June 10, 1952 C. L. AYRES ET AL 2,600,044

DOMESTIC ELECTRIC FURNACE

Filed March 18, 1949 2 SHEETS—SHEET 1

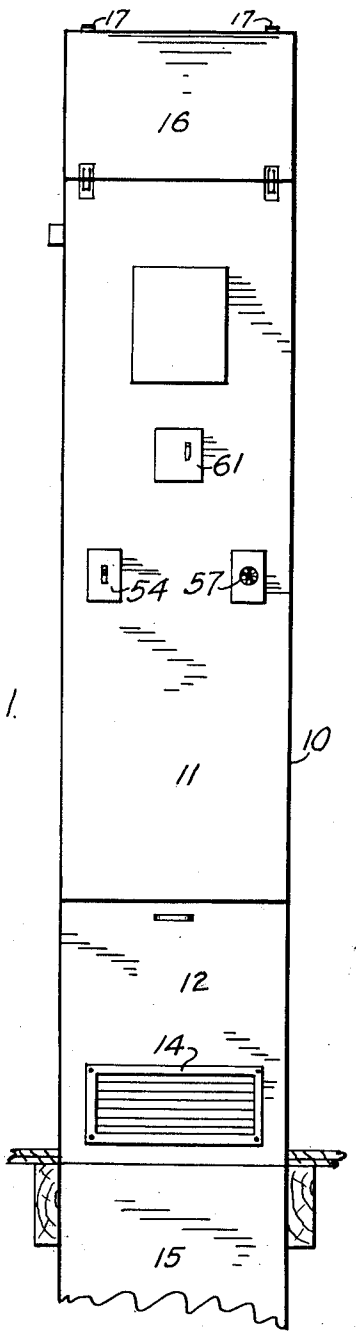


Fig. 1.

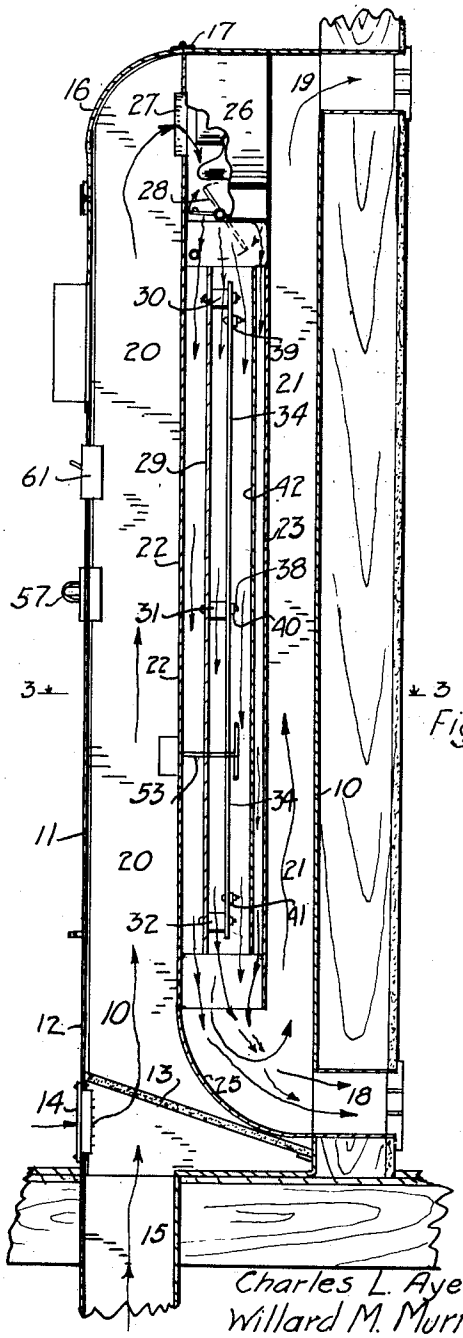


Fig. 2.

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DOMESTIC ELECTRIC FURNACE

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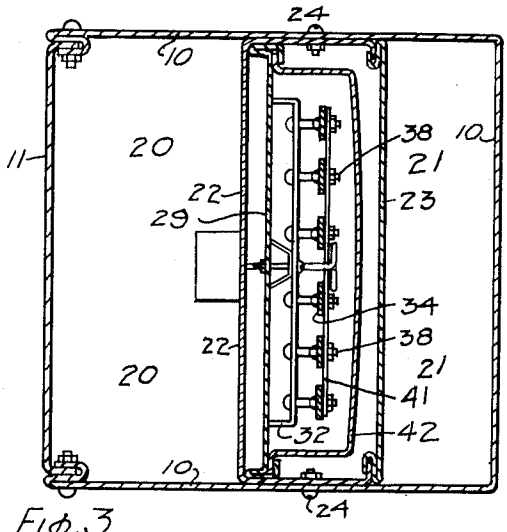


Fig. 3.

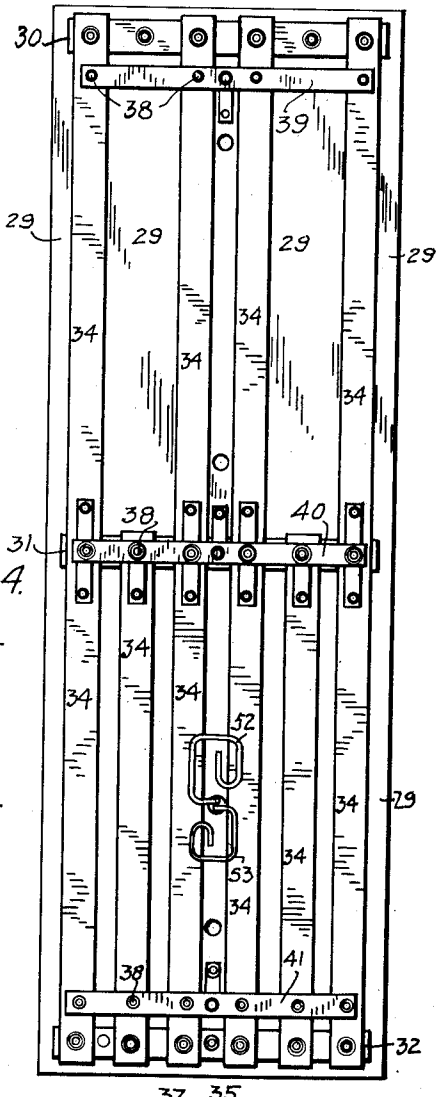


Fig. 4.

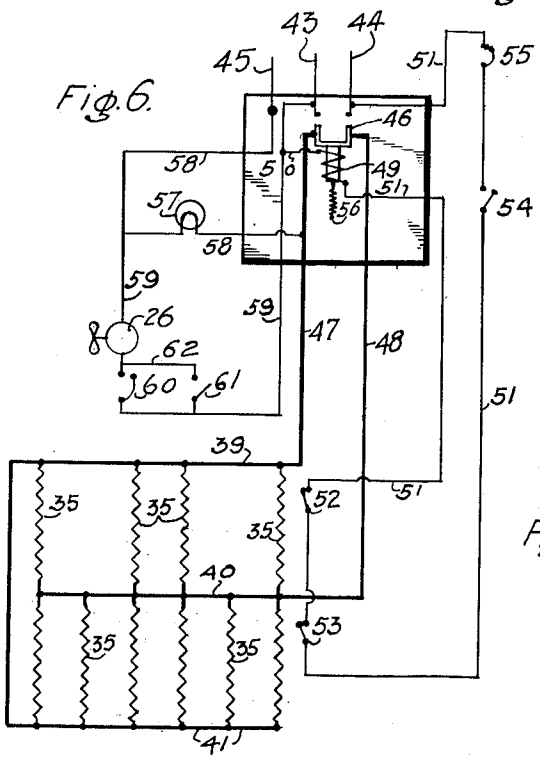


Fig. 6.

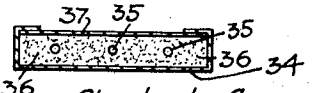


Fig. 5.

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DOMESTIC ELECTRIC FURNACE

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Application March 18, 1949, Serial No. 82,222

5 Claims. (Cl. 219—39)

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This invention relates to the electric heating of residences and other structures and has special reference to such furnaces as supply the residence with heated air.

The objects of our invention are, first, to provide such a furnace as will be safe to use in comparison to electric heaters of other types; second, which is acceptable in its design and construction to The Fire Underwriter's Laboratory, Inc.; third, which will supply an abundant volume of fresh, clean, and uniformly warmed air to the residence; fourth, in which the air is filtered before it is heated, to remove any free dust particles therefrom; fifth, in which the heat is stored when not in operation; sixth, which has an exceptionally high efficiency rating and in which the loss of heat units (B. t. u.) is extremely low; and seventh, which, though providing heated air to the residence, is itself cool and may be touched with the bare hands without discomfort.

We attain these and other objects as will readily be apparent to those skilled in the art, by the devices, mechanisms and arrangements illustrated in the accompanying drawings, in which: Fig. 1 is a front elevation of our improved electric furnace; Fig. 2 is a vertical section thereof; Fig. 3 is a cross section thereof, taken on the line 3—3 in Fig. 2; Fig. 4 is an elevation of the heating unit panel; Fig. 5 is a cross section of one of the heating units; and Fig. 6 is a diagram of the electric wiring.

Identical numerals of reference refer to the same parts throughout the several views.

This electric furnace is composed of a plurality of nested plates dividing it into vertical passages in which the air being heated is caused to flow in such manner that the exposed outside plates are always cool to the touch. As seen in Fig. 1 it is a tall relatively narrow structure which is intended to be erected in contact with or close to one of the partition walls of the house being heated.

As seen in Fig. 3, the outer shell is composed of a vertical box 10, having a front closure panel 11, the two parts being connected together by lock joint as illustrated, and with suitable bolts passing therethrough. The front panel 11 is provided with a removable section 12 at the base whereby access may be had to the two thermostats and to the air filter 13 located inside the structure, and this section 12 may, if desired, be provided with a suitable louvre inlet 14 adapted to admit air to the interior of the heater and under the said filter 13. Air also may be admitted into the interior of the heater by a suitable inlet duct 15, if desired.

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The front panel 11 is also provided with an upper section 16 hinged at 17 to the upper closure of the box 10.

The rear wall of the outer box 10 is provided with two outlet openings, the lower opening 18 being located above the said filter 13, and the upper opening 19 being positioned at the upper corner of the box 10.

This outer shell is divided into two main channels 20 and 21 by the inner structure which contains the heating unit; the channel 20 conducting the cool air from the bottom to the top of the heater, and the channel 21 conveying the heated air from the bottom to the top.

This inner structure comprises a container 22 which forms a rectangular box, similar in form to the outer box 10 and having a closure plate 23, and is secured to the outer shell 10 by suitable bolts 24 (Fig. 3). The lower end 25 of the container 22 is curved rearward and extends to the lower heat outlet opening 18. The upper end of the inner structure 22 is provided with an electric fan 26 adapted to draw cold air from the chamber 20, through the opening 27 in the wall 22 and to drive the air downward in the interior of the container 22. The closure plate 23 extends down from the top of the container 22 to a point slighty above the curved end 25.

A balanced valve plate 28 is mounted on horizontal pivots slightly below the fan outlet, said plate 28 being overbalanced to open the passage when the fan is in operation. When the fan is not in operation the valve plate 28 closes the upper end of the box 22 and retains heat in the interior of the container 22 and prevents the fan and its motor from becoming overheated.

The heating panel is illustrated in Figs. 2–5, and is mounted within the inner structure 22 and comprises a supporting plate 29 suitably secured in vertical position in spaced relation to the walls of the container 22. Three bridge bars 30, 31 and 32 are secured, respectively, at the upper, central and lower portions of the said plate 29. A plurality of heating units 34 are secured to the said bridge bars.

Each of these heating units consists of a metal container having electric wires 35, completely surrounded by a suitable insulation material 36, therein and closed by a plate 37. The wires 35 are suitably led to insulated terminals 38 extending out from the container 34 at each end of the heating units.

The insulated terminals 33 of said heating

units are respectively connected to three bus bars 39, 40 and 41, located respectively at the top, center and lower ends of the plate 29. These bus bars are insulated by sheets of mica from the heating units 34 but are connected to the terminals 38 thereof. The supporting plate 29 and all the elements of the heating unit are enclosed in the container 22 by the closure plate 42. As above described, the container 22 is open at its lower end, and its upper end is open to the flow of air from the fan 26, except that such opening is closed by the plate 28 when the fan is not in operation, to retain the heat in the container and to protect the fan motor from being preheated. The air from the fan contacts the heating elements and the heated air passes from the container out of the furnace by the outlets 18 and 19.

All parts of the heating element are surrounded by flowing air which is being driven downward therepast by the fan 26. This air is cool fresh air from the outer channel 20 and keeps all the surfaces of the plates 22, 29, 42 and 23 relatively cool, and picks up heat as it contacts the heating units 34.

The wiring of our improved electric furnace is illustrated in Fig. 6. The wires 43 and 44 are the live wires of the electric service line which energizes this furnace, and the wire 45 is the neutral line, there being a potential of 110 volts between the wire 45 and either of the wires 43 or 44, while there is a potential of 220 volts on the circuit composed of the wires 43 and 44.

A double pole magnetic switch 46 controls the main heating circuit which is composed of the wires 47 and 48 leading from the poles of the switch to the bus bars; the wire 47 leads to the bus bars 39 and 41, while the wire 48 leads to the bus bar 40, so that when the switch 46 is closed the current flows by the wires 47 and 48 through all the heating wires 35, generating the heat utilized by the furnace. The magnetic switch 46 is closed by means of the electromagnet wire 49 which is energized from the main line wire 43 through the connecting wire 50. The wire 51 leads therefrom through two thermostats 52 and 53 adapted, respectively to open when the temperatures reach 250° and 300°. The thermostat 52 is placed so as to protect the fan motor 26 from getting overheated, and the thermotat 53 is to place an upper limit on the heat developed in the furnace. The wire 51 then passes through the manual master switch 54 and the room thermostat 55, which is open if the room temperature exceeds the selected level and is closed when it falls below that level. The line 51 then passes to the other main line wire 44. Thus the thermostats are in the 220 volt line.

A spring 56 opens the switch 46 when the line 51 is broken by the opening of the switch 54 or any of the thermostats 52, 53 or 55 and thus cuts off the current from the heating units 34.

A pilot light 57 is mounted in a circuit 58 leading from the switch-controlled main line 47 to the neutral wire 45 and is therefore energized when the switch 46 is closed and the furnace is being heated.

The electric fan 26 is also energized on the 110 volt circuit 59, independent of whether the switch 46 is open or closed. This circuit leaves the above circuit 58, passes through the fan motor 26 and through a thermostat 60 and thence to the main line wire 43. The purpose of the heat-closed thermostat 60 is to delay the operation of the fan until the heating units have attained a sufficient heat, otherwise the fan would start blowing cold air into the rooms and the heating of the house would be delayed. When the heating unit has reached a preferred temperature, the thermostat 60 closes and the fan then supplies cool air to the heating units to be heated and delivered as above described. In the summertime the fan 26 may be used to supply a stream of cool air to the house by closing the manual control switch 61 which is placed in the shunt line 62 around the said thermostat 60.

Thus it will be seen that the operation of this furnace is safeguarded against attaining too high a degree of temperature by the thermostats 52 and 53; against overheating the fan by the thermostat 52, and against supplying cold air before the furnace has reached a sufficient degree of heat by the thermostat 60. It will also be seen that the plates 10 and 11 forming the outer surfaces of the furnace are swept by cool air on both sides and are therefore kept cool.

The materials used in the construction of the furnace are preferably: the heating units are each of 500 watts at 220 volts and are commercially known as Westinghouse Heating Units; the sheet metal used is preferably 18 gauge aluminum; and the switches, thermostats and other standard parts are all commercial articles of suitable capacity at present found on the open market.

Having described our improved electric furnace, what we claim and desire to secure by Letters Patent, is:

1. An electric furnace comprising an outer rectangular container; an inner container mounted in said outer container and secured thereto in spaced relation, thereby dividing said outer container into two passages each said passage extending vertically the length of said inner container, and separated from each other by said inner container, the first said passage being adapted to receive cool air at its base, and the second said passage having open connection with the lower end of said inner container; an activated fan in said inner container and drawing cool air from the top of the first said passage and discharging it downward into the top end of said inner container; heating elements mounted in said inner container in spaced relation thereto and adapted to heat the air discharged by said fan; and a hot air outlet from the second said passage at a point remote from said fan.

2. An electric furnace as set forth in claim 1, wherein said actuated fan is positioned at the upper end of said inner container and discharges the air downward in said inner container and past the heating elements therein; together with a balanced plate-valve positioned between said fan and said heating elements, whereby when said fan is in operation the discharge therefrom is free, and when said fan is inactive the upper end of said inner container is closed against the escape of heat past said fan.

3. A furnace comprising a container compartmented to form two outer vertical passages separated by an inner vertical passage, the inner passage communicating at its upper end with the first outer passage and at its lower end with the second outer passage, heater means mounted in the inner passage, fan means for drawing air from the first outer passage downward past the heater means, cool air inlet means communicating with the first outer passage adjacent its lower

end, and hot air outlet means communicating with the second outer passage.

4. An electric furnace comprising a container compartmented to form two outer vertical passages separated by an inner vertical passage, the inner passage communicating at its upper end with the first outer passage and at its lower end with the second outer passage, electric heater means mounted in the inner passage, fan means for drawing air from the first outer passage downward past the heater means, cool air inlet means communicating with the first outer passage adjacent its lower end, and hot air outlet means communicating with the second outer passage.

5. The furnace of claim 3 including a plate valve in the inner passage arranged between the

heater means and fan means and opened upon activation of said fan means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,982,418	Carmichael	Nov. 27, 1934
1,991,280	Hynes	Feb. 12, 1935
1,996,972	Parsons	Apr. 9, 1935
2,244,172	Novak	June 3, 1941
2,248,959	Christman et al.	July 15, 1941
2,360,071	Noll	Oct. 10, 1944