

United States Patent

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[54] **HOT AIR BLOWER**
5 Claims, 6 Drawing Figs.

[52] U.S. Cl..... **219/370,**
 165/122, 219/364, 219/368, 219/375

[51] Int. Cl..... **F24h 3/04,**
 H05b 1/02

[50] Field of Search..... **219/374-**
 —376; 165/120, 121, 122; 219/366—370, 364

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ABSTRACT: A hot air blower of simple, compact and inexpensive construction wherein the air heating means and blower means are both enclosed within a single housing comprising a spaced apart pair of sheet members having sheet metal wall means extending therebetween to form enclosures for the heater and blower respectively, the blower housing or scroll forming a portion of said wall means enclosing the blower, and both the heater and the blower being supported between the sheets on removable panels permitting easy access and replacement of parts. The construction and arrangement of the heater and blower within the space defined by the sheetlike members insures a uniform air flow around the heaters preventing "hot spots," and control means are provided operable to maintain a constant hot air temperature at the outlet of the unit, together with safety devices for preventing overheating.

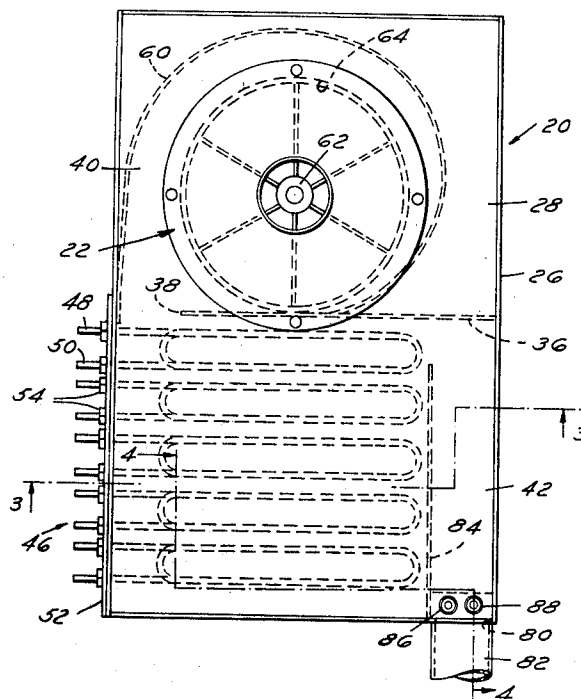


FIG. 1

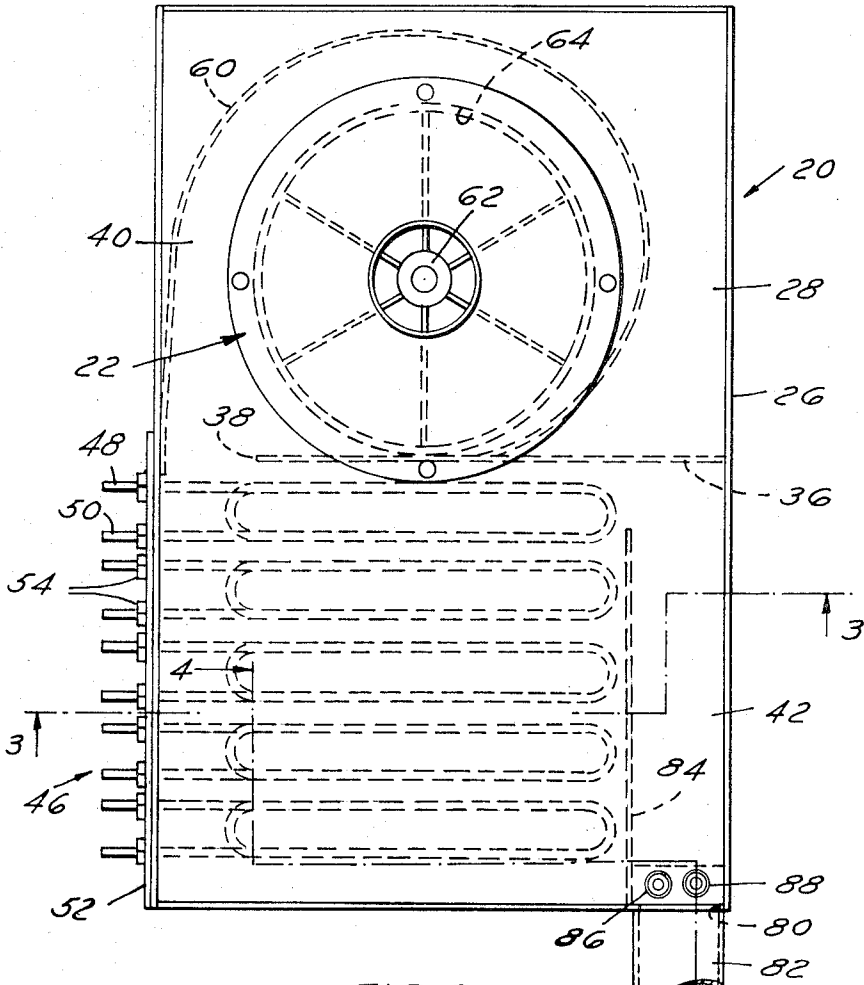
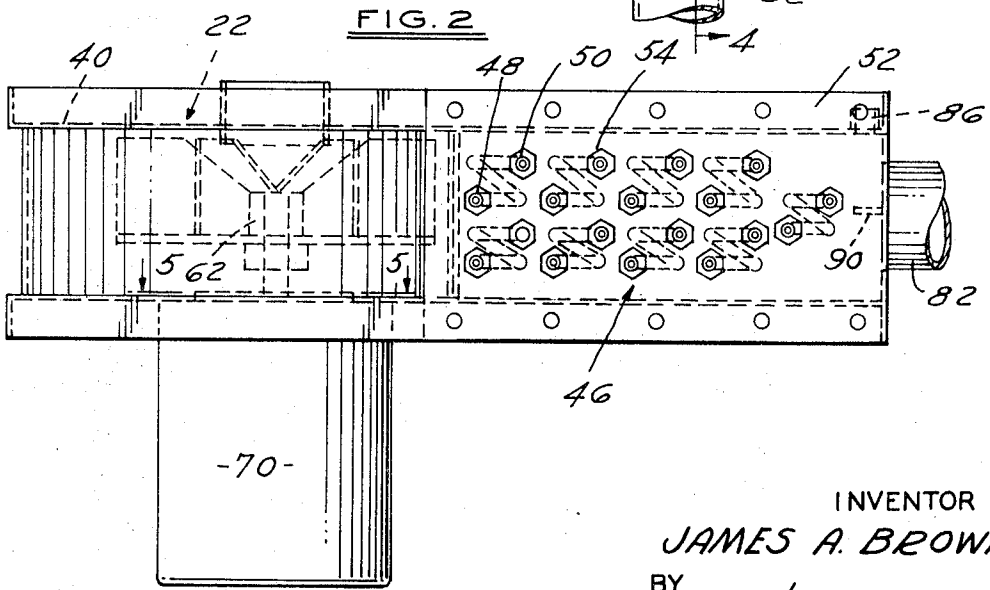


FIG. 2



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FIG. 3

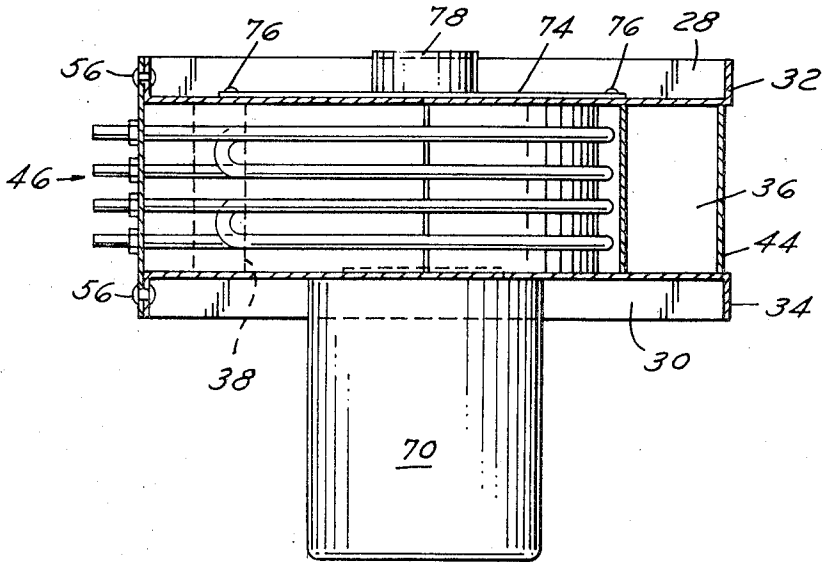


FIG. 4

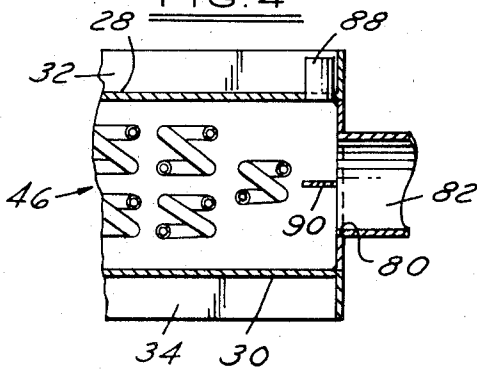
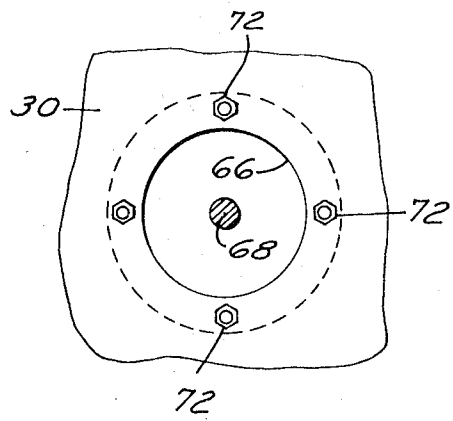
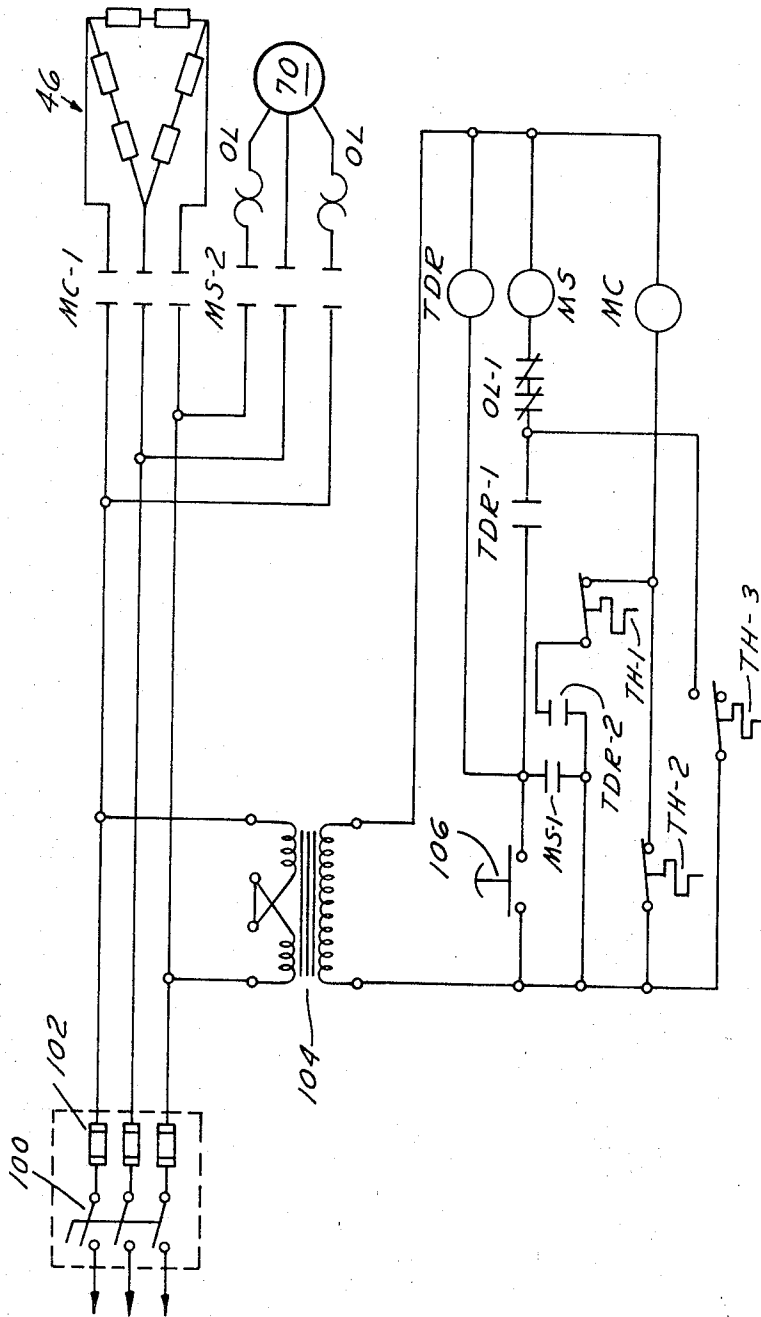


FIG. 5



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FIG. 6



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HOT AIR BLOWER

BACKGROUND OF THE INVENTION

The invention disclosed relates generally to the field of hot air blowers wherein ambient air is introduced into the unit and is blown across heating elements and is thereafter directed through an outlet to the point of use. More particularly, the invention is concerned with the provision of a relatively small and compact hot air blower such as might be used to provide a hot air stream in a hand drier or the like in washrooms. The unit embodying the invention may be connected to one or to a remote of air nozzles or the like which are positioned remote from the unit, obviating any possibility of tampering or malicious destruction of the unit itself.

Prior art devices have generally comprised a boxlike enclosure or housing mounted on the wall with a nozzle protruding from the enclosure, with the entire unit being exposed to the user and subject to damage or destruction. Maintenance of any portion of the unit required complete removal of the housing to gain access to the blower and heater disposed therein, and required dismantling of the complete unit to repair or replace any given component thereof. The unit embodying the instant invention is capable of being located remote from the point of air use, and is so designed as to be mountable in any position, thereby increasing the versatility of the device.

The housing or enclosure is made up of parts which are easily assembled and the working components of the unit are supported within the housing by being mounted on removable panels for easy access, whether for the purpose of maintenance, repair or replacement. The entire unit is compact and light weight and includes a minimum of parts capable of being manufactured and assembled considerably less expensively than prior art devices and capable of being installed in virtually any location with a minimum of time and effort. The versatility of the unit is enhanced by its simplicity of manufacture, and various capacity units may be provided utilizing the teachings of the invention by merely changing the dimensions of a few parts.

BRIEF SUMMARY OF THE INVENTION

The air heater and blower according to the invention comprises a pair of spaced parallel sheet members divided into heater and blower compartments by a transverse partition terminating spaced from one marginal edge of the sheets to provide an opening between the compartments. The blower compartment is enclosed by a scroll tangent at one end to the partition and tangent at the opposite end to said one edge of the sheets. A blower is provided in the blower compartment and heater means in the heater compartment. A hot air outlet is located in the heater compartment diagonally opposite the openings in the compartment. A baffle extends intermediate the heater means and the hot air outlet parallel to the marginal edge of the sheets and terminates spaced from the partition. Control means are provided for controlling the operation of the blower and heater means.

A device embodying the invention is shown in the accompanying drawings, wherein:

FIG. 1 is a front elevation of a hot air blower embodying the invention;

FIG. 2 is a side elevation thereof, taken in the direction of the arrow numbered 2 in FIG. 1;

FIG. 3 is a cross-sectional view taken along the line 3-3 of FIG. 1;

FIG. 4 is a partial cross-sectional view showing the construction of the air outlet, taken along line 4-4 of FIG. 1;

FIG. 5 is a partial cross-sectional view showing the blower motor mounting means, taken along line 5-5 of FIG. 2; and

FIG. 6 is a schematic diagram of the various components of the unit and the control system therefor.

Referring now more particularly to the drawings, first to FIGS. 1-3 thereof, there is shown a hot air blower generally

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indicated at 20, comprising a blower unit 22 and a heater unit 24, both of which units are enclosed with a single housing 26. Additionally, there is provided a control system for the device, which is shown schematically in FIG. 6, and will be described hereinbelow. All of the controls except the temperature responsive means located within the housing 26 may be mounted on a panel or the like immediately adjacent the housing in any convenient fashion. While it is desirable that the controls be mounted together with the unit 20 in a common enclosure to provide a complete unit, such is not mandatory, and the control panel could be mounted remote from the unit 20 shown in FIGS. 1-3 inclusive. However, under normal circumstances the unit 20 and its associated controls shown schematically in FIG. 6 would be housed in a box or the like all preassembled and ready for operation, subject only to the controls being connected to a suitable electrical supply.

The housing 26 comprises a pair of generally rectangularly shaped sheetlike members 28 and 30 positioned in face-to-face parallel relation, each of which members is provided with a peripheral flange shown at 32 and 34 respectively in FIG. 3, which flange is in each case directed outwardly away from the opposite sheet member. Extending between and secured to the inwardly facing surfaces of each sheet 28 and 30 is a divider member 36 extending from one marginal edge of the sheets and terminating spaced from the opposite marginal edge of the sheets, as shown at 38 in FIGS. 1 and 3. The divider member 36 separates the housing 26 into a blower compartment 40 and a heater compartment 42. The heater compartment 42 is enclosed on two sides by wall means shown at 44 in FIG. 3, such wall means extending from the divider 36 along the right-hand marginal edge of the housing and also along the bottom marginal edge thereof as shown in FIG. 1. The third side of the heater compartment 42 is of course partially enclosed by the divider 36. Such may be secured to the sheets 28 and 30 as by welding or in any other convenient fashion.

The heating elements shown herein are so-called double loop electric heating elements indicated at 46, nine such units being shown herein as making up the heater unit. Each of such heater elements exhibits a pair of projecting terminals 48 and 50 for connection to a suitable electrical supply. Such heating elements are readily commercially available, and the invention is not restricted to the use of any specific heating element nor to the specific arrangement or number of elements shown in the drawings, such depending upon the individual application.

In order to support the heating elements 46 within the heater chamber 42, there is provided a platelike member 52 apertured to accept the projecting terminals of each heater shown at 48 and 50, which terminals are preferably threaded and provided with nuts 54 which are tightened against the plate 52 to retain the heaters in place. To assemble the heater into the compartment 42, the ends of the elements 46 are merely inserted thereinto between the sheets 28 and 30, and the plate 52 is secured to the sheet flanges 32 and 34. The use of nuts and bolts to secure the plate 52 has the added advantage that the assembly of plate and heating elements is readily removable in the event one of the heating elements burns out and needs replacement.

The blower compartment 40 which houses the blower unit 22 is enclosed by a curved wall 60 which, as shown in FIG. 1, is of a generally spiral shape, one end portion of which is secured to divider 36 and is substantially tangent thereto, and the other end portion of which terminates spaced from the end 38 of the divider 36 and is substantially tangent thereto, and the other end portion of which terminates spaced from the end 38 of the divider 36 substantially tangent to the left-hand marginal edge of sheets 28 and 30 as shown in FIG. 1. The wall means 60 serves the dual purpose of providing an enclosure for the compartment 40 between the sheets 28 and 30, and provides a scroll housing for the blower unit 22. This construction enhances greatly the simplicity of the unit, and

likewise provides a sturdy construction utilizing a minimum of parts. As can easily be seen from a consideration of FIG. 1, the plate 52 supporting the heating elements additionally functions as a closure member for the heater compartment 42, while the curved wall means 60 performs the combined function of enclosing the blower compartment 40 and serving as a scroll housing for the blower unit 22 disposed in the compartment 40. There is thus provided a housing 26 comprising an absolute minimum of parts which are easily assembled into a complete unit housing both the blower 22 and the heaters 24, and thus eliminating many of the drawbacks inherent in prior art designs of this general type. The entire unit is complete in a very compact package, requiring only the connection to suitable electrical control means for operation.

The blower unit 22 comprises a centrifugal fan or blower 62 which may be of any convenient design, any number of which are available from a variety of fan manufacturers as standard items. The fan 62 is receivable through an aperture 64 provided in sheet 28. In the opposite sheet 30 there is provided an aperture 66 through which the shaft 68 of an electric drive motor 70 projects. The motor 70 is mounted on and secured to the plate 30 by nut and bolt means 72 spaced about the aperture 66 in the sheet. Blower or fan 62 is thereafter inserted through aperture 64, and is locked on shaft 68 of motor 70, which serves as the sole support for the fan within the housing 26.

Placed over aperture 64 in sheets 28 is a circular closure plate 74 which is secured to the sheet as by means of sheet metal screws or the like 76. Cover plate 74 is centrally apertured and is provided with an upstanding collar 78 surrounding the aperture to provide an air inlet for the blower 62. As can be seen, plate 78 is easily removable for access to the blower 62 for maintenance, cleaning or repair. While the blower 62 is shown in the drawings as having straight radial blades, it is to be understood that any suitable blower structure may be utilized, and in fact units have been constructed having a squirrel-cage-type blower wheel.

Referring now to FIGS. 1 and 4 particularly, an air outlet 80 is provided in the end wall 44 extending between plates 28 and 30, within which outlet is secured as by welding or the like outlet conduit 82, which conduit is shown for convenience as being broken off, but which may be of any convenient length to suit the individual application. Immediately adjacent outlet 80 and generally parallel with the marginal edges of plates 28 and 30 is disposed a baffle member 84 which is secured to the divider wall 36, as shown in FIG. 1. Baffle 84 is preferably of perforated sheet metal construction, and is positioned to assist proper air circulation across the heater unit 24, insuring maximum efficient use of the heater capacity and also preventing hot spots within the heater compartment 42. By reference to FIG. 1 it can be seen that air from blower 62 is directed substantially downwardly along the left-hand side of the unit, and without baffle 84 such air would tend to flow across the bottom of the unit and through outlet 80. There would thus be much less air flow across that portion of the heaters at the upper right-hand corner of the heater compartment than across those at the left-hand side and bottom thereof. With baffle 84, however, much of the air is caused to flow up and over the baffle thus insuring flow across all parts of the heaters and eliminating hot spots which could otherwise occur.

Immediately adjacent the outlet 80, sheet 28 is provided with a pair of apertures surrounding each of which there is an outwardly projecting short tube or the like, 86 and 88. Extending between the side wall of the housing 26 and baffle 84 is a short upstanding rib 90 which is aligned with the apertures defined by the collars 86 and 88. The elements 86, 88 and 90 are provided for the purpose of accepting and supporting temperature responsive elements which are part of the control system to be described.

Turning now to an examination of FIG. 6, there is shown therein a control system for the unit 20 in schematic form, comprising a main switch 100 for connecting the unit to a suitable source of electrical supply, not shown, which may be of any suitable available voltage, say for example either 220 volt or 440 volt three phase electrical service. The lines are suitably fused as shown at 102, and are connected to the heaters 46 and blower motor 70 in conventional fashion as shown in FIG. 6. A control transformer 104 is provided for stepping down the voltage to a suitable value for the control portion of the electrical circuit. Such control circuit includes a pushbutton switch 106 for actuating the circuit, a timer shown at TDR, a motor starter MS, and a magnetic contactor MC. There are also provided three temperature responsive devices labeled TH-1, TH-2 and TH-3 in FIG. 6, each of which have remote temperature responsive elements or bulbs located within the unit 20.

TH-1 is provided to control the temperature of the moving outlet air, and its temperature responsive bulb is located at the outlet 80 from unit 20 and may be preset at a temperature of 160° F. approximately. TH-2 is provided to maintain the temperature of the heater compartment 42 at a predetermined minimal level when the unit is inoperative, its temperature responsive bulb being located on the wall of heater compartment 42, and is set at say 125° F. TH-3 is a high limit safety control located above the heaters on the wall of compartment 42, and is operative to operate blower motor 70 when the temperature is compartment 42 rises above a preselected maximum, say 250° F.

The control circuit is shown in unactuated condition in FIG. 6, and in such condition the magnetic contactor MC is intermittently operated through thermostat TH-2, controlling heaters 46 through its contacts MC-1 to maintain the heater compartment at the predetermined minimum temperature at all times. This assures that the unit is almost instantly ready for operation when the switch 106 is closed, because if the heating compartment is always at 125° F., and operating temperature is 160° F., only a 35° F. rise is necessary to achieve operating temperature, while if the heaters were left off except during operation of the unit, the heater compartment might cool to the ambient temperature of 70° F. or so, necessitating a 90° F. rise to operating temperature. As will be apparent to those skilled in the art, a portion of the heaters could be operated to maintain temperature, rather than the entire bank as shown.

To operate the unit, pushbutton switch 106 is depressed, closing its contacts and actuating timer TDR, which is set for a desired time period, say 60 seconds. Actuation of TDR closes contacts TDR-1, actuating motor starter relay MS, closing contacts MS-1 to lock the circuit in around switch 106, closing contacts MS-2 to start blower motor 70. Also contacts TDR-2 are closed, energizing motor starter relay MC through thermostat TH-1, closing MC-1 to energize heaters 46. TH-1 operates to control the operation of heaters 46 during the operating cycle, and its bulb is positioned at outlet 80, being inserted through an aperture 86 or 88 and with its end supported by plate 90 (see FIGS. 1 and 4). Upon the expiration of timer TDR, TDR-1 and TDR-2 are opened, stopping motor 70 and deactuating TH-1. Until switch 106 is again closed, operation of heaters 46 remains under the control of TH-2.

In the event the temperature within heater compartment 42 should rise to an abnormally high level through malfunction of TH-1 or TH-2, TH-3 will respond, closing a separate circuit to motor starter MS, which will be actuated to start blower motor 70, operating blower 62 until the temperature is decreased to a normal level. Blower motor 70 is in addition provided with overload protection shown at OL in FIG. 6, with associated contacts OL-1, to stop the motor in case of overload.

I claim:

1. An air heater and blower comprising, in combination:

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a pair of spaced-apart, parallel sheet members of generally rectangular configuration, the space between said sheets being divided into a heater compartment and a blower compartment by a partition extending from a first marginal edge of the sheets and terminating spaced from the opposite marginal edge of the sheets providing an opening establishing communication between said compartments adjacent said opposite marginal edge, said blower compartment being enclosed by a spiral scroll extending between and secured to said sheets terminating at one end tangent to said partition and at its opposite end tangent to said opposite marginal edge of the sheets adjacent said opening, and said heater compartment being enclosed by peripheral wall means extending between said sheets; blower means in said blower compartment supported between said sheets and housed within said scroll, an air inlet in one of said sheets communicating with said blower compartment, motor means coupled to said blower for operating the same removably mounted externally on the sheet opposite said air inlet, heater means mounted within said heater compartment, a heated air outlet in the end wall of said heater compartment immediately adjacent said first marginal edge of said sheets diagonally opposite the opening establishing communication between the compartments, an upright baffle in said heater compartment secured along opposite marginal edges to said sheets and positioned separating said heater means from said heated air outlet extending generally parallel to said first marginal edge of said sheets from said heater compartment end wall toward said dividing partition and

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terminating spaced from said partition a predetermined distance, and control means for controlling the operation of said blower means and said heater means.

2. The invention as defined in claim 1 characterized in that said sheets are each provided with outwardly facing peripheral flanges, and said peripheral wall means includes a platelike panel member having said heater means connected thereto, said panel member being removably secured to said sheet flanges to removably support said heater means within the heater compartment.

3. The invention as defined in claim 1 characterized in that one of said sheets exhibits an opening therethrough sized to permit entry and removal of said blower, and a cover plate is removably mounted covering said opening, with said plate having an aperture constituting said air inlet for said blower means.

4. The invention as defined in claim 1 characterized in that said control means comprises switch means for initiating operation of said heater means and of said blower means, together with timer means responsive to actuation of the switch for controlling the length of a cycle of operation, and thermostatically controlled means for operating said heater means to continuously maintain the heater compartment at a preselected temperature independently of switch actuation.

5. The invention as defined in claim 2 characterized in that said control means further includes a second thermostatically controlled means coupled to said heater means and responsive to actuation of said switch for maintaining heated air flowing from said air outlet at a preselected temperature during each cycle of operation.

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