July 5, 1949. H. L. STILES 2,475,113

PORTABLE ELECTRIC HEATER

Filed Jan. 20, 1948 3 Sheets-Sheet 1

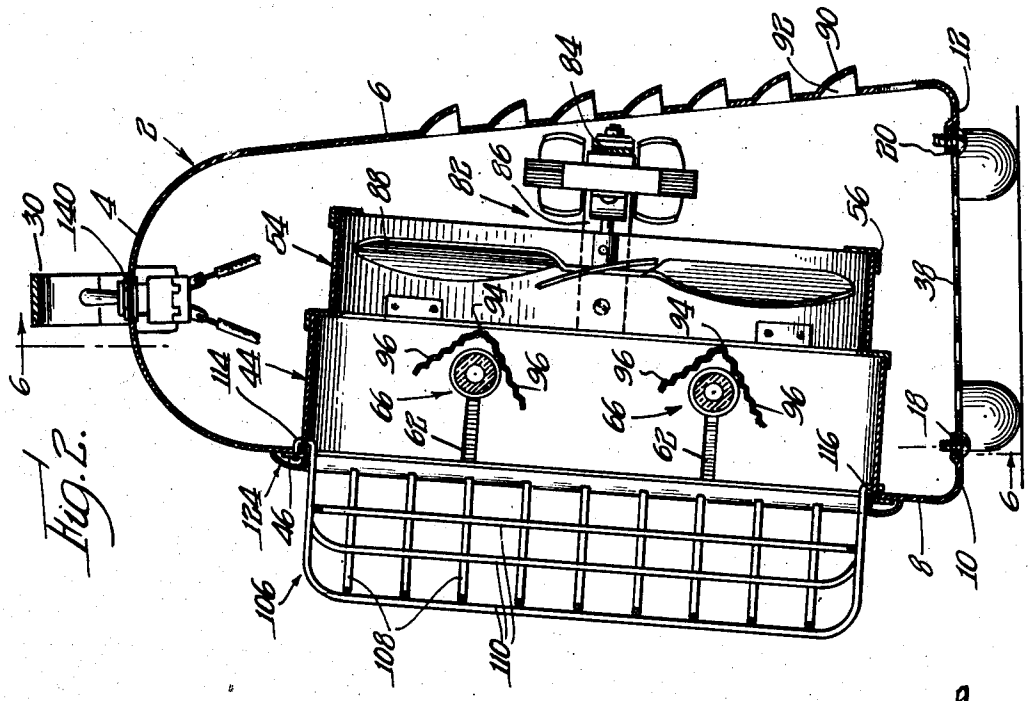


Fig. 2.

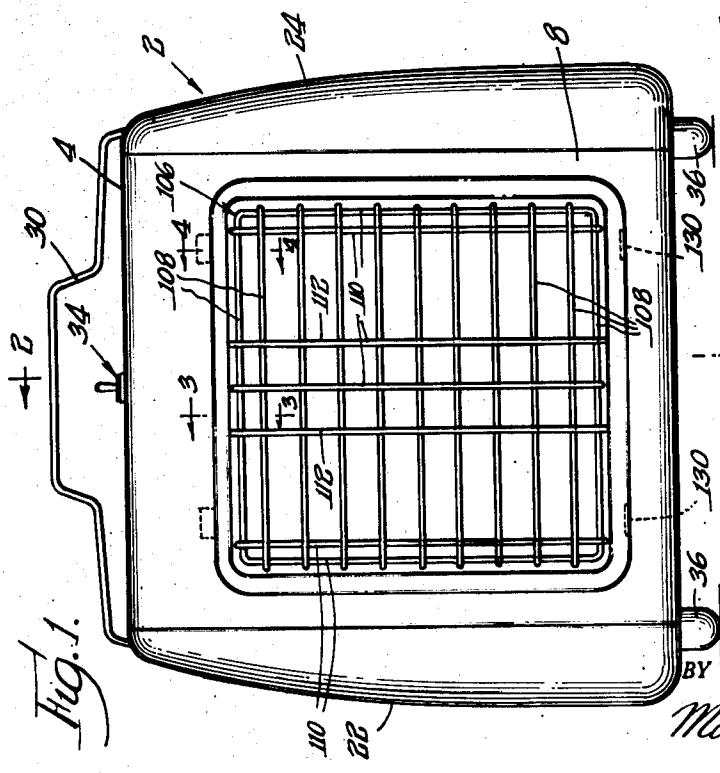


Fig. 1.

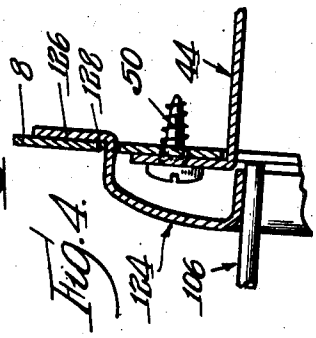


Fig. 4.

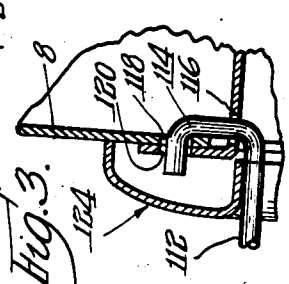


Fig. 3.

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PORTABLE ELECTRIC HEATER

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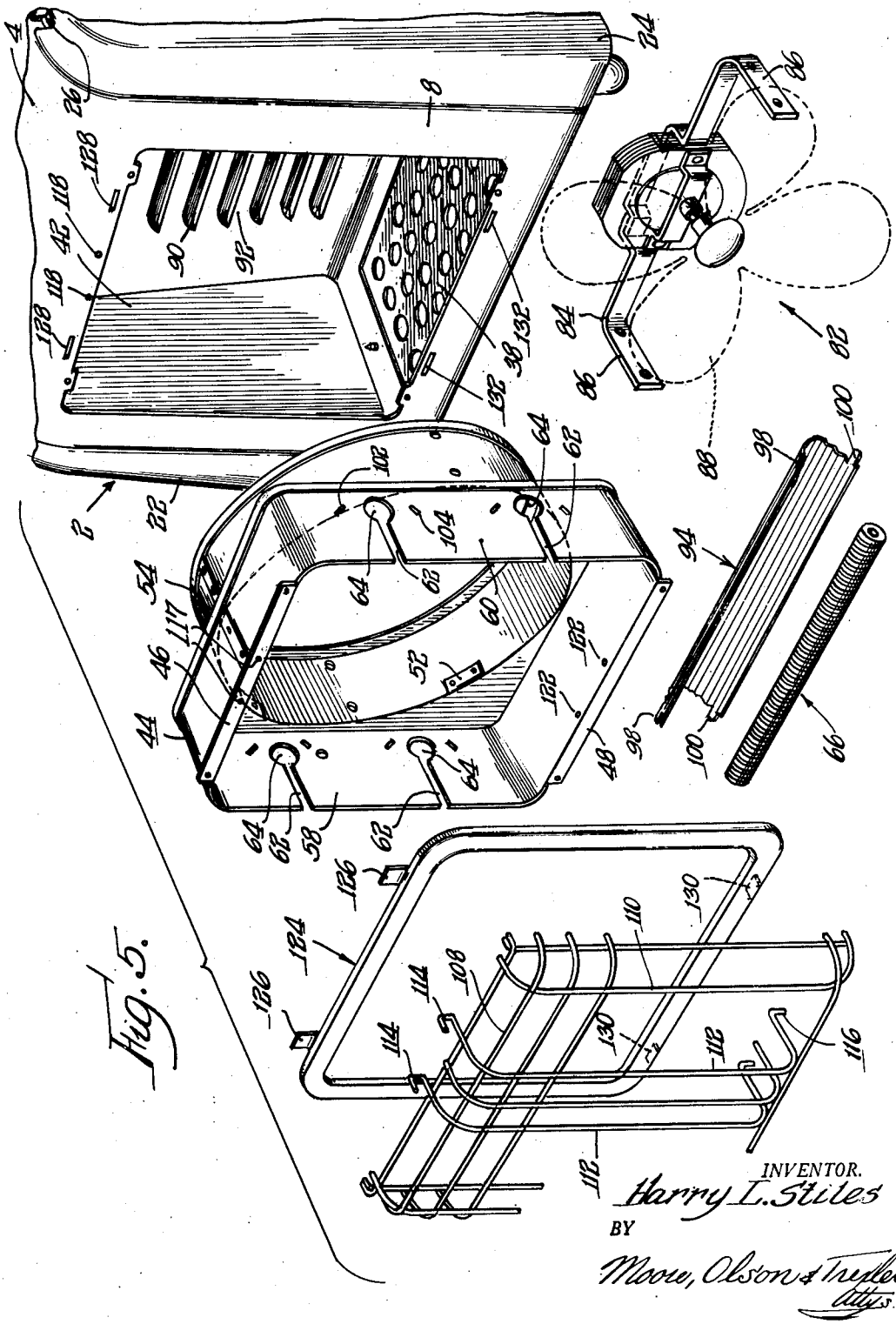


Fig. 5.

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PORTABLE ELECTRIC HEATER

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Fig. 6.

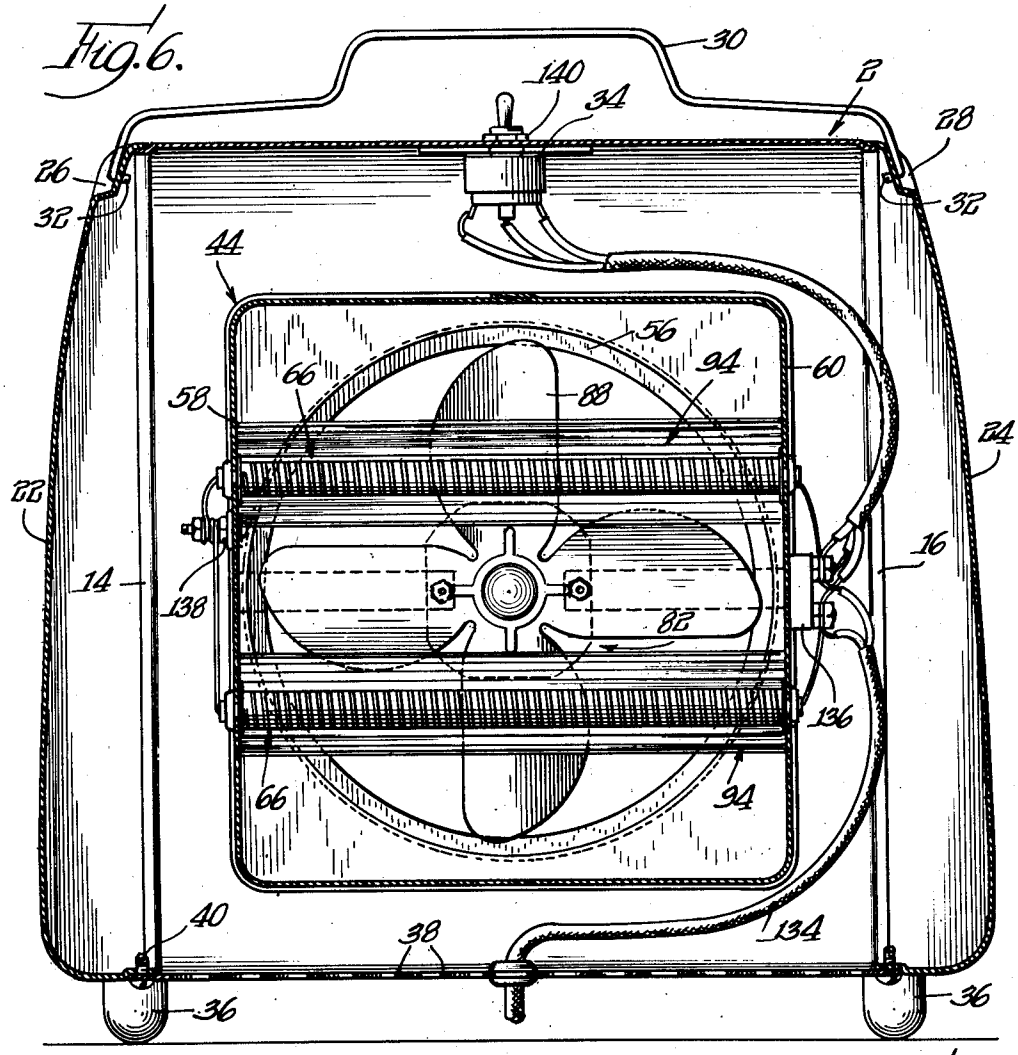


Fig. 7.

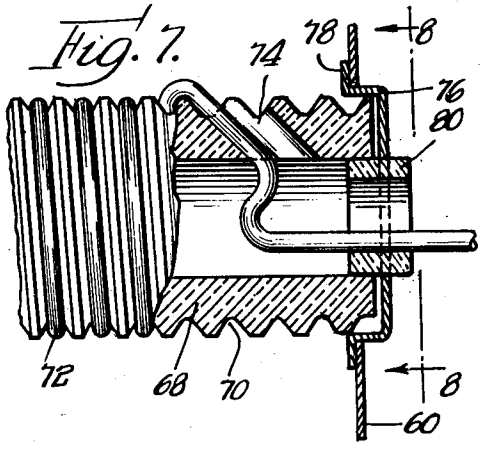
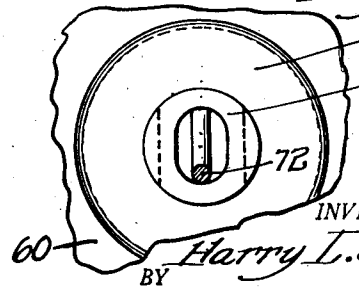


Fig. 8.



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2,475,113

PORTABLE ELECTRIC HEATER

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Application January 20, 1948, Serial No. 3,212

5 Claims. (Cl. 219—39)

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This invention relates to an electric fan heater and more particularly to a portable electric heater having a fan causing the circulation of air to and past the heating elements.

An object of the invention is to simplify the construction and assembly of a portable electric fan heater and to construct the heater of stamped sheet metal parts, so far as possible, whereby to reduce the cost and increase the rate of production of such articles.

A further object of the invention is to provide in an electric fan heater more efficient and less expensive heating elements and more efficient heat ray reflectors angularly positioned with respect to the heating elements in the fan to protect the heating elements against direct impingement of cool air supplied by the fan but to reflect and diffuse the heat rays across the passing stream of air supplied by the fan thereby efficiently to heat the air stream.

A further object of the invention is to provide in an electric fan heater heat ray reflectors which not only efficiently reflect the heat rays but also provide a source of heat energy providing initial heating of the air stream passing across the rear surfaces of the reflectors.

Other and further objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

Fig. 1 is a view in front elevation of a fan heater embodying the present invention;

Fig. 2 is an enlarged view in vertical section taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary, enlarged view in vertical section taken along the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary, enlarged view in vertical section taken along the line 4—4 of Fig. 1;

Fig. 5 is an exploded view in perspective better illustrating the construction of the parts of the heater;

Fig. 6 is a view in vertical section taken substantially along the line 6—6 of Fig. 2;

Fig. 7 is a fragmentary view partly in elevation and partly in section, showing the mounting of the heating element; and

Fig. 8 is a view in vertical section taken substantially along the line 8—8 of Fig. 7.

As shown in the drawings, a heater embodying the invention comprises a sheet metal shell 2 bent and stamped to provide a dome shaped top portion 4; a rear, inclined wall portion 6; a front inclined wall portion 8 and inwardly turned free end portions 10 and 12. The shell 2 is formed on opposite vertical side edges with inwardly offset peripheral flanges 14 and 16 and the inturned bottom portions 10 and 12 are provided with offset flanges 18 and 20.

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Stamped sheet metal end caps 22 and 24 of any pleasing configuration close the ends of the shell 2 and have their free peripheral top, and opposite vertical, edges seated on the offset flanges 14 and 16 of shell 2 so that the top and opposite vertical edges of the end caps lie flat with the surfaces of the top wall 4 and the rear and front walls 6 and 8.

The end caps 22 and 24 are provided at their top ends with depressed portions 26 and 28 to receive the down-turned ends of a sheet metal strap or handle 30, the depressed portions having slots through the walls of the end caps to receive the inwardly turned lugs 32 of the handle. A control switch 34 of any usual construction is secured to the shell 2 at the apex of the dome-shaped top 4 so that it is positioned beneath and protected by the handle 30 and will not be inadvertently turned on or off by a person or object moving past the heater, nor turned on inadvertently by tipping or falling of the heater. The housing shell is supported upon legs or knobs 36 carried by the end caps, or by a perforated plate 38 seated upon the bottom flanges 18 and 20 of the shell 2 and secured thereto by screws or other fastening means 40. The legs 36 space the housing from the supporting surface and cooperate with the perforated plate 38 to assure a circulation of cool air between the supporting surface and the shell under the suction effect of the fan of the heater so that overheating of the supporting surface is precluded.

The front wall 8 of the shell 2 is provided with a large, rectangular opening 42. A sheet metal pan 44 of like size and shape is insertable in the opening 42 and is provided with upper and lower attaching flanges 46 and 48 adapted to overlie the upper and lower edges of opening 42 and to be secured to the front wall of the shell by self-tapping screws or other fastening means 50.

The bottom of the pan 44 is provided with a circular opening and, at the edge of the opening with a plurality of angularly spaced rearwardly bent attaching flanges 52 adapted to be received in a cylindrical shell 54 and to attach the cylindrical shell to the pan 44, the flanges 52 being fastened in any suitable manner, preferably by spot welding to the cylindrical shell. The rear of the cylindrical shell may be rigidified by a circular angle bar or rim 56.

The opposite vertical sides 58 and 60 of the pan 44 are provided with vertically spaced slots 62

opening outwardly at the forward edge of the pan and communicating rearwardly with enlarged circular openings 64. Heating elements 66 are mounted in the pan 44, each heating element comprising a cylinder or rod 68, suitable insulating material, preferably in the nature of a ceramic, the cylinder having a helical groove 70, in which groove is wound a heating wire 72. At each of its opposite ends, the cylinder is provided with an opening 74 communicating with the groove 70 and opening internally of the cylinder so that the wire 72 may be passed through the opening 74 into the central bore of the cylinder 68 and extended longitudinally of the cylinder out of the opposite ends thereof. The cylinder 68 is received at its opposite ends in sheet metal cup-shaped caps 76, each having a peripheral, radially directed flange 78, and a central opening coaxial with the cylinder 68 and receiving an insulating bushing 80 through which one end of the wire 72 extends. Each heating element is mounted in pan 44 by passing the outwardly extending ends of the wire 72 along the slot 62 and inserting the caps 76 in the circular openings 64. The slots 62 and the openings 64 render the side walls of the pan sufficiently yieldable to move outwardly and permit introduction of the ends of the heating elements and the caps into the openings 64, after which the sides of the pan snap back to secure the heating elements in mounted position.

A motor driven fan 82 of any desirable construction is secured to a sheet metal mounting strap 84 having opposite ends 86 which extend along the inner wall of the cylindrical shell 54 in diametrically spaced relation and these ends of the mounting strap are secured to the shell in any convenient manner, as by suitable bolts, rivets or by spot welding. The mounting bracket is so dimensioned that the fan blade 88 is housed within the cylindrical shell 54 and the shell 54 is so dimensioned as to provide a slight but sufficient clearance for the fan blades 88.

The rear wall 6 of the main housing shell 2 is formed with pressed out louvres 90 which provide air apertures 92 opening outwardly and downwardly so that pieces of paper and other light objects will not, when the heater is juxtaposed to them, be drawn into the heater. The apertures 92 provide main air openings through which air is drawn by the fan 82, and these are supplemented by the openings in the perforated bottom plate 38 of the heater which provide not only supplementary air for the fan, but also serve to supply air which circulates about the inner wall surface of the main housing shell 2 and end caps 24 to keep that housing at a safe operating temperature.

Each of the heating elements 66 is provided with a heat ray reflector 94 in the form of a sheet metal channel having longitudinal corrugations or serrations in angularly disposed plane sides 96. Each reflector is provided at its opposite ends with attaching lugs 98 and 100 seated in complementary angularly related slots 102 and 104 in each side wall of the pan 44.

The slots 102 and 104 are so positioned with respect to the opening 64 that the base of the channel shaped reflector, i. e., the vertex of the angle between its plane sides, is offset below the center of the opening 64 and therefore below the center of the cylindrical heating element when mounted in the opening 64. The slots 102 and 104 are, moreover, not at complementary angles but at different angles to the horizontal so that the bottom side of each reflector extends forwardly about its associated heating element a greater distance than the upper side of the reflector, as shown most particularly in Fig. 2. This disposition of the reflectors has been found most effective in protecting the heating element against a direct flow of cool air such as would quickly lower the heating element to a non-working temperature.

Some of the air passing the forward edges of the reflector will, of course, turn downwardly or inwardly and pass in direct contact with the heating element. That flow of air will be restricted by the sides of the reflector. Turbulence in the air stream will, of course, cause additional amounts of air circulating in the pan 44 to pass into each reflector shell and about the heating elements at a restricted rate. The air thus passing at a restricted rate about the heating elements will, on heating, be caused to move laterally to the main body of the air stream. Such turbulence in its air stream is increased by the fact that the air duct defined by the pan 44 is rectangular or square, whereas the air duct defined by the shell 54 is smaller and cylindrical.

The reflectors therefore serve as diffuse reflectors of the heat rays for radiant heating purposes; as sources of energy for heating of the main stream; as baffles for the main heating elements and, with the heating elements, as means providing a stream of laterally and upwardly moving hot air further heating the main air stream.

A pan shaped grill 106, having generally horizontal wires 108 spot welded to vertical wires 110, is mounted on the front wall 8 of the shell 2. Additional vertical wires 112, equidistantly spaced from the vertical center of the grill and secured to the horizontal grill wires, are provided at their opposite ends with reversely bent end portions or hooks 114 and at the lower ends with down-turned portions or lugs 116. The grill is mounted in the shell by first passing the hooks 114 of grill wires 112 through openings 117 in the upper wall of the pan 44 and then swinging the grill downwardly to introduce the ends of the hooks 114 through openings 118 and 120 in the front wall 8 of the shell 2 in the attaching flange 46 of the pan 44, all as shown in Fig. 3. The inturned portions at the bottom of the grill wires 112 are then pressed upwardly to allow the lugs 116 to clear the bottom wall of the pan 44 and the lugs 116 then allowed to snap downwardly into openings 122 in the bottom of pan 44.

An escutcheon or molding strip 124 covers the outwardly projecting ends of the hooks 114 of the grill wires 112 and the attaching flanges 46 and 48 of the pan 44. This escutcheon or molding strip comprises a frame which is channel shaped in cross section, as best seen in Fig. 4.

Along its upper side the frame 124 provides spaced, rearwardly and upwardly extending lugs 126 which are received in slots 128 in the front wall 8 of the shell 2 adjacent the opening 42. On its lower side, the frame 124 is provided with rearwardly extending lugs 130 receivable in slots 132 in the front wall 8 of the shell 2 below but adjacent the opening 42. It will be evident that the molding frame 124 can be readily assembled with the shell by first inserting the free ends of the lug 126 through the slots 128 and then swinging the frame downwardly so that the lugs 126 abut the inner surface of the inner wall 8 of the shell 2 as shown in Fig. 4, as the lugs 130 are passed through the slots 132. The frame is also

readily detachable by the reverse operation once the grill 106 has been removed.

The electric connection of the heater elements 66, the switch 34 and the motor fan 82 to the supply cable or cord 134, Fig. 6, is readily accomplished by the use of connector blocks 136 and 138 of any usual type secured to the sidewalls 58 and 60 of the pan 44.

It is to be noted that with the exception of the switch 34 all of the operating parts of the fan heater are carried by the pan 44 or the cylindrical shell 54 secured to the pan and, therefore, the entire operating mechanism may be assembled and wired with respect to the pan 44 and thereafter assembled with the shell 2 by first inserting the switch 34, already wired to the heating elements and the motor, in the shell and securing it to the dome-shaped top by the usual lock nut 140. The lead-in conductor 134 passing through the perforated bottom plate 38 of the main housing shell may be first assembled with that plate, the plate attached to the main housing shell and the inner end of the conductor passed out of the opening 42 and connected to the connector block 136, the switch 34 and the motor, just prior to the introduction of the pan-shaped shell and parts carried thereby into the main housing shell. The pan-shaped shell is next secured to the main shell by insertion of the proper screws 50 through the apertures of the attaching flanges 46 and 48 and the corresponding apertures adjacent the upper and lower edges of the opening 42. The molding frame 124 is next assembled with the main shell in the manner as previously described and thereafter the grill 106 is attached as previously described.

In order to replace the heating elements when burned out, it is merely necessary to remove the grill 106 by first pressing upwardly on the inturned bottom ends of the grill bars 112 to release the lugs 116 from the openings 122 in the lower sidewall of the pan shell 44 and then swinging the grill outwardly to release the hooked ends 114 of the grill bars 112 from the openings 117, 118 and 120 in the upper sidewall of the pan 44, the front wall of the main housing shell, and in the attaching flange 46 of the pan 44. The frame 124 may readily be removed as previously described, the attaching screws 50 removed, and the entire operating mechanism removed by simply sliding the pan 44 forwardly out of the opening 42. The heating element may be disconnected from the connector blocks and a new element substituted for it and connected to the connector block and the mechanism quickly reassembled in the manner as previously pointed out.

It should be noted that the heat ray reflectors 94, by reason of their shape and corrugation, do not focus the ray into a parallel beam but diffuse the rays more effectively to heat the passing air stream and to prevent the formation of a concentrated beam of heat rays which would mar fine or finished surfaces to which it might be inadvertently directed in the use of the heater.

The corrugations serve to increase the heated, rear surface area of the reflectors across which the air stream from the fan passes so as to more effectively utilize the reflectors as sources of heat for the heating of the air stream.

It will be apparent from the foregoing description that applicant has provided a simplified construction and assembly of a portable electric fan heater, and constructed the heater of stamped sheet metal parts, so far as possible, whereby to

reduce the cost and increase the rate of production of such articles. He has provided in an electric fan heater more efficient and less expensive heating elements and more efficient heat ray reflectors. He has also provided in an electric fan heater heat ray reflectors which not only efficiently reflect the heat rays but also provide a source of heat energy providing initial heating of the air stream passing across the rear surfaces of the reflectors.

It will be obvious that changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

What is claimed is:

1. In an electric heater, a heating element including a helically wound heating coil and a reflector having two angularly related plane sides and mounted behind said reflector with its sides extending over and under said heating element, and an electric fan mounted behind said reflector causing a flow of air to be heated over the rear surfaces of the sides of the reflector, the reflector being so mounted with respect to the heating element that its sides extend at unequal angles to a plane through the axis of the heating coil parallel to the axis of rotation of the fan.

2. In an electric heater, a heating element including a helically wound heating coil and a reflector having two angularly related plane sides and mounted behind said reflector with its sides extending over and under said heating element, and an electric fan mounted behind said reflector causing a flow of air to be heated over the rear surfaces of the sides of the reflector, the reflector being so mounted with respect to the heating element that its sides extend at unequal angles to a plane through the axis of the heating coil parallel to the axis of rotation of the fan and the upper side of the reflector extending at a smaller angle to said plane than the lower side.

3. In an electric heater, a heating element including a helically wound heating coil and a reflector having two angularly related plane sides and mounted behind said reflector with its sides extending over and under said heating element, and an electric fan mounted behind said reflector causing a flow of air to be heated over the rear surfaces of the sides of the reflector, the reflector being so mounted with respect to the heating element that its sides extend at unequal angles to a plane through the axis of the heating coil parallel to the axis of rotation of the fan and the lower side of the reflector extending forwardly farther than the upper side, the lower side extending forwardly of the heating coil to prevent upwardly moving air currents from impinging on the coil while the upper side of the reflector terminates rearwardly of a transverse plane to the front edge of the coil to permit downwardly moving air currents to impinge on the heating coil.

4. An electric heater comprising a sheet metal housing shell having a front wall and a rear wall, the front wall having a relatively large opening therethrough, the rear wall having a plurality of spaced apertures opening downwardly to admit air into the shell, a casing insertable in said housing shell through the opening in the front wall and secured to the front wall of said shell, heating elements mounted within and extending across said casing, each heating element including a helically wound heating coil, an electric fan

carried by said casing behind said heating elements and reflectors mounted in said casing between said fan and heating elements, each reflector having two angularly related longitudinally corrugated plane sides partially encompassing said elements from the rear thereof, said housing shell having a bottom wall and members forming feet for spacing the shell from a supporting surface, said bottom wall having openings therein forming auxiliary air openings causing on operation of the fan circulation of air between said shell and the supporting surface.

5. An electric heater comprising a sheet metal housing shell having a front wall and a rear wall, the front wall having a relatively large opening therethrough, the rear wall having a plurality of spaced apertures opening downwardly to admit air into the shell, a casing insertable in said housing shell through the opening in the front wall and secured to the front wall of said shell, heating elements mounted within and extending across said casing, each heating element including a helically wound heating coil, an electric fan carried by said casing behind said heating elements and reflectors mounted in said casing between said fan and heating elements and partially encompassing said elements from the rear thereof, each reflector having two angularly related plane sides and mounted behind said reflector with its sides extending over and under said heating element, an electric fan mounted behind each reflector causing a flow of air to be heated over the rear surfaces of the sides of said reflectors, the reflectors being so mounted with respect to the heating element that its sides extend at unequal angles to a plane through the axis of the heating coil parallel to the axis of rotation of the fan and the upper side of the reflectors extending at a smaller angle to said plane than the lower side, and a guard grill having means for detachably connecting the grill to said casing and a facing overlying the edge of the opening in the front wall of the housing shell and the forward edge of the casing and encompassing the guard grill.

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