United States Patent

Ehrenberg

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[54] **COMBUSTION SYSTEM FOR A HEATER OR THE LIKE**

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[51] **Int. Cl.**.....**F23h 5/08**

[58] **Field of Search**.....431/75, 79; 317/82; 236/5

[56] **References Cited**

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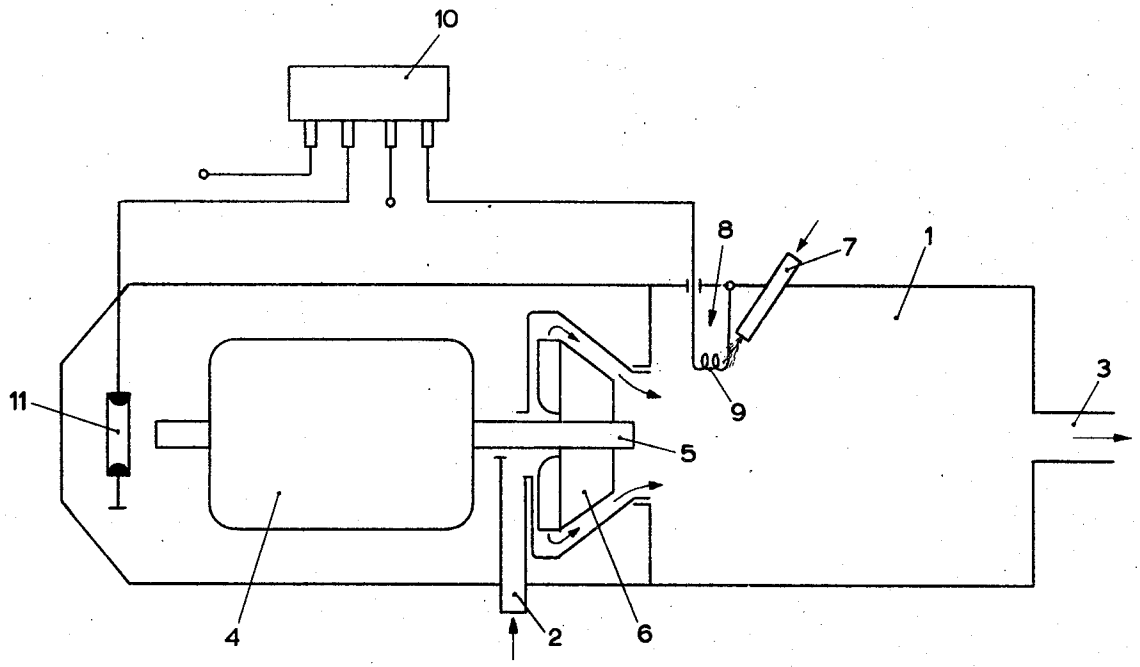
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[57] **ABSTRACT**

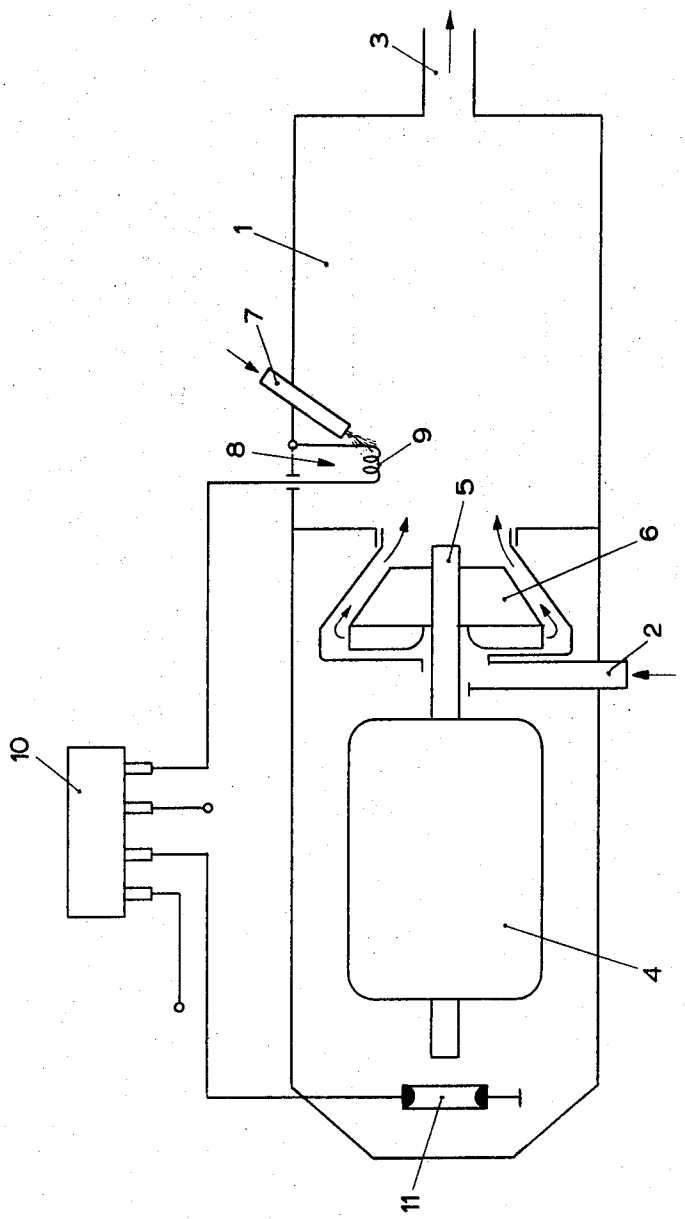
A combustion system, particularly for a fuel burning heater that incorporates a glow plug for initiating combustion and a spark plug for maintaining the combustion. An improved switching arrangement is employed for shutting off the glow plug and initiating the spark plug operation at the appropriate period. This system includes a temperature sensing arrangement that senses the temperature in the combustion chamber by means of a remotely positioned radiantly sensitive switching element. This switching element in effect views the temperature in the combustion chamber through a hollow shaft that drives a fan, which fan circulates the combustion products through the chamber. The sensing element may also be employed for continuing the operation of the fan for a predetermined time period after combustion in the combustion chamber ceases.

5 Claims, 1 Drawing Figure



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COMBUSTION SYSTEM FOR A HEATER OR THE LIKE

BACKGROUND OF THE INVENTION

This invention relates to a combustion system and more particularly to an improved arrangement for sensing the temperature in a combustion chamber.

In various types of combustion devices, such as auxiliary gasoline fired heaters for automobiles, combustion is initiated by a glow plug that brings the charge up to a combustible temperature. At the time the desired temperature is reached the glow plug is switched off and the combustion is maintained by means of a spark plug. Various devices have been used for accomplishing the switching off of the glow plug. Such temperature sensing devices have included quartz switches or other resistive devices located either in the combustion chamber or in the path of discharge of the combustion gases. Since these switches or sensing devices are located in proximity to the combustion area they must be capable of withstanding the high temperatures. As such they are not only expensive but are also subjected to premature failures. If the sensing device is located in the path of the discharge of the combustion gases, a considerable time lag is experienced before the actual switching off of the glow plug occurs.

It is, therefore, a principal object of this invention to provide a temperature device for switching the combustion initiating elements that need not be positioned directly in the combustion chamber.

It is a further object of this invention to provide a system for remotely sensing the temperature in a combustion chamber.

In addition to the switching off of the glow plug, it is a common practice to employ an arrangement for maintaining continued operation of the combustion chamber fan after combustion has ceased. This is done to insure purging of the combustion chamber of combustion products. Again, such switching has previously been accomplished by means of temperature sensing devices that are positioned in the combustion chamber or in the path of discharge of the combustion products. With this type of arrangement the aforenoted problems are also present.

It is, therefore, a further object of this invention to provide a temperature sensing system for maintaining continued operation of a combustion chamber fan for a period of time after the combustion has ceased.

It is yet another object of the invention to provide a temperature sensitive device of the type noted in the preceding paragraph in which the temperature sensing element is not positioned in contact with the combustion products.

BRIEF SUMMARY OF THE INVENTION

This invention is particularly adapted for sensing the temperature in a combustion chamber and for accomplishing a switching action in response to temperature changes in the combustion chamber. This arrangement comprises a combustion chamber in which combustion is to occur, a fan for circulating combustion products through the chamber and a firing device for maintaining combustion within the chamber. The temperature sensing device includes a radiation sensing switching element positioned remotely from the combustion chamber and adapted to perform a switching function in response to temperature variations in the combustion chamber. The fan has a hollow shaft that is adapted to transmit radiant energy from the combustion chamber to the radiation sensitive element.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a partially schematic view of a combustion system embodying this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention is particularly adapted for controlling a supplemental fuel fired heater for an automobile or other motor vehicle. It is to be understood, however, that the invention is capable of use in other embodiments where it is desired to achieve a switching function in response to temperature variations within a combustion chamber. Specifically, the invention has utility in sensing when combustion occurs in a combustion chamber so as to switch off a glow plug and maintain combustion by switching on a spark plug. The device is also adapted for continuing the operation of a fan for a period of time after combustion has ceased so as to purge the combustion chamber.

Referring specifically to the figure of the drawings, a combustion chamber for an automotive heater is identified generally by the reference numeral **1**. Combustion air is delivered to the chamber **1** by means of an inlet pipe **2** and the combustion products are discharged from an exhaust pipe **3**. An electric motor or the like **4** has an output shaft **5** on which a fan blade **6** is mounted. Rotation of the fan blade **6** circulates air and combustion product from the intake pipe **2** through the combustion chamber **1** and out the exhaust pipe **3** in a direction as shown by the arrows in the figure.

Combustion in the combustion chamber **1** is accomplished by delivering fuel in the form of gasoline or the like through a nozzle **7**. The nozzle **7** discharges adjacent an ignition device in the form of a combined glow and spark plug indicated generally by the reference numeral **8**. This combined plug includes an electrical resistance or glow coil **9** and a spark gap (not shown). The spark gap is fired by an ignition circuit of any conventional type (not shown). The glow coil **9** is energized by means including an electric circuit **10**.

In operation, when heat is required, the glow coil **9** is energized by the circuit **10** to raise the temperature in the combustion chamber **1** sufficiently to cause combustion of the fuel introduced by the nozzle **7**. When combustion occurs and is self-sustaining, the glow coil **9** is switched off and combustion is maintained by the firing of a spark across the spark gap. The fan **6** is energized at a suitable time so as to cause a flow of combustible gases from the combustion chamber **1** and discharge the combustion products from the exhaust pipe **3**.

Heretofore, it was the common practice to sense the existence of the temperature in the combustion chamber by the positioning of a sensing element either in the combustion chamber **1** or in the exhaust pipe **3**. The disadvantages of this arrangement have already been noted. In accordance with this invention, the fan

drive shaft 5 is hollow so as to provide a path for the radiant energy in the combustion chamber 1 onto a radiation sensitive switch, indicated generally by the reference numeral 11. The radiation sensitive element 11 is in circuit with the glow coil circuit 10 and operates the circuit 10 when the appropriate temperature is reached in the combustion chamber 1.

As has been previously noted, when combustion in the combustion chamber 1 ceases, it is desirable to maintain the operation of the fan 6 for a period of time so as to purge the combustion chamber 1. The radiation sensitive switching element 11 may also serve this function by connecting it through appropriate circuitry (not shown). When the radiation sensitive element 11 indicates the temperature in the combustion chamber 1 has fallen below the combustion temperature indicating that combustion has ceased, it is used to actuate a suitable time delay circuit (not shown) for continuing operation of the fan 6 through appropriate intervals so as to purge the combustion chamber 1.

The specific circuitry for operating the glow coil 9, spark gap and fan motor 4 have not been described nor illustrated in detail. The form of these circuits may vary and it is well within the scope of those skilled in the art to select suitable circuitry for achieving the desired function. Also, the details of the radiation sensitive switching element 11 have not been shown since any of the known devices of this type may be used.

As has been previously noted, the foregoing description is that of a preferred embodiment of the invention. Various changes and modifications may be made without departing from the spirit and scope of the invention, as defined by the appended claims. For example, various arrangements may be used for changing the path of radiation from the combustion chamber 1 after it has passed through the hollow shaft 5 and before it reaches the radiation sensitive switching element 11. Such well known optical devices such as mirrors may be used for this approach where spacial limitations so dictate.

I claim:

1. In a combustion system including a combustion chamber, a firing device for maintaining combustion within the combustion chamber and a fan for providing circulation in the chamber, the improvement comprising a remotely positioned sensing device for performing a switching function in response to temperature variations in the combustion chamber, said sensing device being positioned remotely from said combustion chamber and sensitive to radiant energy for generating a signal when a predetermined magnitude of radiant energy is experienced, said fan being mounted on a hollow drive shaft which drive shaft extends into said combustion chamber, said hollow drive shaft being positioned to transmit radiant energy from said combustion chamber to said sensing device.

2. A combustion system as set forth in claim 1 wherein the firing device comprises a glow plug and a spark gap, said sensing device being in circuit with said glow plug for switching off said glow plug when a predetermined temperature is experienced in the combustion chamber.

3. A combustion system as set forth in claim 1 wherein the fan includes a motor for driving the fan and further including control circuit means for operating said fan motor, said control circuit means being in circuit with said sensing device for switching said fan motor when a predetermined temperature is experienced in said combustion chamber.

4. A combustion system as set forth in claim 3 wherein the firing device comprises a glow plug and a spark gap, said sensing device being in circuit with said glow plug for switching off said glow plug when a predetermined temperature is experienced in the combustion chamber.

5. A combustion system as set forth in claim 1 wherein the fan is disposed in proximity to an air intake for the combustion chamber, the hollow fan shaft terminating adjacent the sensing device and on the upstream side of the combustion chamber.

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