Dec. 26, 1967 DE WAYNE THOMAS 3,359,966

OIL FURNACE HAVING COMPARTMENTED AIR HANDLING SYSTEMS

Filed July 18, 1966

FIG. 1

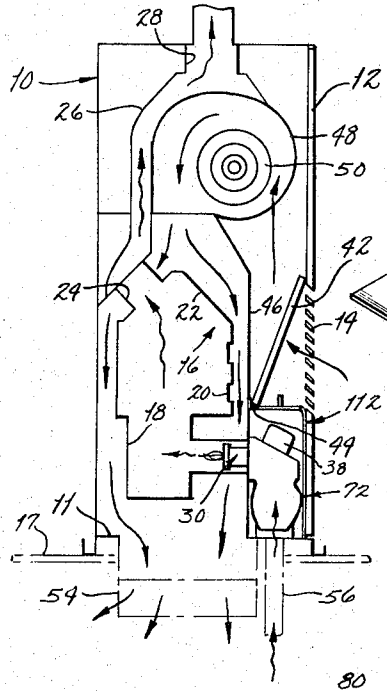


FIG. 2

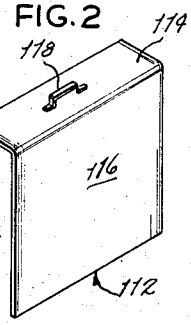


FIG. 3

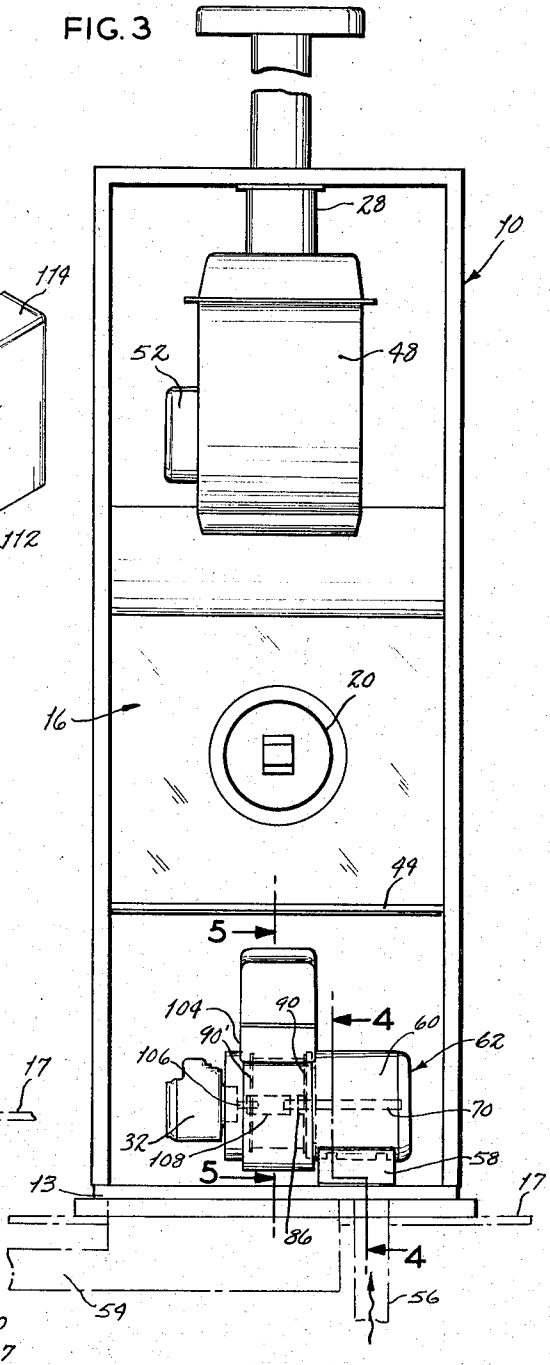


FIG. 4

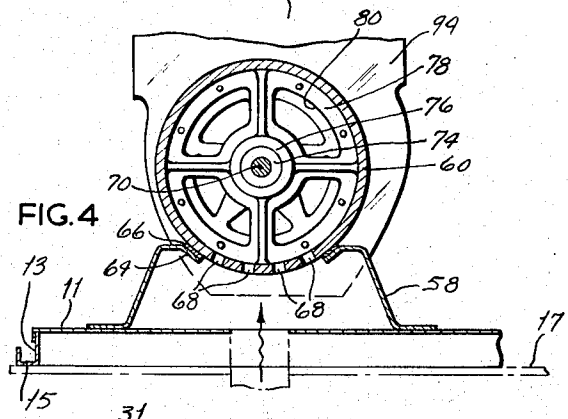
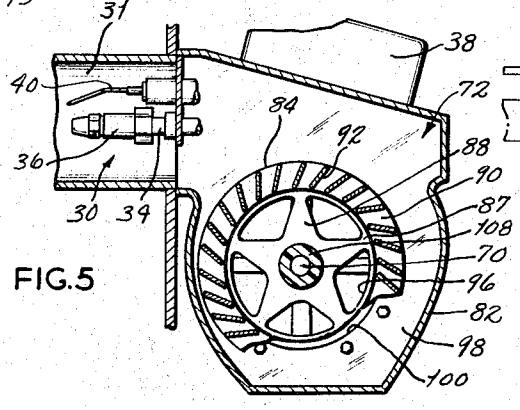


FIG. 5



INVENTOR
DEWAYNE THOMAS
BY Jerome A. Gross
ATTORNEY

United States Patent Office

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OIL FURNACE HAVING COMPARTMENTED AIR HANDLING SYSTEMS

De Wayne Thomas, Belleville, Ill., assignor to International Oil Burner Company, St. Louis, Mo., a corporation of Missouri

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2 Claims. (Cl. 126—110)

The present invention relates to oil-burning furnaces for mobile home sand the like, and particularly to improved air handling provisions therefor.

Combustion of oil is occasionally irregular and accompanied by pulses of back pressure. Requirements of safety, among others, make it imperative that the room air circulating system be separated completely from the path of combustion air.

However, the combustion blower motor requires a cooling flow of air; and certain auxiliary devices, such as the fuel pump, which are likely to create unpleasant odors from time to time, must be available for servicing. These requirements have led to various partial solutions, such as:

(a) Ducting the combustion air directly to the combustion blower, leaving the combustion blower motor, fuel pump and ignition device, and exterior of the burner itself open and near to the air inlet of the room air circulating system. Oil odors will therefore be communicated to the room air circulating system; and the suction of the room air circulating fan will tend to draw combustion gases through any voids which may exist at the attachment of the burner to the furnace.

(b) Enclosing the oil pump, combustion blower, motor and burner exterior in the air passage leading to the combustion air blower. Such a system is considered unsafe; because to open a door in this air passage to service these components leads to the possibility that it may be left open thereafter; if back-pressure pulses should occur, combustion gases would be emitted and drawn into the room air circulating system.

The purposes of the present invention include providing an oil-burning furnace which may be safely serviced while in operation and yet which avoids the disadvantages of both of the systems listed above. Further purposes will be apparent from the description which follows.

Generally summarizing the present invention, I provide a furnace cabinet having an openable sealable compartment in which a combustion blower, motor fuel pump and ignition device are located. An air duct from the exterior of the mobile home penetrates this compartment and supplies all combustion air adjacent through an air inlet port in the motor casing itself. The air flows internally through the motor casing into the side of the combustion blower and through ports in the side wheel element of the blower wheel. In so flowing, it cools the motor internally. Should a back-pressure pulse occur, it will be communicated harmlessly to the exterior of the mobile home. Except when the sealed compartment is opened for servicing, there is no air flow past the exterior of the fuel pump, the motor and the other enclosed devices.

A preferred embodiment of the present invention is shown in the accompanying drawings in which:

FIG. 1 is a schematic side elevation showing an oil burning furnace embodying the present invention, the separate flows of circulating room air and of combustion air being shown by the two types of arrows therein.

FIG. 2 is a perspective view of the removable partition for the sealable compartment.

FIG. 3 is a front view of the furnace of FIG. 1, the partition of FIG. 2, the filter, and the cabinet door being removed.

FIG. 4 is an enlarged fragmentary sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is a similarly enlarged fragmentary view taken along line 5—5 of FIG. 3.

Referring now to FIGS. 1 and 3, the present furnace comprises a rectangular furnace cabinet generally designated **10** having a front door **12** including a central louvered air-conducting opening **14**. The cabinet **10** has a base **11** including a support rim **13** whose bottom flange **15** supports the cabinet on the floor **17** of the room in which the furnace **10** is installed.

Within the cabinet **10** is a somewhat conventional sheet metal oil-burning furnace generally designated **16**, including a combustion chamber **18** having a circular access door provision **20**, a heat transfer surface **22** which consists essentially of the entire outer and upper surfaces of the combustion chamber **18**, a tubular, upward slanting flue connector portion **24**, and a scroll-fitted flue casing **26** which connects to the lower end of a conventional flue outlet pipe **28** extending through the roof of the mobile home to the exterior atmosphere.

An oil combustion burner, generally designated **30**, of the "gun" type, includes a tubular combustion "gun" **31** installed in and directed horizontally into the lower part of the combustion chamber **18**. Such oil combustion burner **30** includes as an auxiliary, a fuel supply device such as the oil pump **32** shown in FIG. 3, a supply tube **34** therefrom shown in FIG. 5, and an atomizing nozzle **36**, within the tubular combustion "gun" **31** and directed into the combustion chamber **18**. The furnace also has oil ignition devices including an electrical transformer **38** shown in FIGS. 3 and 4 connected to a pair of ignition electrodes **40** shown in FIG. 5, which operate in conventional fashion to ignite the atomized oil emitted from the nozzle **36**.

The room air circulating system commences with the louvered air conducting opening **14** of the cabinet door **12**, which serves as a suction inlet into the cabinet. Air flowing therethrough passes thence through a filter **42** which extends the full cabinet width and is supported at its lower edge on an angle **44** on the outer forward side of an air casing **46** which spacedly surrounds the heat transfer surface **22**. At the upper part of the air casing **46** is the enclosing scroll **48** of a room air circulating fan **50** of the conventional squirrel-cage blower type. Air passing through the filter **42** is drawn into the enclosing scroll **48** through a side inlet **52** as shown in FIG. 3. It is driven then downward between the air casing **46** and the heat transfer surface **22**, in heat transfer relationship therewith, and thence beneath the combustion chamber **18** outward through a bottom air outlet **54** installed through the floor **17** into ducts (not shown) which communicate into the room space. The path of flow of the room circulating air is shown in FIG. 1 by the conventional arrows.

Air blown through the combustion air system is shown in FIG. 1 by undulating arrows. The combustion air is drawn from the atmosphere outside the space to be heated through an inlet air duct **56**, shown in FIGS. 1, 3 and 4 as extending through the bottom of the mobile home through an opening in the base **11**. The duct **56** opens into an inverted rectangular pan-like combustion air conduit **58**, beneath the motor casing **60** of an electric motor generally designated **62** which powers the combustion blower hereafter referred to. Downward and inward sloping flanges **64** of the combustion air conduit **58** are sealed against the motor casing **60** by strips of sealing material **66**, as shown in FIG. 4. The portion of the lower wall of the motor casing **60** thus sealed is penetrated by a number of slotted air inlet ports **68**.

The electrical components within the motor casing **60**, including its rotor and stator, are conventional, and are not shown save for the motor shaft **70** which extends through that end of the motor casing **60** which is adjacent to the combustion air blower generally designated

72. At this end, as shown in FIGS. 4 and 5, the motor shaft 70 is held in a bearing 74 supported in the central boss 76 of a ribbed casing end plate 78, provided with arcuate air exit passages 80.

The combustion air blower 72 is best shown in FIG. 5. It includes a sheet metal scroll 82 in which a squirrel-cage blower wheel 84 is mounted as shown in FIG. 5, in axial alignment with the motor shaft 70. In the embodiment illustrated, a mounting hub 86 is secured to a pressed steel side wheel element 87 having star-shaped spokes 88, the tips of which support an integral circular or ring-like side element 90 in which ends of the impeller blades 92 are held. Spaces between these star-shaped spokes 88 serve as air flow ports 96 into the blower wheel 84. The opposite ends of the impeller blades 92 are held in an open ring-like side element 90'.

The scroll casing 82 has a side element 98 mounted, as by bolts, onto the ribbed end plate 78 of the motor casing 60. The scroll casing side element 98 has a large circular air inlet 100 through which the combustion air is introduced (it must then pass through the blower wheel's star-shaped spokes 88). Air drawn by the impeller blades 92 passes successively through the openings in these three adjacent elements.

The side element 104 of the scroll casing opposite to the side 94 adjacent to the motor 62, is closed. Onto it is mounted the fuel oil pump 32 whose shaft 106 is connected to the motor shaft 70 by a flexible coupling 108.

The combustion air system is thus defined not only by the combustion chamber 18, the heat transfer surface 22, the flue connector portion 24, the flue casing 26 and the flue outlet pipe 28, but also by the inlet air duct 56 leading into the rectangular combustion air conduit 58, the slotted air inlet ports 68 and the interior of the motor casing 60, its arcuate air exit passages 80, the air inlet opening 100 in the scroll side elements 98, the air flow ports 96 in the blower wheel side element 87, the inside of the scroll casing 82 and the horizontally-projecting tubular combustion "gun" 31.

Referring to FIGS. 1 and 2, the cabinet 10 is equipped with an openable sealed compartment to enclose the auxiliary fuel supply and ignition devices and the outer of the combustion air blower 72 and that part of the blower motor casing 60 which is not exposed to the interior of the combustion air conduit 58. Such sealed compartment is formed by the close fit of the removable partition generally designated 112, shown in FIGS. 1 and 2. This partition is impervious to air. It has an upper surface 114 which extends forward from the front side of the air casing 46, where it may seal against the angle 44, to near the cabinet door 12; and has a front surface 116 which extends downwardly therefrom at a right angle to the top surface 114 down to the base 11. The edges of the removable partition 112 are in close, substantially sealed contact with the furnace cabinet sides and bottom. When the partition 112 is in closed position as shown in FIG. 1, the air within such compartment is substantially sealed off from the room air circulating system, guarding this system from gases, odors and noises. A handle 118 on the upper surface 114 facilitates removing the partition to open the compartment for servicing the apparatus. The combustion air conduit 58 in effect penetrates such sealed compartment in delivering air through the duct 56 in the floor of the mobile home to the slotted air inlet ports 68 in the motor casing 60.

The present construction takes advantage of the fact that of all the elements shown in the lower part of FIG. 3, only the combustion blower motor 62 requires substantial cooling. Heretofore it has been conventional to cool such portion of the cabinet as a whole; hence the exterior surface of these mechanical elements have been exposed to a flow of air which (as stated at the beginning of this specification) is open either to the room air circulating system or to the combustion air system. In the present invention, however, all the combustion air to be introduced into the combustion air blower 72, flows from the exterior of the mobile home through the combustion air conduit 58 to the inside of the motor casing 60 and thence to the blower scroll 83, thus cooling the motor from the inside. This makes possible the present use of the substantially sealed compartment, separate from both the room air circulating system and the combustion air system.

It will be apparent that oil odors, which are inherent in the region of the fuel pump, will not therefore to communicated to the air circulating system. Furthermore, should there be any slight voids in the installation of the combustion burner 30 within the combustion chamber 18, there is no danger that suction created by the room air circulating fan 50 will draw combustion gases through such voids into the room air circulating system. Also, when the partition 112 is removed for servicing, the mechanical units to be served are exposed without interfering with the normal operation of either the room air circulating system or the combustion air system; hence servicing adjustments may be made safely while the burner is in operation.

Variations in detail from the specific disclosures hereof may be made without department from the scope of the present invention. Accordingly the present invention is not to be construed narrowly, but rather as fully co-extensive with the claims hereof.

I claim:

1. A mobile home oil-burning furnace having improved air-handling provisions, comprising

a furnace cabinet,

a furnace therein having a heat transfer surface, an oil combustion burner, and auxiliary fuel supply and ignition devices therefor,

further having a room air circulating system including a suction inlet into the cabinet, a circulating fan, air flow casing means to deliver the air from the inlet through the fan and in heat transfer relationship with said heat transfer surface, and an air outlet for such air from the cabinet,

further having a combustion air system

including means to duct combustion gases from the furnace to the exterior of such mobile home and

combustion air supply means including

a combustion blower having an air inlet opening,

an electric blower motor having a motor casing including an air exit passage communicating with the blower air inlet opening, the motor casing further having an air inlet port, and

an air conduit sealedly secured to said motor casing about its inlet port and communicating to the exterior of said cabinet and there having inlet duct attaching means,

whereby to furnish all combustion air from the exterior of such mobile home through the motor casing, thereby to cool the said motor,

the cabinet further having an openable sealed compartment which encloses the said auxiliary devices and the said combustion air supply means and is penetrated by the said air conduit to the blower motor,

whereby to guard the said suction inlet of the room air circulation system from gases, odors and noise when the sealeable compartment is closed and to permit uninterrupted operation of said combustion air system when the compartment is opened for servicing.

2. In an oil burning furnace,

a cabinet having an openable sealable compartment, and

fuel and combustion air supply apparatus therein, including

a motor having a shaft extending sidewardly therefrom and a motor casing having an air inlet port and an air outlet spaced therefrom and on the side from which the shaft extends,

an air conduit sealedly secured to that part of the motor casing which includes said air inlet port, and extend-

ing in flow communication thereto through the said compartment from the exterior of the cabinet, and

a centrifugal combustion blower including a scroll casing having a side including an air inlet opening mounted adjacent to and in flow communication with the air outlet of the motor, and having a closed side opposite thereto,

further having a blower wheel rotatably mounted in the scroll casing in axial alignment with and coupled to the said motor shaft,

the blower wheel having blades supported by spaced-apart circular side elements adjacent to the sides of the scroll casing,

that wheel side element adjacent to the air inlet opening in the side of the scroll casing having air flow ports therethrough,

whereby all the combustion air is introduced into the combustion blower from the exterior through the air conduit and motor, thereby cooling the motor without air flow in the compartment.

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JAMES W. WESTHAVER, *Primary Examiner.*