Nov. 3, 1970 J. N. IGNAZIO 3,537,803

SAFETY DEVICE FOR GAS-FIRED FURNACES AND THE LIKE

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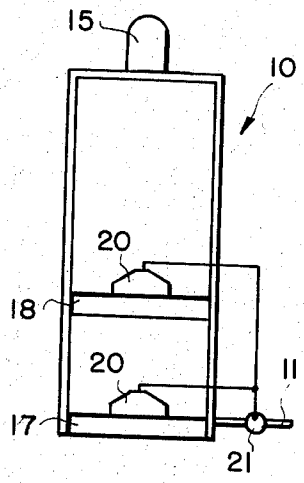

FIG. 1

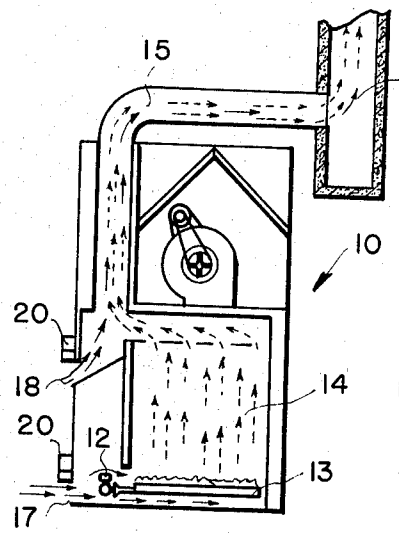

FIG. 2

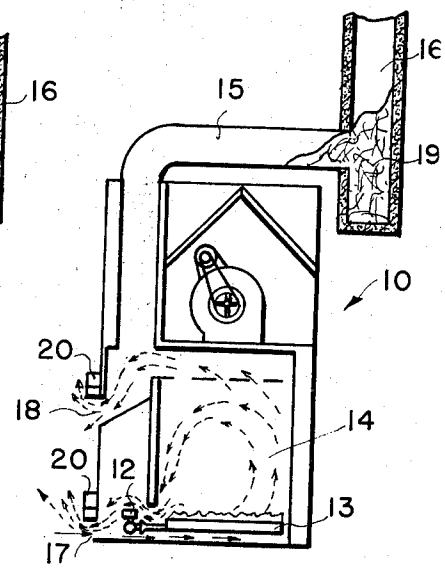

FIG. 3

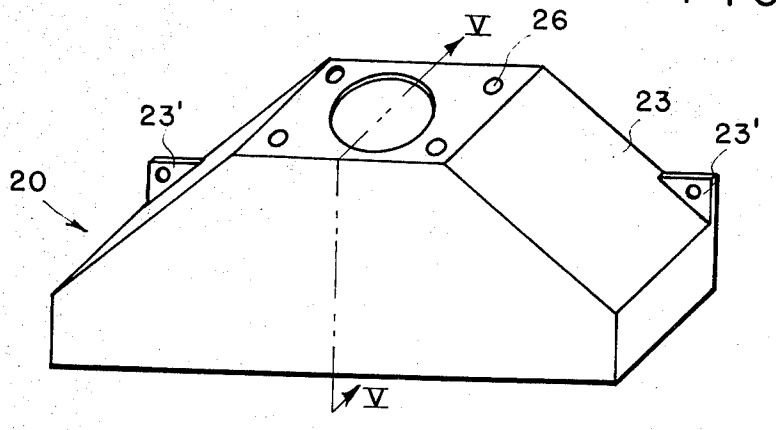

FIG. 4

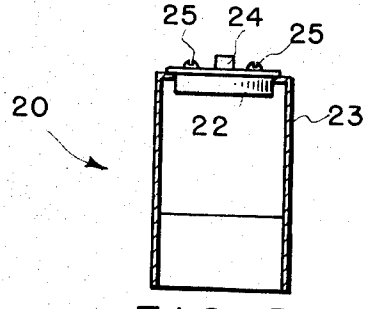

FIG. 5

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SAFETY DEVICE FOR GAS-FIRED FURNACES AND THE LIKE

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Continuation of application Ser. No. 706,355, Feb. 19, 1968. This application Oct. 29, 1969, Ser. No. 872,420
Int. Cl. F23h 5/24
U.S. Cl. 431—22 2 Claims

ABSTRACT OF THE DISCLOSURE

A temperature sensing unit is mounted above the primary, secondary air inlet and/or the draft-diverter inlet of a gas-fired furnace. The sensing device is operative to shut off the fuel supply to the furnace in the event the temperature rises above normal, which occurs when there is any obstruction of the flue or chimney serving the furnace. A mounting box for improved sensitivity is also provided.

This is a continuation of application Ser. No. 706,355, filed Feb. 19, 1968 and now abandoned.

This invention relates to gas-fired furnaces and the like and more particularly to a safety device which automatically shuts off the fuel supply to the furnace in the event there is an obstruction of the combustion chamber, flue, or chimney or if the firing rate of the furnace is excessive.

If for any reason the normal escape path for the combustion products of a gas furnace becomes obstructed the exhaust gases escaped either through the draft diverter opening of the flue or the primary secondary air opening of the combustion chamber. Such a condition may continue unnoticed for a substantial period of time with detrimental and sometimes fatal results. Gas furnaces such as are installed in home heating systems are normally provided with adequate safety devices to protect against over heating of the flue and combustion chamber and to prevent the escape of gas in the event the pilot light is blown out, but these furnaces are normally not provided with any means for shutting down the furnace if the flue or chimney becomes obstructed. While gas analyzers may be used to sense the presence of carbon monoxide, such devices are not practical for home use and consequently are not normally used in conjunction with heating furnaces.

It is the primary object of the present invention to provide a device which shuts off the fuel supply of the furnace in the event there is any obstruction in the normal escape path of the exhaust gases. It is a further object of my invention to provide such a device which is of a high degree of reliability and which is capable of being manufactured and installed at a low cost. Another object of my invention is provision of such a device which may be readily adapted to existing or new equipment with a minimum of modification thereto.

The above and other objects and advantages of my invention will become apparant upon consideration of the following specification and the accompanying drawing wherein there is shown a preferred embodiment of my invention.

In the drawing:

FIG. 1 is a front elevational view of a typical gas furnace showing schematically the installation of my safety device thereto;

FIG. 2 is a side elevational view, in section, of the furnace of FIG. 1 showing the flow of air and exhaust gases under normal operating conditions;

FIG. 3 is a view similar to FIG. 2 but showing the flow of air and exhaust gases when the chimney serving the furnace is blocked by an obstruction;

FIG. 4 is an isometric view of the mounting box for the temperature sensing device of my invention; and

FIG. 5 is a sectional view taken along the line V—V of FIG. 4.

Reference numeral **10** designates generally a gas-fired furnace of the counter-flow type. It will be understood that this type of furnace is chosen for illustrative reasons only and that the invention may be applied to any type of gas-fired furnace. The furnace **10** is connected to a gas line **11** and is provided with the normal controls **12** which are responsive to the thermostat and to the stack temperature safety switches, as is common practice. The furnace is also provided with a burner **13**, combustion chamber **14**, flue **15** which connects with a chimney **16**, with a primary secondary air opening **17** and with a draft diverter opening **18**, all the accordance with common practice. Under normal operating conditions air (indicated by solid arrows in the drawing), enters the opening **17** and combines with the gas in the combustion chamber where it is burned. The exhaust gases (indicated by broken arrows) are carried upward through the chamber **14**, the flue **15** to the chimney **16** and are there exhausted from the building. Some fresh air also enters the draft diverter opening **18** and is carried upward along with the gases from the combustion chamber. If, for any reason, the chimney becomes obstructed as shown at **19** in FIG. 3 the exhaust gases are no longer exhausted through the chimney but rather escape by the openings **17** and **18**, introducing deadly carbon monoxide into the dwelling.

In order to rapidly sense any such malfunction of the furnace I provide temperature sensing devices indicated generally by reference numeral **20**, immediately above the primary air opening **17** and the draft diverter opening **18** of the furnace. Under normal operating conditions such as those shown in FIG. 2 cool air is drawn by these devices and they remain inoperative. However, if there is an obstruction of the chimney, as shown in FIG. 3, or of the flue **15** or the upper portion of the combustion chamber **14**, the exhaust gases and heated air escape through the openings **17** and **18** over the sensing device **20** triggering the temperature sensing units which are connected to a solenoid operated valve **21**. The triggering of any of the sensing devices **20** immediately activates the solenoid valve **21** shutting off the fuel supply to the furnace.

I have found a preferred embodiment of the sensing device **20** consists of a manually resettable thermal disk **22** mounted on the upper end of a hood-like box **23**. The thermal disk **22** is of standard construction and has a reset button **24** which provides a visible indication when overheating has occurred. The disk **22** is also provided with a pair of terminals **25** for connecting the disk to the solenoid control circuit. The box **23** directs a portion of the escaping exhaust gases toward the sensing disk **22**, holes **26** being provided to insure a flow of gas through the box **23**. The box **23** also protects the sensing disk **22** from drafts which tend to effect the reliability of the sensor. In the embodiment shown the sensor mounting box **23** is provided with a pair of lugs **23'** for attaching the unit to the furnace but it will be understood that any suitable mounting means may be used.

The control circuit for the sensing elements **20** and the solenoid valve **21** is not illustrated in detail as the particular circuit employed will be determined by the characteristics of the solenoid **21** and the sensing disk **22**, i.e., whether the solenoid opens or closes the gas line when energized and whether the sensing disk opens or closes the circuit when the temperature of the gases passing through the funnelling box **23** raises above a predetermined level. The details of the control circuit will be readily apparent to one skilled in the art when the characteristics of the control elements are known.

It will be understood that while two sensing elements are shown in the embodiment illustrated, more elements may be used on larger furnaces as desired. Also, the use of this safety system is not limited strictly to furnaces but may be used on other gas appliances as well.

As the above and other changes may be made in and to my invention reference should be had to the appended claims in determining the true scope of the invention.

I claim:

1. In a gas-fired furnace having an enclosure, a combustion chamber within said enclosure, a flue connected to said combustion chamber for conducting the exhaust gases from said combustion chamber, a first opening in said enclosure admitting air into said combustion chamber, and a second opening in said enclosure serving as a draft diverter for said flue, the improvement comprising: a plurality of temperature sensing devices mounted externally of said combustion chamber, one of said temperature sensing devices being mounted on said enclosure immediately above said opening serving as a draft diverter; and means responsive to each of said temperature sensing devices for interrupting the fuel supply of said furnace when the temperature at any one of said sensing devices rises above a predetermined level.

2. The improvement according to claim **1** further including a second temperature sensing device mounted on said enclosure immediately above said first opening, said responsive means being operative upon the rising of the temperature at either of said sensing devices above said predetermined level.

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EDWARD G. FAVORS, Primary Examiner

U.S. Cl. X.R.

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