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(54) Method of manufacturing a radiant electric heater

(57) A method of manufacturing a radiant electric heater incorporating an infra-red lamp (4) having a tubular envelope (6) of generally circular configuration. The tubular envelope is provided with a protrusion (8) intermediate terminal regions thereof by means of which the lamp is supported at least in part on a layer of compacted particulate insulation material (2) in a container (1). The protrusion is also supported by way of a support component (9) which has a first portion (13) embedded in the insulation material and a second portion (14) at least overlying the protrusion. The method comprises the steps of a) compacting particulate insulation material (2) into the container (1) and simultaneously embedding the first portion (13) of the support component (9) therein and b) positioning the infra-red lamp (4) and engaging the protrusion (8) with the second portion (14) of the support component.

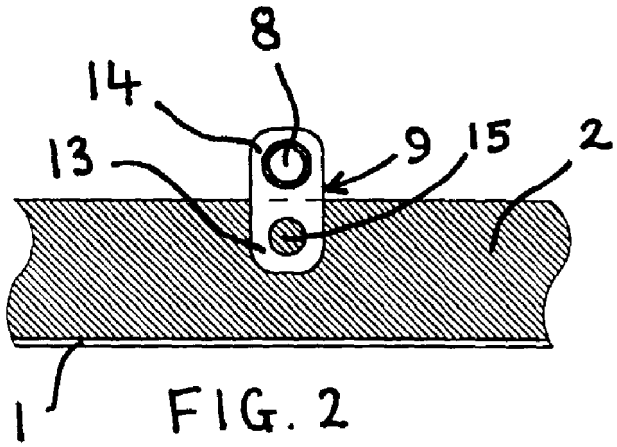

FIG. 2

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Description

[0001] This invention concerns a method of manufacturing a radiant electric heater of the kind incorporating an infra-red lamp having a tubular envelope of generally circular configuration.

[0002] For avoidance of doubt, it is to be understood that the expression "generally circular", whenever used herein in respect of the infra-red lamp, includes polygonal arrangements which approximate to circular forms.

[0003] Radiant electric heaters of this kind are well known, particularly for use in cooking appliances having flat glass-ceramic cooking surfaces. The infra-red lamp generally has a tungsten filament supported inside a tubular envelope of generally circular configuration and comprising fused silica or quartz. A halogenated atmosphere can be provided inside the envelope. Electrical connections are brought out through hermetic pinch seals at terminal regions of the envelope.

[0004] It is known from EP-A-0343868 to provide a radiant heater in which a layer of electrical and thermal insulating material is disposed in a container. An infra-red lamp has a protrusion extending from an envelope thereof intermediate the ends of the envelope, the lamp being supported in the container at least in part by the protrusion. The protrusion can comprise a sealed tube communicating with the interior of the envelope and used to evacuate and back-fill the envelope during manufacture of the infra-red lamp. Clip and/or clamping means are provided applied to the protrusion and optionally to the envelope of the lamp. Such clip and/or clamping means are applied as an additional step after positioning the lamp in the container.

[0005] It is an object of the present invention to provide a method of manufacturing a radiant electric heater in which such additional step of applying the clip and/or clamping means after positioning the infra-red lamp is not required.

[0006] According to the present invention there is provided a method of manufacturing a radiant electric heater in which an infra-red lamp having a tubular envelope of generally circular configuration is provided with a protrusion intermediate terminal regions thereof by means of which the lamp is supported at least in part on a layer of compacted particulate insulation material in a container by way of a support component which has a first portion embedded in the insulation material and a second portion at least overlying the protrusion, the method comprising the steps of a) compacting particulate insulation material into the container and simultaneously embedding the first portion of the support component therein and b) positioning the infra-red lamp and engaging the protrusion with the second portion of the support component.

[0007] The insulation material may comprise microporous thermal insulation material.

[0008] The second portion of the support component may surround the protrusion.

[0009] The support component may comprise a strip or plate, such as of metal or ceramic, having opposite end regions constituting the first and second portions. The end region constituting the second portion of the support component may be provided with an aperture therethrough for accommodating the protrusion on the tubular envelope.

[0010] The end region constituting the first portion of the support component may be profiled and/or apertured whereby securing of the support component in the insulation material is enhanced.

[0011] Alternatively the support component may be of looped wire or looped strip form, and may have legs providing the first portion, the legs being bent whereby securing of the support component in the insulation material is enhanced.

[0012] The protrusion on the envelope may comprise a sealed tube communicating with the interior of the envelope, for example a tube used to evacuate and back-fill the envelope during manufacture of the infra-red lamp.

[0013] The envelope may comprise fused silica or quartz and may enclose a filament such as of tungsten.

[0014] For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a plan view of a radiant electric heater manufactured by the method of the present invention;

Figure 2 is an enlarged part-section along A-A in Figure 1, illustrating one embodiment of a support component used in the method of the present invention;

Figure 3 is an enlarged part-section along A-A in Figure 1, illustrating another embodiment of a support component used in the method of the present invention;

Figure 4 is an enlarged part-section along A-A in Figure 1, illustrating a further embodiment of a support component used in the method of the present invention;

Figure 5 is an enlarged part-section along A-A in Figure 1, illustrating a still further embodiment of a support component used in the method of the present invention; and

Figure 6 is an enlarged part-section along A-A in Figure 1, illustrating yet another embodiment of a support component used in the method of the present invention.

[0015] Referring to Figure 1, a radiant electric heater

has a container in the form of a metal dish 1 containing a layer of compacted particulate thermal and electrical insulation material 2, particularly microporous insulation material. A ring-shaped wall 3 of insulation material extends around the periphery of the dish 1. When the heater is installed in a cooking appliance, the wall 3 is arranged to press against the underside of a glass-ceramic cooking surface (not shown).

[0016] An infra-red heat source is provided in the form of a lamp 4. This lamp is of generally circular configuration and contains a tungsten filament 5 supported within a fused silica envelope 6. The filament 5 is secured at each end to connections brought out through flattened hermetic pinch seals 7 at the ends of the envelope 6. These ends are adjacent one another and the pinch seals extend generally radially of the heater through recesses provided in the underside of the peripheral wall 3 and in the layer 2 and through holes in the edge of the dish 1.

[0017] To restrain the lamp from movement relative to the layer 2, it is secured at two spaced positions. A first support point is where the ends are engaged by the peripheral wall 3. A second support point is provided diametrically opposite the first, in the form of a protrusion 8 provided on the lamp envelope 6. The lamp 4 contains an atmosphere with a halogen gas and the protrusion 8 comprises a tube formed with the envelope 6 and used to evacuate the envelope and back-fill it with gas containing halogen during manufacture of the lamp. Thereafter the tube protrusion 8 is heat sealed.

[0018] The protrusion 8 supports the lamp 4 by way of a support component 9, described in detail hereinafter, which has a first portion embedded in the layer 2 of insulation material during formation of the layer 2, and a second portion at least overlying the protrusion 8.

[0019] Although the lamp 4 is shown to be of smoothly circular form, it need not be so and may be of polygonal form, approximating to a generally circular configuration.

[0020] In order to damp inrush current through the tungsten filament 5 of the lamp 4, upon initial energising of the lamp, a ballast electrical resistance heating element 10 of well known ribbon or coiled wire form is provided in the heater, electrically connected in series with the lamp 4 at least during initial energisation of the lamp.

[0021] A well known form of thermal limiter 11 is provided, extending across the heater and a terminal block 12 is arranged at the edge of the dish 1 for connection of the heater to a voltage supply for operation.

[0022] The invention resides in the method of provision of the support component 9 and of engaging the support component with the protrusion 8 on the lamp envelope.

[0023] In the manufacture of the heater, the base layer 2 of insulation material is provided by compacting particulate insulation material into the dish 1. It is well known to carry this out by compacting, for example, powdered microporous insulation material into the metal dish 1 using an appropriate press tool. In the method of the present invention, a support component 9 such as is illustrated in Figures 2 to 6 has a first portion 13 thereof embedded in the insulation simultaneously with the compacting of the insulation material into the dish 1 to form the layer 2. This results in secure location of the support component 9 in the layer 2.

[0024] In a subsequent process step the infra-red lamp 4 is positioned in the heater and the protrusion 8 engaged with a second portion 14 of the support component 9, the second portion 14 at least overlying the protrusion 8.

[0025] For embedding the first portion 13 of the support component 9 in the layer 2 of insulation material simultaneously with the compacting of the insulation material into the dish 1, the support component 9 is suitably located in the press tool (not shown) which is used to compact the insulation material and such that the second portion 14 of the component 9 is received in a slot in the face of the press tool with the first portion 13 protruding from the face of the press tool.

[0026] As shown in Figure 2, the support component 9 can comprise an elongate strip or plate, such as of metal or ceramic, having a first end portion 13 embedded in the layer 2 by the method described hereinbefore. The second end portion 14 has an aperture through it which receives the protrusion 8 on the lamp envelope during the subsequent process step and such that the second end portion 14 effectively surrounds the protrusion.

[0027] To enhance securing of the component 8 in the insulation layer 2, an aperture 15 may optionally be provided in the first end portion 13. During compacting of the insulation layer 2 and simultaneous embedding of the first end portion 13 of the support component, material of the insulation layer 2 is also compacted into the aperture 15.

[0028] As shown in Figure 3, an alternative support component 9 can comprise a plate, such as of metal or ceramic having a relatively wide first end portion 13 embedded in the layer 2 by the method described hereinbefore. An aperture 15 may optionally be provided in the first end portion 13 to enhance securement in the layer 2. The plate-shaped support component 9 is profiled such that it has a second end portion 14 which is narrower than the first end portion 13 and has an aperture through it which receives the protrusion 8 on the lamp envelope when the lamp is subsequently located in the heater. The second end portion 14 completely surrounds the protrusion 8.

[0029] Figure 4 shows an arrangement which is similar to that of Figure 3, the essential difference being that an enlarged aperture 16 is provided in the second portion 14 of the support component 9 and is shaped such that, although the second portion 14 overlies the protrusion 8 at the top and sides, a portion 2A of the insulation layer 2 is arranged beneath the protrusion 8 and pro-

vides a softer contact point for the protrusion 8.

[0030] Referring now to Figure 5, the support component 9 can also comprise a loop, such as of metal or ceramic, having a first portion 13 embedded in the layer 2 and a second portion 14 arranged to overlie the protrusion 8 on the lamp envelope.

[0031] As shown in Figure 6, the support component 9 could be formed of metal wire or strip having a first portion 13 comprising legs embedded in the layer 2 and bent as denoted by reference numerals 13A, 13B to provide secure anchorage in the layer 2. The second portion 14 is arranged to overlie the protrusion 8 on the lamp envelope. As with the other embodiments illustrated in Figures 2 to 5, the method of the invention, in which the first portion 13 of the support component 9 is embedded in the layer 2 simultaneous with the compacting of powder material of layer 2 into the dish 1, makes it possible to optimise the shape of the first portion 13 for achieving firm securing of the component 9 in the layer 2.

Claims

1. A method of manufacturing a radiant electric heater in which an infra-red lamp (4) having a tubular envelope (6) of generally circular configuration is provided with a protrusion (8) intermediate terminal regions thereof by means of which the lamp is supported at least in part on a layer of compacted particulate insulation material (2) in a container (1) by way of a support component (9) which has a first portion (13) embedded in the insulation material and a second portion (14) at least overlying the protrusion, the method comprising the steps of a) compacting particulate insulation material (2) into the container (1) and simultaneously embedding the first portion (13) of the support component (9) therein and b) positioning the infra-red lamp (4) and engaging the protrusion (8) with the second portion (14) of the support component.

2. A method according to clam 1, characterised in that the insulation material (2) comprises microporous thermal insulation material.

3. A method according to claim 1 or 2, characterised in that the second portion (14) of the support component (9) surrounds the protrusion (8).

4. A method according to clam 1, 2 or 3, characterised in that the support component (9) comprises a strip or plate having opposite end regions constituting the first and second portions (13, 14).

5. A method according to claim 4, characterised in that the strip or plate comprises a metal or ceramic.

6. A method according to claim 4 or 5, characterised in that the end region constituting the second portion (14) of the support component (9) is provided with an aperture therethrough for accommodating the protrusion (8) on the tubular envelope (6).

7. A method according to claim 4, 5 or 6, characterised in that the end region constituting the first portion (13) of the support component (9) is profiled and/or apertured (15) whereby securing of the support component in the insulation material (2) is enhanced.

8. A method according to claim 1, 2 or 3, characterised in that the support component (9) is of looped wire or looped strip form.

9. A method according to claim 8, characterised in that the looped form support component (9) has legs (13A, 13B) providing the first portion, the legs being bent whereby securing of the support component in the insulation material (2) is enhanced.

10. A method according to any preceding claim, characterised in that the protrusion (8) on the envelope (6) comprises a sealed tube communicating with the interior of the envelope.

11. A method according to claim 10, characterised in that the sealed tube is a tube used to evacuate and back-fill the envelope (6) during manufacture of the infra-red lamp (4).

12. A method according to any preceding claim, characterised in that the envelope (6) comprises fused silica or quartz.

13. A method according to any preceding claim, characterised in that the envelope (6) encloses a filament (5).

14. A method according to claim 13, characterised in that the filament (5) comprises tungsten.

15. A radiant electric heater whenever produced by the method according to any preceding claim.

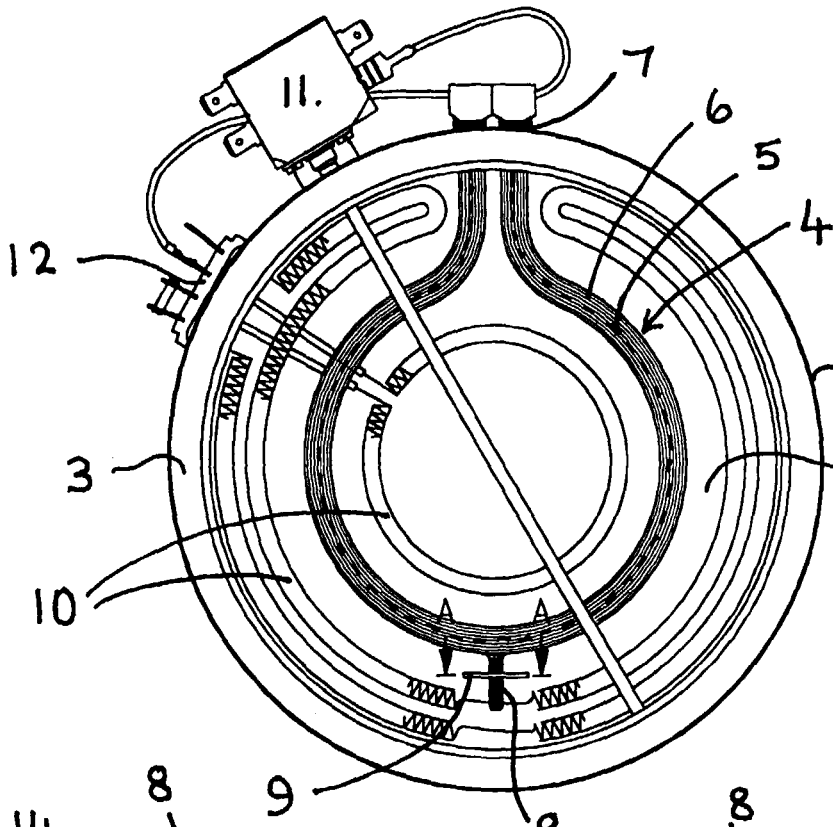

FIG. 1

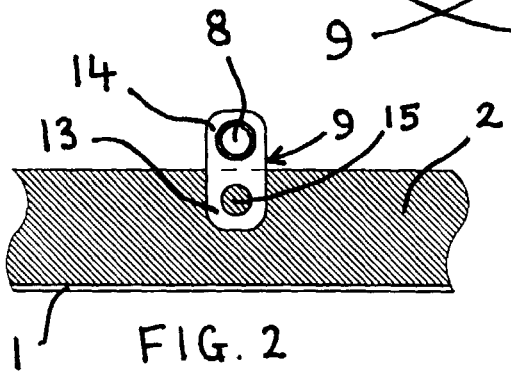

FIG. 2

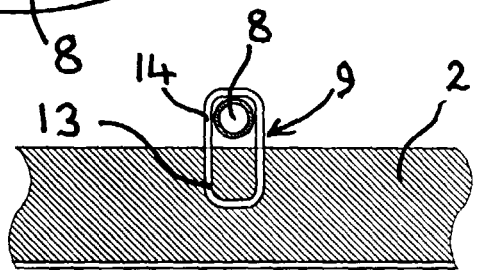

FIG. 5

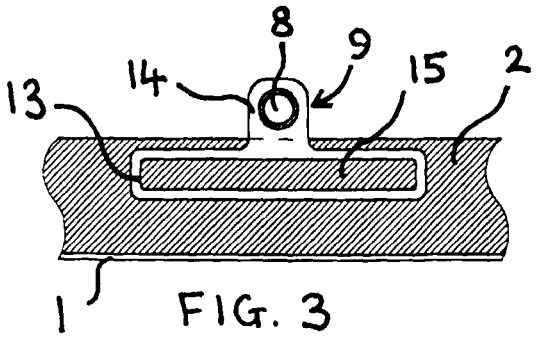

FIG. 3

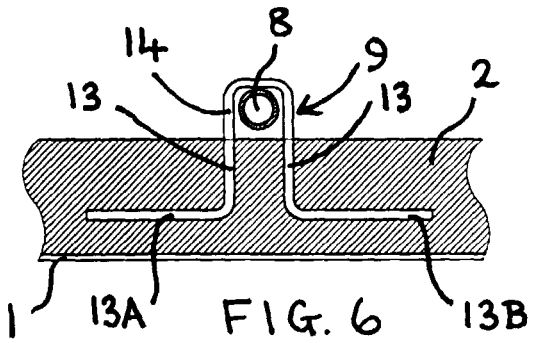

FIG. 6

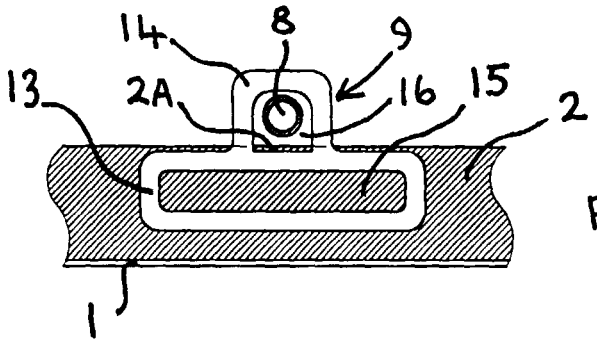

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 4661

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TECHNICAL FIELDS SEARCHED

H05B
F24C
H01M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	22 July 1999	Pierron, P

CATEGORY OF CITED DOCUMENTS

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