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(54) AN INDUCTION HEATING COOKER WITH IMPROVED COOLING PERFORMANCE

(57) The present invention relates to an induction heating cooker (1) comprising a body (2); at least one circuit board (6) which is disposed in the body (2); at least one IGBT component (3) which is disposed in the body (2) and which provides power switching; at least one heat sink (4) which contacts the IGBT component (3) so as to cool the same; at least one fan (5) which is disposed in the body (2) and which provides the cooling of the components by air; and an air guiding member (7) which is positioned in the flow of the air provided by the fan (5) and which guides the air.

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Description

[0001] The present invention relates to an induction heating cooker having improved air circulation and cooling performance.

[0002] Today, induction heating cookers are household appliances which are operated by means of electromagnets generating magnetic fields for domestic or industrial purposes. As a basic working principle, said appliances turn into an open electric circuit when there is no metal pot thereon, and a completed electric circuit when there is. Thus, a magnetic field is generated and heating is provided with the energy transferred to the body of the metal pot. By means of the the energy transferred to the metal pot by changing the strength of the magnetic field generated, the amount of heat can also be adjusted.

[0003] In the household induction heating cookers, the power switching which provides the adjustment of the power and staging of the cooker is performed by means of power transistors called IGBT. During the use of the induction heating cooker, the IGBT heats up due to the switching process during the adjustment of the desired level in the cooker, and the temperature thereof rises as the operating time increases. In order to prevent the IGBT from causing a heating-related safety problem during the operating time thereof, the cooker is automatically turned off upon reaching a certain temperature (usually 90°C), and further heating of the component is prevented. Moreover, various cooling systems are used to prevent the heating of the IGBT component. Thus, the performance of an induction heating cooker depends on the operating time of the cooker and it is accepted that the cooker performance increases as the operating time increases. It is possible to increase the operating time of the cooker by effectively cooling the power switching IGBTs. It is known that in the induction heating cookers where effective cooling cannot be provided, the components which get too hot turn off the cooker, preventing the foodstuffs from being cooked and reducing user satisfaction. Moreover, due to the heating of the circuit boards in the cooker, the lifetime of the cooker may be shortened due to overheating.

[0004] In the state of the art European Patent Application No. EP2712267A1, an induction heating cooker is disclosed, wherein cooling is provided by ventilation by means of two symmetrical openings.

[0005] The aim of the present invention is the realization of an induction heating cooker with improved performance by providing an efficient air cooling on the power switching components.

[0006] The induction heating cooker realized in order to attain the aim of the present invention, explicated in the claims, comprises a body; at least one circuit board which is disposed in the body; at least one IGBT component which is disposed in the body and which provides power switching; at least one heat sink which contacts the IGBT component so as to cool the same; at least one fan which is disposed in the body and which provides the cooling of the circuit board and the IGBT component by air; and an air guiding member which is positioned in the flow of the air provided by the fan and which guides the air. By means of the heat sink which absorbs the excessive heat and the air flow provided by the fan towards the air guiding member, the IGBT component and the circuit boards can be operated within the ideal operating range for a longer period of time, providing a continuous cooker performance. The induction heating cooker further comprises an air guiding member having groove-shaped air ducts, which is placed on the heat sink and the IGBT component so as to allow the cooling air from the fan to be distributed more evenly to the IGBT components. It is aimed that the air molecules pass through the heat sink surface by means of the air ducts in accordance with the flow direction of the air coming out of the fan so as to be guided onto the IGBT components. Moreover, the induction heating cooker comprises at least one first slit which is provided between the air guiding member and the air outlet of the fan so as to guide the air to the circuit boards on the right and left sides of the body, and at least one second slit which is provided on the body and which enables the air passing over the circuit boards to continue to circulate. There may be preferably two first slits and two second slits on the parts of the air guiding member facing the circuit boards. Thus, the air coming out of the fan is guided first to the IGBT components and then to the circuit boards so as to exit through the second slit, ensuring a much more efficient air circulation.

[0007] In an embodiment of the present invention, the induction heating cooker comprises a guide which is positioned at the outlet of the first slit so as to guide the air leaving the first slit directly onto the circuit board. Thus, the air, which is disorderly guided to the circuit boards, passes through the guide more smoothly and spreads over the boards, increasing the cooling efficiency.

[0008] In an embodiment of the present invention, the induction heating cooker comprises the air guiding member of which the air ducts are symmetrically distributed in the horizontal and vertical axes. In order to evenly distribute the air to the IGBT components and the circuit boards positioned at both sides, the air ducts are enabled to be arranged symmetrically in the horizontal and vertical axes. Thus, the efficiency of the cooling performance of the induction heating cooker is increased.

[0009] In an embodiment of the present invention, the induction heating cooker comprises the air guiding member manufactured from a metal material. By means of a metal air guiding member, the durability thereof is increased and a better cooling is obtianed by means of the heat conductivity.

[0010] In an embodiment of the present invention, the induction heating cooker comprises the air guiding member manufactured from a plastic material. Thus, a cost-efficient and lightweight design is obtained, providing ease of production.

[0011] By means of the induction heating cooker of the

present invention, the components which heat up are cooled such that a more smooth cooking performance is provided.

[0012] An induction heating cooker realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of the induction heating cooker.
Figure 2 - is the schematic view of the air guiding member together with the induction heating cooker.
Figure 3 - is another schematic view of the air guiding member together with the induction heating cooker.

[0013] The elements illustrated in the figures are numbered as follows:

1. Induction heating cooker
2. Body
3. IGBT component
4. Heat sink
5. Fan
6. Circuit board
7. Air guiding member
8. Air duct
9. First slit
10. Second slit
11. Guide

[0014] The induction heating cooker (1) comprises a body (2); at least one circuit board (6) which is disposed in the body (2); at least one IGBT component (3) which is disposed in the body (2) and which provides power switching; at least one heat sink (4) which contacts the IGBT component (3) so as to cool the same; at least one fan (5) which is disposed in the body (2) and which provides the cooling of the circuit board (6) and the IGBT component (3) by air; and an air guiding member (7) which is positioned in the flow of the air provided by the fan (5) and which guides the air. By means of the heat sink (4) which absorbs the excessive heat and the air flow provided by the fan (5) towards the air guiding member (7), the IGBT component (3) and the circuit boards (6) can be operated within the ideal operating range for a longer period of time, providing a continuous cooking performance. The induction heating cooker (1) further comprises an air guiding member (7) having groove-shaped air ducts (8), which is placed on the heat sink (4) and the IGBT component (3) so as to allow the cooling air from the fan (5) to be distributed more evenly to the IGBT components (3). It is aimed that the air molecules pass through the heat sink (4) surface by means of the air ducts (8) in accordance with the flow direction of the air coming out of the fan (5) so as to be guided onto the IGBT components (3). Especially by leaving a certain distance between the heat sink (4) and the air guiding member (7) by the producer, an air path is created. Moreover, the induction heating cooker (1) comprises at least one first slit (9) which is provided between the air guiding member (7) and the air outlet of the fan (5) so as to guide the air to the circuit boards (6) on the right and left sides of the body (2), and at least one second slit (10) which is provided on the body (2) and which enables the air passing over the circuit boards (6) to continue to circulate. For example, there may be two first slits (9) and two second slits (10) on the parts of the air guiding member (7) facing the circuit boards (6), and thus two equal air paths can be created at both sides of the body (2). Thus, the air coming out of the fan (5) is guided first to the IGBT components (3) and then to the circuit boards (6) so as to exit through the second slit (10), ensuring a much more efficient air circulation.

[0015] In an embodiment of the present invention, the induction heating cooker (1) comprises a guide (11) which is positioned at the outlet of the first slit (9) so as to guide the air leaving the first slit (9) directly onto the circuit board (6). Thus, the air, which is disorderly guided to the circuit boards (6), passes through the guide (11) more smoothly and spreads over the circuits boards (6), increasing the cooling efficiency. By better cooling the circuit boards (6), the performance of the induction heating cooker (1) is also indirectly improved.

[0016] In an embodiment of the present invention, the induction heating cooker (1) comprises the air guiding member (7) of which the air ducts (8) are symmetrically distributed in the horizontal and vertical axes. In order to evenly distribute the air to the IGBT components (3) and the circuit boards (6) positioned at both sides, the air ducts (8) are enabled to be arranged symmetrically in the horizontal and vertical axes. Thus, identical operation conditions are provided for the IGBT components (3) provided at the right and left sides. Thus, the efficiency of the cooling performance of the induction heating cooker (1) is improved, preventing the same from reaching critical temperatures and being turned off.

[0017] In an embodiment of the present invention, the induction heating cooker (1) comprises the air guiding member (7) manufactured from a metal material. By means of a metal air guiding member (7) preferably manufactured from stainless steel, the durability thereof is increased and a better cooling is obtained by means of the heat conductivity.

[0018] In an embodiment of the present invention, the induction heating cooker (1) comprises the air guiding member (7) manufactured from a plastic material. Thus, a cost-efficient and lightweight design is obtained, providing ease of production.

[0019] By means of the induction heating cooker (1) of the present invention, the power switching components are cooled more efficiently by air, providing an improved cooking performance.

Claims

1. An induction heating cooker (1) **comprising** a body

(2); at least one circuit board (6) which is disposed in the body (2); at least one IGBT component (3) which is disposed in the body (2) and which provides power switching; at least one heat sink (4) which contacts the IGBT component (3) so as to cool the same; at least one fan (5) which is disposed in the body (2) and which provides the cooling of the circuit board (6) and the IGBT component (3) by air; and an air guiding member (7) which is positioned in the flow of the air provided by the fan (5) and which guides the air, **characterized by**

- an air guiding member (7) having groove-shaped air ducts (8), which is placed on the heat sink (4) and the IGBT component (3) so as to allow the cooling air from the fan (5) to be distributed more evenly to the IGBT components (3), and
- at least one first slit (9) which is provided between the air guiding member (7) and the air outlet of the fan (5) so as to guide the air to the circuit boards (6) on the right and left sides of the body (2), and at least one second slit (10) which is provided on the body (2) and which enables the air passing over the circuit boards (6) to continue to circulate.

2. An induction heating cooker (1) as in Claim 1, **characterized by** a guide (11) which is positioned at the outlet of the first slit (9) so as to guide the air leaving the first slit (9) directly onto the circuit board (6).

3. An induction heating cooker (1) as in Claim 1 or 2, **characterized by** the air guiding member (7) of which the air ducts (8) are symmetrically distributed in the horizontal and vertical axes.

4. An induction heating cooker (1) as in any one of the above claims, **characterized by** the air guiding member (7) which is manufactured from a metal material.

5. An induction heating cooker (1) as in any one of the above claims, **characterized by** the air guiding member (7) which is manufactured from a plastic material.

Figure 1

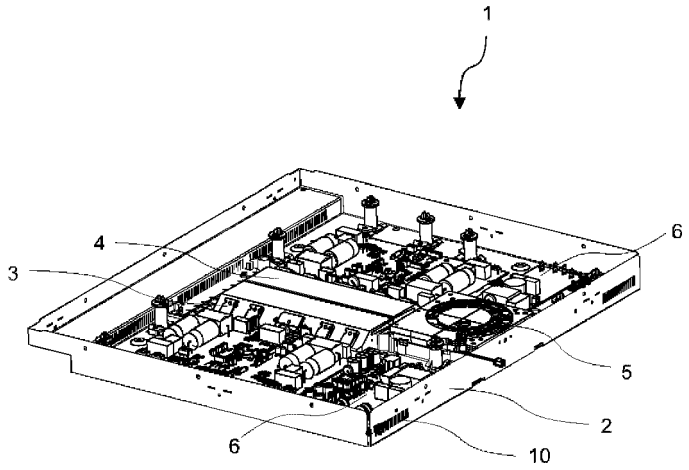


Figure 2

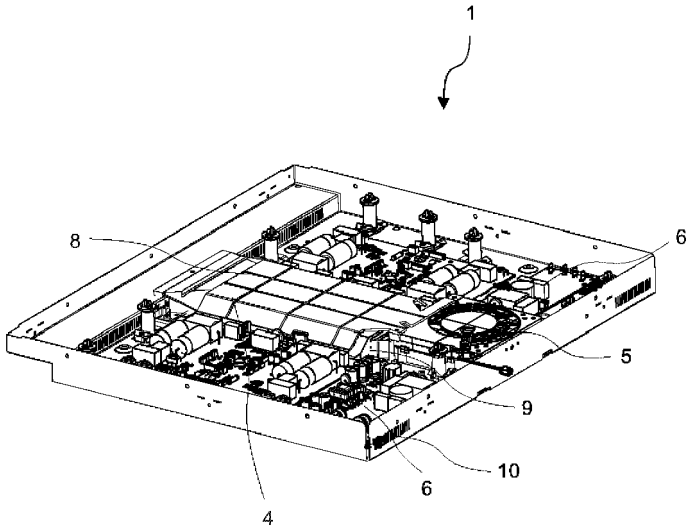
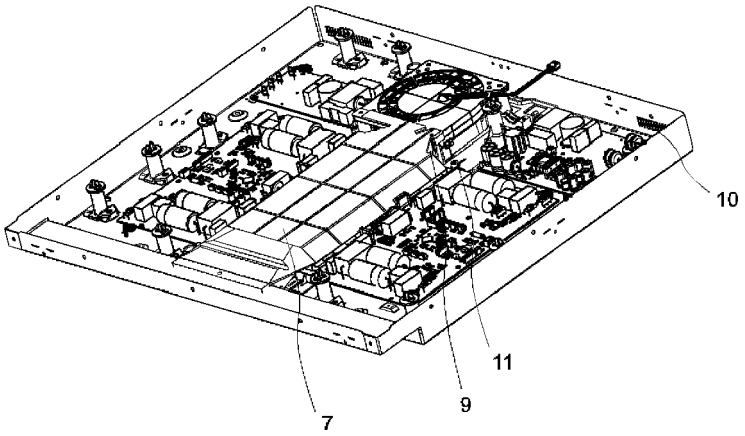


Figure 3



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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 7854

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 2 679 913 A2 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 1 January 2014 (2014-01-01) * abstract; claim 1; figures 1-15 *	1-5	
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1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 December 2021	Garcia, Jesus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 18 7854

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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