April 15, 1952 W. C. COLEMAN 2,592,862

NONFLOODING UNDERFLOW AIR-HEATING FURNACE WITH AUXILIARY EXTERIOR AIR INLET

Filed April 18, 1946 2 SHEETS—SHEET 1

Fig. 1.

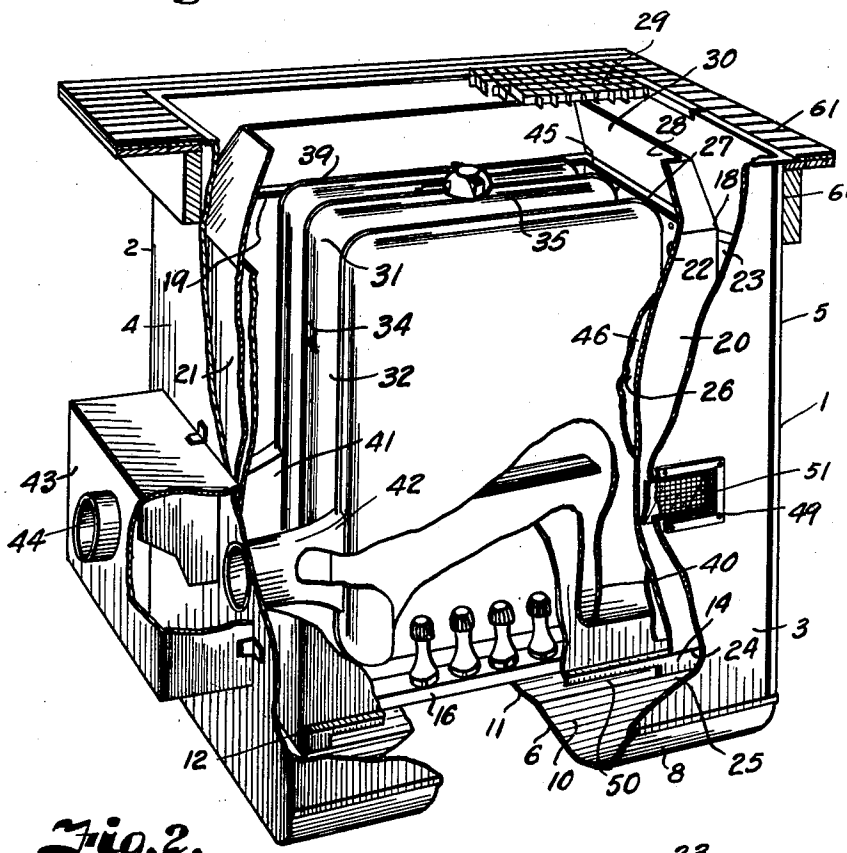
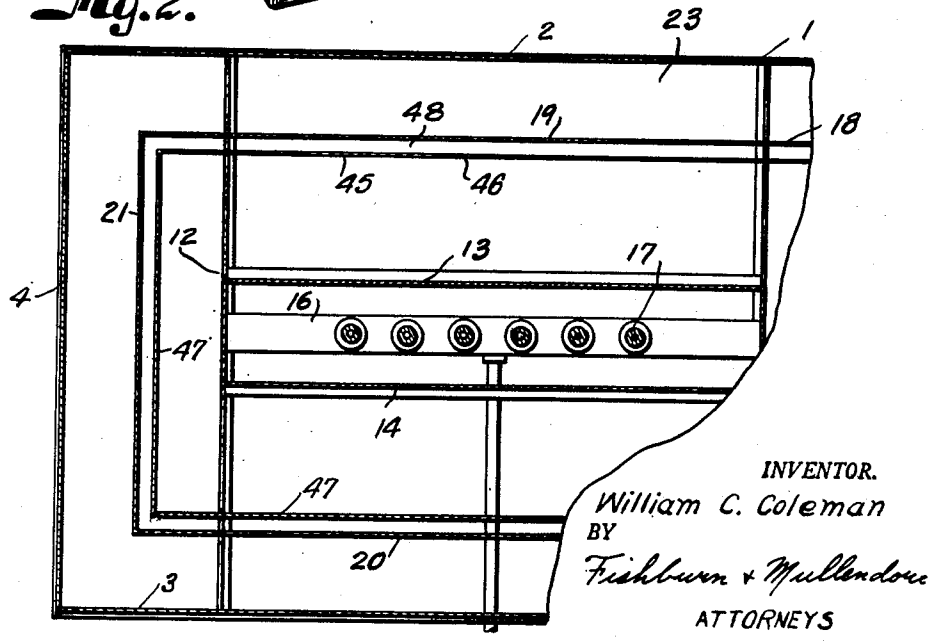


Fig. 2.



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Fig. 3.

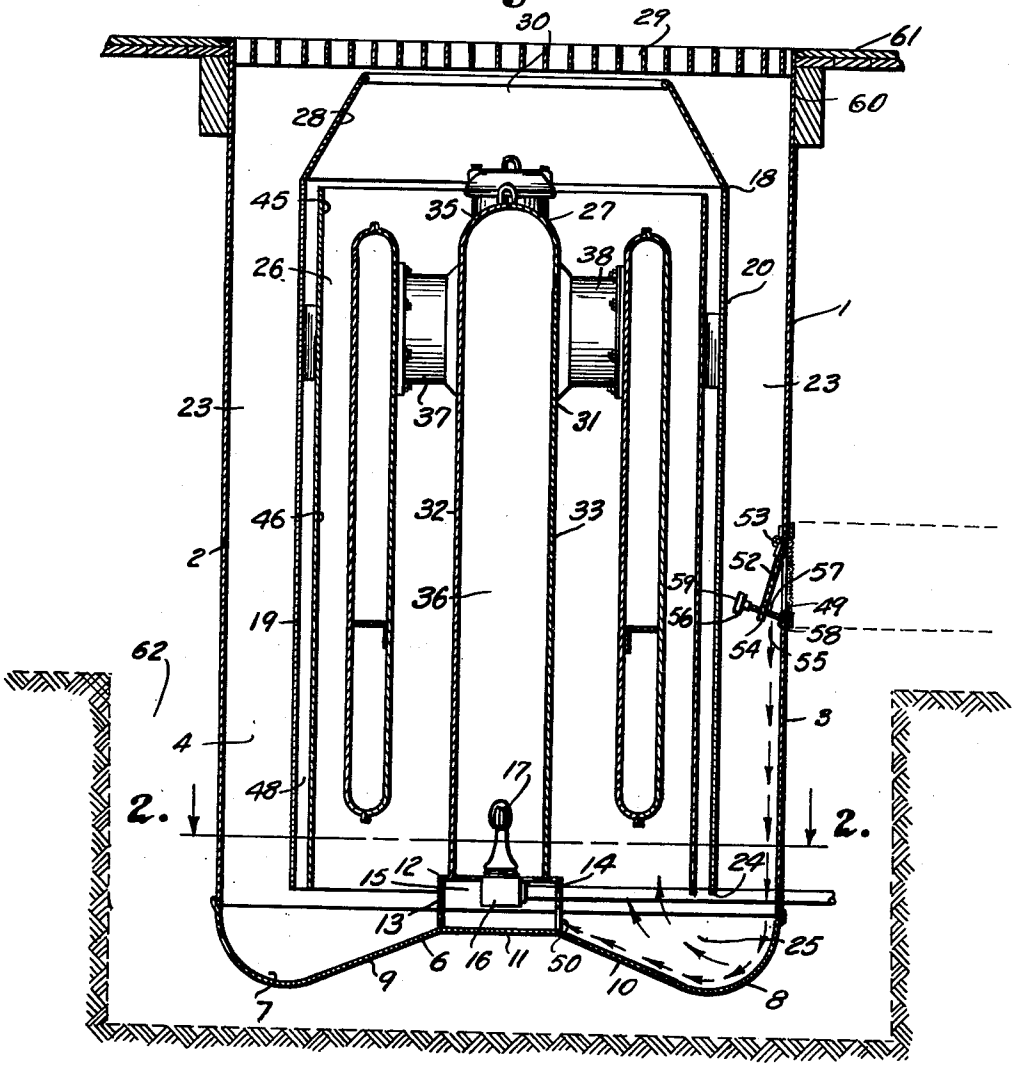
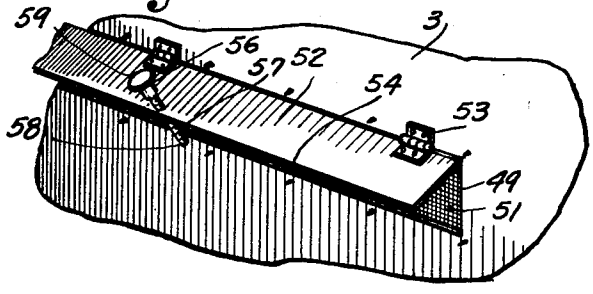


Fig. 4.



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NONFLOODING UNDERFLOOR AIR-HEATING FURNACE WITH AUXILIARY EXTERIOR AIR INLET

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1 Claim. (Cl. 126—116)

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This invention relates to heaters, particularly of the underfloor type sometimes known as floor furnaces.

It is well known that a constant supply of fresh air is required to be admitted to spaces being heated for maintaining wholesome atmospheric conditions and to supply combustion supporting air for operation of the burner of the heater. When underfloor types of heaters are installed in homes built in accordance with present high standard of construction, very little fresh air filters into the space being heated with the result that the walls begin to sweat. Also, when the combustion supporting air is taken from the heated air, the supply of oxygen is gradually reduced.

In some instances, combustion supporting air may be taken from the underfloor space in which the heaters are installed, but in homes having no basements and very little underfloor space, excavations or pits are required to accommodate such heaters; consequently, these pits being of lower level than the outside ground may fill with water which results in shutting off the combustion air supply and flooding of the burner so that the flame is extinguished. Consequently, such arrangements for admitting combustion supporting air produces hazards.

It is, therefore, a principal object of the present invention to provide fresh air from the underfloor space, at a level above the point where water can accumulate, for supplying combustion supporting air to the burner and at the same time supply sufficient fresh air to the space being heated to prevent sweating of the walls as above noted.

It is also an object of the invention to provide a simple and efficient manner of admitting fresh air and to permit control of the air supply from within the heater casing so that the control is readily accessible from above the floor in which the furnace is installed.

In accomplishing these and other objects of the invention, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of an underfloor heater or furnace embodying the features of the present invention, parts of which are broken away to better illustrate the construction.

Fig. 2 is a horizontal section through the heater.

Fig. 3 is a vertical section through the heater, particularly illustrating the means for admitting fresh air to mix with the air being heated and

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for supplying the burner with combustion supporting air.

Fig. 4 is a perspective view of the inside portion of the outer casing illustrating the fresh air inlet opening and the air control and damper therefor.

Referring more in detail to the drawings:

1 designates a floor furnace which includes an outer casing having side walls 2—3, end walls 4—5, and a bottom 6. The bottom 6 is preferably connected with the side walls by leak-tight joints and has downwardly and inwardly curved side portions 7 and 8 for directing air that moves through the casing as later described. The curved portions 7 and 8 terminate in upwardly inclined ramp portions 9 and 10 connected by a horizontal portion 11 extending longitudinally of the casing and on which is supported a burner compartment 12 having longitudinal side walls 13 and 14 to form longitudinal air passageways 15 at the sides of a burner 16 wherethrough air is distributed to support combustion of the fuel discharged from the burner nozzles 17.

Suitably supported within the outer casing is an inner casing 18 having side walls 19 and 20 spaced from the corresponding side walls 2 and 3 of the outer casing and end walls 21 and 22 spaced from the corresponding end walls of the outer casing to provide downflow passageways 23 therebetween. The lower edges 24 of the walls of the inner casing terminate above the curved portions of the bottom to provide outlets 25 for the downflow passageways and to connect with updraft passageways 26 that surround a heater unit 27. The upper edges of the walls of the inner casing are flared inwardly as indicated at 28 to facilitate entrance of air into the upper ends of the flow passageways through a floor grill 29 and to provide a somewhat restricted outlet 30 for the air which has been heated by the heating unit.

In the illustrated instance, the heating unit includes a central combustion chamber section 31 and side walls 32 and 33 supported on the burner chamber as shown in Fig. 3. The side walls are connected by curved end and top walls 34 and 35 to form a closed combustion chamber 36 with exception of the lower portion which connects with the air passageways at the sides of the burner 16. The upper portion of the combustion chamber section has lateral outlets 37 and 38 connected with radiator sections 39 and 40 so that the products of combustion pass upwardly within the combustion chamber for outlet through the lateral connections into the radiator sections

for outlet through flue connections 41 and 42 that are connected with the lower ends of the radiator sections as best shown in Fig. 1. The flue connections extend across the upflow passageway, through the wall of the inner casing across the adjacent downflow passageway and connect with a check draft chamber 43 located on the outer side of the wall 4 of the outer casing and which has a flue connection 44 adapted to be connected by a duct (not shown) with a chimney or other vent for disposal of the products of combustion and to provide the draft necessary for drawing combustion supporting air into the burner chamber as later described.

In order to insulate the heating effects of the heating unit from the walls of the inner casing, the inner casing is preferably provided with a liner 45 having side and end walls 46 and 47 spaced from the corresponding walls of the inner casing to provide secondary upflow passageways 48 for a portion of the air discharged from the lower ends of the downflow passageways.

The structure thus far described is more or less conventional of a standard floor furnace where combustion supporting air is taken from the air circulated through the downflow air passageways, but as above stated, this method of obtaining combustion supporting air avoids the hazards of flooded burner compartments but results in gradual reduction of oxygen content in the space being heated.

In order to overcome this difficulty and at the same time supply a certain amount of fresh air to prevent sweating of the walls in the space being heated, at least one of the side walls of the burner compartment is provided with an elongated air inlet opening 50 and the nearest side wall of the outer casing is provided at a sufficient level above the bottom of the furnace with an elongated air inlet opening 49 of sufficiently large capacity to supply combustion supporting air to the burner and the amount of fresh air necessary to prevent sweating of the walls in the space being heated. For example, assuming that the effective area of the air inlet opening to the burner chamber is approximately 28 square inches, the maximum effective flow capacity through the air inlet opening 49 may be about 60 square inches, although these areas may be changed to suit the operating conditions of the heater. With this arrangement, the air inlet opening 49 may be at a sufficient point above the ground level of the underfloor space so as to avoid inlet of water into the furnace that might result in flooding of the burner. The inlet is preferably covered by a screen or the like 51 to prevent entrance of rodents from the underfloor space to the interior of the heater.

With this construction, it is obvious that the air taken from the underfloor space, being colder than the air moving through the downflow passageway, is of heavy specific gravity and consequently, falls alongside of the inner surface of the side wall 3 to the curved bottom 8 where it is diverted therealong up the inclined ramp into the inlet opening 50 of the burner chamber.

In order to control the amount of air admitted from the underfloor space, the opening 49 is covered from the inside of the furnace casing by a door or damper 52 that is hinged along the upper edge by hinges 53 whereby the lower edge 54 is adapted to swing outwardly from the wall of the casing to cooperate therewith in providing a passageway 55 therebetween for restricting the inflow of outside air.

In order to support the damper in open adjusted position, it is provided with an adjusting screw 56 having a shank 57 threadedly engaged with the door and having its terminal end 58 engaging the inner wall of the casing. The opposite end of the adjusting screw carries a knob 59 which is adapted to be actuated within the downflow passageway from the interior of the casing. The adjusting screw is so formed that the minimum effective area of the passageway 55 is never less than the effective air inlet 50 of the burner chamber so as to avoid possibility of supplementing the burner supply from the air being circulated to the heater.

In using the heater constructed and assembled as described, it is adapted to be suspended within an opening 60 that is provided in the floor 61 of a space to be heated substantially in the same manner as any conventional floor furnace. In case there is not sufficient room below the floor, a suitable pit 62 may be provided to accommodate the lower portion of the heater. The flue opening 44 is connected by a smoke pipe with a chimney or other vent and the burner is connected with a supply duct 63 leading from a source of fuel supply.

When the furnace is placed in operation, the heated air surrounding the heater unit is displaced upwardly through the floor grill into the space being heated by the colder air moving downwardly in the downflow passageway and upwardly through the air flow passageway surrounding the heater unit with the result that constant circulation is maintained through the heater. Simultaneously, cold air from the underfloor space is admitted through the opening 49 as regulated by the position of the door or damper 52 so that the colder air falls downwardly directly along the side wall of the outer casing and is directed by the curved bottom portion 8 up the ramp 10 for discharge through the opening 50 into the burner chamber. The force of the flow is also supplemented by the draft created through the flue connection with the chimney.

When the underfloor heater is installed in a modern home, there is relatively small infiltration of fresh air with result that the walls will begin to sweat after the furnace has been in operation. This sweating may be prevented by adjusting the damper 52 to admit a greater amount of air through the opening 49 so that the amount of air in excess of that required to supply the opening 50 is diverted into the stream of air being circulated through the furnace. Thus, a sufficient amount of fresh air is supplied so as to maintain the desired atmospheric conditions within the space being heated. The damper 52 is readily adjusted upon removal of the floor grill 29. The arm may then be reached downwardly through the downflow passageway so as to turn the adjusting screw 56 to position the damper for admitting more air or reducing the flow of air as conditions may require.

From the foregoing it is obvious that I have provided an underfloor heater which avoids flooding hazards and which also admits exterior fresh air from an underfloor space so as to prevent sweating when the heater is installed in a home of tight construction.

What I claim and desire to secure by Letters Patent is:

An underfloor heater including an outer casing having side walls and a bottom curving inwardly from two oppositely disposed side walls and terminating in upwardly extending ramps joining

at the center of the casing in a substantially horizontal elongated floor portion, an elongated burner housing carried above the floor portion substantially parallel with terminals of said ramps and having a slot-like opening extending along the terminal of one of said ramps, a heating unit having a burner contained in the burner housing, an inner casing surrounding the heating unit and having side walls spaced from corresponding side walls of said outer casing to provide a downflow air passageway between said walls of the outer and inner casings and an upflow passageway within the inner casing, said inner casing terminating short of the curved portion of said bottom to provide a connection between said passageways, the wall of the outer casing which faces the slot-like opening of the burner housing having a slot-like opening extending parallel with and facing the slot-like opening of the burner housing but located above the level of the burner for admitting fresh air into the downflow passageway of the casing, a damper having an upper edge pivoted along the upper edge of the opening in said side wall of the outer casing and adapted to swing inwardly of the downflow passageway for deflecting downflow air in said passageway away from said wall so that the fresh air admitted through the slot-

like opening of the casing gravitates downwardly in contact with said wall within space provided by the deflection of said downflow air and for guided movement across said curved portion of the bottom and up said ramp to supply fresh air to the burner through said slot-like opening of the burner housing and to add fresh air for mixture with upflowing air incidental to the direction of flow imparted by said ramp to the fresh air, and means for holding said damper in an adjusted position over said slot-like opening of the outer casing wall.

WILLIAM C. COLEMAN.

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