United States Patent

Swimmer

[15] **3,637,981**

[45] **Jan. 25, 1972**

[54] ELECTRIC SPACE HEATER

[72] Inventor: **James A. Swimmer, Highland Park, Ill.**

[73] Assignee: **Berns Air King Corporation**

[22] Filed: **Apr. 6, 1970**

[21] Appl. No.: **25,780**

[52] **U.S. Cl.**.....**219/347**, 200/61.52, 219/377

[51] **Int. Cl.**.....**H05b 3/06**

[58] **Field of Search**.....219/342, 346, 347, 348, 349, 219/357, 377

[56] **References Cited**

UNITED STATES PATENTS

1,462,380	7/1923	Richardson	219/347
1,605,421	11/1926	Anderson	219/347
2,234,373	3/1941	Gough	219/342 X
2,410,211	10/1946	Gough	219/347 X
3,062,945	11/1962	Glynn	219/357 X
3,069,525	12/1962	Waters	219/347 X

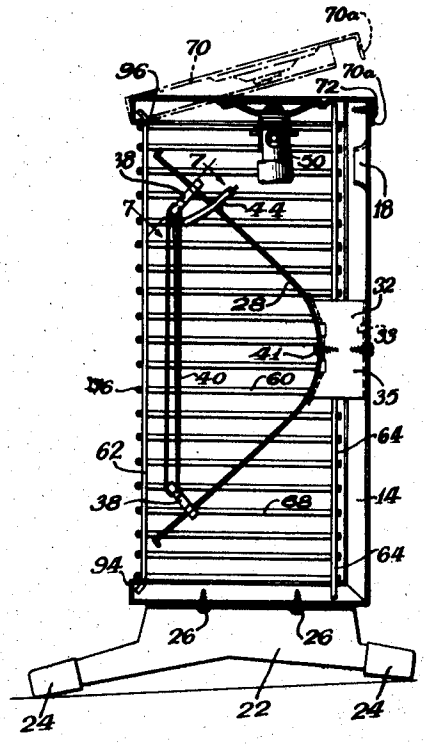
Primary Examiner—R. F. Staubly

Attorney—Lettvin and Gerstman

[57] **ABSTRACT**

An electric space heater having a sinusoidal heating element connected to mirror image portions of a reflector formed of sheet metal and having a substantially uniform parabolic cross-sectional configuration throughout its length. The central portion of the reflector is connected to the space heater housing while the top and bottom mirror image portions of the reflector are free to flex in response to heating of the heating element. The space heater includes a protective grill positioned in front of the heating element, which grill is rigidly secured to a base portion and top cover member of the space heater without the use of external fastening means.

8 Claims, 7 Drawing Figures



PATENTED JAN 25 1972

3,637,981

SHEET 1 OF 2

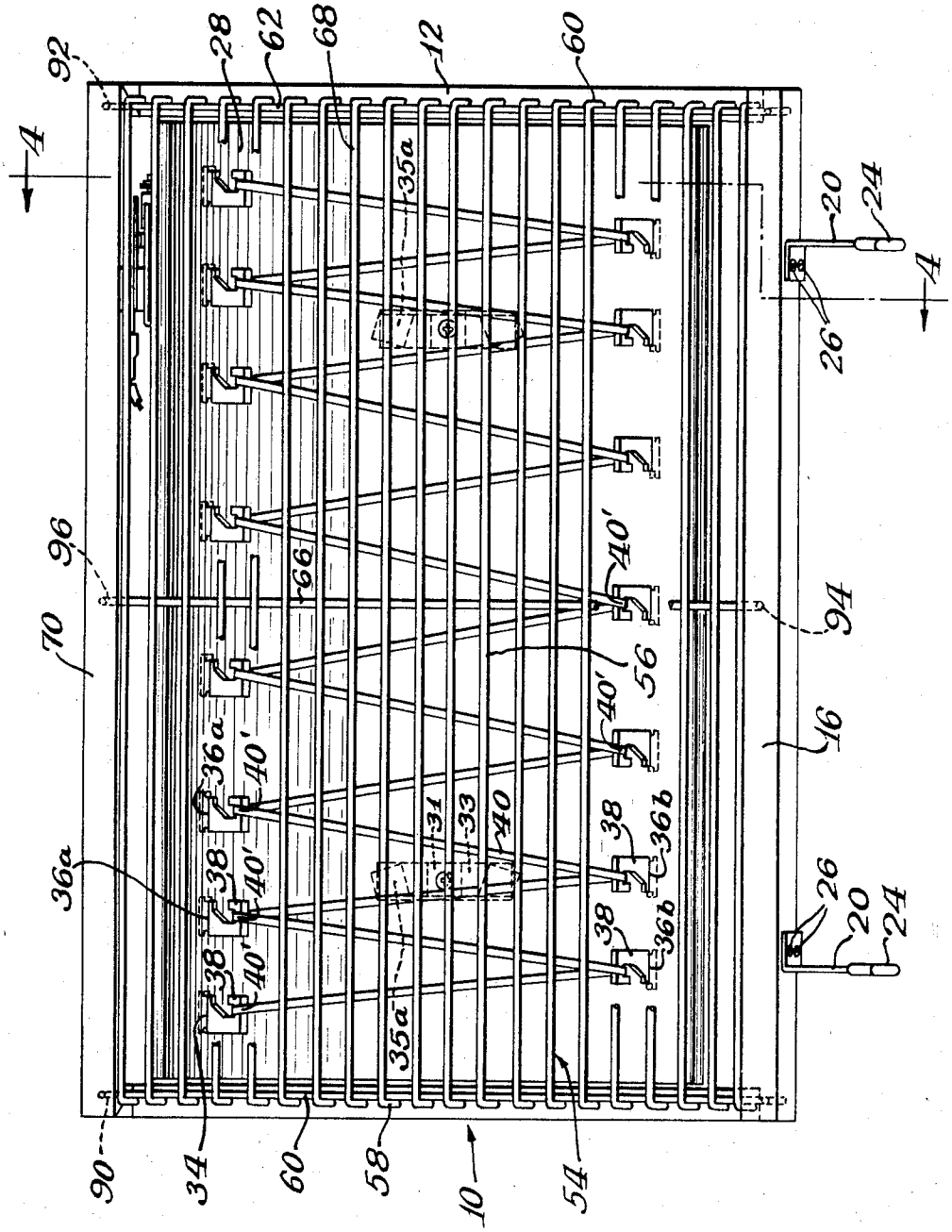


FIG. 1.

Inventor:
James A. Swimmer

By Lettvin and Bernstman Attys.

PATENTED JAN 25 1972

3,637,981

SHEET 2 OF 2

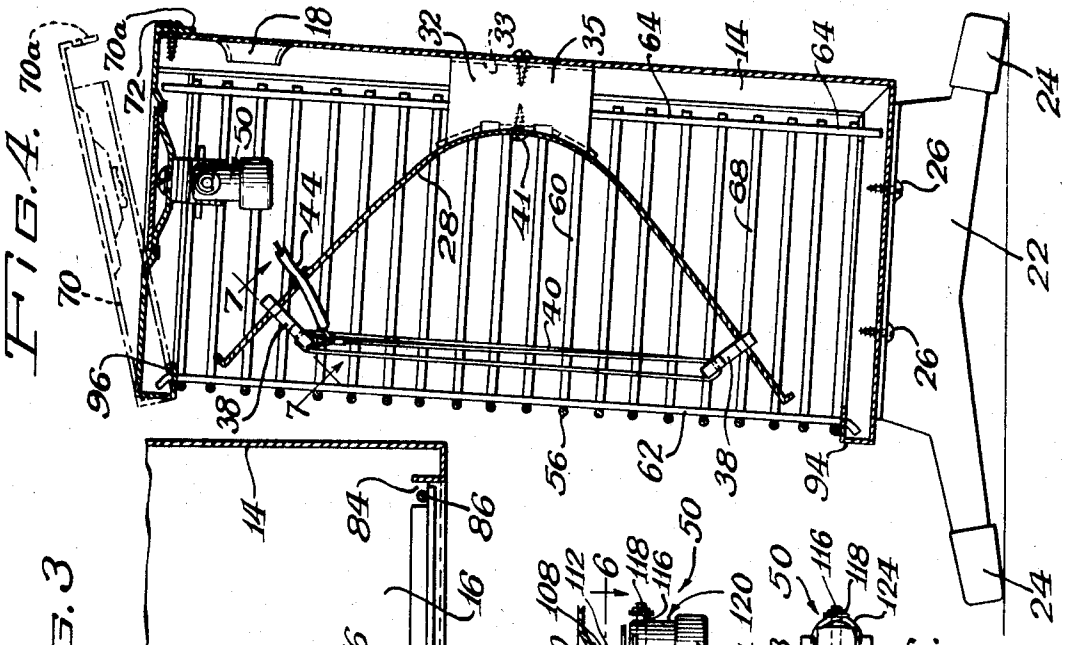


FIG. 4.

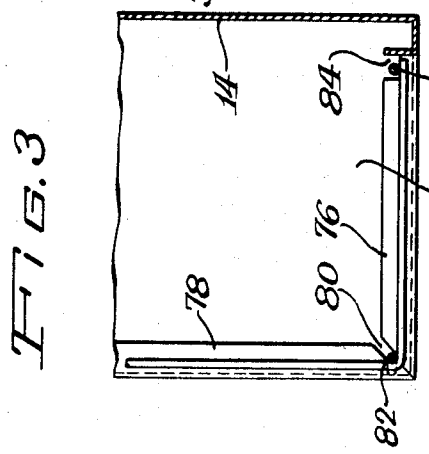


FIG. 3

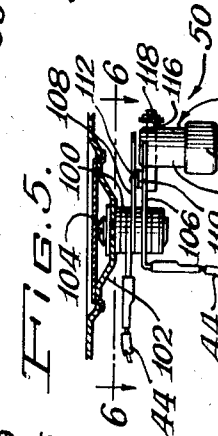


FIG. 5.

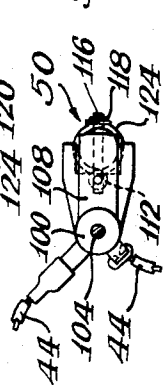


FIG. 6.

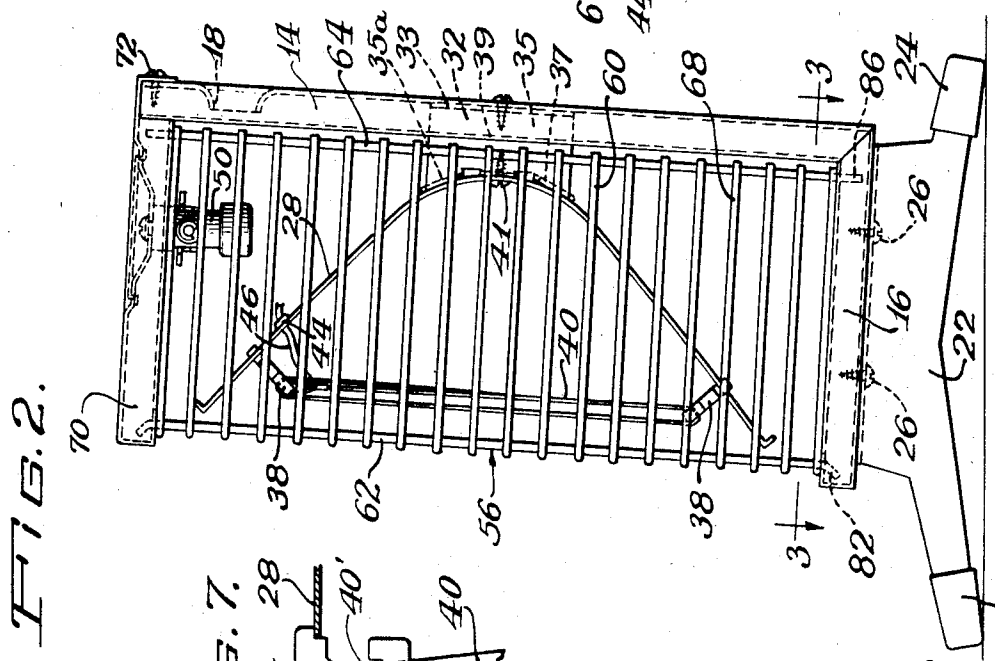


FIG. 2.

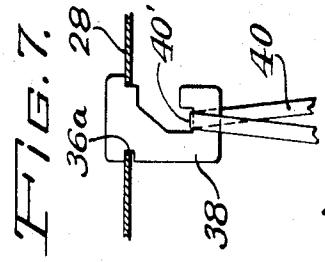


FIG. 7.

Inventor:
James A. Swimmer

By Lettvin and Berstman Attys.

ELECTRIC SPACE HEATER

FIELD OF THE INVENTION

This invention relates to heaters, and more particularly, to an improved electric space or room heater which is relatively simple and inexpensive to manufacture and is attractive in appearance.

BACKGROUND OF THE INVENTION

In order for an electric space heater to be functionally operative, attractive in design, and relatively inexpensive to manufacture, it is desirable that the components of the heater be as simple as possible and cooperate with each other in a manner that enables rapid assembly. The present invention provides an improved electric space heater having the aforementioned desirable characteristics.

SUMMARY OF THE INVENTION

In the illustrative embodiment of the present invention, there is provided an electric space heater that uses a ribbon-type resistance wire for generating radiant heat. The resistance wire tends to expand when being heated and it is carried by spacing means mounted upon a reflector. The reflector has a continuously curving periphery that is substantially symmetrical about a geometrical axis and means are provided for rigidly mounting the reflector adjacent the geometric axis leaving the greater portion of the reflector fully free to expand in response to heat from the resistance wire.

The resistance wire is connected through the spacing means to curved portions of the reflector that are spaced from the reflector mounting means. The reflector mounting means include a sheet metal part with spaced abutment portions and a central member coupling the abutment portions. The spaced abutment portions are arranged to symmetrically engage the outer surface of the reflector with the central member being located at the geometric axis of the reflector. Means are provided for rigidly securing the reflector to the central member so that the engagement of the reflector with the abutment portions is a pressure engagement that helps to stabilize the reflector without interfering with the tendency of the reflector to expand when it is heated.

In the illustrative embodiment of the invention, a protective grill is provided having a front portion and two side portions extending rearwardly from the ends of the front portion. The protective grill has first elongated vertical members at the ends of the front portion and second elongated vertical members at the ends of the side portions, with the ends of the first elongated vertical members being out-turned and angled with respect to the respective vertical members. A plurality of elongated transverse members are supported by the vertical members. The ends of the vertical members extend into grooves defined by walls of a base portion and top cover member of the electric space heater to rigidly secure the protective grill to the space heater housing without the use of external fastening means.

A more detailed explanation of the invention is provided in the following description and claims, and is illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a front elevational view, partially broken away, of an electric space heater constructed in accordance with the principles of the present invention;

FIG. 2 is a right side elevational view thereof;

FIG. 3 is a fragmentary sectional view taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken substantially along the line 4—4 of FIG. 1, and illustrating in broken lines action of the housing's top cover in effective interlocking relationship with the housing's protective grill;

FIG. 5 is a fragmentary front elevational view of a safety switch utilized in the electric space heater shown in FIG. 1;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 5; and

FIG. 7 is a fragmentary enlarged sectional view taken along the line 7—7 of FIG. 4 and showing the typical insulation mounting of the resistance ribbon on the heater's reflector.

DETAILED DESCRIPTION

Referring to the drawings, space heater 10 includes a housing 12 having a back portion 14 and a base portion 16. In the illustrative embodiment, back portion 14 and base portion 16 of the housing are formed from a single piece of sheet metal. A hand grip 18 is formed by cutting and striking inwardly a part of the back portion 14. A pair of sheet metal pedestals 20 and 22, having rubber-protected support ends 24, are fastened to base portion 16 by means of machine screws 26.

A reflector 28 is located within the housing and is supported by back portion 14. The reflector is simply formed of continuous sheet metal having a highly reflective inner surface, and in the illustrative embodiment is shaped to provide a substantially uniform parabolic cross-sectional configuration throughout its length, although other shapes may be used to provide radiant heat reflection.

The central portion of the parabolic reflector is fastened rigidly to back portion 14 by means of a pair of spaced sheet metal brackets 32 which are simply secured by screws or the like to the reflector adjacent its longitudinal centerline. The two brackets 32 are symmetrically disposed and are dimensioned and positioned so that less than 25 percent of the length of the parabolic periphery is rigidly engaged by the bracket means 32 while the remaining top and bottom portions of the reflector 28 are free to flex, as will be explained below.

Each bracket 32 includes: a transverse mounting flange 33, which abuts and is rigidly fastened to the inside surface of back member 14 of the housing by a screw or the like; a transverse elongated bight portion 35 which operates to space the reflector 28 from the back member 14; a pair of spaced abutment flange portions 35*a* which are bent so as to be inclined with respect to the longitudinal axis of spacer bight 35 and to be substantially tangential with respect to the periphery of the reflector; and a securement flange 39. The abutment portions 35*a* are arranged to symmetrically engage the outer surface of the reflector on opposite sides of the geometric axis thereof. Between the spaced abutment flanges 35*a* is a central securement flange 39 to which a central axial portion of the reflector is tied by a connector screw 41.

The securement flange 39 is bent so as to be spaced slightly from reflector 28 to insure that the spaced flange portions 35*a* provide a saddlelike and stable support for spaced portions of the reflector 28. In the illustrative embodiment, bracket 32 including flange 33, bight portion 35, abutment flange portions 35*a* and central securement flange 39, is formed as a unitary stamping for economy and for providing stability during use.

The screw 41, which ties the reflector 28 to the central flange 39, provides a tension force on the reflector in the direction toward the back member 14 thereby providing that each of abutment flanges 35*a* are under a compressive force from the reflector. In this manner, the reflector is stabilized without the abutment flanges 35*a* interfering with the tendency of the reflector to expand when heated.

Reflector 28 has therein a first series of punched slots 36*a* which are horizontally aligned upon the top portion of the reflector, and a second series of slots 36*b* which are horizontally aligned along the bottom portion of the reflector. Each of slots 36*b* is positioned along an imaginary vertical line approximately intermediate vertical lines through two of slots 36*a*. Slots 36*a* and 36*b* each receive therein a wire mount spacing means 38 in the shape of a hook-shaped member formed of an electrically and thermally insulative material. A heating element 40, formed of a conventional electrical resistance ribbon, is strung in a sinuous path between the wire mount spacing means 38 with the nodical portions 40' of heating element 40 being connected to the wire mounts 38, as shown most

clearly in FIGS. 1 and 7. The spacing means 38 adjacent the ends of the reflector are spaced closer to each other than the centrally located spacing means 38 in order for heating element 40 to give a more even heat distribution.

Reflector 28 defines apertures 44 adjacent the ends of heating element 48, through which apertures are passed electrical wire 46 extending from the ends of the heating element to a male plug outside the unit (not shown) for connection to a suitable household current supply. A safety switch 50, which will be discussed in more detail below, is connected in series with one of the electrical lines 44. The outer surfaces of electrical lines 44 are coated with an electrically insulative material to prevent electrical contact with the reflector and other metallic portions of the space heater.

A protective grill 54 is positioned to enclose the front and sides of the space heater. Protective grill 54 has a front portion 56 which is positioned in front of the heating element and has side portions 58 and 60 which extend rearwardly from the ends of the front portion. The protective grill is formed of chrome-plated metal and has elongated vertical members 61 and 62 at the ends of the front portion and elongated members 64 (the elongated member on the left side of the unit is not shown) at the rearward ends of the side portions 58 and 60. An additional elongated vertical member 66 is centrally located with respect to the front portion 56.

All of the elongated vertical members 61, 62, 64 and 66 are used to support a number of elongated transverse grill members 68, which, in the illustrative embodiment of the invention, are shown as horizontal members. The elongated vertical members of the grill cooperate with the top, front and base portions of the housing to effect a simplified assembly as is discussed hereinafter.

The housing of the space heater 10 includes a top cover member 70 which interconnects with the upper portions of grill 54 without separate fasteners, and which is then fastened through down-turned flange 70*a* to back portion 14 by means of only three screws 72. Top cover member 70 carries safety switch 50 and can be removed by simply unscrewing screws 72 and reversing the manner of assembly by pivoting it to the broken line position as shown most clearly in FIG. 4. Protective grill 54 rigidly interconnects with the base 16 and top 70 by means of interfitting of the elongated vertical members 61, 62, 64 and 66 of said grill with grooves and apertures in said top and base. Referring to FIG. 3, it is seen that base 16 of the unit has in-turned flanges 76 and 78 which define therebetween an angled corner groove 80 for receiving therein an angled out-turned bottom finger 82 of vertical corner member 62. The rear end of the in-turned flange 76 is cut away to be spaced from an adjacent in-turned flange of back 14 to define a recess 84 for receiving the bottom 86 of elongated vertical member 64. The left side of the base portion 16 (not shown) is symmetrical to the right side illustrated in FIG. 3 and receives the bottom portions of the elongated vertical members 61 and 64 on the left side of the protective grill.

Top cover member 70, in a manner similar to base portion 16, defines corner grooves for receiving the out-turned and angled top finger 90 of elongated vertical member 61 and the out-turned and angled top finger 92 of elongated vertical member 62, and recesses (not numbered) similar to recess 84 for receiving the upper ends of vertical members 64. Base portion 16 and top cover member 70 define central apertures 94 and 96, respectively, for receiving the out-turned and angled bottom and top, respectively, of elongated central vertical member 66.

As a result of the construction of the illustrative embodiment of the present invention, the unit can be assembled very rapidly, and the components cooperate to form a rigid unit where interlocking elements on the grill fitting into the base and top of the housing operate to hold the parts rigidly and require only a minimum number of fasteners 72 to complete the assembly. Parabolic reflector 28 is very simple to construct and its connection to back portion 14 enables more than 75 percent of the reflector to flex in response to heating of heating element 40.

In order to prevent the unit from operating if it should fall over, a gravity-operable safety switch 50 is utilized. Safety switch 50 comprises an electrically insulative support member 100 which is fastened to a bracket 102 by means of a screw 104. Support member 100 has a first rigid arm 106 fastened thereto and has a flexible arm 108 also fastened thereto. Rigid arm 106 carries a contact 110 which is normally in engagement with contact 112 carried by flexible arm 108.

Arms 106 and 108 are formed of electrically conductive material and normally engage contacts 110 and 112 to cause a series circuit to connect two open portions of line 44.

A pivot 116 having a limit member 118 fastened to its end, and is affixed to rigid arm 106. A weighted operating arm 120 is journaled to pivotal member 116 and comprises an operating member 122 and a weighted member 124. Operating member 122 is so dimensioned that, when the unit tips and weighted member 124 maintains its vertical position resulting from the force of gravity, at a predetermined angle of turn the top portion of operating member 122 will cammingly engage the underside of flexible arm 108 to urge contact 112 away from contact 110, thereby opening the circuit. It has been found that this gravity-operable safety switch in combination with the unit described above provides a very safe and effective unit, which is relatively inexpensive and simple to construct.

Although an illustrative embodiment has been shown and described, it is to be understood that various substitutions and modifications may be made by those skilled in the art without departing from the spirit and scope of the present invention.

What is claimed is:

1. In an electric space heater that uses a ribbon-type resistance wire for generating radiant heat, the resistance wire tending to expand upon being heated and being carried by spacing means mounted upon a reflector means, the improvement comprising, in combination, a reflector having a continuous surface that is substantially symmetrical about a geometrical axis; means for rigidly mounting the reflector adjacent said geometric axis leaving a portion of the reflector fully free to expand in response to heat from the resistance wire, the resistance wire being connected through the spacing means to curved portions of the reflector that are spaced from said means for rigidly mounting the reflector, the means for rigidly mounting the reflector including a sheet metal part with spaced abutments that provide flat portions tangent to the reflector and an attachment member spaced between the spaced flat abutments, the spaced abutments being arranged to symmetrically engage the outer surface of the reflector with the attachment member being located substantially at the geometric axis of the reflector; and tension means for securing the reflector to said attachment member so that the engagement of the reflector with the abutment portions is a pressure engagement that helps to stabilize the reflector without interfering with the tendency of the reflector to expand when heated.

2. In an electric space heater as described in claim 1, wherein said sheet metal part provides a mounting flange adapted to be rigidly secured to the body of the space heater, a transverse bight portion for spacing the reflector from the body of the heater, and said abutment portions and attachment member comprising separate flanges spaced from the mounting flange with said abutment portions being inclined to lie in different planes.

3. A simplified assembly for an electric space heater that is housed in a boxlike enclosure having grill-like sides and front through which heat radiates from an electrically energized emitter, said assembly comprising, in combination, a unitary base and back upon which the radiant heat emitter is mounted, a grill member formed of spaced rodlike elements and shaped to provide opposite sidewalls and a front wall for the boxlike enclosure, a top for the enclosure, recesses defined in the base and top for receiving rodlike elements of

the grill member, certain of the rodlike elements on the grill member being angled with respect to the plane of the surfaces generally defined by the grill so as to interlock with the recesses on the base and top without use of fasteners, the angled rodlike elements being located at the junctions between the sidewalls and front wall of the grill member and each being angled outwardly with respect to both walls that join at said junction, the top having means arranged to interfit with the back to apply tension to the grill member to effect a rigid holding of the rodlike elements on the grill member when the top is assembled, and securing means for selectively securing the top to the back to hold the enclosure together without rattling.

4. An assembly as in claim 3, wherein the securing means are a plurality of screws, which permits assembly or disassembly with a single tool.

5. An assembly as in claim 3, wherein the unitary back and base are formed of sheet metal with in-turned flanges thereon shaped and arranged to define angled grooves between pairs of flanges for receiving thereinto the angled rodlike elements of the grill member.

6. An electric heater as described in claim 3, further including means for connecting said emitter to a current supply including a safety switch carried by the top of the enclosure and wired in series with an electrically conductive line, said switch having a pair of normally closed contacts and means for opening said contacts when the space heater tips to a predetermined angle with respect to its normal upright position.

7. In an electric space heater as described in claim 6, wherein said safety switch includes a support member, a first rigid arm fastened to said support member and carrying a contact and a weighted member, means pivotally connecting said weighted member to said rigid arm, a second flexible arm fastened to said support member and carrying a contact that is normally in engagement with the rigid arm contact when the space heater is in its normal upright position, said weighted arm being dimensioned to cam said flexible arm away from said rigid arm when said weighted member is pivoted as a result of tipping the space heater, whereby said rigid arm contact will disengage said flexible arm contact.

8. A simplified assembly for an electric space heater that is housed in a boxlike enclosure having grill-like sides and front through which heat radiates from an electrically energized emitter, said assembly comprising, in combination, a unitary base and back upon which the radiant heat emitter is mounted, a grill member formed of spaced rodlike elements and shaped to provide opposite sidewalls and a front wall for the boxlike enclosure, a top for the enclosure, recesses defined in the base and top for receiving rodlike elements of the grill member, certain of the rodlike elements on the grill member being angled with respect to the plane of the surfaces generally defined by the grill so as to interlock with the recesses on the base and top without use of fasteners, the unitary back and base being formed of sheet metal with in-turned flanges thereon shaped and arranged to define angled grooves between pairs of flanges for receiving thereinto the angled rodlike elements of the grill member, the top having means arranged to interfit with the back to apply tension to the grill member to effect a rigid holding of the rodlike elements on the grill member when the top is assembled, and securing means for selectively securing the top to the back to hold the enclosure together without rattling.

* * * * *