opening movement of valve 18.

It will be understood, of course, that electromagnet 27 is capable of sufficient movement so as to move valve 18 between its extreme closed position and its extreme open position. When stop 36 is interposed between the upper end of valve 18 and the set screw 25, the spring 31 permits sufficient movement of the operating lever 30 relative to the armature element 28 to compensate for the difference in travel between the condition which then exists and the condition which exists when stop 36 is moved to its inoperative position.

The electric circuit utilized for energizing electro-magnets 27 and 39 and for controlling the operation of the same is illustrated in Figure 2. This circuit includes a transformer 40 having its primary 41 connected to a suitable source of electric power, not shown. Terminal 42*a* of the secondary 42 of the transformer is connected by conductor 43 to one terminal of a thermostat 44. The other terminal of the thermostat 44 is connected by conductor 45 to one terminal of the electro-magnet 27. The other terminal of the electro-magnet is connected by conductor 46 to terminal 42*b* of the secondary 42 of the transformer 40.

Terminal 42*a* of the secondary 42 of the transformer is also connected by conductors 43 and 47 to one terminal of the second thermostat 48. The other terminal of the thermostat 48 is connected by conductor 49 to one terminal of the electromagnet 39. The other terminal of the electromagnet 39 is connected by a conductor 50 and the conductor 46 to terminal 42*b* of secondary 42 of the transformer 40.

From the foregoing it will be apparent that electromagnet 27 constitutes an electric motor for moving the valve 18 between a predetermined closed position and a predetermined opened position under the control of thermostat 44; and that electro-magnet 39 constitutes a motor for selectively predetermining the opened and closed positions, under the control of thermostat 48. It will also be apparent that other forms of switches may be employed in place of either or both of the thermostats 44 and 48, if desired.

Collar 21 may be adjusted on valve 18 so that slot 19 may be either completely closed or only partially closed when the valve is in its lowermost position. For most purposes, as for example, when this control is used with a burner of the vaporizing pot type, collar 21 will be so adjusted that slot 19 will never be completely closed and thus provide for a minute flow of oil at all times sufficient to maintain a pilot fire. Under such

circumstances it will be apparent that the present control is capable of feeding oil in variable quantities which may be defined in terms of the fire produced thereby as follows:

(*a*) Pilot fire—when thermostats 48 and 44 are both open;

(*b*) Low intermediate fire—when thermostat 48 is closed and thermostat 44 is open;

(*c*) High intermediate fire—when thermostat 48 is open and thermostat 44 is closed; and

(*d*) Maximum fire—when thermostats 44 and 48 are both closed.

The structure shown in Figure 3 is generally the same as that shown in Figure 1. Figure 3 differs, however, in one important respect. That difference is that the structure shown in Figure 3 omits the stop 38 and its attendant function, as will more fully appear hereinafter.

The form of the invention shown in Figure 3 includes a housing 60 exactly the same as the housing 8 previously described. The housing has a top wall 61 on which a cover 62 is mounted. The housing 60 is provided with a fuel chamber 63 from which the flow of fuel is controlled by means of a vertically movable metering valve 64.

The upper end of the valve 64 is threaded and receives a pair of collars 65 and 66.

Mounted on the cover 61 over the valve 64 is a bracket 67. A threaded bushing 68 is mounted on the bracket 67. A stop pin 69, which operates as does the stop pin 25 previously described, is threaded through the bushing 68.

The bracket 67 also carries an electro-magnet 70 which is provided with a metallic arm 71 comprising the armature of the electro-magnet. An operating lever 72 is connected to the arm 71 and underlies collar 65 whereby when the electromagnet is energized the metering valve 64 is raised against the stop pin 69 to permit fuel to flow from the fuel chamber 63. When the electro-magnet is de-energized the arm 71 and lever 72 permit the valve to drop by gravity.

A bell crank 73 is pivotally mounted at 74 on a bracket 75 adjacent to bracket 67. One arm of the bell crank is connected to an electro-magnet 76 so that the bell crank may be rocked about its pivot. Another arm of the bell crank 73 is pivotally connected to a stop 77 which is movable from the position shown in Figure 3 to a position where it is below the collar 66. The stop 77 is guided in the opening in a guide 78 attached to bracket 67.

When the parts of the device are in the position shown in Figure 3, the electro-magnet 70 is energized to raise the valve 64 against the stop pin 69. In this position the valve is wide open to permit fuel to flow at its maximum rate. When the electro-magnet is deenergized the valve drops by gravity to its pilot position which is adjusted by means of a collar 79 threaded on the valve 64.

If now the electro-magnet 76 is energized it will rock the bell crank 73 about its pivot and force the stop 77 into a position underneath the collar 66. When that occurs the valve 64 cannot close to pilot position. The movement of the valve due to the energization and deenergization of electromagnet 70 will be between wide open, maximum fire, position against stop pin 69, and a low intermediate fire position determined by the stop 77 and collar 66.

It will be evident, of course, that the device shown in Figure 3 will be employed with a circuit the same as that shown in Figure 2. Then, when the device is operating, fuel will be fed to the

burner with which the control is associated in variable quantities which may be defined in terms of the fire produced thereby, as follows:

(a) Pilot fire—when the thermostats 48 and 44 are both open;

(b) Maximum fire when the thermostat 44 is closed; and

(c) Low intermediate fire—when thermostat 48 is closed and thermostat 44 is open.

The scope of the invention is indicated in the appended claims.

I claim:

1. A fuel feed control comprising: a liquid fuel supply chamber provided with an outlet opening, an adjustable metering valve associated with said outlet opening; means for moving said valve to regulate the flow of fuel through said outlet opening including an electric motor; and means directly acting on the valve structure for limiting the range of movement of said valve under the influence of said motor including a second electric motor; said means being adapted to limit the movement of the valve in one direction when said second motor is energized and to limit the movement of the valve in the other direction when the second motor is de-energized.

2. A fuel feed control comprising: a liquid fuel supply chamber provided with an outlet opening; an adjustable metering valve associated with said

outlet opening; means for moving said valve to regulate the flow of fuel through said outlet opening including an electric motor; and means for limiting the range of movement of said valve under the influence of said motor including a pair of stops and a second electric motor for moving said stops, one of said stops being adapted to limit the movement of the valve in one direction and the other of said stops being adapted to limit the movement of the valve in the other direction.

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