

AUTOMATIC SAFETY GAS HEATING DEVICE

The present invention is related to an automatic safety gas heating device, more particularly, related to a gas heating device for producing instant hot water, in which a diaphragm valve actuated by the water pressure, merely controls a microswitch for an electric control board rather than directly controls the valve of the gas conduit.

Conventionally, as the water pressure acts on a diaphragm valve to move a valve rod, the valve rod will not only actuate a microswitch to continue the sparking of an igniter, but also simultaneously drive a first valve disc to open and admit the gas flowing to the nozzle of a pilot burner and thus igniting the pilot flame thereat. As the pilot flame is ignited, a catch which is controlled by a sensor, will be subsequently disengaged from a second valve disc of a gas conduit of the main flame so that the valve rod will subsequently drive the second valve disc to open and admit the gas flowing to the nozzle of the main burner and burning thereat. In such kind of gas heating device, as soon as the pilot flame or the pilot flame together with the main flame are blown out by the wind, the igniter will re-ignite the pilot flame, and subsequently the main flame as the above-mentioned steps. Hence no unburned gas can be permitted to flow out of the nozzle. The valve disc of the main flame will maintain in close state so long as the pilot flame is not able to be ignited. Therefore, in case the igniter is damaged, only a slight amount of the unburned gas will flow out of the nozzle of the pilot burner, thus resulting

in a serious problem of suffocation and explosive burning. However, as the main and pilot flames are suddenly blown out by a strong wind, while immediate re-ignition is not available, a large amount of unburned gas will rush out of the nozzle of the main burner and cause explosive burning and suffocation. Moreover, in shortage of electricity the valve disc cannot be automatically closed and a great deal of gas will escape from the nozzles of the main burner and pilot burner. Therefore, a further improvement still has to attempted.

In accordance with the present invention, there is provided a gas heating device comprising:

a valve rod connected to a diaphragm valve which is actuated by pressure of water;

an electric control circuit;

a microswitch included in the circuit and adapted to be actuated by movement of the valve rod;

first and second solenoid operable valves connected in series in the circuit and provided respectively in a first gas conduit communicating with

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a nozzle of a pilot burner and a second gas conduit communicating with nozzles of a main burner;

an electrically operable igniter located adjacent the nozzle of the pilot burner and included
5 in and actuatable by the circuit to ignite gas issuing from the pilot burner and thereby provide a pilot flame; and

an electric sensor also located adjacent the nozzle of the pilot burner and included in the
10 circuit for detecting the presence of a pilot flame whereby, when the sensor detects presence of a pilot flame, a signal is generated in the circuit to de-activate the igniter and operate the second solenoid operable valve to supply gas to the main
15 burner.

These and other objects will be apparent by illustrating a preferred embodiment with reference to the following drawings in which:

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Fig. 1 is a schematic view illustrating a preferred embodiment in a state that the diaphragm valve is not thrust by the water pressure;

Fig. 2 is a schematic view as in Fig. 1, but in the other state, in which the diaphragm valve is exerted by the water pressure and the ignition of the pilot burner has been accomplished; and Fig. 3 is a schematic view as in Fig. 1, but in another state, in which the main burner is also fired.

as shown in Fig. 1, as a faucet (not shown) is closed, an elastomeric diaphragm 2 of a diaphragm valve 1 is not thrust by the water pressure and thus sustains in its right position. A valve rod 3 connecting to the elastomeric diaphragm 2 is not driven leftward to actuate a microswitch 4 and an electric control board 11 still maintains in off state. Consequently, each magnet 25, 26 of a first solenoid operated valve 5 and a second solenoid operated valve 6 is de-energised, each spring 7, 8 thrusts the corresponding valve disc 13, 17 against respective valve seat 9, 10 thereby tightly closing the valve. This is to say, the first and second solenoid operated valves 5, 6 will be closed very tightly while the faucet is closed.

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As shown in Fig. 2, as the faucet is open, the elastomeric diaphragm 2 is thrust by the water pressure to drive the valve rod 3 leftward. The microswitch 4 will be lifted to switch on by leftward displacement of a recess 20. At the left end of the valve rod 3 is a spring 22 provided for thrusting the valve rod 3 back as the faucet is closed thereby switching the electric control board 11 off. As the electric control board 11 is switched on, an igniter 12 begins to sparkle while another signal from the electric control board 11 energizes the magnet 25 of the first solenoid operated valve 5 to lift a valve disc 13 upwards against the force of the spring 7 to permit the gas flowing to the pilot flame nozzle 14, which will be ignited by the sparkling of the igniter 12.

As shown in Fig. 3, a sensor 16 is provided near the pilot flame nozzle 14 for detecting the presence of the pilot flame 15. In the presence of the flame 15, the impedance in the sensor 16 varies and induces the electric control board 11 to generate two signals, one of them discontinuing the sparkling action of the igniter 12 and the other energizes the magnet 26 of the second solenoid operated valve 6 and lift the valve disc 17 upward to permit the gas flowing to the main burner 18. The main flame 19 is thus fired thereat by the pilot flame 15. After using it, the faucet is closed and the electric control board 11 is switched off. Consequently each solenoid operated valve 5, 6 de-energizes and the valve discs are thrust back

to close the passage of the gas conduits.

If the pilot flame is blown out undesirably by the strong wind, the sensor 16 will induce the electric control board 11 to send signals to de-energize the magnet 26 thereby closing the valve 6 and at the same time to continue sparking of the igniter 12. The second solenoid operated valve 6 will not open until the pilot flame is re-ignited. Hence, unlike the conventional gas heating device, the possibility of explosive burning and suffocation can be minimized to be negligible.

Further, in shortage of electricity, the solenoid operative valve 5, 6 will automatically close. In case of damage of solenoid operated valves 5, 6 or the springs 7, 8 thereof, the valve discs 13, 17 will be pulled down by the gravity to abutt against the valve seat 9, 10 and close the valves. Therefore, under no circumstance the unburned gas is able to escape from the nozzle of the burners.

With the invention thus explained, it has to be noted that many variation and modifications can be made without departing from the spirit of the preferred embodiment. Therefore, it is intended that the scope of the present invention be defined by the appended claims.



CLAIMS

1. A gas heating device comprising:-

5 a valve rod connected to a diaphragm valve
which is actuated by pressure of water;

an electric control circuit;

a microswitch included in the circuit and
adapted to be actuated by movement of the valve rod;

10 first and second solenoid operable valves
connected in series in the circuit and provided
respectively in a first gas conduit communicating with
a nozzle of a pilot burner and a second gas conduit
communicating with nozzles of a main burner;

15 an electrically operable igniter located
adjacent the nozzle of the pilot burner and included
in and actuable by the circuit to ignite gas issuing
from the pilot burner and thereby provide a pilot
flame; and

20 an electric sensor also located adjacent
the nozzle of the pilot burner and included in the
circuit for detecting the presence of a pilot flame
whereby, when the sensor detects presence of a pilot
flame, a signal is generated in the circuit to



de-activate the igniter and operate the second solenoid operable valve to supply gas to the main burner.

5 2. A gas heating device as claimed in Claim 1 wherein the solenoid operable valves are adapted to close the corresponding first and second gas conduits when supply of electric power to solenoids of the valves is discontinued.

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3. A gas heating device substantially as hereinbefore described and as illustrated in the accompanying drawings.
