

[54] **HEATING SYSTEM**

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[58] Field of Search **431/43, 45, 46, 47, 53; 236/75**

[56] **References Cited**

UNITED STATES PATENTS

3,108,630 10/1963 Forniti **431/72 X**

Primary Examiner—Carroll B. Dority, Jr.

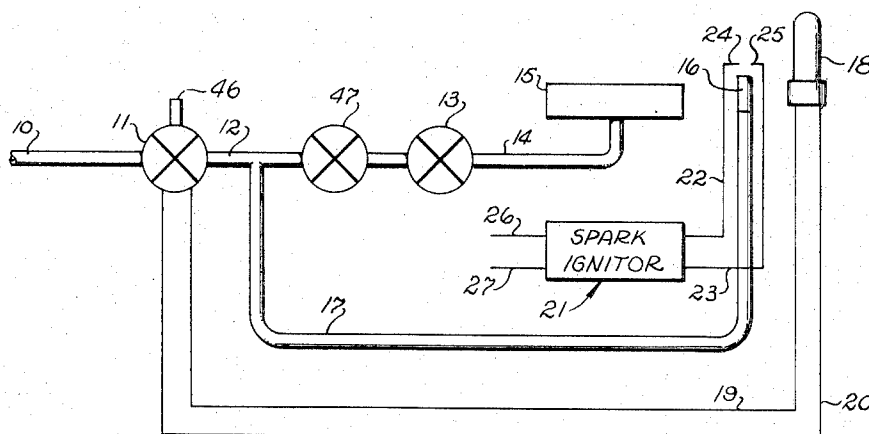
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[57]

ABSTRACT

A heating system including a spark ignitor for a pilot burner which utilizes a safety shut off valve operated by the pilot thermocouple when the pilot goes out, wherein the ignitor is connected in parallel with the thermostat. If an air or gas disturbance causes the pilot to go out, the same disturbance or a temporary electric power failure may prevent or delay pilot reignition. If the safety valve closed before reignition, no hazard exists. However, if the safety valve is still open while initially no reignition occurs, the thermostat opens the main valve and reignition is thus prevented for a relatively long time, e.g., several seconds, a large amount of gas can be dumped into the combustion chamber, mixed with air therein and exploded by delayed ignition. In the unique hook-up where the ignitor is connected in parallel with the thermostat, no delayed ignition can take place. If the pilot has not been reignited prior to the thermostat switch closing, i.e., calling for heat, the ignitor will be disabled by the thermostat switch thus preventing ignition.

5 Claims, 2 Drawing Figures



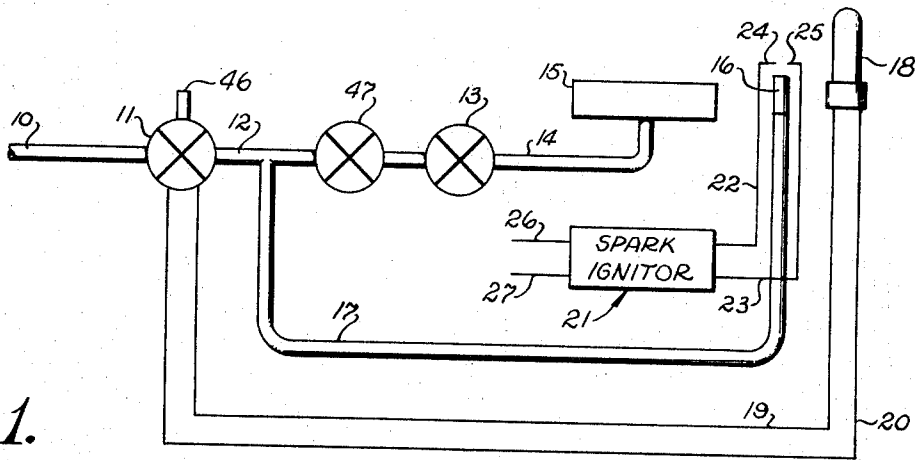


Fig. 1.

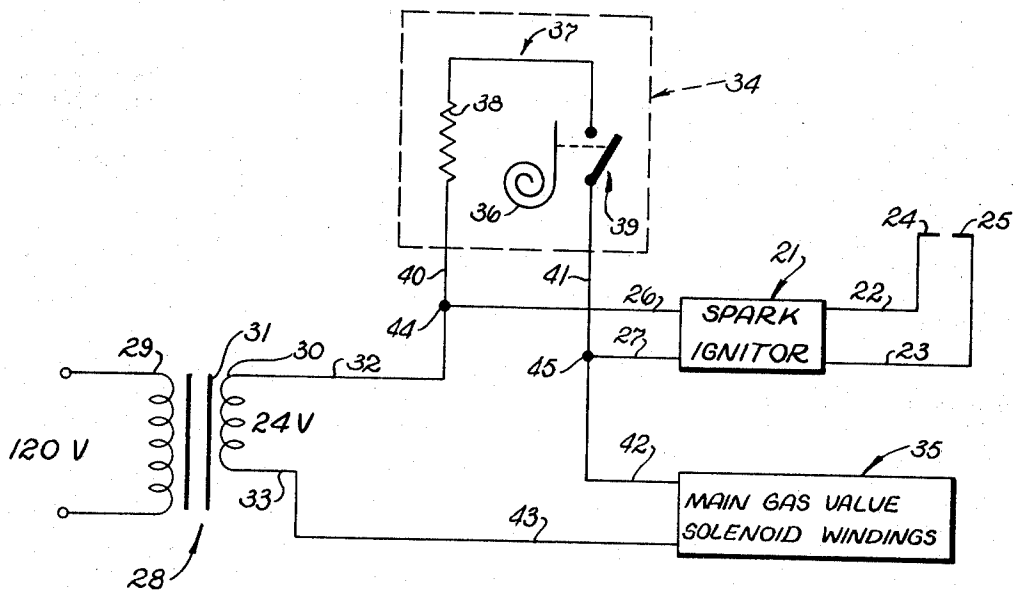


Fig. 2.

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HEATING SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to fuel burning apparatus, and more particularly, to a safety shut off for an electrical pilot ignitor.

In a conventional heating system, an electromagnetic safety valve is energized by a thermocouple heated by, for example, a natural gas pilot. The gas inlet is connected first to the safety valve. Closure of the safety valve thus prevents gas from entering any part of the system. So long as the pilot is burning and keeps the thermocouple up to temperature, the safety valve is maintained open. If the pilot goes out, the safety valve closes after a time delay dependent upon the rate of cooling of the thermocouple.

By themselves, spark ignitors are old in the art. It is also old in the art to use a spark ignitor to light the pilot of a heating system. However, during the said time delay the safety valve is open. Conventional spark ignitors spark at regular intervals during actuation. However, if the same disturbance that caused pilot outage persists, reignition may be delayed. Thus, several seconds before reignition, great quantities of gas can escape from the main burner while the pilot is put. Subsequent reignition of this gas mixed with air in the combustion chamber can thereby cause an explosion that is extremely hazardous to both person and property.

SUMMARY OF THE INVENTION

In accordance with the system of the present invention, the above-described and other disadvantages of the prior art are overcome by employing an electrical ignitor for the pilot of a heating system, the ignitor having a power input circuit connected in parallel with the system thermostat circuit.

The thermostat circuit includes a series connected switch which, when closed, shunts the ignitor input and renders it inoperative. The same switch, when closed, may also open the main gas valve. However, with the ignitor rendered inoperative, the hazard due to the escape of gas is substantially lessened.

The above-described and other advantages of the present invention will be better understood from the following detailed description when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings which are to be regarded as merely illustrative:

FIG. 1 is a diagrammatic view of a heating system; and

FIG. 2 is a schematic diagram of a portion of the heating system shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing in FIG. 1, a gas inlet 10 is connected to the inlet of an electromagnetic safety valve 11. As gas line 12 connects the outlet of valve 11 with the inlet of a manual gas valve 47. The outlet of manual gas valve 47 is connected to the inlet of a main gas valve 13. A gas line 14 connects the outlet of valve 13 with the main burner 15 of the system.

A pilot burner is indicated at 16. A gas pipeline 17 forms a pipe "T" with line 12 and connects the same to pilot burner 16.

A thermocouple 18 is positioned adjacent pilot burner 16 to be heated by the burning gas over pilot burner 16. Thermocouple 18 has electrical output leads 19 and 20 which are connected to valve 11. When thermocouple 18 is up to temperature, and the gas escaping from pilot burner 16 is ignited, valve 11 will stay open. If the pilot light goes out, thermocouple will cool. However, valve 11 will not close immediately. Specifically, there will be a time delay between when the pilot goes out and when valve 11 closes.

A spark ignitor 21 has contacts 22 and 23 from the output thereof to spark electrodes 24 and 25, respectively, positioned over pilot burner 16. Ignitor 21 may be of the spark type for automatically igniting the pilot only when it goes out. Alternatively, ignitor 21 may be of the spark type that produces sparks at regular intervals independently of pilot outage. Ignitor 21 has power input leads 26 and 27.

As stated previously, ignitor 21 may take any one of a great many forms. However, as an example only, ignitor 21 may be of the type disclosed in copending application Ser. No. 77,070 filed Oct. 1, 1970, and now U.S. Pat. No. 3,662,185 for SPARK GENERATOR AND COMPONENTS THEREFOR by Said Sapir, assignor to the assignee of the present application. Said application, in its entirety, is hereby incorporated herein by this reference hereto as though fully set forth herein hereat.

Whatever ignition apparatus is employed will generally have an input resistance which is large in comparison to the resistance of winding 35. Stated other ways, circuit 37 in relation to ignitor 21 must have a resistance low enough to disable it by creating effectively, a short circuit between leads 26 and 27 when switch 39 is closed. Further, the input resistance of ignitor 21 must be sufficiently large so as to prevent sufficient energization of winding 35 to open main valve 13 when switch 39 is open. Still further, the parallel resistance of circuit 37 with the ignitor input resistance must be sufficiently low when switch 39 is closed so as to energize winding 35 enough to open main valve 13.

In FIG. 2, an input transformer 28 is shown having a 120 volt primary 29, a 24 volt secondary 30 and a magnetic core 31.

Secondary 30 has a lead 32 connected to one end thereof, and a lead 33 connected to the other end thereof.

Also shown in FIG. 2 is a thermostat 34, the solenoid winding 35 of main gas valve 13 and spark ignitor 21.

Thermostat 34 includes a spiral bimetal 36 and a series circuit 37 including a resistive heater winding 38 and a switch 39 connected in series therewith. Winding 38 is called an anticipator and heats the bimetal 36 when switch 39 is closed to prevent the space to be heated from getting too hot before switch 39 opens. Bimetal 36 operates switch 39.

Circuit 37 has leads 40 and 41 extending therefrom. Thermostat 34, with leads 40 and 41 disconnected from the circuit shown in FIG. 2, by itself, may be entirely conventional. The same is true of ignitor 21 when input leads 26 and 27 thereto are disconnected from

the circuit of FIG. 2, and the same is true of winding 35 of gas valve 13 when its leads 42 and 43 are disconnected from the circuit of FIG. 2.

As shown, leads 26, 32 and 40 are connected to a common junction 44. Leads 27, 41 and 42 are connected to a common junction 45. Leads 33 and 43 are connected together.

OPERATION

When safety valve 11 is closed and the system is cold, as is conventional, safety valve 11 may be opened manually by depressing a pin 46 shown in FIG. 1. The pilot may then be lit manually and pin 46 depressed for a length of time to heat thermocouple 18 up to temperature. The voltage appearing between thermocouple leads 19 and 20 will then hold safety valve 11 open without depressing pin 46 any longer. Pin 46 may be spring biased upwardly, as viewed in FIG. 1.

Manual gas valve 47 may then be opened, and the system can be controlled by thermostat 34 located in a space to be heated by main burner 15.

Should the pilot go out, ignitor 21 will attempt to relight the pilot. If thermostat 34 is not calling for heat, switch 39 will be open, and the voltage drop across winding 35 will not be sufficient to disable ignitor 21. Further, the voltage drop across winding 35 will be insufficient to open main valve 13. Main valve 13 will thus remain closed.

If the temperature of thermostat 34 is of a certain value, switch 39 may close. When switch 39 is closed, the resistance of circuit 37, which is then connected in parallel with the power input circuit of ignitor 21, is sufficiently low so as to render ignitor 21 inoperative. That is, the output voltage therefrom is insufficient to produce ignition.

Note will be taken that closure of switch 39 will cause winding 35 to be energized. This means that main gas valve 13 will be opened and gas can escape from main burner 15.

Were spark ignitor input leads 26 and 27 disconnected from leads 40 and 41 and reconnected directly to transformer leads 32 and 33, a hazardous condition could exist. In such a case, if the pilot light went out would not reignite because of the same persisting condition that caused the initial outage, closure of thermostat switch 39 would energize winding 35, open main valve 13 and cause a large amount of gas to be built up in the combustion chamber before the safety valve 11 would shut off. Later reignition of the said large amount of gas could then cause an explosion.

The said hazardous condition is avoided in accordance with the device of the present invention because thermostat 34 which energizes solenoid 35 by the closure of switch 39 also disables the ignitor by the self same switch closure. Thus, even through the main valve 13 has been opened by the switch closure the gas admitted to the main burner 15 by the main valve 13 cannot explode because the disabled ignitor 21 cannot ignite the said gas so admitted.

Note will be taken that even though the closure of switch 39 creates a hazard by energizing main valve winding 35, the very same switch 39 minimizes this hazard by shunting the power input circuit of ignitor 21.

Note will be taken that the system of the present invention is by no means limited to a spark ignitor or to an ignitor with two spark electrodes. For example, it is conventional to use three spark electrodes or only one. That is, a spark may be produced between a high voltage electrode and, for example, a pilot shield which is grounded when the ignitor has a ground connection.

By this reference hereto, said application Ser. No. 77,070 is hereby incorporated herein as though fully set forth herein hereat.

By this reference hereto, corrected U.S. Pat. No. 3,303,866 is also hereby incorporated herein as though fully set forth herein hereat. Said patent may be substituted for the entire structure shown in FIG. 1, except for leads 22, 23, 26 and 27; spark electrodes 24 and 25; and ignitor 21.

The system of the present invention is by no means limited to any particular voltage such as 24 volts.

What is claimed is:

1. A heating system comprising: an inlet; a main burner; an electromagnetic safety valve having an inlet and an outlet; a main solenoid valve, said safety valve and said main valve being connected in that order to said main burner to admit gas to said main burner only when both of said valves are open; a pilot burner connected from the outlet of said safety valve to receive combustible fuel therefrom when said safety valve is open; a thermocouple positioned adjacent said pilot burner to be heated when fuel escaping from said pilot burner is ignited; means electrically connecting said thermocouple to said safety valve, said thermocouple supplying an operating voltage to said safety valve sufficient to hold said safety valve open when the fuel escaping from said pilot burner is ignited for a sufficient length of time, said safety valve being adapted to close at a time after the pilot light has gone out; an electrical ignitor having ignition means connected to the output thereof and extending contiguous to said pilot burner for ignition of fuel escaping therefrom, said ignitor having first and second leads; first and second main leads; and a thermostat positioned in a space to be heated by said main burner and including a series circuit, said circuit including a series connected switch, said thermostat including a temperature sensitive device to close said switch when the ambient temperature falls below a set temperature and to open said switch when the ambient rises thereabove, said circuit having first and second leads connected from each end thereof, said first main lead being connected to said first circuit lead and to said first ignitor lead, said main valve including a solenoid winding having a lead connected from each end thereof, said second circuit lead being connected to said second ignitor lead and to one of said winding leads, said second main lead being connected to the other of said winding leads, said circuit having a resistance such that closure of said switch renders said ignitor inoperative, said ignitor being operative when said switch is open, said ignitor having an input resistance sufficiently large to prevent sufficient energization of said solenoid winding to open said main valve when said switch is open, the resistance of the parallel connection of said circuit and the ignitor input when said switch is closed to cause sufficient energization of said solenoid winding to open said main valve.

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2. The invention as defined in claim 1, wherein said ignitor is a spark ignitor which produces a spark at said pilot burner with a predetermined frequency when the pilot light is out, said ignition means including at least two spaced spark electrodes.

3. The invention as defined in claim 2, wherein said circuit includes a heat anticipator, said heat anticipator being a resistive heater positioned to heat said temperature sensitive device and connected in series with said switch.

4. The invention as defined in claim 3, including a

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conduit connecting the outlet of said safety valve with said pilot burner, and a manually operable valve connecting the outlet of said safety valve with the inlet of said main valve.

5 5. The invention as defined in claim 1, wherein said circuit includes a heat anticipator, said heat anticipator being a resistive heater positioned to heat said temperature sensitive device and connected in series with said switch.

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