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THERMOSTATIC SAFETY BY-PASS DAMPER

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This invention relates to a forced air heating unit.

Forced air heating units have been widely used for a number of years and it has been usual to incorporate an air filter for the purpose of taking impurities from the air as it is circulated from the rooms, through the furnace, and back to the rooms. The incorporation of a filter in a coal stoked forced air furnace, however, is a fire hazard in the event of blower failure for any reason. Upon blower failure, circulation through the furnace is retarded by the filter, and the almost still air around the furnace becomes heated to above the safety level. While it is possible to use a combination gravity and forced air feed in furnaces of this nature to overcome this difficulty, it is not very desirable to do so because the air that flows through the gravity feed ducts is not filtered. Moreover, the continuous gravity circulation tends to interfere with the automatic operation of the blower in the filtered forced air duct. I have invented a unit which overcomes these difficulties.

It is then an object of my invention to provide a coal stoked forced air heating unit which will operate with safety in the event of a blower failure, but which does not pass unfiltered air through the furnace on normal operation.

With this and other objects in view, a forced air heating apparatus unit according to my invention is formed with a primary cold air duct and a by-pass cold air duct which communicates with the primary cold air duct. An air forcing blower and a filter are mounted in the primary cold air duct and a damper means is mounted in the by-pass duct. According to the invention, control means are provided for holding the damper closed during normal operation of the unit, both when the blower is operative and inoperative, and for permitting it to open on abnormal operation of the unit when a dangerously high air temperature is reached within the furnace. The invention will be clearly understood after reference to the following detailed description read in conjunction with the drawings.

In the drawings,

Figure 1 is a perspective view partly broken away showing a furnace and an air directing unit according to the invention.

Figure 2 is a detailed sectional view showing the heat responsive bimetal member and the manner of operatively connecting it with the damper retaining latch.

In the drawings, letter A generally indicates a heating unit. It comprises a coal fired furnace

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generally indicated by numeral 10 and an air directing unit generally designated by the numeral 12 for directing air from the rooms into the furnace 10. The operation of this type of unit is well known. Air is conducted into the opening 13 at the top of the air directing unit 12 and forced into the bottom of the furnace 10 by means of the blower 14. From there it passes around the heated fire pot 11 of furnace 10, out the opening 15, and back into the rooms. Numeral 16 indicates a conventional filter for cleaning the air as it is drawn through the air directing unit 12 by the blower 14.

As indicated above, the danger encountered with this type of air heating unit is that the blower 14 may fail in operation. If this occurs cool air from the rooms cannot pass through the cleaning filter 16 and the blades of the air forcing blower 14 with sufficient ease to insure a safe flow of air through the furnace. Under these conditions air in the upper portion of the furnace becomes overheated to the danger point and may cause a fire.

According to my invention, though, the air directing unit 12 is formed with a primary cold air duct 18 in which the blower 14 and filter 16 are located and a by-pass cold air duct 19 that connects with the primary cold air duct 18 as at 20. A damper 22 is hingedly mounted within the by-pass cold air duct 19 and control means is provided for holding the damper closed during normal operation of the unit, both when the blower is operative and inoperative, and for permitting it to open on abnormal operation of the unit when a dangerously high air temperature is reached in the furnace.

In the embodiment of the invention shown, the damper 22 is hingedly mounted as at 23 and biased about its hinge axis to assume an open position (dotted lines Figure 1). The control means for holding the damper in a closed position during normal operation comprises the pivotally mounted latch 24, a helical bimetallic heat responsive member 25, and a connecting link 26 that extends between the arm 27 and the latch 24. The helical member is rigidly connected at one end to the unit frame as at 28 and at the other end to the rotatably mounted shaft 29 which in turn carries the arm member 27. Member 25 is designed to twist when it is subjected to an abnormally high temperature whereby to turn the shaft 29 and raise the latch 24 through the connecting link 26. This, of course, permits the damper 22 to drop to the open position.

The operation of the unit is as follows. Under

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normal conditions of use the damper 22 is retained in a closed position by means of the latch 24 (solid lines Figure 1). The blower 14 usually goes into and out of operation in response to automatic furnace bonnet temperature control devices, to force filtered air through the primary air passage 18 and furnace 10. If, for any reason, the blower motor were to fail only a very small quantity of air could pass through the filter 16 and air surrounding the fire box of the furnace 10 will become overheated. The temperature responsive helical bimetallic member 25 mounted in the upper portion of the furnace then responds to this abnormal temperature to rotate the shaft 29, and shaft 29 carries the arm 27 as it rotates to lift the latch 24. Release of latch 24 permits the damper 22 to drop to the open position and air can enter the furnace by gravity circulation through the by-pass passage 19. When the temperature in the top of the furnace cools down to normal, the bimetallic member 25 of course resumes its normal position and the latch 24 is actuated to its closed position. If, then, the blower 14 again resumes operation, the initial blast of air from the primary air passage on the open damper 22 is sufficient to slam it to the closed position and into locked engagement with the pivotally mounted latch 24. The damper will not open again until released by the temperature responsive bimetallic element 25.

Other forms of the invention than the one shown will of course be apparent to those skilled in the art. I have found it possible, for example, to balance the damper 22 to a closed position and eliminate the temperature responsive member 25. I choose the balancing weights so that they can be overcome by a pressure condition created by overheated air surrounding the furnace to open the damper.

I do not intend then that my invention should be limited by specific embodiment of the invention shown in the drawings.

What I claim as my invention is:

1. For use with a forced air heating unit, apparatus for directing cold air to the furnace thereof, comprising: a housing formed with a primary cold air duct therethrough that communicates with the furnace in use, and a by-pass cold air duct communicating with said primary cold air duct, an air forcing blower mounted in said primary cold air duct between the point of communication therewith of said by-pass cold air duct and the discharge end thereof, a damper hinged in said by-pass cold air duct, a damper retaining means for retaining said damper closed during normal operation of a furnace to which the apparatus claimed herein is con-

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nected in use, both when said blower is operative and inoperative, said damper retaining means being responsive to abnormally high and dangerous temperatures within said furnace to which the apparatus claimed herein is connected in use to free said damper, said damper being mounted to normally hinge to an open position in said by-pass when released by said damper retaining means, said damper being mounted to hinge open towards the discharge end of said primary cold air duct and assume a position in front thereof and thereby in a path of air leaving said latter duct in operation, and having an area, when in open position, in the air path from said latter duct sufficiently large that the force of air thereon from said primary duct created by said blower in operation will urge said damper to a closed position and into operative relation with said damper retaining means.

2. Apparatus as claimed in claim 1, having a filter mounted in said primary cold air duct.

3. Apparatus as claimed in claim 1, in which said damper retaining means comprises a latch to engage and hold said damper in a closed position during normal operation of the heating unit to which said apparatus is connected, and a heat responsive member mountable in the furnace of the heating unit to which said apparatus is connected in use for releasing said latch in response to abnormally high and dangerous temperatures as aforesaid.

4. Apparatus as claimed in claim 1, having an air filter mounted in said primary cold air duct, and in which said damper retaining means comprises a latch to engage and hold said damper in a closed position during normal operation of the heating unit to which said apparatus is connected, and a heat responsive member mountable in the furnace of the heating unit to which said apparatus is connected in use for releasing said latch in response to abnormally high and dangerous temperatures as aforesaid.

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