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RADIANT HEATER ADAPTED TO A COOKING APPARATUS

(57)

Radiant heater adapted to a cooking appliance, comprising an insulating base (2), at least one radiant heating element (5), a metal housing (4) at least partially housing the insulating base (2), a temperature sensor (20) adapted to measure the temperature inside the radiant heater (1), and a support (10) of the temperature

sensor (20). The support (10) comprises an inner body that supports the temperature sensor (20), an outer body that surrounds the inner body, and a base that joins the inner body to the outer body, the outer body, the inner body and the base being delimited by an air chamber configured to thermally insulate the inner body.

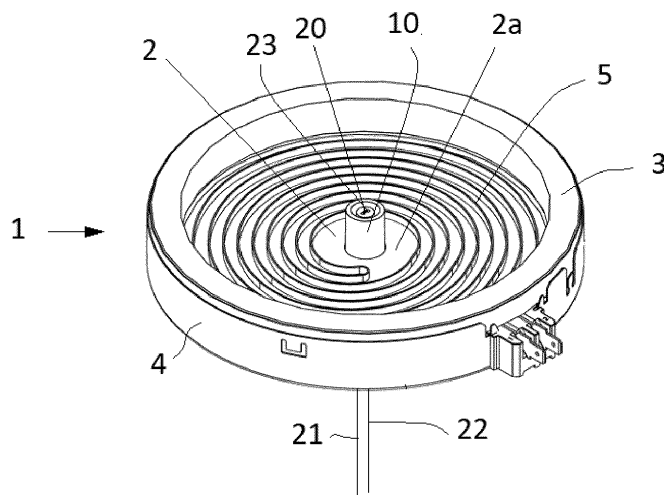


FIG. 2

Description

TECHNICAL FIELD

[0001] The present invention relates to a radiant heater adapted to a cooking appliance, preferably a glass ceramic cooker.

PRIOR ART

[0002] Cooking appliances comprising radiant heaters with safety devices against overheating of the glass ceramic hob of the cooking appliance are known in the state of the art. These devices are usually electromechanical devices which pass through an insulating ring of the radiant heater and are mounted on the corresponding radiant element of the radiant heater.

[0003] There are also known radiant heaters which include, in addition to the safety device or replacing the safety device, temperature sensors whose purpose is to measure the temperature of the glass-ceramic hob through which the temperature of the vessel above the corresponding radiant heaters can be controlled. These sensors pass orthogonally through the insulating base of the radiant heater.

[0004] DE102013216258A1 discloses a radiant heater with a temperature sensor fixed to a conductive plate in direct contact with the glass ceramic plate. The sensor is housed in a support element made of a thermally insulating material that protects the sensor from the direct effects of thermal radiation from the radiant elements of the radiant heater. The support element is cylindrical, has one or two through holes for passing the temperature sensor connection cables, and has a recess where the conductive plate is housed together with the sensor.

[0005] WO2022144475A1 discloses a radiant heater with a temperature sensor housed inside a ceramic cylinder. The ceramic cylinder comprises a housing at one end in which the temperature sensor is arranged. The housing is bounded by sidewalls that thermally shield the temperature sensor from direct radiation from the radiant elements of the radiant heater, thereby increasing the accuracy of the temperature sensor reading.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide a radiant heater adapted to a cooking appliance, as defined in the claims.

[0007] The radiant heater according to the invention comprises an insulating base, at least one radiant heating element, a metallic housing at least partially housing the insulating base, a temperature sensor adapted to measure the temperature inside the radiant heater, and a temperature sensor support.

[0008] The support comprises an inner body that supports the temperature sensor, an outer body that surrounds the inner body, and a base that joins the inner

body to the outer body, the outer body, the inner body and the base being delimited by an air chamber configured to thermally insulate the inner body.

[0009] In this way, the outer body protects the inner body from direct radiation from the heating element, so that the radiation from the heating element does not directly hit the temperature sensor, and as a consequence, the temperature reading of the temperature sensor does not suffer very sudden changes in value that make it difficult to read and interpret the data.

[0010] Furthermore, thanks to the air chamber, heat conduction in the substrate is minimised, so that thermal conduction from the inner body to the temperature sensor, in particular to the temperature sensor wires, is reduced. In this way, the temperature reading of the temperature sensor does not undergo sudden changes in value that make it difficult to read and interpret the data, and in addition, the temperature sensor is more sensitive to the temperature of the glass ceramic plate or the pan placed on the radiant heater, i.e. the measured value of the temperature sensor reflects more accurately the temperature of the glass ceramic plate or the pan placed on the radiant heater, which is the purpose of the measurement.

[0011] These and other advantages and features of the invention will become apparent in view of the figures and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 shows a perspective view of a cooking apparatus comprising radiant heaters according to the invention.

Figure 2 shows a perspective view of a first embodiment of a radiant heater according to the invention.

Figure 3 shows a sectional view of the radiant heater shown in figure 2.

Figure 4 shows a perspective view of a temperature sensor support of the radiant heater shown in figure 2.

Figure 5 shows a sectional view of the support shown in figure 4.

Figure 6 shows a top view of the support shown in figure 4.

Figure 7 shows a sectional view of a second embodiment of a radiant heater according to the invention.

Figure 8 shows a sectional view of a support of a temperature sensor of the radiant heater shown in figure 7.

Figure 9 shows a top view of the support shown in detail in figure 8.

DETAILED DISCLOSURE OF THE INVENTION

[0013] Figure 1 shows a cooking appliance 100; 100' comprising radiant heaters 1;1' according to the invention under a glass ceramic glass (not shown), the radiant heaters 1;1' being electric radiant heaters.

[0014] Each radiant heater 1;1' according to the invention comprises an insulating base 2 having a substantially flat upper surface 2a on which at least one heating element 5 is fixed, an insulating ring 3 which rests on the insulating base 2, and a metallic housing 4 which houses inside the insulating base 2 and partially, said insulating ring 3. The housing 4 is adapted to the outer geometry of the insulating base 2 and the insulating ring 3.

[0015] The radiant heater 1;1' comprises a temperature sensor 20 adapted to measure the temperature inside the radiant heater 1;1', and control means 30 configured to cut off the power supply to the heating element 5 when the temperature sensor 20 detects a safety temperature threshold value inside the radiant heater 1;1' that cannot be exceeded to avoid damaging the glass ceramic glass 6, and to control the power output of the respective radiant heater 1;1' according to the temperature measured by the temperature sensor 20.

[0016] The temperature sensor 20 is arranged supported in the inner body 12;12'. In particular, the temperature sensor 20 comprises a sensing element 23 supported on the top of the inner body 12;12', and electrical wires 21 and 22 passing through the inner body 12;12' through holes 15;15'. In the embodiments shown in the figures, the temperature sensor 20 is a thermocouple. In other embodiments, another type of temperature sensor may be used.

[0017] The heating element 5 is a radiant heating element, mainly an electrical resistance. The insulating base 2 is made of a uniform microporous material, which is a good thermal insulator, has good mechanical properties and is resistant to moisture absorption. Insulating ring 3 is made of thermally insulating material that has good mechanical properties as well as high temperature resistance. The insulating ring 3 is made of a denser material than the insulating base 2 due to the mechanical requirements to which it is subjected, which means that it has higher thermal losses.

[0018] The radiating heater 1;1' comprises a support 10;10' extending substantially orthogonal to the insulating base 2 and supporting the temperature sensor 20. The support 10;10' shown in detail in Figures 3 to 5, 8 and 9, comprises an inner body 12;12' supporting the temperature sensor 20, an outer body 11;11' surrounding the inner body 12;12', and a base 14;14' connecting the inner body 12;12' to the outer body 11;11', bounding the outer body 11;11', the inner body 12;12' and the base 14;14' an air chamber 13;13' configured to thermally insulate the inner body 12;12'. The outer body 11;11' ther-

mally insulates the inner body 12;12' from direct thermal radiation from the radiant heating element 5. To this end, the outer body 11;11' has a height H1 that prevents thermal radiation from impinging directly on the inner body 12;12'.

[0019] In the embodiments shown in the figures, the outer body 11;11' protrudes in height with respect to the inner body 12;12'. In other embodiments not shown, the inner body protrudes in height with respect to the outer body, the height of the outer body being such that the heat radiations from the heating element impinge on the outer body without impinging on the inner body.

[0020] In the embodiments shown in the figures, the outer body 11;11' protrudes a height of between 0.25 mm and 5 mm with respect to the inner body 12;12' protecting the temperature sensor 20 from the direct radiation of the radiant heating element 5. Preferably, the outer body 11;11' protrudes a height of 2 mm with respect to the inner body 12;12'. Preferably, the distance of the temperature sensor 20 to the end of the radiant heater 1;1' is between 0.5 mm and 6 mm.

[0021] On the other hand, the air gap 13;13' minimizes thermal conduction by conduction between the outer body 11;11' and the inner body 12;12'. For this purpose, the air gap 13;13' surrounds the inner body 12;12' so as to separate the outer body 11;11' from the inner body 12;12'. Preferably, the outer body 11;11' and the outer body 12;12' are cylindrical. Preferably, the chamber 13;13' has a conical section with the part near the base 14;14' being narrower to facilitate its manufacture. The air chamber 13;13' has a thickness of between 0.5 mm and 5 mm, preferably 2 mm, thickness being understood as the distance between the outer body 11;11' and the inner body 12;12'.

[0022] The air chamber 13;13' slows down the heating of the inner body 12;12' by conduction as it does not receive direct radiation since the direct radiation is received by the outer body 11;11'. The base 14;14' of the support 10;10' is arranged below an upper face 2a of the insulating base 2 of the radiating source 1;1'. Preferably, the base 14;14' is arranged in alignment with the metal housing 4. That is to say, the bottom of the air chamber 13;13' corresponding to the upper surface of the base 14;14' is as low as possible. In this way, the base 14;14', which is arranged on the outside of the metal casing 4, is cooler because it is outside the direct radiation zone of the radiant heating element 5. The thermal conduction between the outer body 11;11' and the inner body 12;12' is reduced, reducing the effect of the direct radiation on the reading of the temperature sensor 20.

[0023] In the embodiments described the support 10;10' is made of electrically insulating ceramic material.

[0024] In the embodiments shown in the figures, the inner body 12;12', the outer body 11;11' and the base 14;14' form a single piece, i.e., the support 10;10' is made of one piece.

[0025] The support 10;10' is arranged fixed to the insulating base 2 and to the metal housing 4 through the

base 14;14' of the support 10;10'. In particular, the support 10;10' is arranged screwed to the metal housing 4 and/or to the insulating base 2 through a screw 18 for which the base 14;14' includes a corresponding hole 17;17'.

[0026] On the other hand, in the embodiment shown in figures 7 to 9, the base 14' of the support 10' further comprises openings 16' which communicate the air chamber 13' with the outside of the radiant heater 1'.

Claims

1. Radiant heater adapted to a cooking appliance, comprising an insulating base (2), at least one radiant heating element (5), a metal housing (4) at least partially housing the insulating base (2), a temperature sensor (20) adapted to measure the temperature inside the radiant heater (1;1'), and a support (10;10') of the temperature sensor (20), **characterised in that** the support (10; 10') comprises an inner body (12;12') supporting the temperature sensor (20), an outer body (11;11') surrounding the inner body (12;12'), and a base (14;14') connecting the inner body (12; 12') with the outer body (11;11'), the outer body (11;11'), the inner body (12;12') and the base (14;14') being delimited by an air chamber (13;13') configured to thermally insulate the inner body (12;12').
2. Radiant heater according to the preceding claim, wherein the air chamber (13;13') surrounds the inner body (12;12').
3. Radiant heater according to any of the preceding claims, wherein the base (14;14') of the support (10;10') is located below an upper face (2a) of the insulating base (2).
4. Radiant heater according to any of the preceding claims, wherein the base (14;14') of the support (10;10') is arranged in alignment with the metal housing (4).
5. Radiant heater according to any of the preceding claims, wherein the air chamber (13;13') has a thickness of between 0.5 mm and 5 mm, preferably of 2 mm.
6. Radiant heater according to any of the preceding claims, wherein the outer body (11;11') has a height (H1) that allows thermally insulating the inner body (12;12') from direct radiations of the radiant heating element (5).
7. Radiant heater according to any of the preceding claims, wherein, the outer body (11;11') protrudes in height with respect to the inner body (12;12'),
8. Radiant heater according to the preceding claim, wherein the outer body (11;11') protrudes a height of between 0.25 mm to 5 mm with respect to the inner body (12;12'), preferably of 2 mm.
9. Radiant heater according to any of the preceding claims, wherein the outer body (11;11'), the inner body (12;12') and the base (14;14') form a single piece.
10. Radiant heater according to any of the preceding claims, wherein the support (10;10') is made of a ceramic material.
11. Radiant heater according to any of the preceding claims, wherein the temperature sensor (20) is arranged supported on the inner body (12;12'), wherein the inner body (12;12') includes holes (15) which are traversed by wires (21,22) of the temperature sensor (20).
12. Radiant heater according to any of the preceding claims, wherein the base (14') of the support (10') comprises openings (16') that communicate the air chamber (13') with the outside of the radiant heater (1').
13. Radiant heater according to any of the preceding claims, wherein the support (10;10') is fixed to the insulating base (2) and to the metal casing (4) through the base (14;14').
14. Radiant heater according to any of the preceding claims, wherein the temperature sensor (20) is a thermocouple.
15. Cooking appliance comprising a plurality of radiant heaters (1;1') according to any of the preceding claims.

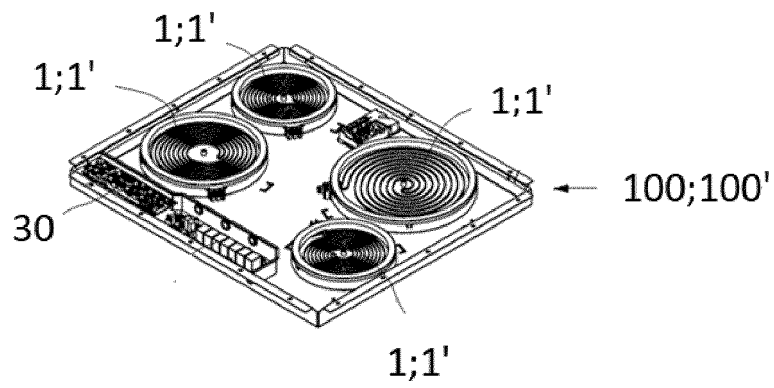


FIG. 1

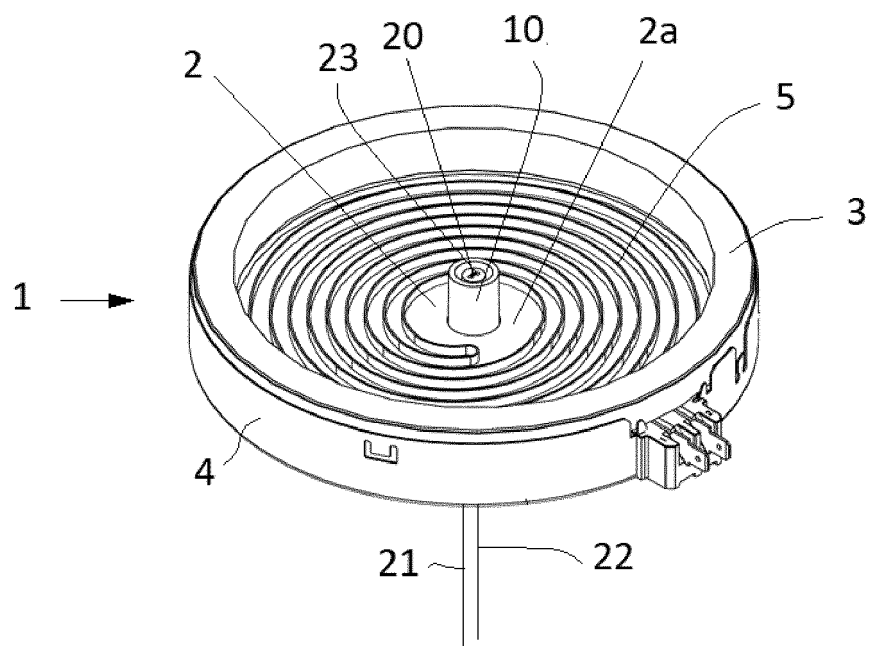


FIG. 2

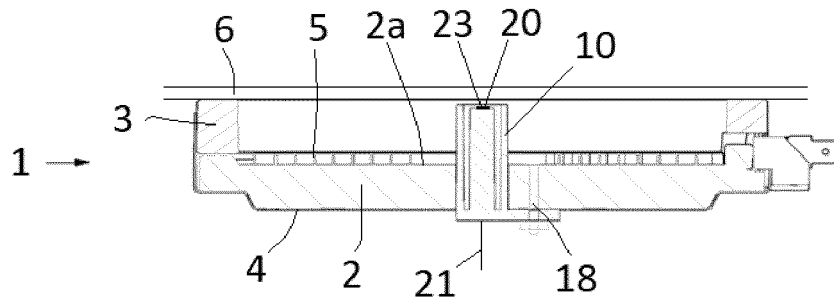


FIG. 3

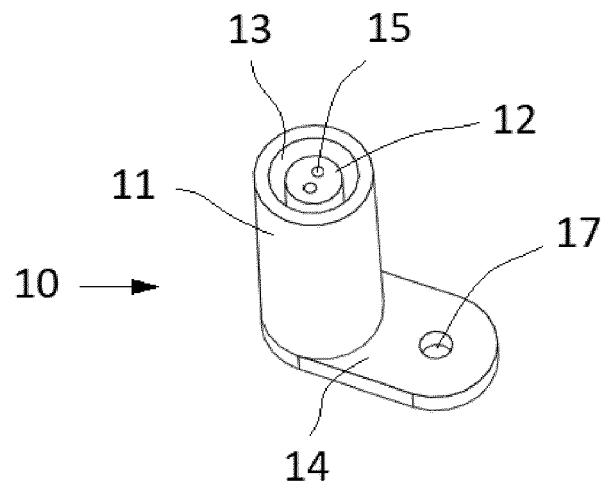


FIG. 4

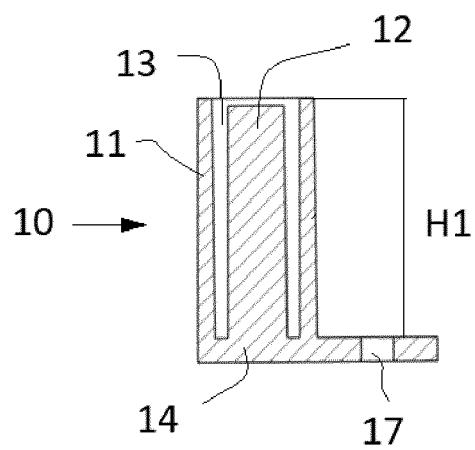


FIG. 5

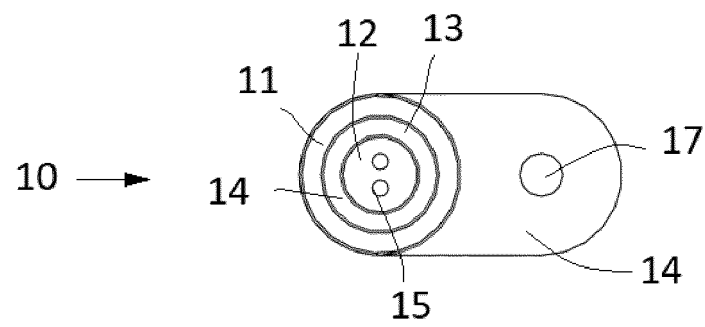


FIG. 6

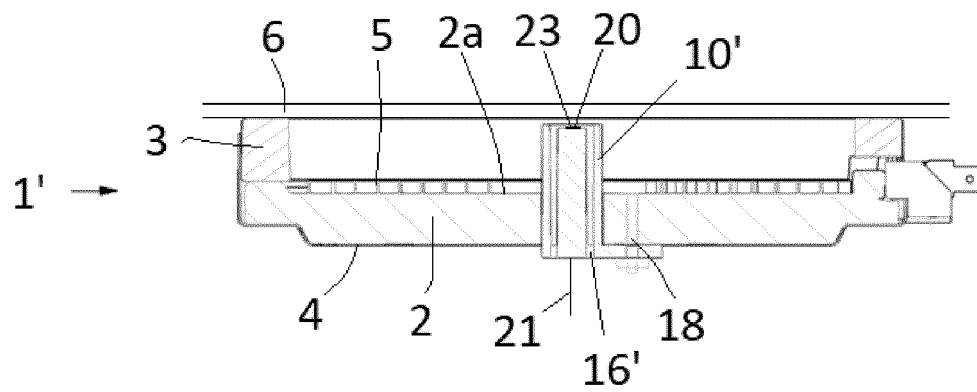


FIG. 7

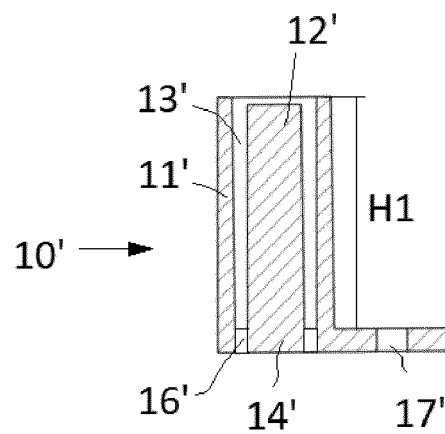


FIG. 8

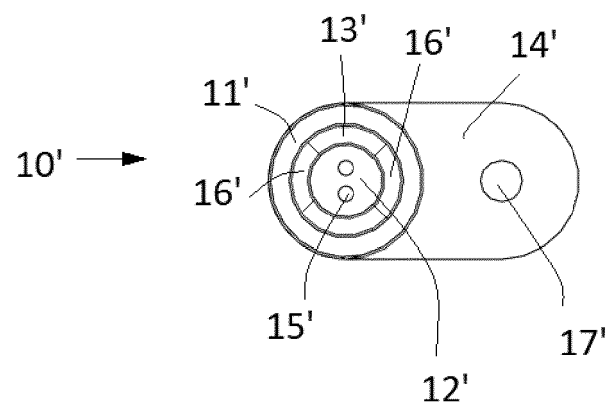


FIG. 9



EUROPEAN SEARCH REPORT

Application Number

EP 23 38 2466

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EPO FORM 1503 03.82 (P04C01)

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X	US 2016/174299 A1 (DE LOS TOYOS LOPEZ DANIEL [ES] ET AL) 16 June 2016 (2016-06-16) * paragraph [0006]; claims 1, 5; figures 2, 4 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24C H05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 October 2023	Examiner Meyers, Jerry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EP 23 38 2466

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