Jan. 20, 1959 J. C. KUYKENDALL 2,869,628

SAFETY FEED CONTROL FOR LIQUID FUEL

Filed Aug. 11, 1954 2 Sheets-Sheet 1

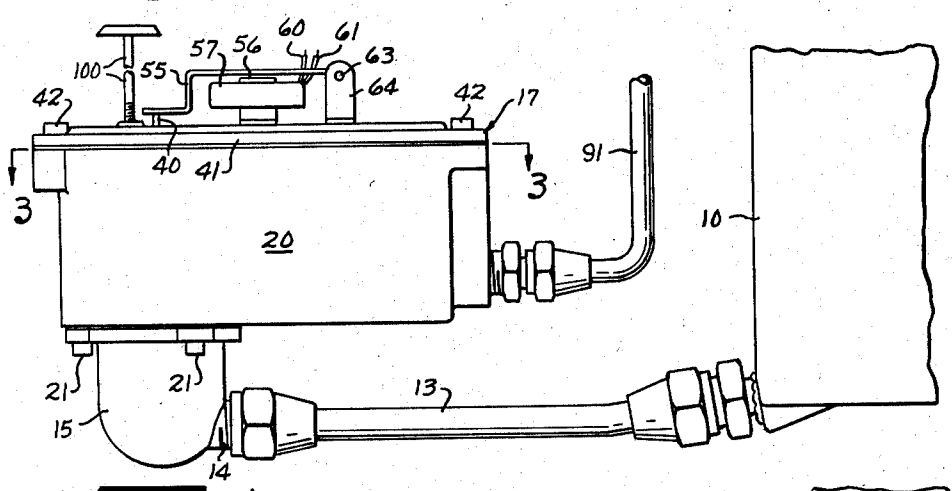


Fig-1

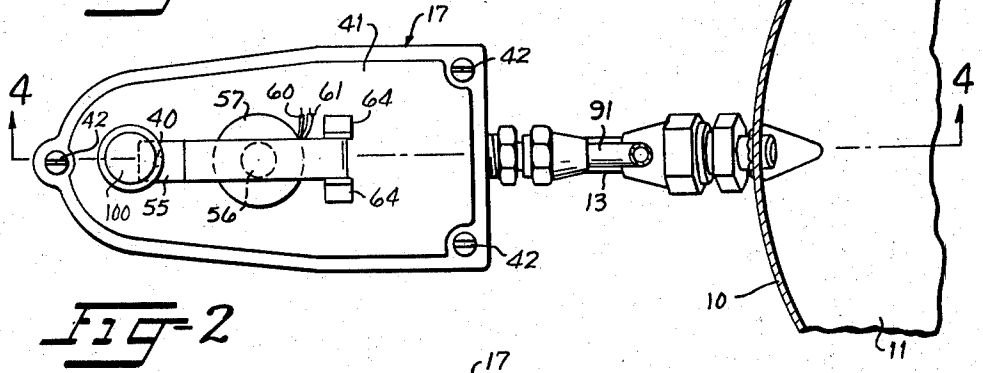


Fig-2

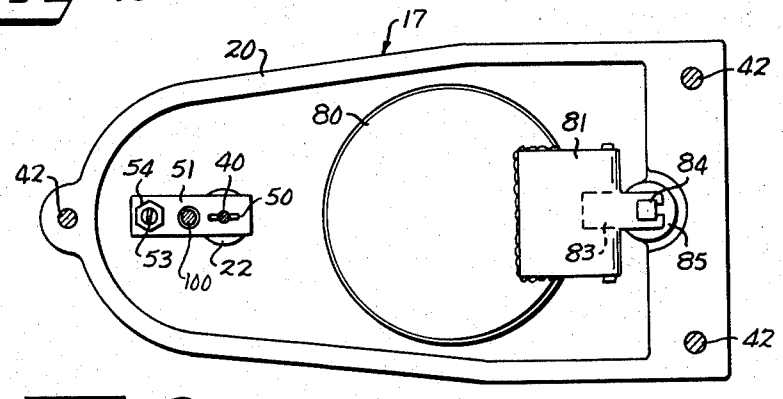


Fig-3

INVENTOR:
JACK C. KUYKENDALL.

BY Eaton & Bell

ATTORNEYS.

Jan. 20, 1959 J. C. KUYKENDALL 2,869,628

SAFETY FEED CONTROL FOR LIQUID FUEL

Filed Aug. 11, 1954 2 Sheets-Sheet 2

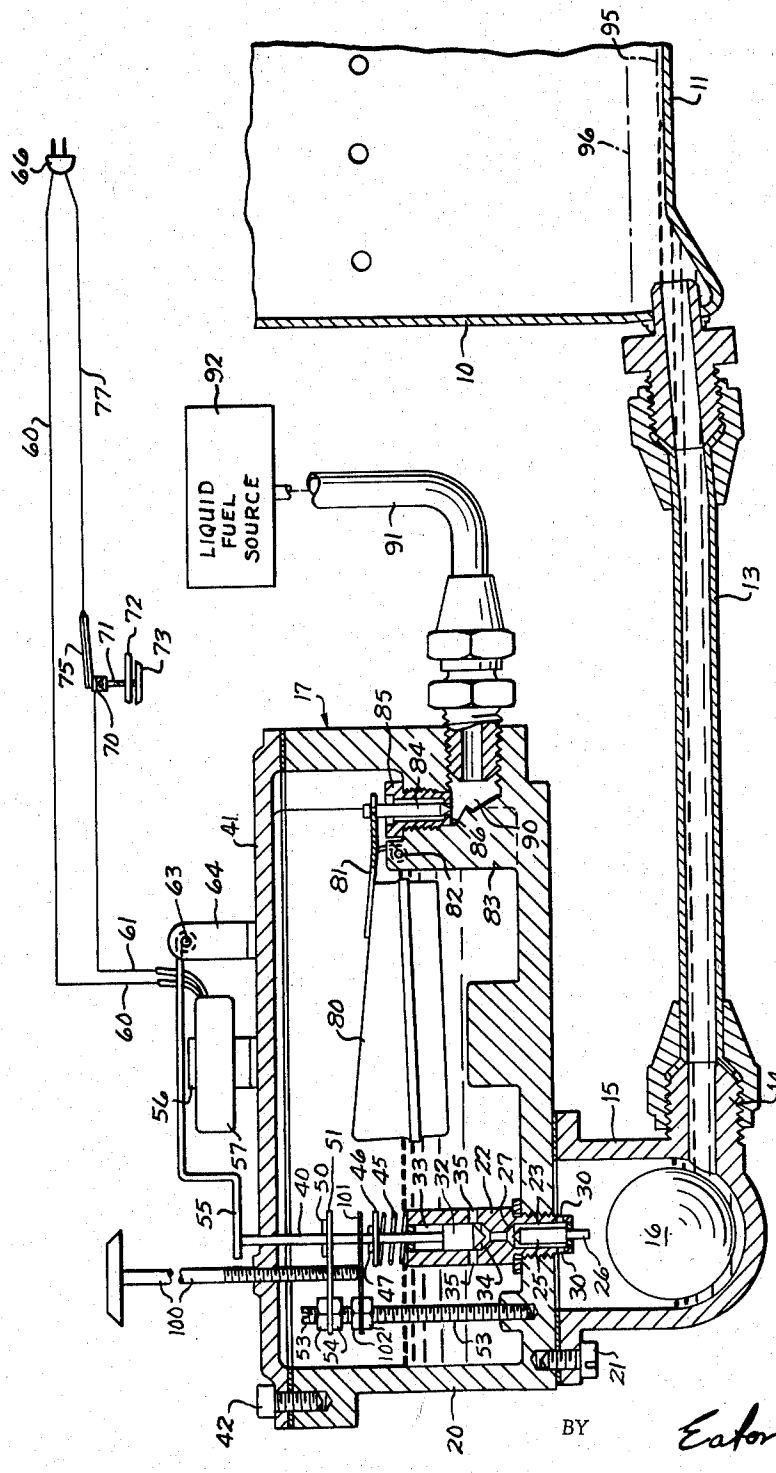


FIG. 4

JACK C. KUYKENDALL, INVENTOR.

BY Eaton & Bell

ATTORNEYS.

United States Patent Office

2,869,628

Patented Jan. 20, 1959

2,869,628

SAFETY FEED CONTROL FOR LIQUID FUEL

Jack C. Kuykendall, Charlotte, N. C.

Application August 11, 1954, Serial No. 449,192

1 Claim. (Cl. 158—38)

This invention relates to improvements in liquid fuel feeding or metering devices for oil furnaces and the like and, more especially, to an improved means for stopping the flow of liquid fuel upon a tendency of the amount of fuel being delivered to the burner to exceed the rate at which it is consumed.

As is well known, in pot type liquid fuel burners, it is necessary in the course of initially igniting the fuel in the burner to admit sufficient fuel into the burner to form a pool of fuel in the bottom of the burner before igniting the same and, upon the fuel in the burner being ignited, the fuel is vaporized by the heat created by combustion thereof. It is evident that, upon permitting fuel to flow into the usual pot type burner, a short period of time is required to permit sufficient fuel to enter the bottom of the burner prior to lighting or igniting the fuel and it quite often happens that the operator may fail to ignite the pool of fuel in the bottom of the burner at the proper time with the result that an excessive amount of fuel will accumulate in the bottom of the burner, to the extent that it would be hazardous to ignite the fuel, since excessive fuel in the burner would cause the fuel to explode upon being ignited or would result in an excessive amount of carbon being deposited on the walls of the burner and would create excessive heat, thus involving a definite fire hazard.

It is therefore an object of this invention to provide improved liquid fuel feed control means which normally permits fuel to flow into an oil burner or the like, but which will prevent fuel from entering the burner if, for any reason, the fuel tends to accumulate in the burner to the extent that it would become flooded.

It is another object of this invention to provide an improved liquid fuel feed control of the character described wherein liquid fuel is delivered into a primary float chamber from whence it flows into a secondary float chamber and then into the fuel burner and wherein an improved valve mechanism is interposed between the primary and secondary float chambers. The improved valve mechanism embodies means for metering the flow of fuel into the secondary float chamber and, in the event of the fuel in the bottom of the burner and the secondary float chamber reaching a level of a predetermined maximum height, the float in the secondary float chamber will close a safety valve in said improved valve mechanism to prevent the fuel from flowing from the primary float chamber into the secondary float chamber, although the metering valve may still be open.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the liquid fuel metering device showing the same connected with a suitable burner pot;

Figure 2 is a plan view of the fuel metering device and a portion of the burner pot looking down on Figure 1;

Figure 3 is an enlarged plan view through the fuel metering device, partially in section, and being taken substantially along line 3—3 in Figure 1;

Figure 4 is an enlarged vertical sectional view through the improved fuel metering device and a portion of a pot burner and is taken substantially along line 4—4 in Figure 2.

Referring more specifically to the drawings, a burner pot 10 has a bottom portion or wall 11 and one end of a metered fuel delivery line or conduit 13 connected thereto. The opposite end of the metered fuel line 13 is fixedly secured to a nipple 14 communicatively connected with a fuel cut-off lower float chamber 15 which is a part of a fuel metering device 17. The fuel cut-off lower float chamber 15 has a float 16 therein. It should be noted that the chamber 15 should be on substantially the same level as the bottom 11 of the burner 10. The cut-off lower float chamber 15 is fixedly secured to the lower surface of a fuel reservoir or upper float chamber 20 as by screws 21. The float chambers 20 and 15 may also be termed as primary and secondary float chambers, respectively. The fuel reservoir float chamber 20 is provided with an improved valve mechanism including a combination valve housing 22 threadably mounted in the bottom thereof and in axial alinement with the center of the cut-off float chamber 15.

The valve housing 22 (Figure 4) is provided with a suitable bore 23 in the lower end thereof in which a cut-off valve or safety valve 25 is adapted to have vertical sliding movement. The lower end of the valve 25 is provided with a reduced valve stem 26 which extends downwardly in Figure 4 and into the lower cut-off float chamber 15. The cut-off valve 25 is adapted to, at times, be seated against a valve seat 27 to prevent the flow of fuel therethrough. It will be noted by referring to Figure 4, that the cut-off valve 25 is slightly smaller than the lower bore 23 in the cut-off valve housing 22 to provide a passageway for the fuel to pass thereby and the lower edge of the valve housing 22 is provided with a plurality of openings 30 through which the fuel may pass into the cut-off float chamber 15.

The valve housing 22 is also provided with an upper fuel metering valve 32 which is slidably mounted in an upper bore 33 in the valve housing 22 and the lower end of said bore is constricted to form an upper valve seat 34. The valve housing 22 is also provided with a plurality of openings 35 therein, through which the fuel may pass, and which communicate with the upper bore 33 immediately above the upper valve seat 34.

The fuel metering valve 32 is provided with an upwardly extending stem portion 40 which extends through the closed upper end of the valve housing 22 and through a removable cover 41 fixedly secured on the reservoir float chamber 20 as by screws 42. The fuel metering valve 32 is resiliently urged upwardly by a compression spring 45 surrounding the valve stem 40. The lower end of spring 45 bears against the upper surface of the valve housing 22 and its upper end bears against a suitable collar 46 surrounding the valve stem 40 and being prevented from upward movement by a pin 47 penetrating the valve stem 40. Downward movement of the fuel metering valve 32 is limited by a pin 50 extending through the valve stem 40 and, at times, engaging an adjustable pilot light adjusting plate 51, one end of which loosely surrounds the valve stem 40 and the opposite end of which is held in vertically adjusted position on the upper end of a threaded standard, post or screw 53 as by lock nuts 54. The lower end of the threaded standard 53 is threadably embedded in the bottom wall of the upper reservoir float chamber 20 (Figure 4). The adjustable pilot light adjusting plate 51 is provided to prevent the valve 32 from completely closing so that enough fuel

may continue to flow to the burner so that a pilot flame may be maintained in the pot 10.

The upper end of the stem 40 of the fuel metering valve 32 is, at times, depressed, to thereby depress the fuel metering valve 32, by one end of a solenoid or magnetically actuated arm 55 engaging the upper end thereof and which extends to the right in Figure 4 and upwardly and then again to the right to pass over an electro-magnet 56 having a coil of wire 57 wound therearound and which is energized by electric wires 60 and 61 connected thereto. The right-hand end of the solenoid actuating arm 55 is pivotally mounted, as at 63, in the upper end of a pair of spaced standards 64, the lower ends of which are fixedly secured to the cover 41 of the upper reservoir float chamber 20. The electric wire 60 extends to one side of a suitable plug 66 which may be connected to a suitable source of electrical energy, not shown.

The wire 61 extends to one side of an adjustable contact point 70 which may be a part of any suitable thermostatically controlled switch mechanism and is shown schematically in the drawings for purposes of illustration. The thermostatically controlled switch illustrated in the drawings comprises a threaded shaft 71 connected to the contact point 70 and threadably embedded in a fixed plate 72. The shaft 71 has a handle or turning wheel 73 fixed thereto. The electrical contact 70 of the thermostatically controlled switch is adapted to at times be engaged by one end of a bi-metallic contact arm 75, the opposite end of which has one end of wire 77 connected thereto, the opposite end of which extends to the plug 66.

The upper reservoir float chamber 20 is provided with a float member 80 fixedly secured to the outer end of a lever arm 81, the central portion of which is pivotally connected, as at 82, to a projection 83 in the chamber 20. The lever 81 fits in a groove in the upper end of a fuel supply valve 84 mounted for vertical sliding movement in a valve housing 85 threadably secured in the projection 83 in the reservoir float chamber 20. The lower end of valve 84 is adapted to, at times, engage a valve seat 86 in the lower end of the valve housing 85. The lower end of the valve housing 85 communicates with one end of a bore 90 in the reservoir float chamber 20 the opposite end of which has one end of a fuel supply line 91 connected thereto. The opposite end of fuel supply line 91 extends to any suitable source of liquid fuel, such as a storage tank or the like, shown schematically at 92 in Figure 4.

The float 80 and the valve 84 are provided to maintain a predetermined level of liquid fuel in the reservoir float chamber 20 and it is apparent that, upon the float 80 being lowered by the fuel level in the reservoir float chamber, the valve 84 will be lifted from the valve seat 86 to permit fuel to pass from the source 92, through the supply line 91 and into the reservoir float chamber 20 to raise the float 80 until valve 84 is closed.

The adjustable contact 70 is provided in order to be engaged by the bi-metallic arm upon the ambient temperature being raised above a predetermined amount. The bi-metallic thermostatic contact 75 then engages the contact point 70 to thus direct current to the coil 57 of the electro-magnet 56. The electro-magnet 56 will then pull the metallic actuating arm 55 downwardly, in Figure 4, so that the pin 50 in the valve stem 40 is forced against the stop plate 51 to substantially close the ports 35 and minimize the flow of fuel through the openings 35 in the valve housing 22 to the extent that only enough fuel will pass through the cut-off lower float chamber 15 to the burner 10 to allow a pilot light to burn without creating any appreciable amount of heat.

Upon the ambient temperature dropping below the desired point, the bi-metallic arm 75 moves upwardly away from the contact 70 to thus de-energize the coil 57 of the electro-magnet 56, whereupon the compression spring 45, surrounding the stem 40 of the fuel metering valve 32, urges the fuel metering valve 32 upwardly. The openings 35 will then be fully opened to permit the maximum amount of fuel to flow into the cut-off float chamber 15, through the line 13, into the burner 10 to accelerate combustion within the burner 10.

The cut-off float chamber 15 and the cut-off valve 25 are provided to prevent an excessive accumulation of fuel in the bottom of the burner 10. The normal operating level of the fuel in the bottom of the burner 10 is indicated by the broken line 95 in Figure 4 and the cut-off or trip-off level of fuel is indicated by the broken line 96 in Figure 4. Upon the pilot light going out or before lighting the burner and upon the fuel metering valve 32 being open, gravity will feed the fuel through the openings or ports 35, through the valve housing 22, past the cut-off valve 25, into the cut-off float chamber 15, through the meter fuel line 13 and into the bottom of the burner 10. Upon an excessive accumulation of fuel in the bottom of the burner 10 the fuel level in the cut-off float chamber 15 raises as the level of fuel in the bottom of the burner 10 raises to thus raise the float 16 into engagement with the stem portion 26 of the fuel cut-off valve 25 to thus raise the same and cause the fuel cut-off valve 25 to seat against the valve seat 27 thus preventing any additional fuel from flowing from the reservoir float chamber 20 into the cut-off float chamber 15 and thereby limiting the amount of fuel which may enter the burner 10 in the absence of the fuel being consumed by combustion.

Although thermo-electrically operable means are provided for opening and closing the metering valve 32 in the valve housing 22, there are times, such as in the case of electrical power failure, when it may be desirable to control or adjust the position of the metering valve 32 manually. To this end, it will be observed in Figure 4 that a manual adjustment element in the form of a rod or shaft 100 threadably penetrates the upper wall or cover 41 of the upper reservoir float chamber 20. The lower medial portion of the adjustment rod 100 loosely penetrates the pilot light adjusting plate 51 and its lower end bears against the medial portion of a leaf spring member 101, one end of which is loosely penetrated by the medial portion of the valve stem 40 and the other end of which is suitably adjustably secured to the threaded post or screw 53, as by lock nuts 102.

It will be noted that the leaf spring member 101 is normally spaced above the abutment or pin 47 to permit the metering valve 32 to move upwardly and open when the coil 57 of the electro-magnet 56 is de-energized.

It is apparent however that, when the coil 57 of the electro-magnet 56 is de-energized, the position of the valve 32 may be varied by corresponding adjustment of the manual adjustment rod 100. In other words, by adjusting the rod 100 downwardly relative to the cover 41 of the reservoir 20, the leaf spring member 101 will be moved in engagement with the pin or abutment 47 to thereby move the valve 32 downwardly toward closed position. On the other hand, when the rod 100 is rotated to cause the same to move upwardly in the cover 41, the leaf spring member 101 will move upwardly therewith whereupon the spring 45 will return the metering valve 32 to open position.

It is thus seen that, there has been provided an improved fuel metering device which is automatically operable to stop the flow of fuel to the burner under any circumstances in which the fuel being supplied to said burner is not being consumed at the same rate at which it is delivered thereto or in any event in which the fuel would tend to accumulate in the bottom of the burner and which will effect automatically the flow of fuel upon any reduction in the amount of fuel in the burner below a given amount without the necessity of manually resetting any valves or the like. Of course the delivery of fuel into the pipe line 91 may be stopped by any suitable means, not shown, when the burner 10 is not in use, although the switch 75 may be open or the adjustment rod 100 may be in raised position.

In the drawings and specification there has been set

forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claim.

I claim:

In a feed system for a liquid fuel burner having a primary float chamber, means for delivering fuel into the primary float chamber, and means for maintaining the fuel in the primary float chamber on a predetermined level; the combination therewith of a burner, a secondary float chamber disposed beneath the primary float chamber and having its bottom wall portion disposed on substantially the same level as the bottom of said burner, conduit means extending from the lower portion of the secondary float chamber to the lower portion of said burner, a valve mechanism disposed in said primary float chamber above the secondary float chamber, a float loosely disposed in the secondary float chamber, said valve mechanism including a housing having a vertically extending bore in its lower portion and being constricted adjacent the upper portion of said bore to form a valve seat, an elongated safety valve member loosely disposed in said bore, means closing the lower end of said bore, said valve member having a reduced stem portion slidably

penetrating said closure means and projecting downwardly beyond the closure means and normally being spaced above said float and out of engagement therewith, at least one passageway establishing communication between the bore and the secondary float chamber, means for metering fuel from the primary float chamber through said constriction and thence through the bore and passageway into the secondary chamber whereby, upon a given amount of fuel being present in the burner and the secondary float chamber, the float is elevated thereby to engage the stem portion of the safety valve and to move the safety valve upwardly into engagement with the valve seat to prevent additional fuel from entering the secondary float chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,129,428	Salisbury	Feb. 23, 1915
1,695,705	Ball et al.	Dec. 18, 1928
1,852,261	Piatt	Apr. 5, 1932
2,129,937	Johnson	Sept. 13, 1938
2,397,120	Breese et al.	Mar. 26, 1946
2,456,170	Bennett	Dec. 14, 1948
2,493,474	Breese	Jan. 3, 1950
2,573,696	Dominic	Nov. 6, 1951