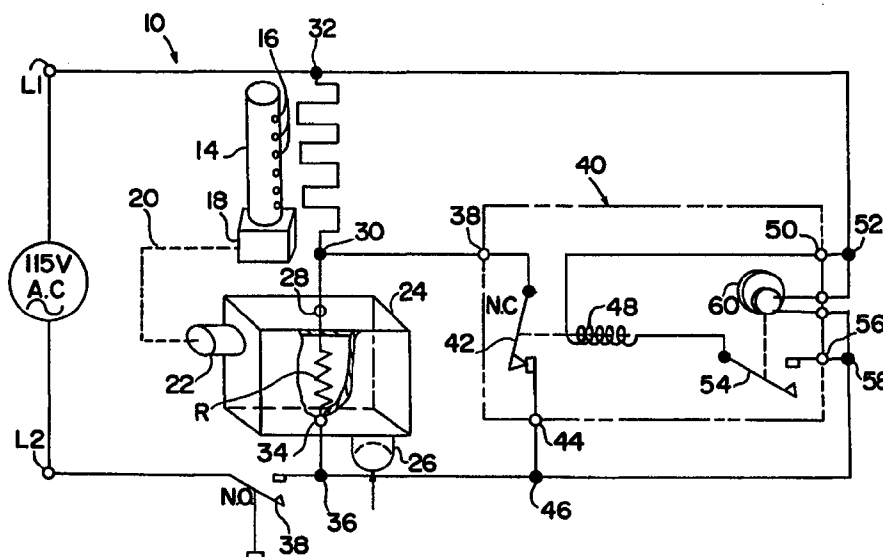




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(21) International Application Number: PCT/IB98/00437 (22) International Filing Date: 17 February 1998 (17.02.98) (30) Priority Data: 08/802,623 19 February 1997 (19.02.97) US (71) Applicant: RANCO OF DELAWARE, INC. [US/US]; Suite 1704, 300 Delaware Avenue, Wilmington, DE 19801-1612 (US). (72) Inventor: CEJI, Li; Apartment 211, 545 Thornhill Drive, Carol Stream, IL 60188-2722 (US). (74) Agents: MARTIN, Terrence et al.; The Foxboro Company, 33 Commercial Street, Foxboro, MA 02035-2099 (US).		(81) Designated States: AU, BR, CA, JP, KR, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>

(54) Title: IGNITION CONTROL SYSTEM FOR IGNITING A FUEL GAS BURNER



(57) Abstract

An ignition system for a gaseous fuel burner having an electrical resistance ignitor series wired with the actuator of an electrically operated gas line valve controlling flow to the burner. A normally closed shunt switch by-passes current flow to the valve actuator allowing full line voltage across the ignitor for rapid heating. Upon user closing of a power line switch to light the burner, a time delay means is energized and after lapse of a predetermined interval is operable to open the shunt switch allowing current to flow to the valve operator for opening the line valve. The time interval is chosen to ensure the ignitor heats to ignition temperature before the shunt switch is opened.

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IGNITION CONTROL SYSTEM FOR IGNITING A FUEL GAS BURNER**BACKGROUND OF THE INVENTION**

The present invention relates to electrical resistance ignitors of the type which are disposed adjacent a fuel gas burner for igniting the fuel air mixture emanating from the burner flame generating ports. In particular, the invention relates to resistance heating ignitors of the type which are employed electrically series connected with a heat motor associated with an electrically operated gasline valve controlling flow to the burner. Burner ignition systems of the latter type require that the ignitor reach ignition temperature of the gas before sufficient current flows in the valve heat motor to cause the valve to open and create flow through the burner ports. It is known to utilize an ignitor formed of a negative thermistor or negative slope resistance material such as silicon carbide having the properties that the resistance decreases with temperature. Negative slope thermistor type ignitors when connected in series with the gas valve heat motor actuator can be tailored such that the resistance maintains a level sufficient to prevent adequate current flow through the valve to cause the valve to open until the ignitor has reached ignition temperature. However, in order to achieve this result in a manner which is predictable and which will accommodate fluctuations in power line voltage, it is required to have tight control of the tolerances on the resistance value versus temperature of the ignitor and of the resistance of the heating element in the gas valve actuator. This has proven to be somewhat costly and created problems in manufacturing of the ignitors and of the heat motor actuator for the gas valve.

It has thus been desired to provide a way or means

of utilizing an electrical resistance ignitor in series with a gas valve heat motor actuator and to eliminate the problems of maintaining tight control of the values of resistance for the ignitor and the valve heat motor actuator.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide an ignition system for igniting a fuel gas burner utilizing a resistance heating ignitor electrically series connected with an actuator in an electrically operated gasline valve.

It is a further object of the present invention to provide an ignition system for a fuel gas burner having a resistance type ignitor electrically series connected with a heat motor actuator associated with an electrically operated gasline valve which does not require a negative thermistor type ignitor or tight control of the resistance versus temperature properties of the ignitor.

It is a further object of the present invention to provide a resistance type ignitor for a fuel gas burner of the type series connected with an electrically operated gasline valve with the valve actuator initially shunted for a predetermined time interval to apply full line voltage across the ignitor to maximize the rate of heating of the ignitor.

The present invention provides a solution to the above described problem of eliminating the need to precisely control the resistance properties of an ignitor and the heat motor for actuating a gasline valve to control flow through the burner. The present invention utilizes a resistance heating ignitor of the type disposed adjacent a burner for igniting the fuel gas upon impingement of the gas on the hot surface of the ignitor with the ignitor electrically series

connected to the heat motor actuator in the electrically operated gas valve and employs a shunt switch for allowing full line voltage to be applied across the ignitor. The ignition system of the present invention employs a time delay which is initiated upon the user closing the line switch to power the ignitor and the time delay maintains the shunt switch closed for a sufficient period of time to allow the ignitor to reach ignition temperature whereupon the shunt switch is opened and the current flowing through the ignitor is allowed to flow through the valve actuator for opening the gas line valve.

The shunt switch may be either electromechanically actuated by a solenoid or the shunt switch and time delay may comprise solid state electronic circuitry or a combination thereof.

BRIEF DESCRIPTION OF THE DRAWING

The sole figure of the drawing is a pictorial schematic of the ignitor of the present invention installed in a typical series connected burner ignition system.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, the ignitor of the present invention denoted by reference numeral 10 is indicated as installed in a burner ignition system indicated generally at 10 which has a burner tube 14 with a plurality of flame generating ports 16 disposed adjacent ignitor 12. The burner tube 14 has an inlet end 18 thereof connected via a gas conduit 20 to the outlet 22 of an electrically operated gas valve 24. The valve 24 has an inlet 26 which is adapted for connection to a source of fuel gas (not shown) which provides flow in the direction shown by a black arrow in the drawing.

The gas valve 24 has an electrical operator provided therein which is indicated by the resistance R which is connected through one connecting terminal 28 of the valve to junction 30 which is connected to one side of ignitor 12, with the opposite side of the ignitor connected to junction 32 on one side L1 of the power line. The opposite side of valve actuator R is connected through terminal 34 of the gas valve to a junction 36 which is connected through a user control switch 38 to a second side L2 of a power line.

Ignitor junction 30 is connected to a terminal 38 of a time delay switch circuit indicated generally at 40; and, terminal 38 is connected to one side of a normally closed switch 42 which has its opposite side connected through terminal 44 to junction 46 on power line L2. The switch 42 is operable in its normally closed condition to act as a shunt for valve 24 such that the full power line voltage is applied across ignitor 12 when the switch 42 is closed.

Switch circuit 40 includes a relay 48 in the form of a solenoid coil which has one side thereof connected through terminal 50 to junction 52 on power line L1. The opposite side of relay 48 is connected to a normally open switch 54 which has its opposite side connected to terminal 56 which is connected to power line junction 58 on power line L2. Power line junctions 52, 58 are each connected to one side of a motorized timing device 60 which is connected to operate switch 54. In operation, upon user closure of switch 38 timing device 60 is energized and after a predetermined time delay preferably on the order of about thirty seconds (30-60 sec.) to one minute operates to close switch 54 which energizes coil 48 to open normally closed switch 42. However, it is anticipated that the delay may be of about ten to about sixty seconds. Opening of switch 42 allows the voltage at junction 30 to be applied to the resistor R to begin heating the valve actuator for

opening of the valve. The time delay for opening of switch 42 is chosen to be more than sufficient to ensure ignitor 12 reaches ignition temperature before valve 24 can open thereby preventing a hazardous condition. It will be understood that although device 40 has been illustrated using an electromechanical relay, timer and switches, solid state electronics may be alternatively used to perform the function of device 40.

The present invention thus provides a unique and novel electrical resistance hot surface ignitor for igniting a fuel gas burner and particularly for ignition systems where the resistive ignitor is electrically series connected with an electrical operator in the gas line valve controlling flow to the burner; and, it is not necessary to rely upon the resistance versus temperature properties of the ignitor to control the opening of the valve. If the current flowing in the ignitor is sufficient to operate the valve actuator, when the switch 42 is opened, the valve will be open. It is thus only required that the time delay be chosen to ensure the ignitor will reach ignition temperature at the minimum line voltage.

Although the invention has hereinabove been described with respect to the illustrated embodiments, it will be understood that the invention is capable of modification and variation and is limited only by the following claims.

CLAIMS

1. An ignition system for supplying gaseous fuel to a burner and for igniting a fuel gas air mixture discharging from a burner flame port, said system comprising:
 - (a) a resistance ignitor disposed adjacent said burner port and operable upon sufficient current flow therethrough to ignite the mixture;
 - (b) valving structure operable upon connection to a source of fuel gas and upon electrical energization to open for controlling flow of fuel gas to the burner, said valving structure including an electrical operator series connected with said ignitor;
 - (c) a normally closed shunt switch means connected to bypass said valving structure electrical operator; and,
 - (d) switch actuation means including time delay means and operable upon user electrical energization for delaying opening of said shunt switch for a predetermined time to permit current flow through said ignitor to cause said ignitor to heat to a temperature sufficient to ignite the fuel gas-air mixture, whereupon lapse of said predetermined time, said actuation means is operable for opening said switch thereby permitting sufficient current flow through said electrical operator to effect opening of said valving structure and fuel gas flow from the source to the burner.

2. The system defined in claim 1, wherein said valving structure includes a bi-metal member and said electrical operator comprises a resist heater for heating said bi-metal member.
3. The system defined in claim 1, wherein said time delay predetermined time comprises a time period not greater than sixty seconds.
4. The system defined in claim 1, wherein said predetermined time period is in the range thirty to sixty seconds.
5. A method of controlling gaseous fuel flow from a source to a burner and igniting a gaseous fuel-air mixture flow emanating from the burner, said method comprising:
 - (a) connecting an electrically operated valve to a source of fuel gas;
 - (b) connecting said valve electrically in series circuit with a resistance ignitor and disposing said ignitor adjacent said burner;
 - (c) shunting said valve with a normally closed switch and energizing said series circuit and flowing current through said ignitor and said switch; and,
 - (d) delaying a predetermined time after said energization and opening said switch and flowing current through the valve.

6. The method defined in claim 5, wherein said step of delaying includes delaying for a time period in the range of about ten to about sixty seconds.
7. The method defined in claim 5, wherein said step of delaying includes delaying for a time period in the range of about thirty to about sixty seconds.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 98/00437

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F2307/10

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F23Q F24C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 968 785 A (PERL RICHARD L) 13 July 1976 see the whole document ---	1,2
A	US 4 235 586 A (HIRSCH JAMES A) 25 November 1980 ---	
A	US 5 133 656 A (PETERSON SCOTT M) 28 July 1992 -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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24 June 1998

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 98/00437

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