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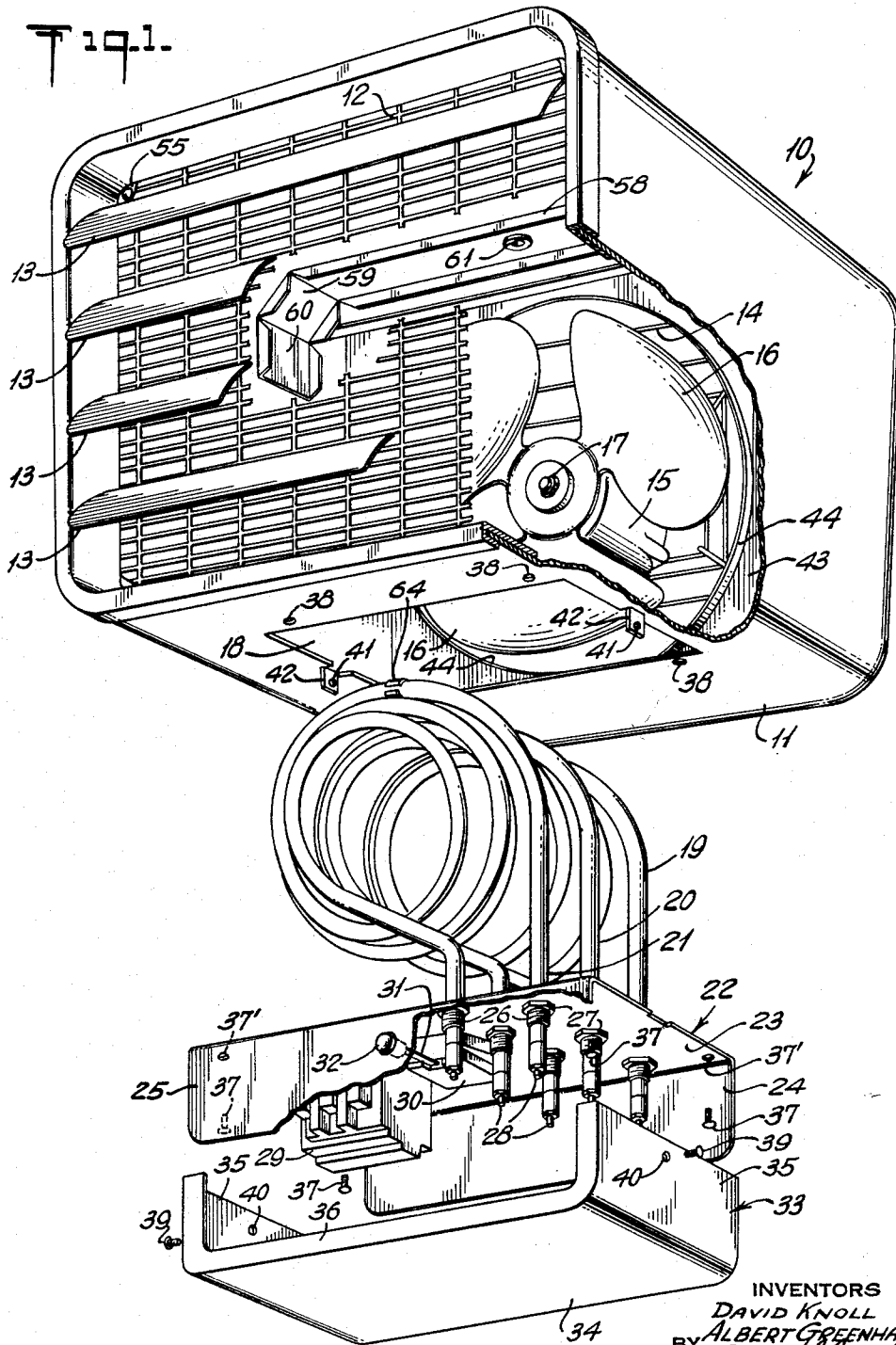
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ELECTRIC SPACE HEATER UNIT

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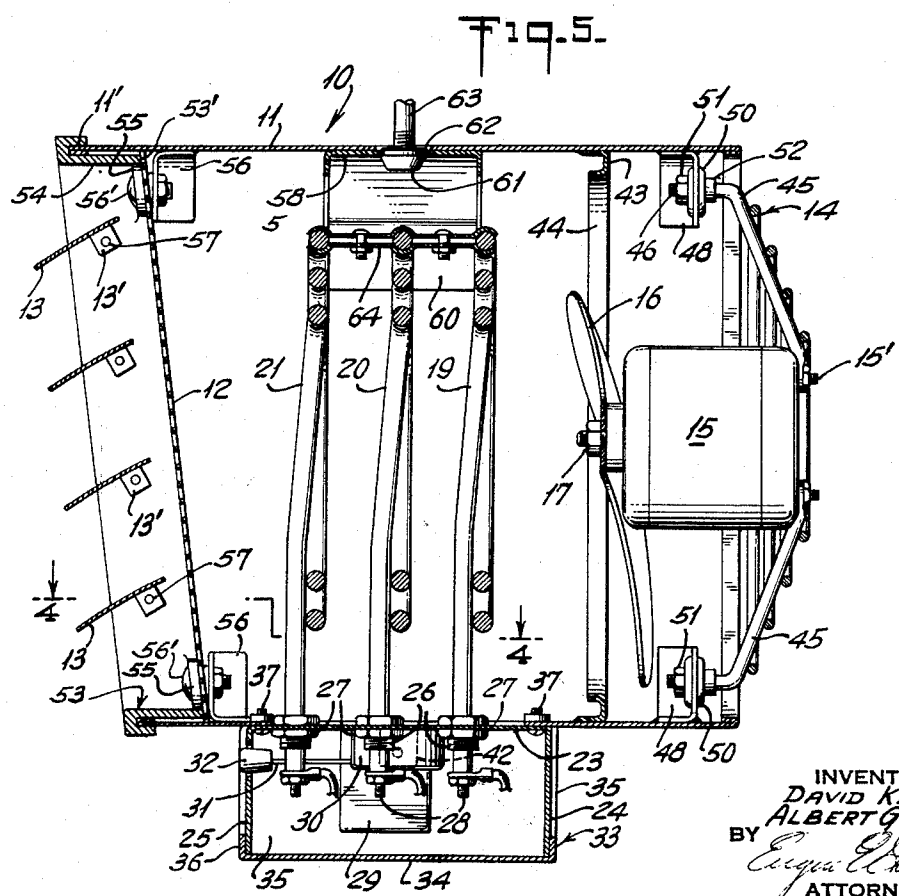
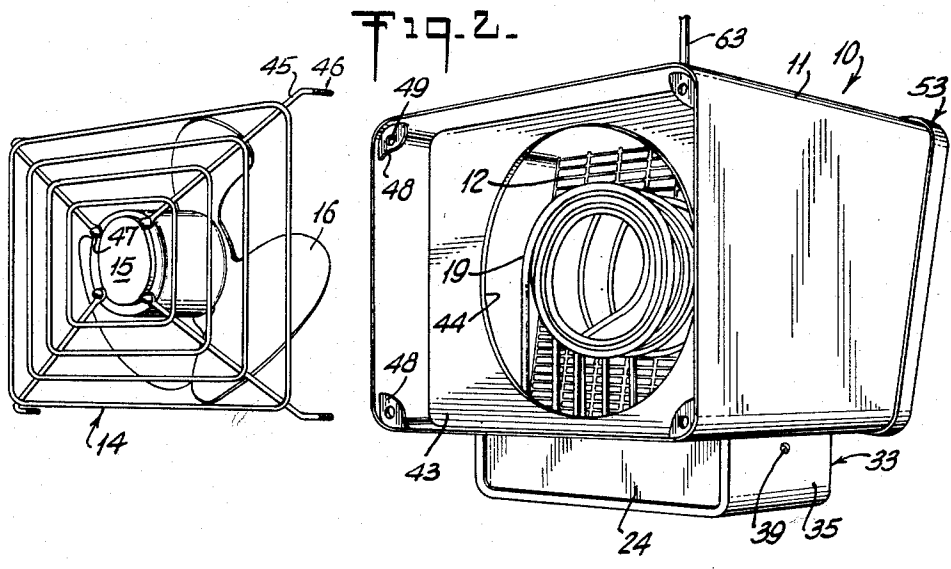
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ELECTRIC SPACE HEATER UNIT

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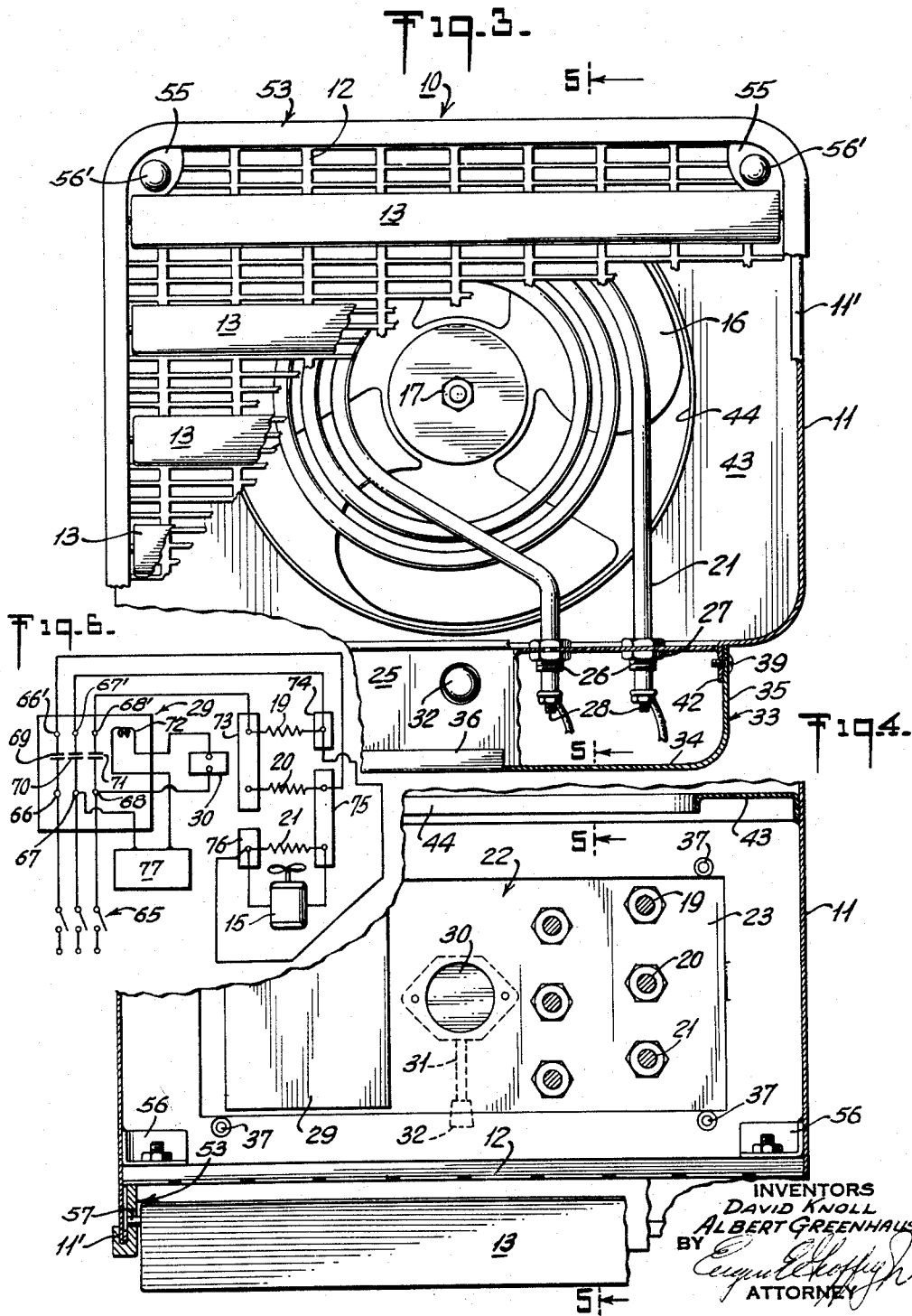
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ELECTRIC SPACE HEATER UNIT

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ELECTRIC SPACE HEATER UNIT

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4 Claims. (Cl. 219—370)

This invention relates to electric heaters and more specifically to a novel and improved heater and cooperating air circulating means that is particularly adaptable to wall or ceiling suspension.

While numerous electric heaters have been proposed utilizing electrical heating elements with a cooperating fan, they have not been found entirely satisfactory for a number of reasons, including complicated and expensive construction which greatly aggravates the problems of maintenance, repair and periodic cleaning. By reason of an improved arrangement and coordination of elements the heater in accordance with the invention is characterized by its simplicity of construction which facilitates the removal of the electrical elements for maintenance and repair, improved air flow to afford maximum diffusion of the air for greatest comfort, maintenance of turbulence at a low level and the inclusion of an improved safety control for controlling the operation of the device and protect it against dangerous over-heating.

Another object of the invention resides in the provision of a novel and improved heating unit utilizing a unique assembly of elements wherein the heating and control mechanism therefor is arranged with a unitary construction that may be quickly and easily removed from the body of the heater.

Still another object of the invention resides in the provision of a novel and improved electric heater particularly adaptable to wall and ceiling suspension.

The above and other objects and advantages of the invention will become more apparent from the following description and accompanying drawings forming part of this application.

In the drawings:

FIG. 1 is a partially exploded view, in perspective, of one embodiment of a heater in accordance with the invention;

FIG. 2 is a rear partially exploded view of the invention as illustrated in FIG. 1;

FIG. 3 is a front view in partial section of the apparatus shown in FIG. 1;

FIG. 4 is a cross sectional view of the invention as illustrated in FIGS. 1 to 3 and taken along the line 4—4 of FIG. 5;

FIG. 5 is a cross sectional view of the heater in accordance with the invention taken along the lines 5—5 of FIGS. 3 and 4; and,

FIG. 6 is a circuit diagram illustrating one mode of operation of the invention.

The heater now to be described is particularly intended for space heating and may be supported on a ceiling or wall in order to provide uniform distribution of heat throughout a predetermined area. It will also become evident as the description proceeds, that other types of mounts may be employed.

Referring first to FIG. 1 which illustrates one of the important advantages of the invention, the heater is generally denoted by the numeral 10 and comprises an essentially rectangular wrap-around housing or casing 11 having a front grill 12 and adjustable louvers 13. The rear portion of the housing 11 carries a rear grill 14 which in turn supports the fan motor 15 and fan blades 16 secured to the motor shaft 17. The under side of the housing includes

a relatively large rectangular opening which permits the insertion of the heating elements 19, 20 and 21. In this instance three heating coils are shown in substantially axial alignment, though it is evident that one or more such coils may of course be employed. The heating coils 19 through 21 are carried by a chassis 22 having a base plate or panel 23 and depending side portions or walls 24 and 25. The heating elements, each of which are in the form of metal tubing with the heating elements carried within the tubing, are secured directly to the chassis by threaded end portions 26 on the metal tubing and cooperating nuts 27. In this way the electric terminals 28 on the heating elements are disposed within the chassis 22 which facilitates wiring of the elements and protects the wire against the heat radiated by the elements 19 through 21 on the housing 11.

The chassis 21, in addition to carrying the heating elements also carries a relay control 29 and a thermal cutout 30, the latter having a reset lever 31 and a knob 32 accessible on the outer surface of the depending side wall 25 of the chassis 22 to reset the thermal switch should it be actuated to interrupt the flow of energy to the heating units. The chassis 22 is enclosed by a cover 33 which comprises a bottom portion 34, end walls 35 and side flanges 36. The heating elements, together with the supporting chassis 22 is secured to the housing or casing 11 by means of four screws 37 which engage cooperating openings 37' and 38 on the chassis 22 and housing 11, respectively. When the chassis 22 is in place on the casing 11, the cover 33 may be secured in position by screws 39 which engage openings 40 in the cover and threadably engage openings 41 in tabs 42 carried by the casing 11.

The fan assembly in accordance with the invention is illustrated more clearly in FIG. 2 and it will be observed from this figure that the casing 11 includes a plate or wall 43 permanently secured to the casing and having a central opening 44 for accommodation of the fan blades 16. The rear grill 14 includes four essentially radially disposed rods 45 with the outer end of the rods bent forwardly and having screw threads 46. The inner ends of the rods have loops or eyes for accommodating rearwardly extending fastening means forming part of the motor 15. In the instant embodiment the fastening means are in the form of threaded studs 15'.

The fan assembly together with the grill 14 is secured to the casing 11 by means of four corner brackets 48 welded or otherwise secured to the casing 11. These brackets each have an opening 49 substantially larger than the diameter of the threaded portions 46 of the rods 45 for the purpose of accommodating grommets 50 of rubber or other suitable material. The threaded end portions 46 of the rear grill assembly extend through the grommets and are secured in place in the grommets by appropriate fastening means 51 and 52 such as threaded nuts or the like.

The front grill and louver assembly 12-13 is formed as an individual unit and comprises, as will be observed more clearly in FIG. 5, an essentially rectangular escutcheon or frame 53 having essentially J-shaped cross section with the elongated portion 54 thereof lying against the inner surface of the casing 11 and the outer portion curving around the forward edge 11' of the casing 11 to firmly engage the edge of the casing. The frame or escutcheon 53 carries four corner brackets 55 as may be observed more clearly in FIG. 1 and it is secured to the casing by bolts 56 extending through cooperating openings in the corner brackets 55 and extending through openings in corner brackets 56 welded or otherwise secured to the casing 11. In this way, the escutcheon is secured firmly against the edge of the casing 11 and adds rigidity to the casing.

The front grill 12 may be welded or otherwise secured to the inner edge 53' of the escutcheon 53 and each of the louvers 13 are provided with end tabs 13' which are pivoted at 57 to the sides of the escutcheon 53.

The entire heater assembly may be supported by a single mount and for this purpose the casing includes an elongated channel member 58 secured to the inner side of the top surface of the casing 11 and having side portions 59 and 60 which may be welded or otherwise secured to the side of the casing. The bracket 58 is positioned within the casing 11 so that the entire unit will be balanced about a central threaded opening 61 in the channel 58. The top of the casing also has an opening 62 aligned with the threaded attaching means 61 so that a supporting rod 63 may threadedly engage the attaching means 61. With the use of a single rod mount it is evident that the unit may be supported directly from the ceiling by attachment of the rod to the ceiling or may be attached to a wall by the provision of a suitable wall mounting angle bracket which carries the rod with the heater supported on the lower end thereof. In the instant embodiment of the invention the provision of a single support in the form of the rod 32 is illustrated, since the heater is intended to dissipate upwards to 5 to 7½ kilowatts of electrical energy and accordingly it is desirable to utilize such a heater in an elevated position in order to get uniform heat distribution throughout a given space. It is apparent, however, that the heater can be mounted in any desired position and may even be provided with a suitable stand for supporting the unit on the floor.

In certain instances it may be desirable to provide added support for the heating elements 19 through 21 which is mechanically secured to and carried by the chassis 22. For this purpose a bracket 64 may be employed which clamps the upper portions of the heating coils one to the others as shown more clearly in FIG. 5. In so doing, the upper end of the coils are fixedly positioned one relative to the others and with the bottom support of the heaters the entire heater assembly forms a substantially rigid unit free from vibration.

It will be observed from the foregoing description and drawings that the heating coils 19 through 21 are of fairly large diameter and the operable portion of the heating elements lie essentially in line with the major portions of the fan blades 16. In so doing, the heating elements are uniformly cooled by the fan, since the major air flow is substantially perpendicular to the blades and the hub portion of the fan blades does not provide any material air flow. Moreover, it has been found that by the disposition of the heating elements with the entire heating unit substantially in line with the blades themselves, that the heating elements in heating the air flowing through them will effect some diffusion of the air with a minimum of turbulence. In addition, the blades 16 of the fan have their larger dimension disposed in the direction of rotation and their radial dimension relatively narrow. This enables the development of the greater air velocity over the heating elements and at the same time enables the attainment of relatively high air velocity with minimum turbulence and attendant noise. Moreover, the utilization of the shock mounts for the fan motor 15 and the support of the motor 15 by the rear grill 14, greatly minimizes the transmission of vibration into the housing 11 and consequently greatly reduces noise.

The electrical circuitry in shown in FIG. 6 and for convenience the elements have been illustrated diagrammatically. This particular circuit utilizes three-phase A.C. current power to energize the apparatus and the power is connected through a three pole single throw control switch 65 to the control relay by means of terminals 66, 67 and 68 of the relay control 29. The relay control includes three sets of contacts 69, 70 and 71 these contacts being in the normally open position and are closed by the application of energy to the operating coil 72. When in the closed position the contact function

to connect the terminals 66, 67 and 68 with the output terminals 66', 67' and 68'. The heating elements 19, 20 and 21 are also illustrated diagrammatically with the heater element 19 being connected between terminal blocks 73 and 74, the heating element 20 being connected between terminal blocks 73 and 75 and the heater 21 being connected between terminal blocks 76 and 75. The terminal 66' of the control 29 is connected to the terminal block 73, the terminal 67' to the block 74 and the terminal 68' to the block 73. In this way, when the elements 19, 20 and 21 are energized, each of the three heaters is connected across one of the three phases so that there is, in effect, a Delta connection of the heaters.

The fan motor 15 is operated in parallel with the heater 21 by connection of the motor to the blocks 75 and 76. Operation of the unit may be accomplished automatically by the utilization of an external thermostat 77. Since the energy to the heaters is controlled by the relay 29, a relatively low current thermostat 77 is connected in series with the relay coil 72 of the control 29 and the thermal cutout 30. Furthermore, one terminal of the thermostat 77 is connected to the relay terminal 67 while the other terminal of the thermostat is connected to the coil 72. The remaining terminal of the coil 72 is connected to the normally closed thermal cutout 30 and thence to the terminal 68 of the control 29. In this way and under normal conditions, the heater will operate in response to the thermostat 77. In the event of overheating within the casing 11 which may occur by reason of faulty fan operation, the heat generated by the elements 19 through 21 will actuate the thermal cutout and interrupt the flow of energy to the heating element. After the faulty condition is corrected, the thermal cutout may then be reset by actuation of the cooperating button 32 as previously described.

While only one embodiment of the invention has been illustrated and described, it is evident that changes, alterations and modifications may be made without departing from the true scope and spirit thereof.

What is claimed is:

1. An electric space heater unit comprising a double open ended housing having top, bottom and side walls, a supporting rod secured to and extending upwardly from the top wall for attachment to a supporting member, a grill carried at one end of the housing, a fan carried at the other end of said housing and operable to produce a flow of air through said housing, said bottom wall having a relatively large opening therein disposed between the ends of said housing between said fan and said grill, a chassis removably secured to peripheral edges of and closing said opening, a cover member overlying said chassis, said chassis and said cover defining a box-like enclosure, electric coiled heating means carried by and in cantilevered relationship to said chassis and extending into said housing and air flow at a point intermediate said fan and grill, said heating means extending through said chassis for support of said heating means and having terminals located in said enclosure adapted to be connected to a source of electric energy, wiring means for said heating means located in said enclosure and including electrical control means interconnected with said heating means terminals to control the application of electrical energy thereto, said electrical control means including a thermal circuit breaker and a manually resettable circuit breaker means having a reset lever accessible from the exterior of said enclosure.

2. An electric space heater unit according to claim 1 including a grill at the other end of said housing and wherein said fan is supported by said grill.

3. An electric space heater unit according to claim 1 wherein said electric coiled heating means comprises a plurality of coiled elements spaced one from the other and wherein each element is in the form of a spiral with the turns of each spiral being spaced axially one from the others,

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4. An electric space heater unit according to claim 1 including a plurality of louvers carried at said one end of the housing and adjoining the outer surface of said grill.

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