Sept. 14, 1954 L. V. LEYSEN 2,689,001

FLUID FUEL BURNER

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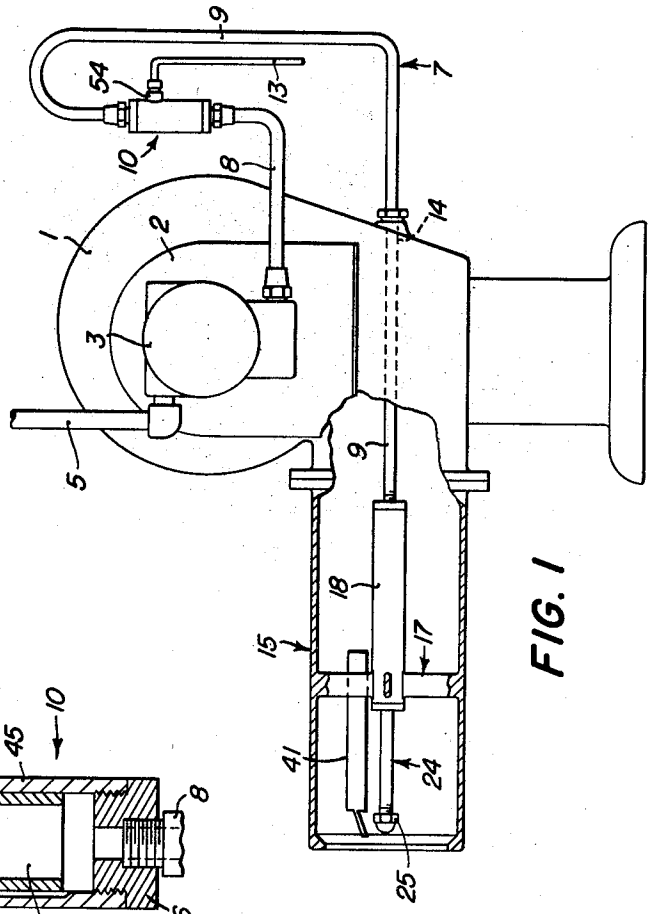


FIG. 1

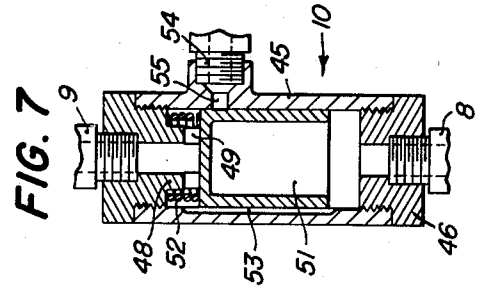


FIG. 7

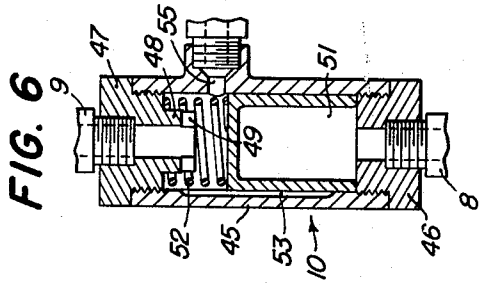


FIG. 6

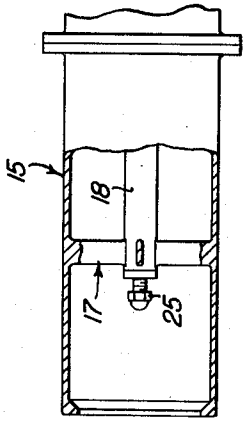


FIG. 2

INVENTOR.
L. V. LEYSEN
BY
Merrill M. Blackburn
ATTORNEY

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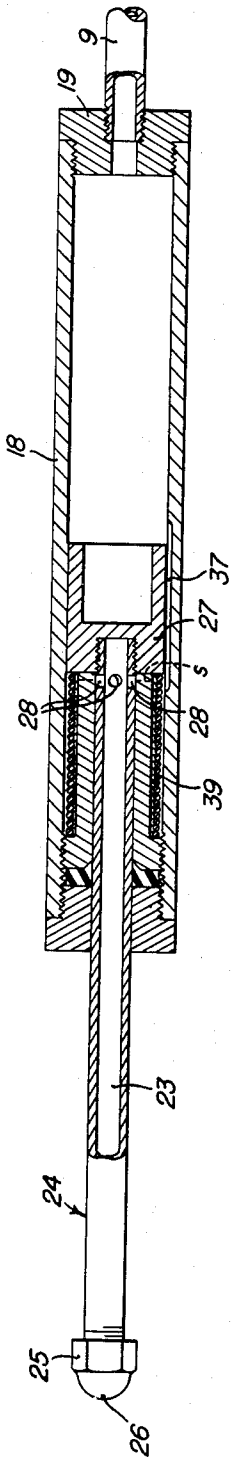


FIG. 3

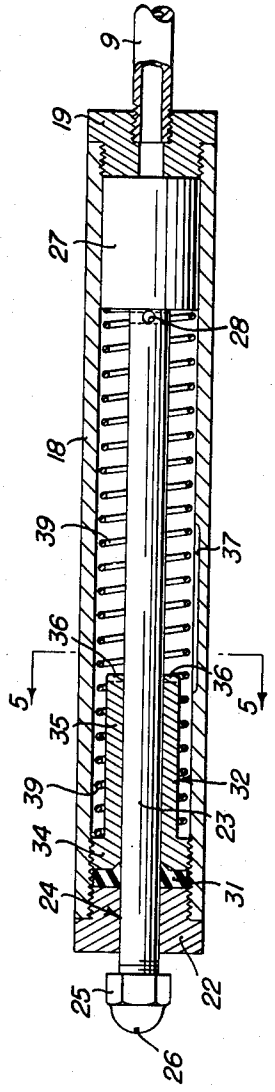


FIG. 4

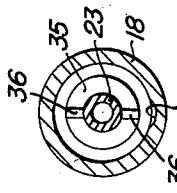


FIG. 5

INVENTOR.
L. V. LEYSEN
BY
Merrill M. Blackburn
ATTORNEY

Patented Sept. 14, 1954

2,689,001

UNITED STATES PATENT OFFICE

2,689,001

FLUID FUEL BURNER

Leyle V. Leysen, Davenport, Iowa

Application July 12, 1949, Serial No. 104,165

10 Claims. (Cl. 158—76)

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The present invention relates, in general, to fluid fuel burners and more particularly to oil burners in which atomized oil is burned with a blast of air to support combustion. More particularly, the present invention relates to burners of this type which are automatically controlled by changes in the temperature of the space heated by the burner, such as a room or apartment in a building, and in which the burner is turned on or turned off by the operation of a thermostat which responds to slight changes in the temperature of the space being heated.

The object and general nature of the present invention is the provision of a new and improved burner in which the fuel-atomizing nozzle is automatically moved away from the zone of combustion when the fuel supply is cut off, as controlled by the room thermostat reaching the desired temperature, thereby withdrawing the nozzle from adjacent highly heated surfaces and thereby eliminating to a large extent the tendency for residual fuel in or on the nozzle to carbonize and plug up or reduce the size of the nozzle opening during periods when the burner is not operating.

More specifically, it is a feature of this invention to provide a nozzle control which is energized by the pressure of the fuel being delivered to the nozzle. Another important feature of this invention is the provision of means facilitating the return of the nozzle to its retracted position in practically immediate response to an interruption of the delivery of fuel under pressure to the nozzle, and, also, such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction disclosed herein. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now regarded as the preferred embodiment of this invention, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 is a side view of an oil burner in which the present invention has been incorporated, certain parts being broken away to show the nozzle in operating position;

Fig. 2 is a fragmentary view, similar to Fig. 1, showing the nozzle in its retracted position, when the burner is inactive;

Figs. 3 and 4 are enlarged sectional views of the nozzle and the principal control means therefor,

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Fig. 3 showing the nozzle extended and Fig. 4 showing the nozzle retracted;

Fig. 5 is a sectional view taken along the plane indicated by the line 5—5, of Fig. 4; and

Figs. 6 and 7 are sectional views, showing the two positions of the by-pass control valve, Fig. 6 showing the valve in its position when the burner is inactive and in which provision is made for a flow of fuel away from the nozzle, as when the latter is retracted, while Fig. 7 shows the position of the by-pass valve when the fuel pump is forcing oil out through the pipe 8.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this invention. As shown in Fig. 1, the present invention is incorporated in an oil burner which includes a fan housing 1 in which there is a blower which is driven by a motor 2 which also drives a fuel pump 3. The latter draws fuel from a supply tank, not shown, through a supply line or conduit 5 and delivers the fuel under pressure through a high pressure line 7. The latter includes two sections 8 and 9 interconnected through a by-pass valve mechanism 10 which controls communication between the section 9 of the fuel line 7 and a by-pass line 13 which leads back to the tank or some other point of low pressure.

The high pressure fuel line 7 is extended at 14 into the lower part of the fan or blower housing 1 which is constructed with a draft tube 15 fixed to the housing 1 in a position to receive the blast of air from the fan or blower. The outer or discharge end of the draft tube leads into, and forms a part of, the zone of combustion in the furnace to which the burner is connected. The draft tube carries or is formed with a spider 17 which is arranged to support a cylinder 18 at one end of the latter, and the inner end of the cylinder is internally threaded to receive a closure plug 19 which is apertured and connected to the discharge end of the fuel line section 9. The outer end of the cylinder 18 is closed by a screw-threaded closure plug 22 which is apertured centrally to receive the tubular section 23 of a nozzle 24, the outer end of the tubular section 23 being threaded to receive a nozzle head 25 which is provided with a plurality of small openings 26 which serve to atomize fluid fuel forced through the nozzle.

The inner end of the nozzle tube 23 is fixed to a piston 27 which is slidable in the cylinder 18 and just outwardly of the connection of the tube 23 to the piston 27, the tube is provided with a plurality of openings 28 through the walls of

the tube 23. A packing gland 31 seals the tube 23 where it passes through the cylinder end 22, the gland 31 being confined between the closure plug 22 and an abutment 32 which is fixed to the outer end of the cylinder 18, as by having a screw-threaded head 34 within the internally threaded portion of the outer end of the cylinder. The abutment 32 includes a shank portion 35 which snugly embraces the nozzle tube 23, guiding and supporting the latter. The inner end of the shank portion 35 is formed with a pair of lugs or ribs 36 against which the outer end of the piston 27 is adapted to bear, as shown in Fig. 3, which thus provides a space *s* which, when the piston 27 and nozzle 24 are in the position shown in Fig. 3, cooperate with a by-pass groove 37 to establish communication between the interior of the cylinder 18 and the interior of the nozzle tube 23, whereby fuel may flow from the cylinder to the nozzle. A spring 39 bears at one end against the head 34 of the abutment member 32 and at the other end against the outer end of the piston 27, thereby tending to shift the nozzle into its retracted position with the piston 27 against the closure plug 19 at the inner end of the cylinder 18. The lugs or ribs 36 may be replaced by a groove or grooves and may be of any desired number, preferably an odd number.

Referring now to Figs. 1, 6, and 7, the valve 10 includes a cylinder 45 closed at opposite ends by apertured closure plugs 46 and 47, the delivery line 8 being connected to the closure plug 46 and the line 9 being connected to the closure plug 47. The latter has an inner reduced section 48 terminating in abutment ribs 49. A piston 51 is slidable in the cylinder 45 and is biased for movement toward the inlet end by a spring 52. A groove 53 in the cylinder 45 by-passes the piston 51 when the latter is in its upper position, as shown in Fig. 7, so as to provide for a flow of fuel from supply conduit section 8 to conduit section 9. The piston 51 is held in its upper position, against the bias exerted by the spring 52, by the pressure of the fuel when the pump 3 is operating. The by-pass line or conduit 13 is connected into the cylinder 45 by a fitting 54 which is located so that, when the pump is shut off and the piston 51 is held by the spring 52, or by gravity, the fuel line 9, coming from the cylinder 18, is in direct communication with the by-pass line 13. The latter leads to a zone of lowered pressure, as to atmosphere, or back to the supply tank, preferably the latter.

Operation

When the room thermostat, not shown, calls for heat, the burner motor 3 is actuated, and this starts the blower 1 and the fuel pump 2. The latter then delivers fuel under pump pressure through the fuel line 7 and into the cylinder 18. The pressure of the fuel delivered to the cylinder exceeds the force exerted by the spring 39 and therefore the incoming fuel forces the piston 27 from the position shown in Fig. 4 toward the position shown in Fig. 3. However, no fuel passes to the nozzle 24 until the piston 27 moves over the groove 37 and into substantially the position shown in Fig. 3, at which time fuel is free to flow through the groove 37, the space *s*, the ports 28, and the tube 23, to the nozzle head 25. The groove 37 and associated passages are so formed as to set up sufficient resistance to the flow of fuel that the pressure within the cylinder 18 is always great enough to hold the piston 27 in the position shown in Fig. 3, maintaining the spring 39 in a compressed condition, as long as the fuel pump is operating. Thus, the nozzle 24 is held in its extended position by the fuel pressure and is maintained in the proper position relative to the combustion zone. The fuel is ignited by a conventional spark coil 41, or other suitable means, which is energized when the pump is started.

When the room thermostat no longer calls for heat, the pump is shut off and fuel under pressure is no longer directed into the cylinder 18. However, the cylinder 18 and the associated conduit lines are filled with fuel and therefore, before the spring 39 can act to retract the nozzle, the cylinder and associated lines must be emptied. As the piston 27 is forced backwardly by the spring 39, the by-pass groove 37 is closed and further movement caused by the spring 39 causes air to be sucked in to replace the oil escaping from the tube 24 into the cylinder 18. At the same time, oil is forced out of the right half of the cylinder 18, as shown in Fig. 3, and this is forced through line 9, keeping the by-pass valve 10 open for the escape of oil through the pipe 13 to the oil tank, not shown. For installations where the pump control is such that the delivery lines are not open to atmosphere, or other reduced pressure, the by-pass valve 10 is provided.

Referring now particularly to Figs. 6 and 7, as soon as the pump is shut off, the piston 51 is moved downwardly by the spring 52 and, when the piston 51 clears the opening 55 in the wall of the cylinder 45 with which the by-pass fitting 54 communicates, the fuel line 9 and the cylinder 10 are opened to the by-pass line 13. The spring 39 then begins to expand which forces the piston 27 inwardly and retracts the nozzle 24 from the combustion zone at the discharge end of the draft tube 15. Therefore, the nozzle head 25 is moved away from sources of high heat, and any residual fuel, on the nozzle or oozing therefrom, is not carbonized and does not plug up the small holes in the nozzle head.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as disclosed in this specification and as defined by the appended claims.

Having now described my invention, I claim:

1. A fluid fuel burner comprising a blower housing, a draft tube connected therewith, means for directing a blast of air through said draft tube, a burner nozzle mounted for movement in said draft tube toward and away from the discharge end thereof, means for delivering a flow of fuel under pressure to said nozzle, spring means for shifting said nozzle away from the discharge end of said draft tube, means, actuated by the pressure of fuel flowing toward said nozzle, for forcing said nozzle against the force of said spring means toward the discharge end of said draft tube, and means preventing the flow of fuel to said nozzle until the nozzle reaches a position adjacent the discharge end of said draft tube.

2. A fluid fuel burner comprising means forming a chamber for carrying air under pressure, a cylinder mounted therein, a piston movable in said cylinder, a nozzle projecting from said cylinder and connected with said piston to be shifted by movement of the piston, spring means acting against said piston for retracting said nozzle, means for supplying fluid fuel under pressure to said cylinder, the pressure being sufficient to move said piston against the force of said spring means, and means forming a passage leading from

said cylinder to said nozzle and located in said cylinder in such position as to be opened when said piston reaches the outer end of the cylinder, whereby, when said nozzle is extended by the pressure of fuel delivered to said cylinder, fuel will flow through said passages to the nozzle.

3. A fluid fuel burner comprising a draft tube, a source of fluid fuel, a pump for delivering fuel from said source, under pressure, a nozzle head movable into and out of operative position in said draft tube, a cylinder, a piston movable therein, a rigid conduit fixed at its inner end to said piston and extending outwardly of said cylinder, said nozzle head being fixed to the outer end of said conduit, a stop in said cylinder for limiting the forward movement of said piston and nozzle, spring means acting between the outer end of said cylinder and said piston for moving the piston rearwardly of said cylinder and retracting said nozzle out of said operative position, means for conducting fuel under pressure from said pump into said cylinder to act against said piston to shift the piston against said stop and move said nozzle head into operative position in said draft tube, against the force of said spring means, and port means by-passing said piston, said port means being operatively associated with and rendered effective by said piston adjacent its forward position for by-passing said piston when the piston is disposed against said stop, for conducting fuel under pressure from said cylinder around said piston and through said rigid conduit to said nozzle head.

4. A structure as defined by claim 3, in which said fuel conducting means is provided with an auxiliary conduit leading to a discharge end, and valve means controlling said auxiliary conduit and normally open under no-flow conditions but closed in response to flow of fuel under pressure from said pump, said valve means serving to prevent fuel flow through said auxiliary conduit when said pump is operating but accommodating a flow of fuel from said cylinder whereby to discharge when said pump is inoperative, thereby permitting said spring means to retract said nozzle out of operative position in said draft tube.

5. A fluid fuel burner comprising a draft tube, a source of fluid fuel, a pump for delivering fuel from said source, under pressure, a nozzle head movable into and out of operative position in said draft tube, a cylinder, a fluid conduit leading to said cylinder, a piston movable in said cylinder and connected by a hollow piston rod to the nozzle head to serve as means for carrying fuel from the cylinder to the burner nozzle, spring means acting against one end of said cylinder and against said piston for yieldably resisting movement of the latter toward said one end of the cylinder, and fluid passage means carried by said cylinder and positioned to by-pass said piston, when the piston moves into a position at said one end of the cylinder carrying the head into burning position, to conduct fluid from said cylinder to the exterior thereof as long as the pressure in said cylinder is sufficient to overcome said spring means and hold said piston in said position at said one end of the cylinder.

6. A fluid fuel burner comprising means forming a chamber for carrying air under pressure, a cylinder mounted therein, a piston movable in said cylinder, spring means acting against said piston to yieldably hold the latter adjacent the inlet end of the said cylinder until fluid pressure is developed in said cylinder against the piston, and a passage formed in said cylinder in a position to by-pass said piston when the piston is forced to the other end of the cylinder by pressure of fluid delivered through said inlet into said cylinder, whereby said fluid flows around said piston and out through the outlet of said cylinder, a piston rod extending forwardly from said piston, and a burner head carried by the forward end of said rod.

7. A structure as defined by claim 6 having a second outlet from said cylinder positioned relative to said passage so as to be closed when said piston is at said other end of the cylinder and open when said spring means moves said piston to the inlet end of said cylinder, thereby placing the two outlets in communication with each other.

8. A fluid fuel burner comprising means forming a chamber for carrying air under pressure, a cylinder mounted therein, having a groove cut in the internal wall of the cylinder approximately midway of the length of the cylinder, a piston movable in said cylinder and partly over-lapping said groove when the piston reaches the forward limit of its motion, a nozzle projecting from said cylinder and connected with said piston to be shifted by movement of the piston, a combustion zone originating within the forward end of the chamber when the piston has reached substantially the limit of its forward motion, combustion taking place in the forward end of the chamber, spring means acting against said piston for retracting said nozzle, and means for supplying fluid fuel under pressure to said cylinder, the pressure being sufficient to move said piston against the force of said spring means, said groove serving as a by-pass means for receiving fuel from said chamber when fuel from said fuel-supplying means is forced into the chamber.

9. In a fluid fuel burner having a draft tube and a combustion zone located in the forward end thereof, a nozzle located in said draft tube, means supporting said nozzle for movement toward and away from the combustion zone, an ignition device fixedly located in the combustion zone, a piston and cylinder unit for shifting said nozzle, a nozzle tube for delivering fluid fuel to said nozzle by first directing said fluid fuel into said cylinder to cause the pressure of said fuel to shift said piston and move said nozzle into said combustion zone, a groove cut in the internal wall of the cylinder and cooperating with said cylinder wall in the formation of a by-pass, said by-pass allowing the fuel to by-pass the piston and reach the nozzle tube when said nozzle is forced forwardly, and means for retracting said nozzle from said combustion zone and for withdrawing fuel from said nozzle when the burner ceases to operate.

10. In a fluid fuel burner, a cylinder carrying fluid fuel to a nozzle, a piston movable lengthwise of said cylinder, a nozzle carried by said piston, an air-carrying pipe surrounding said nozzle and extending beyond said nozzle when the latter is fully extended, said nozzle being extended by the pressure of fuel on said piston, a by-pass within said cylinder opened to the flow of fuel by said piston when it is forced forwardly by pressure of said fluid fuel on said piston, a passageway into said nozzle being opened to said by-pass when the nozzle is forced forwardly, and a spring for returning the piston, which causes fuel to be withdrawn from said nozzle when the piston is withdrawn.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
966,987	Barnhill	Aug. 9, 1910
1,160,806	Wuestner et al.	Nov. 16, 1915
1,858,302	Marshall	May 17, 1932
1,928,839	Marsden	Oct. 3, 1933
2,047,523	Scranton et al.	July 14, 1936
2,070,411	Powers	Feb. 9, 1937
2,071,143	Scott	Feb. 16, 1937
2,094,943	Gianola	Oct. 5, 1937
2,096,267	Tilghman	Oct. 19, 1937
2,120,387	Bargeboer	June 14, 1938
2,331,603	Falcon	Oct. 12, 1943
2,382,483	Holden	Aug. 14, 1945
2,458,372	Grimmeisen	Jan. 4, 1949
2,592,132	Feilden	Apr. 8, 1952

FOREIGN PATENTS

Number	Country	Date
774,362	France	Sept. 17, 1934
63,609	Netherlands	May 26, 1949