March 30, 1965 R. S. KNAPP 3,175,550

DUAL AIR HEATER

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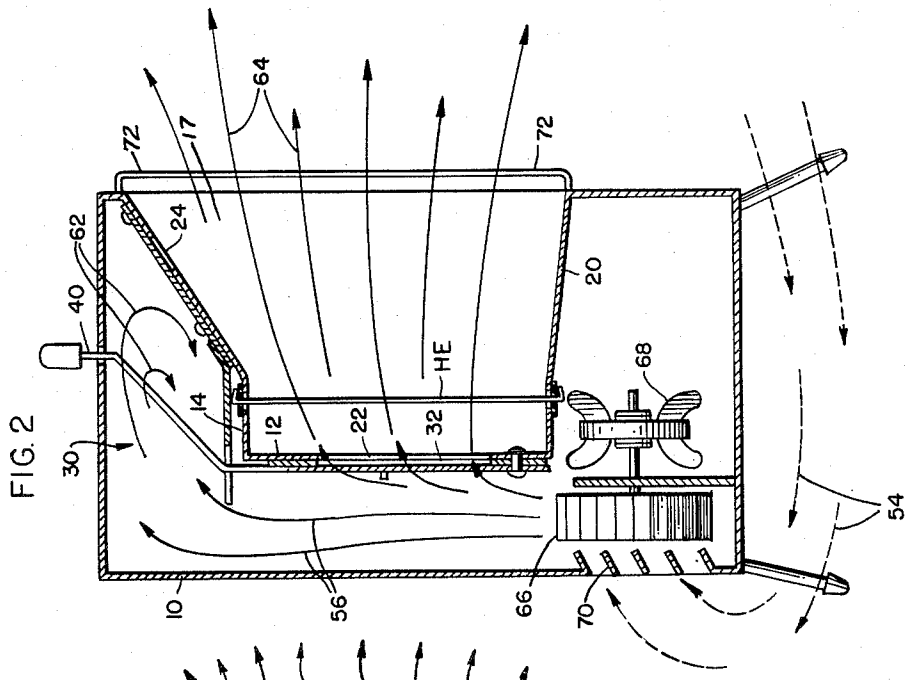


FIG. 2

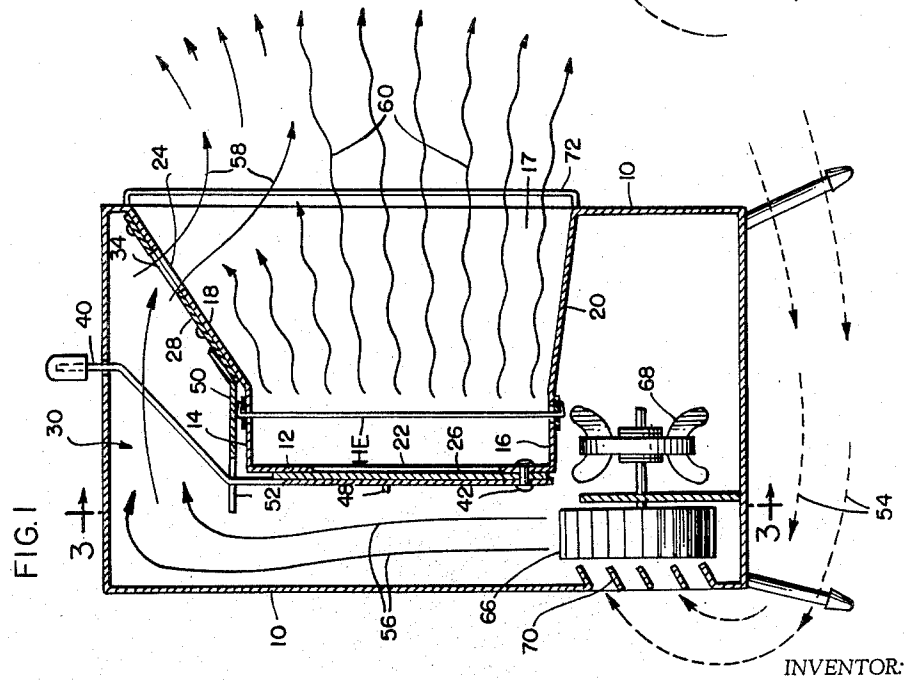


FIG. 1

INVENTOR:
ROBERT S. KNAPP
BY
Bair, Freeman & Molinare
ATT'YS

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FIG. 4

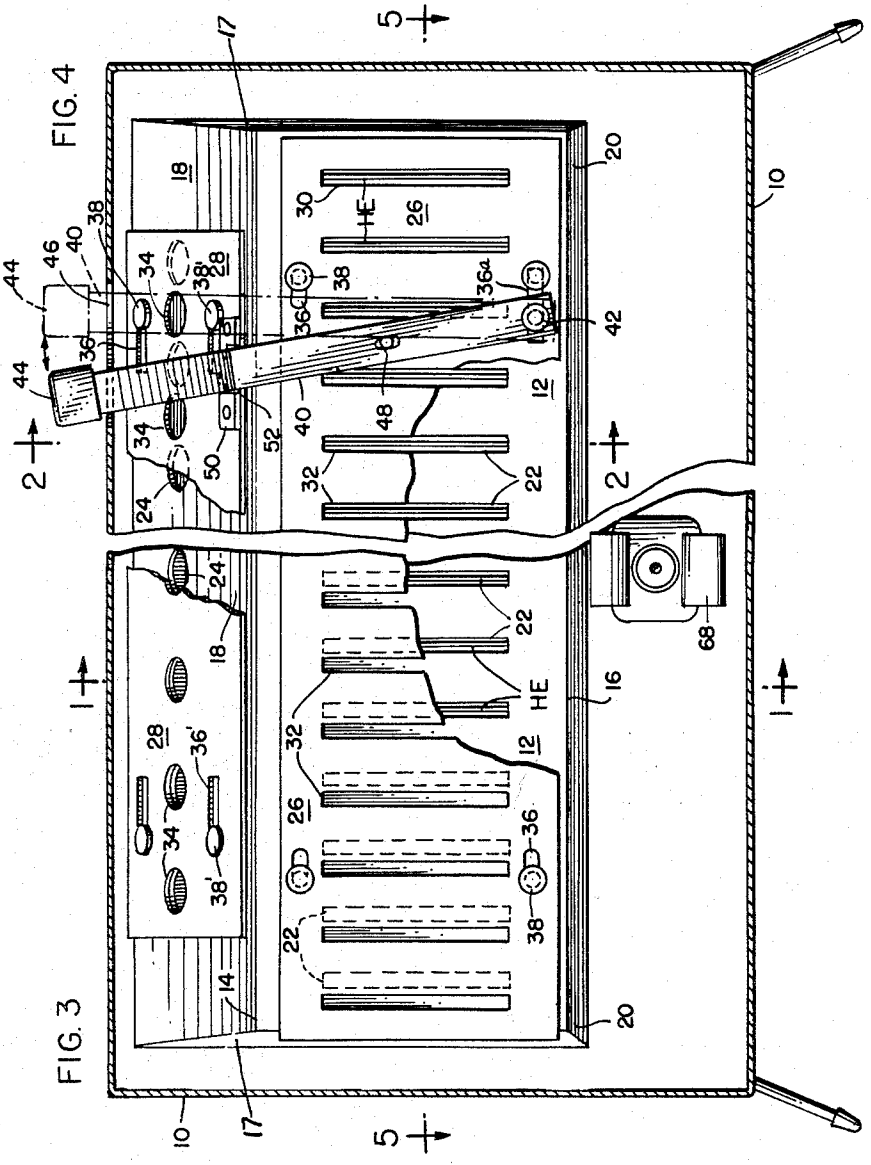


FIG. 3

INVENTOR:

ROBERT S. KNAPP

BY

Bair, Freeman & Molinare

ATT'YS

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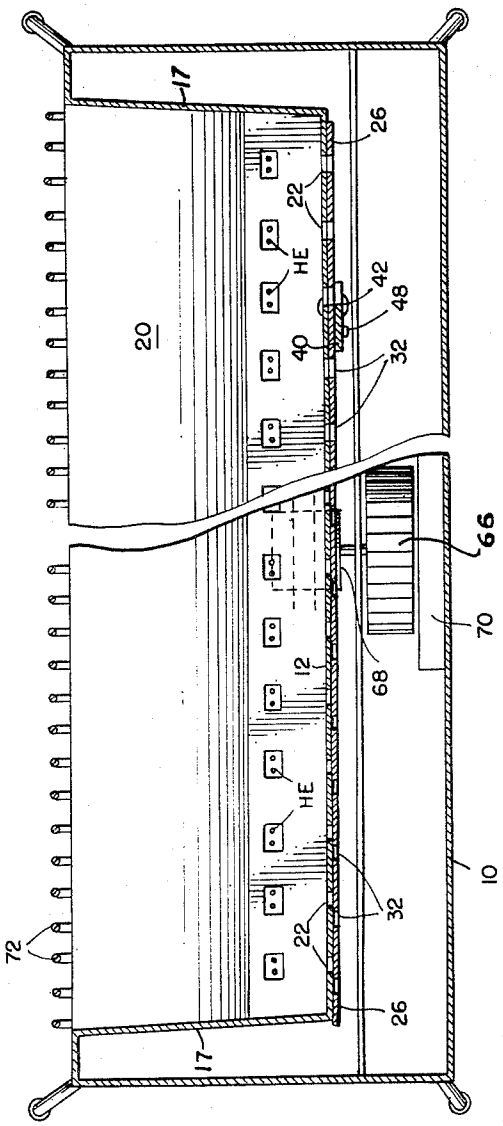


FIG. 5

INVENTOR:
ROBERT S. KNAPP
BY
Bair, Freeman & Molinare
ATT'YS

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3,175,550
DUAL AIR HEATER

Robert S. Knapp, St. Louis, Mo., assignor to Knapp-Monarch Company, St. Louis, Mo., a corporation of Delaware

Filed Feb. 25, 1963, Ser. No. 260,757
5 Claims. (Cl. 126—63)

This invention relates to a dual air heater having means for adjusting the heater for either of two types of heating, namely, radiant heating or convection heating.

One object of the invention is to provide damper means for effecting the adjustment of the heater for either radiant heating or convection heating, wherein the damper means is adjustable to control circulated air and selectively operable to permit flow thereof over the heating element for convection heating or in a path bypassing the heating element for radiant heating.

Another object is to provide a pair of damper means, one for permitting the circulated air to flow past the heating element for convection heating and the other one for permitting the circulated air to bypass the heating element for radiant heating, a single means being provided to control the two damper means to render one operable and the other inoperable or vice versa.

A further object is to provide a dual air heater having a heating element in a housing thereof and a reflector for the heating element which has a wall back of the heating element and another wall above and forward thereof, means being provided for drawing air into the housing of the heater and discharging it against these walls and damper means being associated with each of the walls and selectively operable for opening action of one coupled with closing action of the other or vice versa so that either radiant or convection heating may be had, or in intermediate positions of the control means, a mixture of the two in the desired proportions.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my dual air heater, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in detail on the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view through a dual air heater embodying my invention and is taken substantially on line 1—1 of FIG. 3 and shows it adjusted for radiant heating;

FIG. 2 is a similar vertical sectional view showing the heater adjusted for convection heating;

FIG. 3 is a fragmentary vertical sectional view taken on the line 3—3 of FIG. 1 and showing one end of the heater and the damper means therein;

FIG. 4 is a fragmentary sectional view similar to FIG. 3 showing the other end of the heater and the damper means therein adjusted as in FIG. 2, the upper portion of FIG. 2 being taken on the line 2—2 of FIG. 4, and

FIG. 5 is a fragmentary top plan view taken substantially on line 5—5 of FIGS. 3 and 4.

On the accompanying drawings I have used the reference numeral 10 to indicate a heater housing. A generally enclosed reflector of channel-shaped cross-section of polished aluminum or chrome plated metal is mounted in the housing 10 and comprises a back wall 12, a top flange 14, a bottom flange 16, top and bottom sloping walls 18 and 20 forming continuations of the flanges 14 and 16, and lateral walls 17 spaced from the lateral walls of housing 10. The back wall 12 is provided with damper openings 22 which as shown in FIGS. 3 and 4 are in the form of vertical spaced-apart slots. The top sloping wall is provided with damper openings 24 which are shown circular in shape.

A main damper plate 26 is slidable on the back of the back wall 12 and is provided with damper openings 32 adapted to be staggered relative to the openings 22 as shown in FIG. 3 or aligned with them as shown in FIG. 4. In order to slidably mount the damper plate 26 on the wall 12, the damper plate is provided with slots 36 through which shouldered rivets 38 extend, the rivets being secured in the wall 12.

A secondary damper plate 28 is slidable along the top of the top sloping wall 18 and has damper openings 34 adapted to align with the openings 24 as in FIG. 3 or to be positioned out of alignment with them as shown in FIG. 4. The damper plate 28 may likewise be slidably mounted on the top sloping wall 18 by means of slots 36 and rivets 38.

For controlling the opening and closing of the damper plates 26 and 28, I provide a damper actuating lever 40 pivoted at 42 to the back wall 12. In FIG. 4 the lowermost of the slots 36 is indicated at 36*a*, and is elongated to permit extension of the rivet 42 through the damper plate 26 to mount in the back wall 12. The lever 40 extends upwardly and through an elongated slot 46 to the exterior of the housing 10 where it is provided with a control knob 44 for convenience in manipulating the lever and thereby the damper plates.

The lever 40 is operatively connected to the damper plate 26 by means of a connector pin or rivet 48 through the two and with an appropriate lost motion connection, such as an enlarged hole in plate 46 for rivet 48 to permit of motion without binding. The lever 40 is operatively connected to the damper plate 28 by means of a bifurcated bracket 50 secured thereto and defining a notch 52 for operatively receiving the lever. This type of construction permits swinging of the lever 40 from the full line position to the dot-and-dash line position shown in FIG. 4 for adjusting the dampers and, of course, the lever may be stopped in any intermediate position desired.

The construction is such that one damper is opened when the other is closed and vice versa. In FIG. 4 with the lever 40 in the full line position the damper openings 22–32 are in alignment with each other and therefore open, and the openings 24–34 are closed. The heating element of the dual air heater is shown at HE in FIGS. 1 and 2, and may be in any physical form such as a straight strand, or a helical coil, as are well known in the art. Preferably, the vertical segments of the heater HE are arranged and spaced so that each such segment is adjacent, or in register, with an opening 22 in wall 12. Preferably the strands of the elongated heater element HE are arranged in a modified sinuosity, as shown in the copending application of John J. Kueser, Serial No. 259,021, now issued as Patent No. 3,119,924, and assigned to the common assignee of this application. The rather close spacing of slots 22 insures that the disposition of strands forwardly of wall 12 will always insure that such strands are, at the most, only slightly offset from the slots 22. In FIGS. 3 and 4 the strands of the heating element are illustrated as closely adjacent the openings so they may be seen through the openings 22, and so that when air is blown outwardly through these openings the air will move across the heating element segments, so as to effect heat transfer therefrom. When the actuating lever 40 is moved to the dot-and-dash line position shown in FIG. 4, the damper plates are adjusted as shown in FIGS. 1 and 3 with the openings 24–34 in register and open and with the openings 22–32 closed, whereupon a different path of air flow is provided as will hereinafter appear.

Referring to FIG. 1 a blower 66 driven by a motor 68 is provided for pressurizing and circulating air. Intake louvers 70 are provided through which air at room tem-

perature may flow as indicated by the arrows 54. This air is drawn into the blower wheel 66 and discharged, as shown at 56, into the pressurized substantially enclosed chamber defined between housing 10 and the reflector. Since the only intended openings to the chamber defined between housing 10 and the reflector are the air intake 70 and the rather restricted air discharge openings 32–22 or 34–24, the blower 66 operates to build up pressure within said chamber. With the damper plates adjusted as in FIGS. 1 and 3 (lever 40 of FIG. 4 in the dot-and-dash line position) the pressurized air acts to absorb heat from the walls 12, 14, 17 and 18 of the reflector while insulating the housing 10 from such heat, and the air discharges as indicated by the arrows 58 through the damper openings 24–34, and is directed forwardly by inclined wall 18 into the room in front of the heater At the same time substantial radiant heating is effected by the heat radiated from the heating element HE as indicated by the arrows 60. Under these circumstances the heating element wire glows brightly (approximately 1600° F. operating temperature of the wire) so that it is highly radiant and the heater radiates heat by the glow of the wires in the manner of an efficient radiant heater which is conveniently used for "spot" or localized heating. At the same time air is forced downwardly and outwardly at an angle from the openings 24–34 but does not blow onto the heating element and thus there is desirable mild air circulation in the vicinity of the area where radiant heat is maximum. This circulation of the pressurized air keeps the heater housing 10, motor 68, and other parts cool and still permits the heating element wire to operate at a bright high temperature condition for obtaining excellent radiant heating.

With the lever 40 in the full-line position, the openings 22–32 are open and the openings 24–34 are closed as previously indicated. Under this condition the pressurized air through the heater discharges forwardly through the vertical slots 22–32 and passes over and across the vertical wires of the heating element and outwardly from the front of the heater to thereby act as a connector to constantly remove the heat from the wires and produce a net effect that the local temperature at the wire is lowered so that the wire will not glow or glow at a dull, or low, emission level. After this air passes the hot resistance wire it is convected out into the room past the safety grill 72 which may be formed of a plurality of spaced vertical wires mounted on housing 10 or on the reflector. The pressurized air moves into the room in a circulating motion to heat a relatively large area by convected heat. At this time the dampers are positioned as in FIGS. 2 and 4, and while the air pressure forces the air through the slots 23–32, still some air circulates through the chamber 30 in the housing 10 behind the walls 12 and 18 and helps to keep the housing 10 cool. While there still is some radiant heat, its intensity is cut down sufficiently so that a person can stand directly in front of the heater without discomfort.

In previous designs the air heaters were either of the radiant or convection type and a heater was purchased for either one of these purposes or the other in spite of the fact that in most cases there would be times and conditions where a radiant heater could have served better than if it were a convection heater and vice versa. My type of heater is adjustable to furnish either type of heat with the lever 40 at its extreme limits or a mixture of the two types in the desired proportions depending on intermediate positions of the lever.

Some changes may be made in the construction and arrangement of the parts of my dual air heater without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may reasonably be included within their scope.

I claim as my invention:

1. An air heater for selectively producing heating effect at two distinct heating levels wherein one heating level is primarily a function of radiant heat and the other heating level appears primarily as a function of convection heating, said heater comprising, in combination: housing means defining a substantially enclosed chamber in which air is to be pressurized and an open-sided chamber whose open-side is substantially unobstructed and through which heat is to emanate, said housing means including two apertured walls that are common between the two said chambers, heating means of the type which normally glows when energized so as to produce primarily radiant heat therefrom carried on said housing means in said open-sided chamber, air-pressurizing means carried on said housing means and arranged for ingesting air into said substantially enclosed chamber and for pressurizing the air therein, the said two apertured walls being transverse to each other and each having a face which faces into the open-sided chamber with one wall facing the heating means and the other wall facing away from the heating means, and control means selectively operable to vary the flow of pressurized air from the enclosed chamber through the said two apertured walls, so that when pressurized air flows solely through the one wall facing away from the heating means, then the heating means primarily produces radiant heating, and when the pressurized air flows solely through the wall facing the heating means, then the heating means primarily appears to produce convection heating.

2. An air heater as set forth in claim 1 wherein said heating means includes a sinuated heating wire disposed in an upright plane, and the apertured wall that faces the heating means being upright and opposite the open side of said open-sided chamber.

3. An air heater as set forth in claim 1 wherein said heating means is disposed in an upright plane opposite the open-side of said open-sided chamber, and wherein the apertured wall that faces away from the heating means is spaced forwardly of the heating means and is inclined so that it faces in a direction downwardly and forwardly through the open side of the open-sided chamber.

4. An air heater as set forth in claim 1 wherein the control means includes dampers associated with the apertures in the two apertured walls, and a single controller for simultaneously actuating the dampers associated with both apertured walls.

5. An air heater for selectively producing heating effect at two distinct heating levels wherein one heating level is primarily a function of radiant heat and the other heating level appears primarily as a function of convection heating, said heater comprising, in combination: housing means defining a substantially enclosed chamber in which air is to be pressurized and an open-sided chamber whose open-side is substantially unobstructed and through which heat is to emanate, said housing means including two apertured walls that are common between the two said chambers, heating means of the type which normally glows when energized so as to produce primarily radiant heat therefrom carried on said housing means in said open-sided chamber, air-pressurizing means carried on said housing means and arranged for ingesting air into said substantially enclosed chamber and for pressurizing the air therein, the said two apertured walls being transverse to each other and each having a face which faces into the open-sided chamber with one wall facing the heating means and the other wall facing away from the heating means, and control means selectively operable to vary the flow of pressurized air from the enclosed chamber through the said two apertured walls, so that when pressurized air flows solely through the one wall facing away from the heating means, then the heating means primarily produces radiant heating, and when the pressur-

ized air flows solely through the wall facing the heating means, then the heating means primarily appears to produce convection heating, said heating means including a sinuated heated wire disposed in an upright plane and defining a plurality of spaced heater segments, and the apertured wall that faces said heating means provides slit-like apertures therein with the slit apertures adjacent the spaced heater segments of the heater means.

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JAMES W. WESTHAVER, *Primary Examiner.*