Feb. 2, 1954 E. SPURR 2,668,220

ELECTRIC HEATING APPLIANCE

Filed June 10, 1952 2 Sheets-Sheet 1

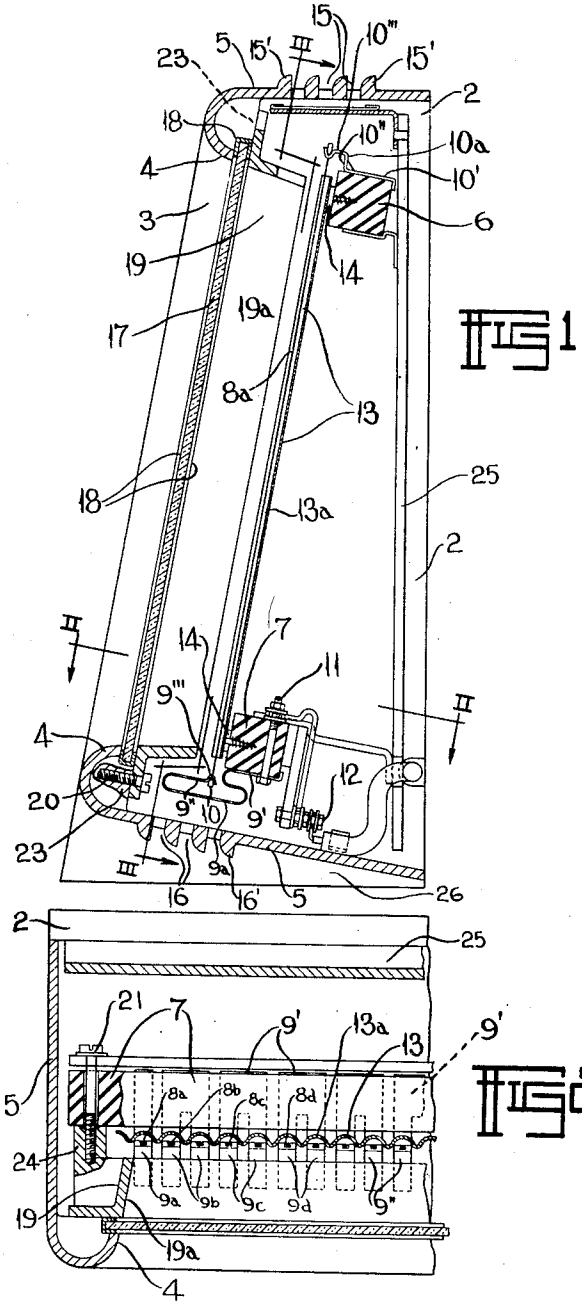



Fig 1




Fig 2

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ELECTRIC HEATING APPLIANCE

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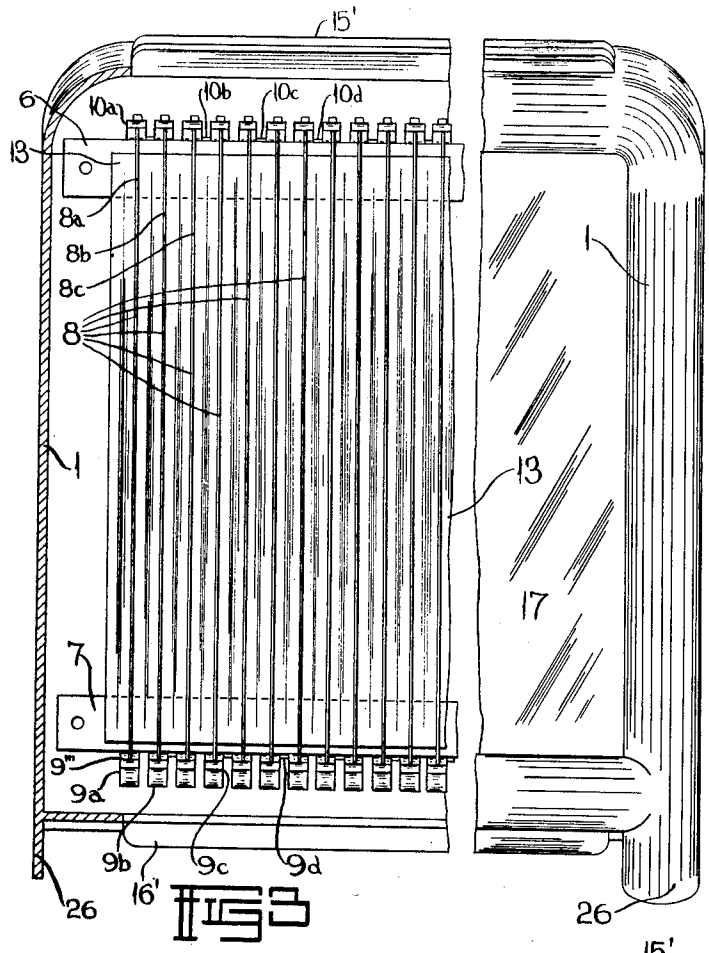



FIG 3

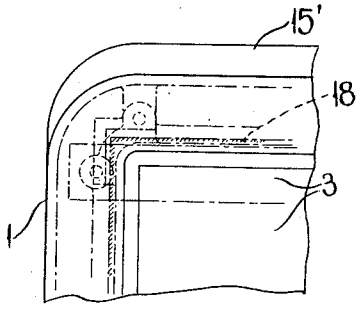



FIG 4

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## ELECTRIC HEATING APPLIANCE

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3 Claims. (Cl. 219—34)

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This invention relates to electric heating appliances of the kind comprising an electric resistor element associated with a polished reflector surface for directing heat from the appliance as a beam. It provides a form or forms of such appliance having improvements in the construction and arrangement of the resistor element and the reflector, and in the relative disposition of these parts, making for cheapness of construction, reduction of repair costs, enhanced protection of the resistor and reflector parts and greater safety in use.

According to the invention in a heating appliance of the foregoing kind a resistor element is made up of a number of separate relatively short resistance wires electrically connected in a series arrangement by connecting members devised to hold the several wires under tension in the mutual disposition desired.

Such members may be arranged to present the wires which they connect, in front of a suitable reflector, in a zig-zag or like tortuous path between electric supply terminals to which the extreme wires are respectively connected; the said connecting members occurring at and constituting the turning corners or bends in the path aforesaid.

The resistor may be presented in this way as a flat skeleton panel, i. e. with the wires and turning corner connections conforming to a plane arranged in front of and parallel to the general plane of a reflector of approximately equal extent with that of the said panel, the combination being arranged for use vertically or at a backward inclination in the usual way of wall-fixing or pedestal radiators.

Alternatively the said connecting members may be arranged so as to present the wires constituting the resistor element in a curved arrangement, e. g. with the wires conforming substantially to the surface or envelope of a figure of revolution, e. g. the surface of an imaginary cylinder or prism or other such solid figure, the component wires extending generally from connecting member to connecting member and end terminals in alternately opposite senses substantially coplanar with the axis of generation of the said surface or envelope. The reflector in such a case is arranged to the concave side of the aforementioned surface or envelope, itself conforming to a surface or envelope of a figure of revolution, cylinder, prism or other solid figure, similar to the said surface but of smaller radius or modified form providing suitable clearance between the resistor wires and the active surface of the reflector.

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According to the invention also, in a heating appliance wherein the resistor comprises straight lengths of resistance wire, which may be the aforementioned separate wires series-connected electrically by connecting and tensioning members and following a path in which the several wires are substantially parallel the reflector may be formed with corrugations or the like in and along the several valleys of which the several wires of the resistor element may extend so that the wires are individually provided with concave more or less semi-cylindrical reflectors, the combined effects of which provisions being to project the rearwardly radiating fractions of the heat rays from the component wires of the resistor element in a parallel or substantially parallel beam through the plane or the like occupied by the resistor element. More particularly the corrugation form is made substantially cylindrical in the valleys aforesaid, and the wires are arranged each to occupy a line parallel to the cylinder axis at approximately half the radius of the corrugations from their axes. This preferred relative disposition of the wires and their respective reflector surfaces practically obviates overheating of the wires by back rays from the reflector, which are instead projected in parallelism past the wires.

The invention extends to detail constructional features in the manufacture of electric heaters in which the main features above set forth are embodied preferably in combination, as now to be described by way of example, with reference to the accompanying drawings wherein:

Figure 1 is a sectional elevation of a pedestal-type heater constructed according to the invention;

Figure 2 is a fragmentary sectional plan on the line II—II of Figure 1;

Figure 3 is a front elevation of the heater, broken in width (to indicate that it may be of any desired width) and partly in section on the line III—III of Figure 1;

Figure 4 is a fragmentary front elevation showing a corner of the heater and in broken lines certain internal parts and fittings.

The illustrated heater comprises a body 1 of square or oblong frontal form, open at 2 over its rear and providing a framed front opening 3 through which the interior is visible, the frame cross-section being of approximately J-form as shown in Figures 1 and 2, the foot 4 of which form coincides with or frames the front opening, the leg 5 constituting the periphery of the body. The body may be a casting, or a pressing from suitable metal, a moulding of adequately refrac-

tory material, or built up from sheet material in any way.

Two rigid beams 6 and 7 of non-conducting, refractory material are fixed across the inside of the body parallel to and one above the other with the upper beam 6 near the rear of the body; and from these the resistor element 8 is supported in a plane parallel to the front of the body near the medial plane thereof.

The resistor element is built up from a number of like separate lengths 8*a*, 8*b*, 8*c* etc., of suitable resistance wire starting from an end one 9*a* of a series of highly flexible, e. g. springy brass, contacts or connector brackets 9*a*, 9*b*, 9*c* etc., of the plan forms shown partly in broken lines in Figure 2, fixed in equispaced arrangement, e. g. about 1" apart along the underside of the lower beam 7 so as to project forwardly therefrom. From the said end bracket 9*a* the first length of wire 8*a* runs straight upward to connect, under tension, with the corresponding end bracket 10*a* of a second series of contact or connector brackets 10*a*, 10*b*, 10*c* etc., arranged along the upper side of the upper beam 6 in similar and if desired staggered relationship with the lower series of brackets. The second wire (8*b* in Figure 3) extends downwardly under tension from the said upper end bracket 10*a* to the second bracket 9*b* of the lower series; the third wire 8*c* from the latter bracket to the second of the upper brackets; the fourth wire from this last bracket to the third lower bracket, and so on over the width of the interior of the body and to such an extent that the resistor panel or skeleton thus built up fills an area about equal to and inwardly opposite to the frontal opening 3 of the body 1.

More particularly, the lower brackets may be strips of spring brass or the like bent up from blank into a modified Z-form or S-form, as best seen in Figures 1 and 3, for fixing conveniently by the head part 9' to the underside of the lower beam, its leg extending downwardly and its foot projecting forwardly from the beam and being rolled upwardly and inwardly into a hairpin bend the tail 9'' of which lies below and a short distance in front of the lower beam.

The tail part or parts of each such bracket accommodates a very liberal springing action in the vertical direction and provides the lower connection for either one or two adjacent wires to be held as above in the plane of the resistor panel or skeleton. For this purpose each tail is bifurcated and the thus separated tail portions are each curled round as at 9''' and provided with a slot, notch, or the like into which the lower end of a wire may be readily inserted to engage in an upward direction a head, bead, nipple or the like 10 provided at the wire end to form a readily made and unmade connection of the wire to the bracket and an electrically conductive connection between the wire or each of the two wires which may thus be fixed to each bracket.

The upper brackets, made in a somewhat similar fashion, are of a less distorted Z-form, with their feet as 10' fixed to the top of the upper beam 6, their legs extending upwardly and their heads as 10'' projecting straight forwardly beyond the front of the uper beam to finish in bifurcated, notched, or like tails as 10''' by which upper ends of the wires may be fixed and connected singly or in pairs in a similar way to that described with reference to the lower brackets.

The upper brackets being located above the wires are subjected to higher working temperatures than are the lower brackets and are of substantially rigid construction as they are not expected in such conditions to provide the wire-tensioning spring effect, for accommodating expansion and contraction of the resistor wires and maintaining them in taut condition at all times; the said effect being provided by the much more springy lower brackets which operate in the cooler conditions below the wires.

Binding posts or terminals as 11 and 12 are conveniently embodied as part of the fixings for the end brackets on the lower beam so that the resistor element is series-wired through the several component wires.

The reflector 13 consists of a sheet of polished metal plate of an outline corresponding to the extent of the resistor panel or skeleton with a safe marginal clearance distance from the upper and lower brackets, and is mounted in any convenient manner inside the heater body close to but so as to leave an air gap between it and the fronts of the beams aforesaid, e. g. fixed as shown, using spacers as 14. The reflector sheet is corrugated vertically with the several front corrugation valleys 13*a* rearwardly coincident with the several wires aforesaid. The form of the corrugations and their disposition in relation to these wires are as already indicated herein; so that the heat is projected very largely as a beam of parallel rays and forwardly through the front opening of the heater body.

The body of the heater is provided with louvres as 15 and 16 through its upper and lower walls or peripheral parts to admit of convection air currents taking place upwardly through the heater. Such louvres may be in the form of series of parallel slots and these are preferably provided with external guards as 15' and 16', against access, in the form of ribs or fins alternating with the slots and incidentally providing extended heat transfer surfaces of the heater body.

For the rest, in this particular construction of heater, a plate or other refractory glass panel 17 is applied over the front opening from the inside to fit, with a suitable cushioning marginal seal 18, against the inner extremity 4 of the J-section of the body; and an L-section metal shrouding frame 19 of outline corresponding generally to the shape of the front opening is applied inside the glass to extend therefrom inwardly to a plane close to the front of the resistor and reflector combination. The interior surface 19*a* of the shroud may, if desired, be curved, e. g. to a parabolic or like concave or flared section.

Preferably the beams, shroud and intervening resistor and reflector are designed for sandwiching together in correct relative positions before assembly or during assembly in the heater body after the front glass has been inserted, and for fixing in final position by a number of bolts, studs or the like as 20 and 21 entering suitable bosses, webs, lands or the like as 23 and 24 provided inside the front of the body and/or by the shroud flange. Any suitable form of back plate 25 may be applied as a closure over the rear of the heater body for protection of its contained parts.

Adverting to the wires used for the resistor element, these are preferably of relatively stout or heavy gauge, suited to operation at relatively low temperature besides being more suitable for use in the manner above explained whereby they may be individually and easily replaced when burnt out or damaged.

The heater particularly described above may be provided with a base or with feet as 26 for

pedestal or like mounting, e. g. with the body tilted backwardly as shown; or it may be provided with means enabling it to be set into or against a wall or the like.

In a modification the front glass may be replaced by a copper or other suitable metal front panel, with the whole supported on its back or otherwise to provide a domestic hot plate, toaster or other such appliance.

In a further modification the heater may be designed to present its resistor element and associated reflector in a curved form, or even in cylindrical or like column or pillar form, whereof a vertical half-section taken in any radial plane may closely resemble the vertical longitudinal section of the construction particularly described above.

I claim:

1. In a radiant-convector type heating device, comprising a rectangular frame having slotted upper and lower horizontal members, spaced horizontal bars of electrically conductive and refractory material which are rigidly mounted across the upper and lower regions of the frame, a corrugated reflector fixed to said bars and spanning the space between said bars with the corrugations substantially vertically disposed, a separate length of resistor wire located in each forwardly directed corrugation valley of the reflector in constant spaced relationship to the substantial semi-circular surfaces of the respective corrugation valleys, a transparent refractory panel mounted across the front opening of the rectangular frame in parallel spaced relationship to the face of the corrugated reflector to permit heat radiation therethrough and for forming a convection cavity, a plurality of spaced rigid brackets mounted cantilever fashion on the upper bar for attachment of the upper ends of the separate resistor wires, a plurality of spaced resilient fixing brackets mounted cantilever fashion to the lower bar in the coolest zone of the heating device for connection of the bottom ends of said wires and taut retention of the wires in the aforesaid constant spaced relationship relative to the reflector corrugation valleys during expansion and contraction of said wires, the arrangement being



such that the alternate pairs of rigid wire brackets are electrically connected, while the resilient mounting brackets are similarly connected for all the resistor wires to be connected in series.

2. A radiant-convector type heating device, as claimed in claim 1, wherein said resilient mounting bracket provides prong-like extensions projecting cantilever-fashion forwardly of the reflector bottom edge and bent from blank into a modified S-like shape having the upper region secured to the said lower bar, whereas the bottom end is bent back upon itself in spaced relationship for the resistor wire connecting end to be disposed above the intermediate region of the bottom loop and provides movement of said end along compensating opposingly centred arcs providing straightlined deflection of said fixing end and resultant constant spacing of the resistor wire relative to the respective reflector corrugation valleys.

3. In a radiant-convector type heating device as claimed in claim 1, wherein each resistor wire is located in spaced relationship to the concave face of the relative reflector corrugation valley at approximately half the distance of such concave face to the focus or centering line of the concave face to obviate overheating of the wire by back rays from the reflector.

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