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CONTROL DEVICE

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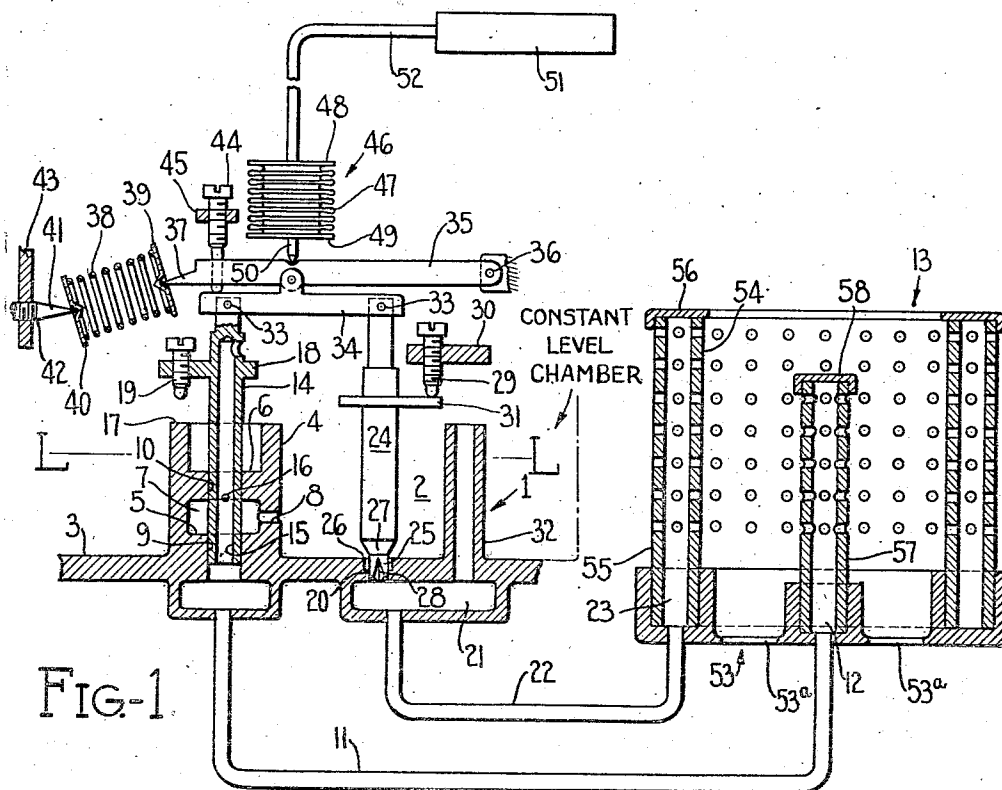


FIG-1

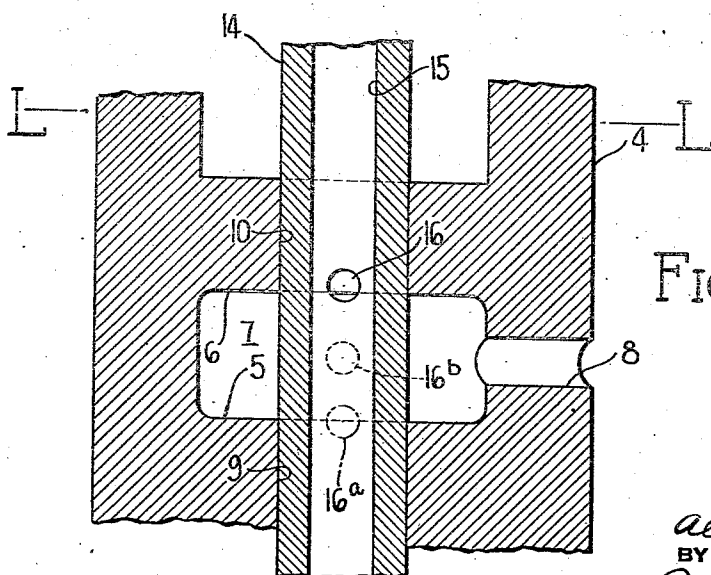


FIG-2

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CONTROL DEVICE

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9 Claims. (Cl. 158—28)

This invention relates to fluid control devices and more particularly to a device for controlling the flow of liquid fuel to a gravity type oil burner.

An object of the invention is to provide fluid flow controlling means having two control positions and a transitory intermediate position.

A further object is to provide means automatically reducing a pilot flame when the main flame is ignited.

A further object is to provide means for controlling the pilot flame to insure ignition of the main flame.

A further object is to provide means to feed excess oil to the pilot flame at the time oil is admitted for the main flame.

A further object is to provide a modulated flame to prevent excessive fuel consumption.

A further object is to provide means whereby the flame controlling means is automatically flushed to prevent clogging.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, there is fully and clearly illustrated a preferred embodiment of the invention, in which drawing:

Figure 1 is a diagrammatic view with some parts shown in section and others in elevation of an oil burning system embodying the invention, and

Fig. 2 is an enlarged view showing in central vertical section a feature of the invention.

Referring to the drawing by characters of reference, the numeral 1 represents generally a casing or container having a constant level chamber 2 in which liquid fuel is maintained substantially at the level L—L by any of the suitable means well known to the prior art. The casing 1 has a bottom wall 3 and projecting upward therefrom into the chamber 2 is a hollow valve casing or boss 4. Within the boss 4 and positioned above and substantially parallel to the wall 3 are a pair of substantially parallel spaced walls or wall portions 5 and 6, wall 5 being the lower wall. The walls 5 and 6 are positioned so that the adjacent spaced faces of each are both below the line L—L and cooperate with boss 4 to form a valve chamber 7. The side wall of boss 4 has one or more apertures or outlets 8 therethrough leading from the chamber 2 below the line L—L into the chamber 7 to supply liquid fuel thereto. The walls 5 and 6 have respectively aligned apertures 9, 10 therethrough, aperture 9 opening downwardly through the bottom wall 3 and into a conduit 11 which conducts the fuel which flows therethrough, as will hereinafter be described in detail, to the pilot burner fuel cham-

ber 12 of an oil burner assembly 13. Reciprocal within the apertures 9, 10 is a cylindrical hollow or tubular pilot valve member 14 and which has a piston tight or sliding fit therein to prevent flow of fuel between the walls 5 and 6 and the valve member 14. The valve member 14 has a central longitudinally extending aperture or internal bore 15 opening through its lower end wall and opening through its side wall above the line L—L into the chamber 2. The member 14 also has a small orifice or port 16 opening through its side wall and adaptable to register with the chamber 7 to allow flow of liquid from chamber 2, through aperture 8 and chamber 7 to the bore 15 from whence it flows through the conduit 11 and to the fuel chamber 12 of the burner assembly 13. The orifice 16 is cooperable, upon movement of the valve member 14, with either of the walls 5 or 6 to control the flow of fuel into the bore 15 depending upon the portion of the area of the orifice 16 which is shielded from the fuel due to its partial registry with the walls 5 or 6. The valve member 14 extends upward beyond the top wall 17 of the boss 4 and integral therewith is an arm or annular plate member 18 which is of a size such that it is able to have threadedly secured therein an adjustable screw or stop member 19 which has a downwardly extending portion for engagement with the top wall 17 to determine the downward movement of the valve member 14 and thereby the degree of registry of the orifice 16 with the bottom wall 5. In this manner the fuel flow to the pilot burner fuel chamber 12 is adjustable for any desired fuel flow from zero to the maximum flow of the orifice 16.

The bottom wall 3 has a second opening or port 20 leading from the chamber 2 into a chamber or cavity 21 to which a conduit 22 is communicatively connected for flow of fuel to an annular main burner fuel chamber 23 of the burner assembly 13. A main burner valve member 24 has a reduced diameter sleeve portion 25 which is reciprocal within the port 20 and due to its piston fit therewith prevents fuel from flowing between the inner wall of port 20 and the portion 25. The upper portion of the port 20 is of enlarged diameter and at its opening into the chamber 2 through the wall 3 forms a valve seat 26 against which a conical portion 27, formed on the valve member 24 at the intersection of the sleeve portion 25 with the normal diameter portion, seats upon the extreme downward movement of the valve member 24 to completely stop flow from the chamber 2 to the cavity 21. The sleeve portion 25 has a V-shaped slot 28 cut therein with its apex adjacent the conical portion 27. As the valve member 24 is moved upwardly, the conical portion 27 leaves its seat 26 and oil flows into the enlarged diameter portion

of the port 20 and then through the exposed area of the slot 28 into the cavity 21. Increased upward movement causes more area of the slot 28 to be exposed to the fuel with a consequent increase in fuel flow into the cavity 21 for flow through conduit 22 to the main burner fuel chamber 23. An adjustment screw member 29 is threadedly secured within a member 30 rigid with the casing 1 and acts upon engagement therewith by a flange 31 rigid with the valve member 24 to limit opening or upward movement of the valve member 24 thereby determining the maximum fuel flow to the main burner fuel chamber 23. The wall 3 has a second hollow boss 32 extending upward therefrom into the chamber 2 and opening above the liquid level line L—L. The boss 32 opens downwardly through the wall 3 into the cavity 21 to maintain atmospheric pressure therein so that the only pressure tending to promote fluid flow is that due to the head of the liquid itself.

The valve members 14 and 24 are each pivotally secured, as at 33, to a bar member 34 which is in turn pivotally secured substantially at its mid-point to a lever member 35. The lever member 35 is pivoted at one end portion to a pin 36 which is rigid with the casing 1 and has its other end portion tapered substantially to a point 37. A helical coil compression spring 38, having end members 39, 40, is held under compression between the tapered point 37 of the lever member 35 and a pointed end 41 of a screw 42 threadedly secured in a member 43 rigid with the casing 1. The pointed screw end 41 is so positioned relative to the pin 36 that when the lever member 35 is in its lowermost position, the tapered point 37 remains above an imaginary line drawn between the pointed end 41 and pin 36. The spring 38 is also so chosen that the component of force thereof urging the lever member 35 in a clockwise direction decreases continually upon movement of the lever member 35 in a counter-clockwise direction so that the initial force necessary to cause movement of the lever member 35 in a counter-clockwise direction is sufficient to move the member 35 completely through its range of movement. Likewise with such a construction, once the force exerted on the lever member 35 in a counter-clockwise direction decreases to a force less than the clockwise force exerted by the spring 38, the lever member 35 will be moved throughout its range in a clockwise direction. It is to be understood that with the addition of suitable springs the point 37 could move overcenter or beyond the imaginary line of centers drawn between end 41 and pin 36. Attention is called to Patent No. 1,841,326, granted January 12, 1932 to Lewis W. Eggleston. Upward or clockwise movement of the bar member 34 is limited by its engagement with an adjustable screw or stop member 44 threadedly secured within a member 45 rigid with the casing 1. The stop member 19 limits downward movement of the valve member 14 and stop member 44 limits upward movement thereof. Downward or counter-clockwise rotation of the lever member 35 is limited by engagement of the conical portion 27 with the seat 28 and by engagement of the stop member 19 with the top wall 17 of the boss 4.

The lever member 35 is actuated by a power element 46 having an expansible-contractible bellows member 47 with a rigidly held end wall 48 and a movable end wall 49. Secured to the wall 49 is a thrust pin 50 which engages the lever

member 35 and urges it in a counter-clockwise direction. A bulb member 51 is communicatively connected to the bellows member 47 by means of a capillary tube 52. The members 47 and 51 and tube 52 comprise an expansible-contractible sealed system which may be filled with a temperature sensitive fluid so that as the bulb member 51 warms up, the pressure within the sealed system will increase and the movable wall 49 will be urged outwardly to move the lever member 35 in a counter-clockwise direction. Upon decrease in temperature of the bulb member 51, the pressure exerted on the movable wall 49 will decrease and the spring 38 will act to move the lever member 35 in a clockwise direction.

The burner assembly 13 comprises a base plate or casting 53 having an annular or main burner fuel chamber 23 and has concentric with the main burner fuel chamber 23 the pilot burner fuel chamber 12. The chamber 23 is not connected for fuel flow with the chamber 12 but is mechanically joined thereto by arms 53^a which form passageways for air to pass upwardly through the assembly 13.

A pair of annular or perforated cylindrical members 54, 55 each having one end portion fitting within the chamber 23 and substantially having a sleeve fit with the inside walls thereof, have their other end portions extending upwards and capped with an annular ring member 56. The pilot chamber 12 has projecting upward therefrom and substantially sleeve fitted therein a perforated cylindrical member 57 capped by a disk member 58.

In Figure 2 there is shown the three positions of the orifice 16. Numeral 16 indicates the position of the orifice when the pilot burner is operating at a reduced flame with the main burner operating. Numeral 16^a indicates the position of the orifice when the pilot flame is operating without main burner operation and numeral 16^b indicates the transient position of the orifice with full or maximum flow to the pilot burner. The flushing action it will be noted occurs at position 16^b.

The operation of the control device is as follows: Assume that the main burner is operating as shown. The liquid fuel is flowing from the chamber 2, through the port 20 metered by the area of the V-shaped slot 28 which is exposed to the liquid fuel in the chamber 2. The liquid fuel then flows from the slot 28 into the cavity 21 which is maintained at atmospheric or the same pressure which is maintained in the chamber 2 and then flows through the conduit 22 to the main burner fuel chamber 23. The liquid fuel is vaporized in the chamber 23 and the fuel vapor passes upwardly between the members 54, 55. The ring 56 prevents escape of the fuel vapors from the top end of the members 54, 55 and forces the vapors to escape through the side wall perforations where they are burned or oxidized by the atmospheric air which passes upwardly past and through the assembly 13. At the same time the valve member 14 is in its upward position with the orifice 16 partially registering with the top wall 6 so that only a portion of the area of orifice 16 is exposed to the liquid fuel within chamber 7 and a limited flow of liquid fuel passes from chamber 2 through apertures 8, chamber 7, orifice 16, aperture 15, conduit 11 to the pilot burner fuel chamber 12. The liquid fuel is vaporized in the chamber 12 and passes upwardly within the cylindrical member 57. The disk member 58 prevents flow of the fuel vapor out of

the upper end of the member 57 and forces the vaporous fuel to pass outwardly through the perforations of the member 57 where it is burned or oxidized by the atmospheric air which passes upwardly through the assembly 13. The exposed area of the orifice 16, when the burner is operating as described, is so limited that only a relatively small flame is maintained by the pilot burner and just enough to maintain it in operation. As the medium which may be water or an enclosed space is heated to the desired temperature, the bulb member 51 which is in heat exchange relation therewith reaches the predetermined temperature at which the fluid pressure acting on the movable wall 49 is just sufficient to cause movement of the lever member 35 in a counter-clockwise direction. Upon initial movement and due to the fact that the force exerted by the movable wall 49 does not vary appreciably with change in its position and that the component of force exerted by the spring 38 decreases upon counter-clockwise movement of the lever member 35, the lever member 35 will be moved completely through its range of movement with a quick or snap action. This movement of the lever member 35 will be limited by engagement of the stop member 19 with wall 17 and of the conical portion 27 with seat 28 and the valve member 24 will stop flow of liquid fuel to the main burner while the valve member 14 will have been moved downward until the orifice 16 is in partial registry with the wall 5. The area of orifice 16 exposed to the chamber 7 is preferably greater than that exposed when the valve member 14 was in its up position and so that an increased liquid flow to the pilot burner fuel chamber 12 will occur resulting in an increased pilot burner flame which is sufficient to maintain the members 54, 55 warm and in a condition such that when liquid fuel is again supplied to the chamber 23 the main burner will ignite and burn. The heat output of the burner assembly 13 under solely pilot fire conditions is, however, not sufficient to overheat the medium heated by the main burner of the assembly 13. As the temperature of the heated medium and consequently bulb member 51 decreases, the fluid pressure exerted on the wall 49 decreases and the lever member 35 will start clockwise rotation. As the member 35 rotates clockwise, the component of force exerted by the spring 38 urging the lever member 35 in a clockwise direction increases and because the force exerted by the wall 49 does not change appreciably with movement of the wall 49, the bar member 34 will quickly and positively be moved against the stop member 44 or into the position shown for the first operation described due to the ignition of the main burner by the pilot burner.

It will be noted that as the orifice 16 is moved from one position of partial registry with wall 5 to a second position of partial registry with wall 6 that it transitorily passes through a position for wide open unrestricted flow of liquid therethrough. This provides a washing or flushing of the orifice to prevent clogging and it also supplies excess fuel to the pilot burner fuel chamber 12 so that the pilot burner will momentarily increase to an abnormal flame to insure ignition of the main burner and so that the pilot burner will be prevented from becoming starved at its initial operating times.

What is desired to be claimed and secured by Letters Patent of the United States is:

1. In an apparatus for controlling the supply

of fluid fuel to a burner, a casing having an outlet, a reciprocal valve means movable independently of the direction of fuel flow and cooperable with said outlet for controlling flow therethrough, said means having two positions of rest and an intermediate position, two abutment members to stop movement of said valve means at said two positions, said means when in one of said two positions being operable to control flow of fluid in one direction from said outlet for a predetermined burner flame and when in a second of said two positions being operable to control flow of fluid in said one direction from said outlet for a predetermined burner flame, said valve means when in said intermediate position acting to momentarily control the flow of fluid from said outlet for a predetermined flow greater than the flow of fluid from said outlet in either of said two positions, and automatic means to move said valve means from one completely to the other of said two positions and to hold said valve means against one or the other of said abutment members.

2. In an apparatus for controlling the flow of fluid fuel to a fluid fuel burner, a casing having an outlet, a valve means supported by said casing and controlling flow through said outlet, said means having irrespective of the direction of fluid fuel flow two positions of rest and an intermediate position, said means when in one of said two positions being operable to control flow of fluid in one direction from said outlet for a predetermined burner flame and when in the second of said two positions being operable to control flow of fluid in said one direction from said outlet for a predetermined burner flame, said valve means when in said intermediate position acting to control the flow of fluid for a predetermined flow greater than the flow of fluid in either of said two positions, and thermostatic means operable to move said valve means from one completely to the other of said two positions upon movement of said valve means by said thermostatic means.

3. In a device for controlling the flow of fuel to a fuel burning apparatus, a pilot burner, a main burner, a casing having a main burner outlet port and having an outlet connected for flow of fuel to said pilot burner, a first valve means controlling flow through said port and operable in a first position to supply fuel to said main burner for high fire operation and operable in a second position to change the supply of fuel to said main burner, a second valve means cooperable with said outlet to control the flow of fuel therethrough and having two positions of rest and a transitory intermediate position, said second valve means being operable in one of said two positions to supply fuel at a predetermined rate for a minimum pilot flame and being operable in another of said two positions to supply fuel at a predetermined rate for a high pilot flame, said second valve means when moving between said two positions being operable to supply fuel at a high rate above that of either of said two positions, and means for actuating both of said valve means so that when said first valve means is in said first position said second valve means is in said one position and when said first valve means is in said second position said second valve means is in said other position.

4. In a device for controlling the flow of fuel to a fuel burning apparatus, a pilot burner, a main burner, a casing having a main burner outlet port and having an outlet connected for flow

of fuel to said pilot burner, a first valve means controlling flow through said port and operable in a first position to supply fuel to said main burner for high fire operation and operable in a second position to stop the supply of fuel to said main burner, a second valve means cooperable with said outlet to control the flow of fuel therethrough and having two positions of rest and a transitory intermediate position, said second valve means being operable in one of said two positions to supply fuel at a predetermined rate for a minimum pilot flame and being operable in another of said two positions to supply fuel at a predetermined rate for a high pilot flame, said second valve means when moving between said two positions being operable to supply fuel at a high rate above that of either of said two positions, and means for synchronously moving said first valve means from said second to said first position and said second valve means from said other to said one position.

5. In a device for controlling the flow of fuel to a fuel burning apparatus, a pilot burner, a main burner, fuel supply means having a main burner outlet port and having an outlet connected for flow of fuel to said pilot burner, a first valve means controlling flow through said port and operable in a first position to supply fuel to said main burner for high fire operation and operable in a second position to stop the supply of fuel to said main burner, a second valve means cooperable with said outlet to control the flow of fuel therethrough and having two positions of rest and a transitory intermediate position, said second valve means being operable in one of said two positions to supply fuel at a predetermined rate for a minimum pilot flame and being operable in another of said two positions to supply fuel at a predetermined rate for a high pilot flame, said second valve means when moving between said two positions being operable to supply fuel at a high rate above that of either of said two positions, and means operable upon movement of said first valve means to said first position to move said second valve means through said intermediate position.

6. In a device for controlling the flow of fuel to a fuel burning apparatus, a pilot burner, a main burner, fuel supply means having a main burner outlet port and having an outlet connected for flow of fuel to said pilot burner, a first valve means controlling flow through said port and operable in a first position to supply fuel to said main burner for high fire operation and operable in a second position to stop the supply of fuel to said main burner, a second valve means cooperable with said outlet to control the flow of fuel therethrough and having two positions of rest and a transitory intermediate position, said second valve means being operable in one of said two positions to supply fuel at a predetermined rate for a minimum pilot flame and being operable in another of said two positions to supply fuel at a predetermined rate for a high pilot flame, said second valve means when moving between said two positions being operable to supply fuel at a high rate above that of either of said two positions, means for synchronously moving said first valve means from said second to said first position and said second valve means from said other to said one position, and means for moving said synchronously moving means with a snap action.

7. In a device for controlling the flow of fuel to a fuel burning apparatus, a pilot burner, a main burner, a casing having a main burner outlet port and having an outlet connected for flow of fuel to said pilot burner, a first valve means controlling flow through said port and operable in a first position to supply fuel to said main burner for high fire operation and operable in a second position to stop the supply of fuel to said main burner, a second valve means cooperable with said outlet to control the flow of fuel therethrough and having two positions of rest and a transitory intermediate position, said second valve means being operable in one of said two positions to supply fuel at a predetermined rate for a minimum pilot flame and being operable in another of said two positions to supply fuel at a predetermined rate for a high pilot flame, said second valve means when moving between said two positions being operable to supply fuel at a high rate above that of either of said two positions, and automatically operable means sensitive to the output of one of said burners for synchronously moving said first valve means from said second to said first position and said second valve means from said other to said one position.

8. A main fluid fuel burner igniting means, comprising a fuel flow controlling device for supplying fuel to a pilot burner and including means for metering the fuel at a low rate to the pilot burner during operation of the main burner, means for metering the fuel at a higher rate to the pilot burner when the main burner is inactive, and means for increasing the fuel flow to said pilot burner above said higher rate to provide a pilot burner igniting flame.

9. In a device for controlling the flow of liquid fuel to a fuel burning apparatus, a main burner, a pilot burner for igniting said main burner, a container having a constant liquid level chamber with an outlet therefrom, a conduit connecting said outlet to said main burner, a metering valve controlling flow through said outlet, a valve casing in said chamber and having spaced upper and lower walls with aligned apertures therethrough, the space between said walls being open to said chamber, a tubular pilot valve for controlling fuel flow to said pilot burner and reciprocally fitting said apertures and extending from said valve casing to a point above the chamber liquid level, said valve casing having an outlet communicating below the chamber liquid level with the lower one of said aligned apertures, a conduit connecting said valve casing outlet to said pilot burner, said pilot valve having a vent above the chamber liquid level, said pilot valve having a side wall port movable into partial closing relation with said upper and lower walls such that said valve casing outlet is in communication with said chamber through said port in all positions of said pilot valve, means to limit the extent of closure of said port by said lower wall, means to limit the extent of closure of said port by said upper wall, and a single means to move said metering valve and to move said pilot valve from its closing relation with one of said walls to its closing relation to the other of said walls.

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