

May 10, 1955

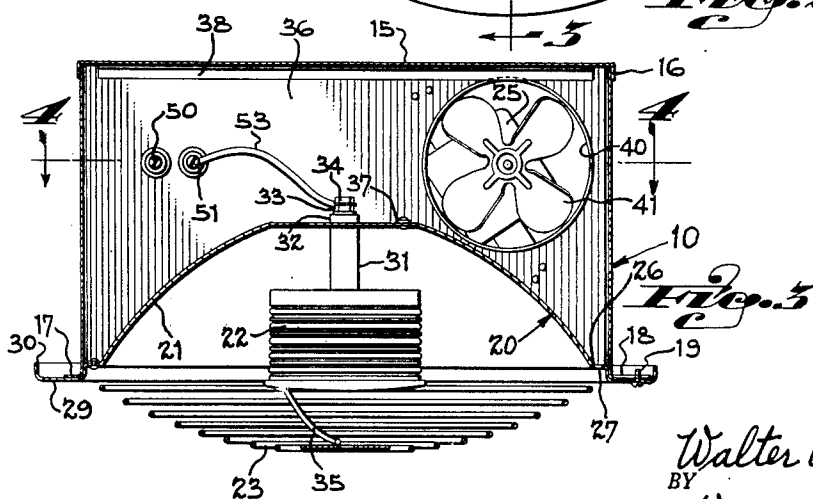
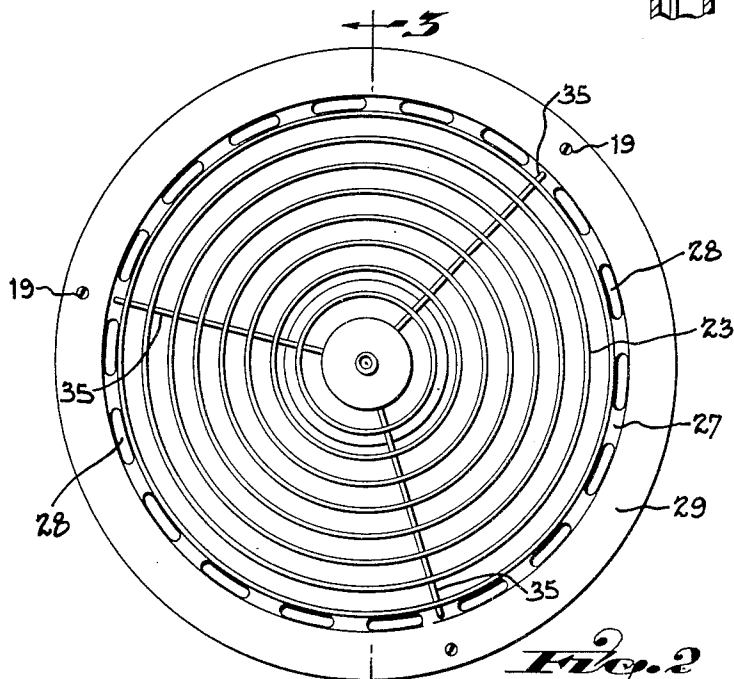
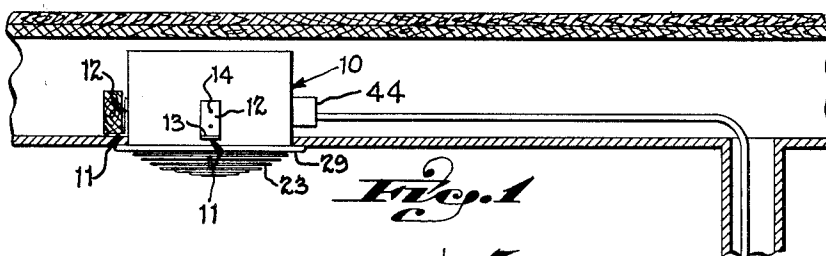
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2,708,232

CEILING HEATER

Filed June 15, 1954

2 Sheets-Sheet 1



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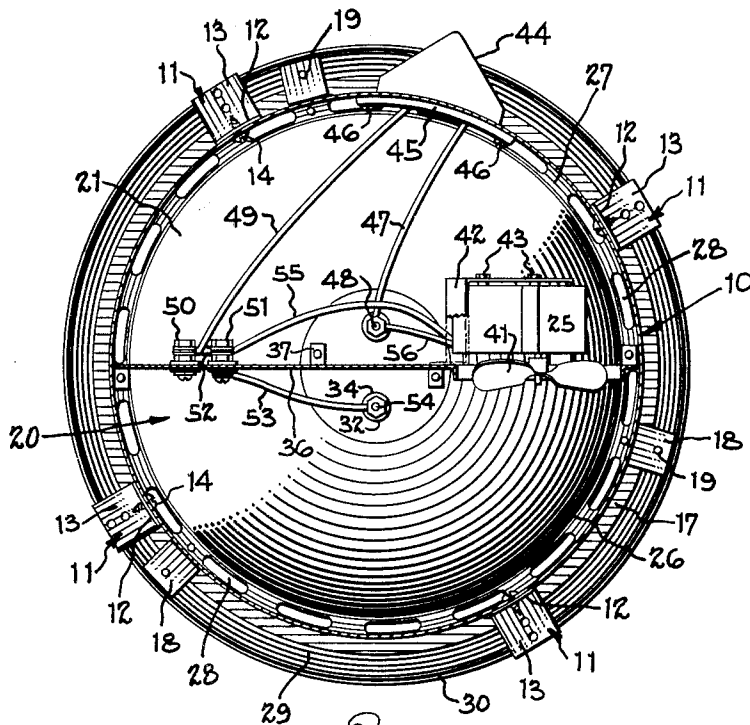


Fig. 4

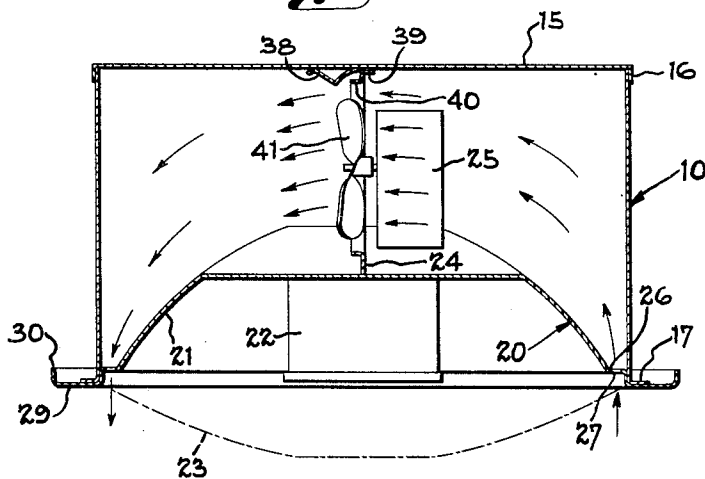


Fig. 5

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CEILING HEATER

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10 Claims. (Cl. 219—39)

This invention relates to radiant heaters, and is directed in particular to an electric heater of the radiant or reflector type which is adapted to be installed in a recess in the ceiling of a room, such as a bathroom.

The recessed, ceiling installation of a radiant heater has many advantages over a wall installation, particularly in a bathroom. The ceiling location makes it impossible, under ordinary circumstances, for a person to come into contact with the heater or for water to be splashed from a shower or washbowl onto the heating element. In addition to this, the ceiling location produces a diffused, broad cone of heat which, unlike a wall heater, heats all sides of a person standing beneath it. Also, the downwardly directed cone of radiant heat warms the floor upon which the person is standing.

Although highly advantageous from the viewpoint of comfort, a recessed, ceiling installation gives rise to a serious safety problem from the underwriters' point of view, because of the high concentration of heat in the ceiling area immediately above and surrounding the heat reflector. Even the most efficient heat reflector is incapable of directing more than 70 to 80 per cent of the heat produced downwardly in the form of radiant heat. The other 20 to 30 per cent escapes upwardly either by radiation, convection or conduction, so that in a short while after a ceiling heater has been in operation there can be a dangerous buildup in the temperature and in the amount of heat in the recess in which the heater is mounted.

This invention is concerned primarily with a practical solution to the problems imposed by this concentration of heat; and with this in mind, it is an objective of the invention to provide an efficient, radiant heater which may be safely recessed in a ceiling, the heater including means to effectively dissipate the concentration of heat which collects above the reflector.

A further objective is to provide a heater construction of the type set forth in which the means to dissipate this heat is adapted to direct such heat downwardly into the room where it can serve a useful purpose.

Other objectives and advantages of the present invention will be readily apparent to those skilled in the art from the following description of the drawings in which:

Figure 1 is a diagrammatic cross sectional view showing a radiant heater incorporating the principles of the present invention.

Figure 2 is a plan view of the heater as seen from below. Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a diagrammatic cross sectional view illustrating the operation of the means provided to cool the area above the reflector of the heater.

The electric ceiling heater of this invention is mounted within a cylindrical, sheet metal housing indicated generally at 10. This housing, in the preferred embodiment, is approximately 7½ inches deep by 13¼ inches in diameter so that it fits into the usual space provided between

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floors and so that it may be attached to joists which are on standard 16 inch centers. The housing is equipped with four vertically adjustable mounting brackets 11. These brackets are equally spaced around the circumference of the housing adjacent to the lower end thereof. Each bracket 11 is L-shaped, including a vertical leg 12, which is preferably arcuate in lateral cross section to conform to the outside diameter of the housing, and a horizontal leg 13 having holes therein to accommodate nails or screws. The vertical leg also has a pair of holes which are vertically spaced and configured to accommodate metal screws such as those shown at 14. These screws at each mounting bracket traverse a vertical slot which is cut through the wall of the housing so as to provide a means to adjust the housing vertically with respect to the joists or other structural members to which the assembly is affixed. Preferably the horizontal legs of two of the mounting brackets in an installation are affixed to cross headers placed between the joists at the two sides of the housing, and the other two affixed to the joists themselves.

The upper end of the housing is closed by a circular plate 15 which has a flange 16 turned downwardly at the periphery thereof and which may be spot welded to the upper edge of the housing. The lower end of the housing has an outwardly turned flange 17 thereon and at three equally spaced places around this flange metal fastener tabs 18 are spot welded. Each of these tabs has a rectangular hole therein to accommodate a bolt 19 which holds a reflector assembly, indicated generally at 20, to the housing. The reflector assembly, which includes all of the operating elements of the heater, is adapted to be installed as a unit in the housing after the housing has been mounted and after the ceiling has been plastered or otherwise finished.

Assembly 20 includes a reflector 21, a heater element 22, a removable grill 23, a baffle 24 and an electrically powered fan 25. More specifically, the reflector 21, in the preferred embodiment, is made of polished aluminum which is anodized for high corrosion resistance, this being an important factor in a bathroom installation where the atmosphere is saturated with moisture from time to time. In the illustrative embodiment, the center of the reflector at the top thereof is substantially flat. The reflector curves downwardly and outwardly from the central flattened portion, and may conform to the usual parabolic reflector shape, to a stepped shoulder 26 adjacent to the rim thereof, which rim includes a horizontally disposed annular land 27. This land, which may be seen in Figures 2 and 4, has a plurality of arcuate slots 28 cut through it. The slots 28 are equally spaced around the land, have rounded ends for appearance sake, and are spaced apart to leave substantial webs of metal between adjacent slots. The outer marginal rim area of the reflector is channel-shaped in cross section, being turned downwardly from land 26, then horizontally to provide a mounting ring 29, and then upwardly at the outer marginal edge of the mounting ring to provide a rim 30 which contacts the ceiling in an installation. The mounting bolts 19, which thread into the tabs 18, pass through holes which are stamped in the mounting ring as shown in Figure 2. In an installation, the bolts 19 provide a certain latitude of vertical adjustment for rim 30 relative to the finish plaster line.

The heating element 22 is substantially cylindrical. The outer surface of the element has a helical groove in it in which a conventional nickel-chrome heater wire is wound. The core of the element preferably is high thermal shock porcelain so as to not crack under drafty conditions or in the event water is accidentally splashed on it. As a result of the means which are provided to dissipate heat above the reflector, an element which is rated as high as 1000

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watts may be employed. Furthermore, the heater element is mounted upon two porcelain tubes designated 31 which suspend it in spaced relation to the flattened center portion of the reflector 21, thus keeping much of the heat of the hot element from reaching the reflector by conduction. A bolt in the center of each porcelain tube extends through an appropriate opening in the top of the reflector. A porcelain collar 32 on each bolt above the reflector, which is held in place by a nut 33, serves to clamp the element in place. The upper ends of the bolts serve as clamping posts for terminal eyelets of the wires which deliver current to the element. A second nut 34 is threaded onto each bolt to secure the eyelet connector in place.

The grill 23 in the illustrative embodiment comprises a plurality of wire rings which are mounted in stepped concentric relationship upon three radially disposed mounting wires 35. The outer end of each mounting wire is received in a hole provided in one of the webs of the land portion of the reflector, the wire being bent so as to provide a snap-lock fit with the hole.

The inside of cylindrical housing 10 above reflector 21 is divided into two parts by the baffle or partition wall 24. The lower edge 36 of the baffle is shaped to conform to the profile of the top of the reflector across a diameter thereof and a plurality of small feet or tabs such as those indicated at 37 are struck over from the lower edge of the baffle and are riveted to the reflector. The baffle or partition wall is substantially as long as the inside diameter of the cylindrical housing 10. The baffle is also sufficiently high so that the upper edge thereof is close to the cover 15 of the housing when the reflector assembly is seated all of the way within the housing as shown in Figure 3. In order to allow for the relative vertical adjustment between the reflector assembly and the housing made possible by the bolts 19, the upper edge of the baffle has a spring steel sealer strip 38 spot welded thereto. The shape of the spring strip is best seen in Figure 5. The upper edge of the baffle is turned over at right angles to provide a horizontal flange 39. The spring plate which is substantially an open V-shape in cross section has one longitudinal edge thereof spot welded to flange 39. It will be seen from Figure 5 that vertical adjustment of the baffle, within reasonable limits, does not result in an opening over the top of the baffle inasmuch as the spring plate, being biased in an upper direction maintains the closure.

A flanged circular opening 40 is provided in the baffle plate at one side thereof so that the area within the housing above the reflector plate is open through it from one side of the baffle to the other. The air propeller 41 of the electrically driven fan 25 is mounted within the opening 40 and arranged so that it moves air from one side of the baffle to the other. The net effect of this movement is to pull cooling air up through the slots 27 at one side of the reflector and to push it out and down through the slots which are at the other side of the reflector. See Figure 5. The motor which drives the fan, in the preferred embodiment, is one which is used commercially for record changers. These motors are readily available and have the advantage that they are adapted to operate continuously without added lubrication for over 20,000 hours. The motor is mounted on the baffle by means of a U-shaped bracket 42 which straddles the opening 40 and which has its ends riveted to the baffle. Bolts such as those shown at 43 are employed to anchor the motor to the bracket. In the drawings, the motor is shown diagrammatically only in the form of a substantially rectangular block. The block is not intended to represent a housing, it being preferred that the stator and rotor be exposed to the stream of air which is moved by the fan for cooling purposes.

The numeral 44 designates a generally triangularly shaped wiring box. This box is disposed between two of the mounting brackets 11 so that it will be at a corner of the square formed by the studs and cross headers in an installation. The outlet box, which may otherwise be

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of conventional construction, is mounted on the outside of the circular housing 10. A cover plate 45 for the wiring box is disposed on the inside of the housing, being arcuate in shape and secured to the inside of the housing by metal screws 46—46. The main wiring leads (not shown) which supply the current for the heater and for the fan enter box 44 from the outside through a conduit such as the one shown in Figure 1. From the box, one lead designated 47 goes to a terminal indicated at 48 for the heating element. A second lead designated 49 goes to a terminal 50 which is secured to the baffle at the side thereof opposite the fan. Terminal 50 is connected to a second and similarly mounted terminal 51 through an automatic, thermal responsive overload protector, which may be of conventional construction and which is shown diagrammatically only at 52. Two leads are taken from the terminal 51. One of these, indicated at 53, goes to the second terminal 54 of the heating element. The other one of these two leads, designated 55, goes to the fan motor. The circuit is completed through the fan by means of a lead 56 which extends from the fan to the terminal 48 of the heating element to which lead 47 is connected.

In operation, the fan pulls the air in through the slots at one side of the reflector and drives it out the slots at the opposite side of the reflector. Thus, the upper surface of the reflector is washed continuously by a cooling flow of air. The heat which this air picks up is directed back down into the room in which the heater is located so that it is not lost. The gentle circulation of air directed into the room is not enough to cause a disturbing draft. It has the effect, however, of diffusing and mixing the air in the room sufficiently to even out the temperature gradient from floor to ceiling.

The 1000 watt heater element, although somewhat high in comparison with the usual wall heater or portable electric heater is found to heat up the average size bathroom to a comfortable temperature within a minute. The great amount of heat generated is safe, despite the recessed installation because of the efficient heat dissipation provided by the fan and baffle construction.

I claim:

1. A radiant heater adapted to be installed in a ceiling, said heater comprising a housing formed of sheet metal, a top closure member on said housing, a metal heat reflector mounted in the lower portion of said housing, said reflector having a mounting ring portion at the periphery thereof which is of greater diameter than said circular housing so as to extend beyond the sides of the housing and overlap the edges of the ceiling opening in which the housing is mounted, an electric heating element depending from the center of said reflector, a vertical partition wall dividing the area in the housing above the reflector into two compartments, a circular opening in said partition wall, an electrically driven fan associated with said opening and being adapted to propel a stream of air through said opening from one compartment to the other, and a plurality of apertures in the reflector adjacent to the rim thereof which are in communication with the respective compartments, whereby during the operation of the heater the fan serves to cool the area within the housing above the reflector by pulling air through the apertures in the reflector at one side of the partition wall and driving air out of the apertures in the reflector at the other side of the partition wall, said air thereby serving to carry heat from the compartments into the room below the heater.

2. A radiant heater adapted to be installed in a ceiling, said heater comprising a housing which is closed at the top and sides, a heat reflector mounted in the lower portion of said housing, an electric heating element depending from the center of said reflector, a vertical partition wall dividing the area in the housing above the reflector into two compartments, an opening in said partition wall, an electrically driven fan associated with said opening and being adapted to propel a stream of air

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through said opening from one compartment to the other, and a plurality of apertures in the reflector adjacent to the rim thereof which open into the respective compartments, whereby during the operation of the heater the fan is adapted to pull air up through the apertures in the reflector at one side of the partition wall and exhaust air out of the apertures in the reflector at the other side of the partition wall, said exhausted air thereby serving to carry heat from the compartments into the room below the heater.

3. A radiant heater adapted to be installed in a ceiling, said heater comprising a cylindrical housing which is closed at the top and sides, a metal heat reflector mounted in the lower portion of said housing, said reflector having a mounting ring portion at the periphery thereof which is greater in diameter than said circular housing so as to extend beyond the sides of the housing and a ceiling opening in which the housing is mounted, an electric heating element suspended from the center of said reflector in spaced relationship therewith, a vertical partition wall extending across a diameter of said cylindrical housing above the reflector, said partition wall dividing the area in the housing above the reflector into two compartments, an opening in said partition wall, an electrically driven fan associated with said opening and being adapted to propel a stream of air through said opening from one compartment to the other, and a plurality of apertures in the reflector adjacent to but inwardly of the mounting ring portion thereof which open into the respective compartments, whereby during the operation of the heater the fan pulls air upwardly through the apertures in the reflector at one side of the partition wall and drives air out of the openings in the reflector at the other side of the partition wall, said air thereby serving to carry heat from the compartments into the room below the heater.

4. A radiant heater adapted to be installed in a ceiling comprising a cylindrical housing formed of sheet metal and having a top closure thereon, a heating element, a heat reflector, means to suspend said heating element from the center of said heat reflector so that heat generated by said element is directed downwardly into the room below the heater in the form of radiant heat, a vertical partition wall dividing the area within the housing above said reflector into two compartments, an opening in said partition wall, a fan associated with said opening and adapted to propel air from one compartment into the other, and a plurality of apertures adjacent to the rim of the reflector to provide passageway for air into and out of said compartments, whereby upon the operation of the heater and fan heat lost upwardly from the reflector into said compartments is returned to the room below the heater in air which is pulled into one of the compartments and forced from the other one of said compartments by the fan.

5. A heater adapted to be installed in a ceiling comprising a housing which is closed at the top and sides, a heat reflector closing the bottom of said housing, a heating element, means to suspend said heating element from the center of said heat reflector so that the heat generated by said element is directed downwardly into the room below the heater in the form of radiant heat, a vertical partition wall dividing the area within the housing above said heater into two compartments, an opening in said partition wall, a fan associated with said opening and adapted to propel air from one compartment into the other, and a plurality of apertures adjacent to the rim of said reflector to provide passageway for air into and out of said compartments, whereby upon the operation of the heater and fan heat lost upwardly from the reflector into the area within the housing above the reflector is returned to the room below the heater in air which is pulled into one of the compartments and forced from the other one of said compartments by the fan.

6. In a radiant heater having a reflector mounted within the lower portion of a closed housing, said heater

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being adapted to be installed within a recess in a ceiling, a vertical baffle dividing the inside of the housing above the reflector of the heater into two compartments, a plurality of apertures in the rim area of the reflector opening into said compartments, an opening in said baffle, and an electrical fan associated with said opening and adapted to propel air from one compartment into the other, whereby upon the operation of the heater and fan, heat lost upwardly from the reflector into said compartments is returned to the room below the heater in air which is pulled upwardly into one of the compartments and forced downwardly from the other one of said compartments through said apertures by said fan.

7. In an electrically operated radiant heater adapted to be mounted in a recess in the ceiling of a room, said heater having a housing which is closed at the top and sides and a heat reflector in the lower portion thereof, a vertical partition wall dividing the area within the housing above said reflector into two compartments, a plurality of apertures in the reflector adjacent to the rim thereof to provide passageway for air into and out of said compartments, an opening in said vertical partition wall, an electrically operated fan associated with said opening and adapted to propel air from the one of said compartments into the other of said compartments, whereby upon the operation of said heater and fan air is drawn through said apertures into one of said compartments and exhausted from the other one of said compartments thereby cooling the area within the housing above the reflector and returning heat lost upwardly from the reflector to the room in the air exhausted from said apertures.

8. In a radiant heater adapted to be installed in a ceiling, a cylindrical housing, said cylindrical housing being made of sheet metal and closed at the top and sides, a metal heat reflector mounted in the lower portion of said housing, said heat reflector being configured at the periphery thereof to provide a circular land which is in a horizontal plane, said circular land having a plurality of apertures therein to permit passage for air into and out of the housing in the area thereof above said reflector, a vertical partition wall dividing the area within the housing above the reflector into two compartments, an opening in said partition wall, a fan mounted upon said partition wall adjacent to said opening and adapted to propel a stream of air through said opening from one compartment to the other, whereby air to cool the area within the housing above said reflector is drawn into one of said compartments through the apertures at one side of said reflector and is discharged from the other compartment through the apertures at the other side of said reflector.

9. In a radiant heater adapted to be installed in a ceiling, a housing, said housing being closed at the top and sides, a heat reflector adapted to be mounted in the lower portion of said housing, said heat reflector being configured to provide a narrow land which is in a horizontal plane and which surrounds said reflector at the periphery thereof, a plurality of apertures in said land to permit passage of air through the reflector into and out of the housing at all sides of the reflector, a vertical partition wall dividing the area within the housing above the reflector into two compartments, an opening in said partition wall, means to propel a stream of air through said opening from one compartment to the other, whereby air to cool the inside of the housing above said reflector is drawn into one of said compartments through the apertures at one side of said reflector and is discharged from the other compartment through the apertures at the other side of said reflector.

10. In a radiant heater adapted to be installed in a ceiling, a cylindrical housing which is made of sheet metal and which is closed at the top and sides, a heat reflector having an outside diameter which is substantially greater than the outside diameter of said cylindrical housing, means to removably secure said reflector to

said housing to close the bottom thereof, means to suspend an electrically operated heating element from the center of said heat reflector in spaced relation therewith, a circular land extending around said reflector in a horizontal plane just inwardly of the wall of the cylindrical housing, a plurality of apertures in said land, said apertures being equally spaced around the reflector, a vertical baffle wall secured to said reflector and dividing the area within the housing above said reflector into two compartments, an opening in said vertical baffle, a fan mounted upon said baffle and associated with said opening to propel air from one compartment into the other through said opening, and said fan being connected electrically with the circuit to said heating element so that said fan operates whenever the heating element is turned

on to pull cooling air through the apertures into one of the compartments and to propel it downwardly and outwardly through the apertures from the other compartment.

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