

May 14, 1963

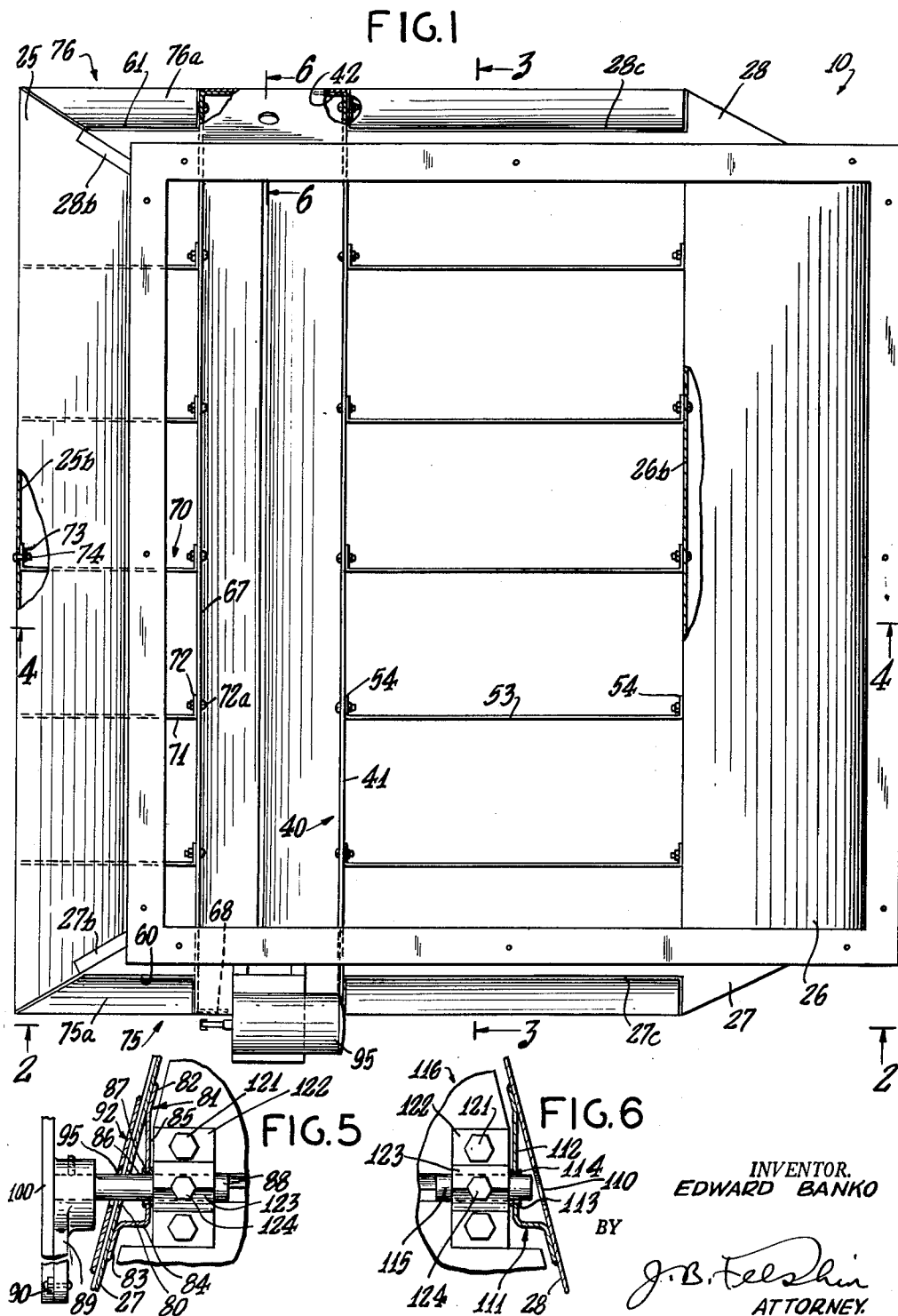
E. BANKO

3,089,403

DUAL PURPOSE DOOR HEATER DISCHARGE

Filed Jan. 19, 1961

3 Sheets-Sheet 1



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DUAL PURPOSE DOOR HEATER DISCHARGE

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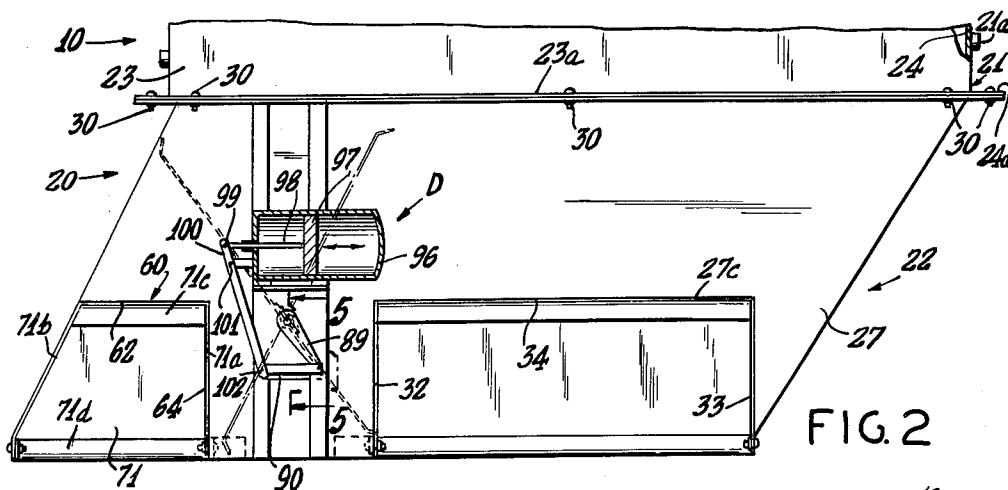


FIG. 2

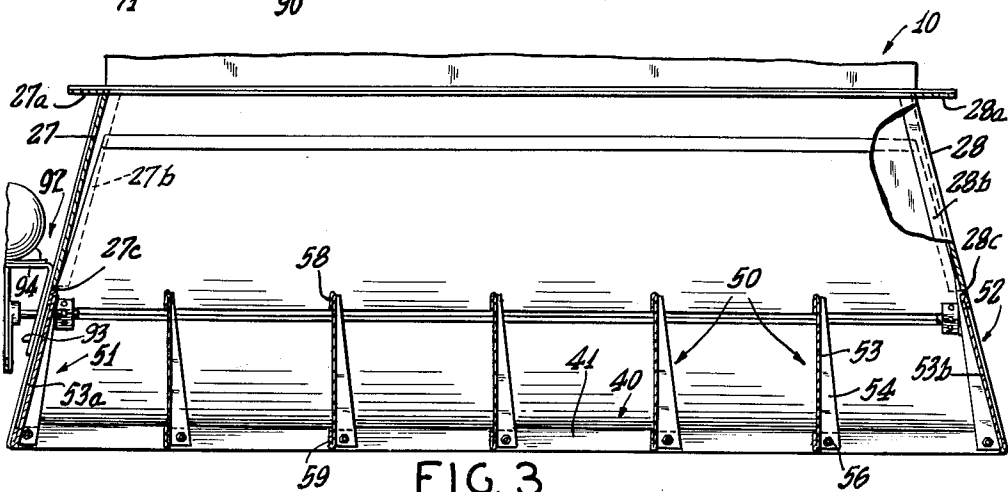
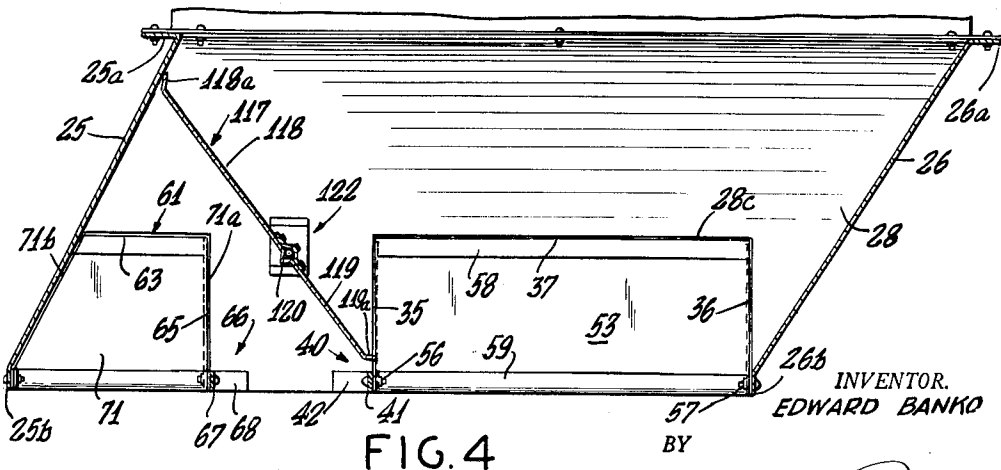


FIG. 3



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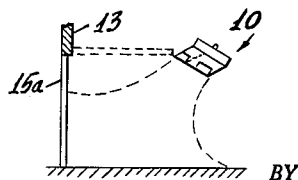
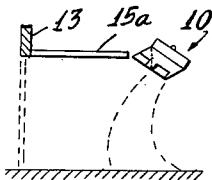
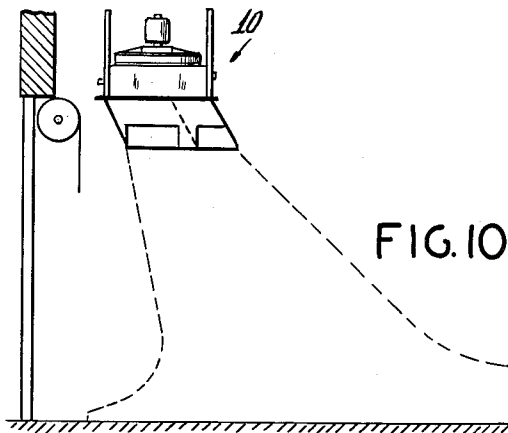
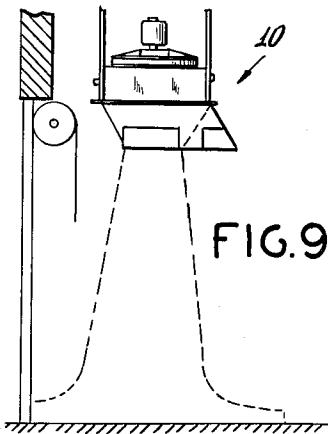
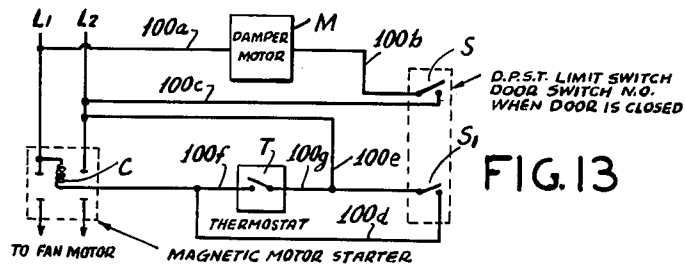
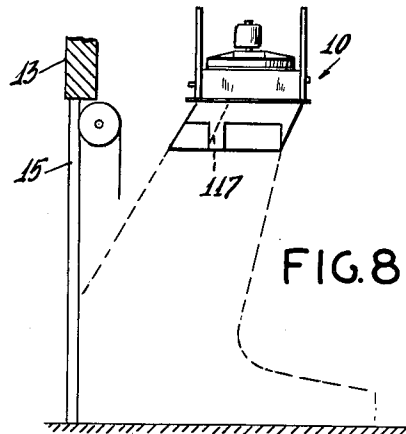
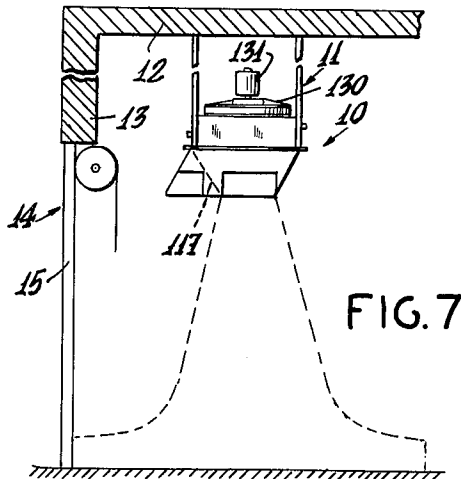
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DUAL PURPOSE DOOR HEATER DISCHARGE

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3 Sheets-Sheet 3



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3,089,403

DUAL PURPOSE DOOR HEATER DISCHARGE

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12 Claims. (Cl. 98—36)

This invention relates to heaters. It is particularly directed to space heaters for heating door openings, rooms or perimeters thereof.

Door heaters have been known for years, and have heretofore been designed specifically to eliminate the problem of cold drafts entering through large doorways during cold weather, to protect workers located near the door against discomfort which often lowers efficiency and causes sickness and complaints. Such door heaters, as heretofore designed, provided for blanketing the door opening with a high velocity blast of heated air that tempers the incoming breezes and eliminates chilling drafts. One difficulty with such prior door heaters has been that they heated the door openings only in cold weather and only when the door opened. Additional heaters were necessary and hence used, to heat the plant as part of the plant heating system, when the doors are closed. This arrangement made for a costly operation and reduced efficiency because the door heaters were only used part-time.

It is hence an object of this invention to provide heaters of the character described so constructed as to enable them to be used both as door heaters when the doors are open as well as room or perimeter heaters, as part of the plant heating system, when the doors are closed, so as to permit full-time use of the equipment to augment the coverage and effectiveness of the rest of the system.

Another object of this invention is to provide a heater of the character described in which the changeover from door heating to room or perimeter heating is accomplished by a motor operated damper contained in the discharge portion of the heater, to change the direction and extent of flow of discharged air.

Yet another object of this invention is to provide a heater of the character described comprising an electric motor to rotate a fan for flowing air past heating elements, in which an electric switch controlled by the door, is connected in parallel with a thermostat switch, so that both control the fan motor. When the door is closed the damper which is operated by a motor controlled also by a door switch is in such position that the air is discharged through the full discharge end of the heater so as to heat the room or the perimeter of the room. In such condition, the door controlled switch for the fan motor is open, and the fan motor is controlled by the thermostat switch, so as to be energized only when temperature condition requires. When the door begins to open, said door controlled fan motor switch closes to operate the fan, and the door controlled switch for the damper motor is actuated to operate the damper motor to position the damper so that all the heated air will be discharged through a reduced portion of the discharge end of the heater to heat the door opening. By this reduction in outlet area, the heat flow is at high velocity to penetrate and temper the incoming cold air, and the fan motor is always energized while the door is open irrespective of the condition of the thermostat switch.

Still another object of this invention is to provide a heater of the character described which may be mounted vertically in one position, so as to act either as a door heater or a perimeter heater, or in a reversed vertical position to act either as a door heater or as a room heater, both such positions being employed for rolling or sliding doors. The heater may also be mounted in an angular position for canopy or overhead doors, as a door

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heater or perimeter heater. With the present improved heater, furthermore, the construction is such that when the door is closed, the heat flow pattern spreads for long distances sideways along the floor, when the heater is mounted for room heating. Also, with the door closed, and with the heater mounted for perimeter heating, a perimeter heat flow pattern spreads for a long distance sideways along the wall, thereby preventing cold air from cascading down the wall and causing drafts along the floor to the discomfort of workers in adjacent positions. For this arrangement, the heater is mounted with the room discharge section toward the door.

A still further object of this invention is to provide a heater of the character described having a discharge end provided with inclined parallel walls, a damper in said discharge end and means to move the damper from a position parallel to both said walls, allowing air flow through the entire discharge, to a position where the damper converges from the upper end of one of said walls toward the lower end of the other of said walls, to cut down the area of discharge and to gradually reduce the cross-sectional area from the inlet to the outlet end of the discharge.

A still further object of this invention is to provide a strong, rugged and durable heater of the character described which shall be relatively inexpensive to manufacture, smooth in operation and yet practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown an illustrative embodiment of this invention,

FIG. 1 is a top view of the discharge end of a heater embodying the invention;

FIG. 2 is a cross-sectional view of the heater on line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 1;

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 2;

FIG. 6 is a cross-sectional view taken on line 6—6 of FIG. 1;

FIG. 7 is an elevational view showing a door and perimeter heater for a rolling or sliding door mounted in relation to a door and illustrating flow of air for heating the door opening;

FIG. 8 is an elevational view of the apparatus of FIG. 7, but illustrating flow of air for perimeter heating, with the door closed;

FIG. 9 is an elevational view showing a door and room heater in relation to an open door illustrating flow of air for heating the door opening;

FIG. 10 is an elevational view of the apparatus of FIG. 9 but illustrating flow of air for room heating, when the door is closed;

FIG. 11 is an elevational view of the heater used in conjunction with a canopy or overhead door, with the door open, and illustrating flow of air to heat the door opening;

FIG. 12 is an elevational view of the apparatus of FIG. 11, but illustrating flow of air for perimeter heating when the door is closed; and

FIG. 13 is a wiring diagram of the controls for the fan motor and damper motor.

Referring now in detail to the drawing, 10 designates a

heater embodying the invention, which may be hung by means of suitable bracket 11 from a ceiling 12 adjacent a wall 13 having a door opening 14 closed by a rolling or sliding door 15.

The heater 10 comprises a casing 20 of sheet metal, having an upper section 21 housing a usual heating means such as steam heat coils 21a, and a lower discharge section 22. The upper section 21 is a rectangular and has vertical, parallel side walls 23 interconnected by vertical, parallel end walls 24. Said walls 23, 24 have horizontal outwardly extending flanges 23a, 24a respectively, at their lower ends.

The lower discharge section 22 comprises parallel inclined walls 25, 26 inclined downwardly and to one side of walls 24; and downwardly and outwardly inclined walls 27, 28. Walls 25, 26, 27, 28 have horizontal outwardly extending flanges 25a, 26a, 27a, 28a at their upper ends riveted, bolted or otherwise fixed to flanges 23a, 24a as at 30. The ceiling bracket 11 may have portions engaging beneath flange 25a, 26a, 27a, 28a. Walls 25, 26 have short vertical flanges 25b, 26b at their lower ends.

The side walls 27, 28 may have end flanges 27b, 28b respectively overlapping the adjacent ends of end walls 25a, 26 and spot welded or otherwise secured thereto.

Side walls 27, 28 have rectangular cut outs 27c, 28c extending up from their lower ends, and inwardly from the lower end of wall 26. Cut away 27c forms parallel side edges 32, 33 in vertical planes interconnected by a top horizontal edge 34. Cut-out 28c forms parallel side edges 35, 36 in vertical planes interconnected by a top horizontal edge 37.

The lower ends of side walls 27, 28 are interconnected by a strap or vane support 40 having an elongated portion 41 located at the plane of edges 32, 35, and offset end flanges 42 welded or otherwise secured to the lower ends of side walls 27, 28. Portion 41 of strap 40 is located about midway between flanges 25b, 26b and parallel thereto.

Supported by and between strap 40 and flange 26b are a plurality of similar diffuse vanes 50, spaced equally apart, in parallel, vertical positions. A member 51 similar to vanes 50 closes the cut away 27c in wall 27. A member 52 similar to vane 50 closes the cut away 28c in wall 28.

Each vane 50 has a vertical wall 53 from which extend parallel triangular shaped side flanges 54 formed at their lower wider ends with suitable openings to receive bolts 56, 57 for bolting said vanes to strap portion 41 and flange 26b, respectively. The upper and lower ends of walls 53 are folded over for rigidity as at 58, 59. Vanes 50 are independently adjustable angularly.

Member 51 is tilted so that its main wall 53a lies in the plane of wall 27 to close cut away 27c. Member 52 is reversed in position so as to be symmetrical with respect to member 51, and its main wall 53b is in the plane of wall 28 and closes cut out 28c.

Walls 27, 28 are also formed with cut outs 60, 61, adjacent wall 25, of same height as cut outs 27c, 28c, forming top horizontal edges 62, 63, respectively, at the horizontal level of edges 34, 37 of cut outs 27c, 28c, and end edges 64, 65 located in a vertical plane disposed about mid-way between flange 25b and strap 40. Interconnecting the lower ends of walls 27, 28 is a second strap 66 parallel to strap 40 and spaced therefrom, and comprising an elongated portion 67 located at the plane of edges 65 and having end flanges 68 welded or otherwise secured to the lower ends of walls 27, 28.

Fixed to flange 25b and strap portion 67 of strap 66 are a plurality of similar equally spaced vanes 70, each having a wall 71 in a vertical plane, and at one end an offset flange 72 of triangular shape similar to shape of flanges 54. Wall 71 is of trapezoidal shape having inner edges 71a in plane of edges 64, 65 of cut outs

60, 61 and outer edges 71b adjacent wall 25. The lower ends of flanges 72 are bolted as at 72a to strap portion 67 of strap 66. Walls 71 are in the planes of walls 53 as seen in FIG. 1. At the lower end of each wall 71 on the side opposite to flange 72, is a small flange 73 bolted as at 74 to flange 25b. The upper and lower ends of wall 71 are folded back as at 71c, 71d. To close cut out 60 in wall 27 is a member 75 similar to vane 70 and similarly fixed, but in a tilted position, so that its main wall 75a is in the plane of wall 27. Another member 76, similar to vane 70 closes the cut out 61 in wall 28. In member 76, the side attaching flanges extend oppositely to flanges 72, 73 of vanes 70 so as to extend into the casing. Its main wall 76a is in the plane of wall 28. Vanes 70 are independently angularly adjustable.

In FIGS. 7 and 8, heater 10 is shown mounted in position to operate either as a door heater (FIG. 7) with the door open, or as a perimeter heater (FIG. 8), with the door closed, as will be explained hereinafter.

For this purpose wall 27 is formed with a through opening 80 (FIG. 5) located midway between edges 32 and 64, and at a level somewhat below edges 34, 62. Attached to the inner side of wall 27 is a bracket 81 having inclined end flanges 82, 83 contacting and welded or otherwise secured to said wall above and below said opening 80. Extending from flange 83 is a horizontal shoulder 84 from which extends upwardly a vertical portion 85 formed with a hole 86 horizontally aligned with opening 80 and receiving a bushing 87. Extending through the bushing 87 is a horizontal stud shaft 88 which passes out of the casing through said opening 80. Fixed to the outer end of shaft 88 is a crank 89 to the outer end of which is pivoted a link 90 for the purpose hereinafter appearing.

Fixed to the outer side of wall 27 is a bracket 92 having an inclined portion 93 contacting and welded or otherwise secured to said wall. Extending outwardly from said portion 93 is a horizontal platform 94. Portion 93 is formed with an opening 95 through which shaft 88 passes. On platform 94 is fixed a damper actuator D.

The damper actuator D may be of the quick acting electro hydraulic type such as Damper Actuator DH-OA-252 made by General Controls, of 205 East 42nd Street, New York city, New York. The damper actuator D includes an electric motor M which is energized when the door opens to actuate a piston rod 98 fixed to a piston 97 or actuated by a diaphragm in cylinder 96 to the left, looking at FIG. 2. Piston rod 98 passes out of the cylinder and is loosely pivoted, as at 99, to one end of a lever 100. Said lever 100 is pivoted to the cylinder, as at 101 mediately the ends thereof. The lower end of the lever 100 is pivoted as at 102 to link 90. The damper actuator motor M is controlled by circuit shown in FIG. 13, to be explained hereinafter, to move the piston 97. Movement of the piston in one direction will cause rotation of shaft 88 in one direction. Movement of piston 97 in an opposite direction will rotate shaft 88 in an opposite direction.

Referring now to FIG. 6, it will be seen that wall 28 is formed with an opening 110 aligned with opening 80 in wall 27. Fixed to the inside of wall 27, is a bracket 111 similar, but symmetrically disposed to bracket 81, and having a vertical portion 112 formed with an opening 113 receiving a bushing 114. Rotatably mounted in bushing 114 is a horizontal stud shaft 115. Mounted on and fixed to stud shafts 88, 115 is a damper 116. Said damper 116 comprises a main plate 117 of sheet metal comprising aligned coplanar walls 118, 119 connected by a transverse V-shaped portion 120 into which the stud shafts 88, 115 project. Walls 118, 119 are in a plane substantially passing through the axis of shafts 88, 115. Clamped to the ends of walls 118, 119 as by bolts 121 are brackets 122, also having central V-shaped grooved portions 123 receiving the stud shafts 88, 115.

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Set screws 124 screwed through the V-shaped portions 123 serve to fix the damper to the stud shafts 88, 115 so that the damper rotates with the shafts under the control of the damper motor 95. The damper plate 117 has downwardly and outwardly inclined side edges conforming to the inclination of walls 27, 28. At the upper end of wall 118 is an upwardly and inwardly inclined flange 118a. At the lower end of wall 119 is a flange 119a inclined in symmetry with flange 118a.

In the position of FIGS. 2, 3, 4 and 7, the damper 116 is inclined from the upper end of wall 25 down to the lower end of the discharge, adjacent strap 40. In this position, air blown downwardly by the fan through the discharge, will pass diffuser vanes 50 straight downwardly. In this position, the door is open.

The fan 130 is mounted in the upper section 23 of the casing and is operated by an electric motor 131. The velocity of the flow of air is increased because of the gradual contraction of the discharge cross-sectional area.

When the door is open, the fan motor is energized, and the damper motor is actuated to keep the damper 116 in the position shown in FIG. 7. The damper motor and the fan motor are controlled by switches shown in the wiring diagram of FIG. 13.

When the door closes, the fan motor switch is opened, and the fan motor is then controlled by the thermostat switch. Also, closing of the door causes operation of the damper motor to move piston 97 to the right, looking at FIG. 2, to cause rotation of the damper 116 to the dot-dash position of FIG. 2, where it is parallel to walls 25, 26. This position is also shown in FIG. 8. In such position, the air flow, when the thermostat starts the fan motor 131, is through the whole discharge end of the casing in a direction down and toward the door to heat the perimeter of the room including the lower part of the wall 13 and door 15 and the adjacent part of the floor. The flow is toward the door and door wall because the walls 25, 26 are inclined downwardly and toward the wall. The air flows past diffusers 50 and 70 as well as through the space therebetween.

Should it be desired to use the heater 10 as a door opening heater and room heater, the heater is mounted as shown in FIGS. 9 and 10. In FIG. 9 the door opening is heated with the damper 116 inclined down and toward the wall. It will be noticed that to change the heater from position of FIG. 7 to position of FIG. 9, it is merely rotated 180° about a vertical axis so that walls 25, 26 are inclined down and away from wall 13. In FIG. 10 the damper has been swung to allow discharge of air through the entire discharge end of the heater to blow air down to the floor to heat the room.

Since the walls 27, 28 are inclined downwardly and outwardly, the air spreads out as it comes down to cover a large area of the floor or perimeter. This is true whether the heater is mounted, as shown in FIGS. 7 or 9.

In FIGS. 11, 12, the heater 10 is mounted in relation to a canopy or overhead door, angularly so that when the door is closed, perimeter heating is obtained. The heater 10 of FIGS. 11, 12 is mounted as in FIGS. 7 and 8 beyond the position of the inwardly swung open door, and is rotated in a clockwise position through an angle of about 45 degrees from the FIGS. 7, 8 position. Any suitable brackets may be employed to keep the heater in such position.

In FIG. 13, the circuit comprises power lines L_1 , L_2 which pass through a magnetic motor starter comprising a coil C having means, which when energized converts the power lines to the fan motor 131. L_1 is connected by wire 100a to damper actuator motor M, which in turn is connected by wire 100b to one (S) of a pair of normally open door actuated limit switches S , S_1 . These switches are normally open when the door is closed, and are closed together when the door opens. Switch S is connected by wire 100c to line L_2 .

The coil C is connected at one side to line L_1 , and is

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connected by wire 100d to one side of switch S_1 . The other side of switch S_1 is connected by wire 100c to line L_2 . A thermostat switch for controlling the operation of the fan motor 131 when the door is closed, is connected by wires 100f, 100g across wires 100d, 100c.

When the door is closed, switches S , S_1 are open and damper motor M is de-energized to retain the damper in the position shown in FIGS. 8, 10 and 12 (by means of a suitable spring means acting on the piston 97).

At this time, the fan motor is controlled by the thermostat switch T, through the coil C, and wires 100f, 100g; 100e. When the thermostat switch is energized, coil C is energized to start operation of the fan motor.

When the door opens, switches S , S_1 close, thereby energizing the damper motor M through switch S , and wires 100a, 100b, 100c, to swing the damper 117 to the positions of FIGS. 4, 7, 9, 11 and at the same time, coil C is energized through wire 100e, switch S_1 and wire 100d, to energize the fan motor independently of the thermostat switch T.

The damper actuator may be of the type wherein when the motor M is energized oil is pumped from one chamber to another separated by a diaphragm, thereby moving the diaphragm to move a spring loaded piston in one direction, and when the motor is de-energized a port is opened, and the spring presses the oil back to the first chamber, and moves the diaphragm, and hence the piston in an opposite direction.

It will thus be seen that there is provided an apparatus in which the several objects of this invention are achieved and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A wall having a door opening, a door for said opening, a heater inside the wall and spaced therefrom and adjacent said opening, said heater comprising a casing having an inlet end and a discharge end, a motor operated fan at the inlet end of the casing, a damper in said casing at the discharge end thereof, an electric motor on the casing, means controlled by the motor to actuate the damper, heating means in the casing, and said damper being movable from a position allowing air to be blown by the fan through the entire discharge end and in one direction to a position in which the air can be blown by the fan through part only of said discharge end and in another direction, and means controlled by said door to control operation of said electric motor.

2. A heater comprising a casing having an upper inlet and a lower discharge end, fan means on the casing to cause a flow of air through the casing, heating means in the casing, said casing having side walls and end walls, said end walls being parallel to one another and inclined to the axis of the inlet end of the casing, a motor operated damper in the casing, pivoted on an axis spaced from said end walls and parallel to said end walls, closer to one end wall than the other and perpendicular to said axis, and said damper being, in one position thereof, inclined from the upper end of said one end wall down toward the other end wall, and said damper being pivotally movable to a second position parallel to said end walls.

3. The combination of claim 2, a set of diffuser vanes at the lower discharge end of said casing between the lower end of the damper in the first position thereof and the lower end of said other end wall, and a second set of diffuser vanes located between the lower end of the damper in said second position thereof and the lower end of the first inclined wall.

4. The combination of claim 3, said diffuser vanes being independently adjustable angularly.

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5. In combination, a heater comprising a casing having an upper inlet and a lower discharge end, fan means on the casing to cause a flow of air through the casing, heating means in the casing, said casing having side walls and end walls, said end walls being parallel to one another and inclined to the axis of the inlet end of the casing, a motor operated damper in the casing, pivoted on an axis spaced from said end walls and parallel to said end walls, closer to one end wall than the other and perpendicular to said axis, and said damper being, in one position thereof, inclined from the upper end of said one end wall down toward the other end wall, and said damper being pivotally movable to a second position parallel to said end walls.

6. In combination with a wall formed with a door opening provided with a door, a heater, means to cause flow of heated air from the heater, means to discharge heated air from the heater in one direction when the door is closed, and electric motor actuated damper means within the heater at the discharge end thereof to change the direction of discharge of air from the heater, and means controlled by the opening of the door, to actuate said damper means, when the door opens.

7. The combination of claim 6, and thermostat means to control the operation of the air flow causing means, when the door is closed.

8. The combination of claim 7, and means independ-

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ent of the thermostat means and controlled by opening of the door to retain the air flow causing means in operative condition while the door is open.

9. The combination of claim 6, said direction changing means including means to reduce the discharge area at the discharge end of the heater and to provide nozzle means to increase the velocity of flow of air through the reduced discharge area.

10. The combination of claim 9, and thermostat means to control the operation of the air flow causing means, when the door is closed.

11. The combination of claim 10, and means independent of the thermostat means and controlled by opening of the door to retain the air flow causing means in operative condition while the door is open.

12. The combination of claim 3, said diffuser vanes being independently adjustable angularly.

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