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(54) Baking oven with a heater / fan assembly

(57) The oven (1) with a baking chamber (3) has a heater assembly (4) fixed to its vertical rear wall (2) in order to generate a forced flow of hot air (6). The heater assembly (4) is fitted in the oven by means of a single installation operation and comprises a support device (7) acting as a single coupling and supporting means, a blade fan (8), a panel or flat substrate (11) carrying a flat heating resistor (12) and electrical connection means (16). The connecting and support device (7) is made up of a central plate (7a) from the periphery of which extend a number of radial arms (13) which support the flat ring-shaped panel (11) separate at a space width "W" from the rear wall, the ducts for heating said air flow (6) being formed between both the rear (2) and the adjacent (2a) chamber walls.

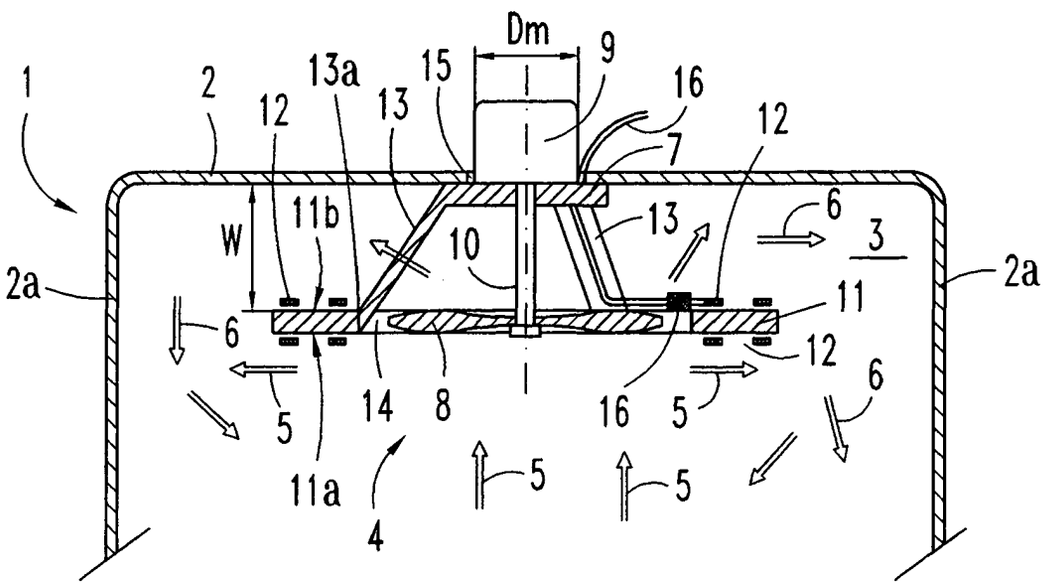

FIG. 2

EP 1 559 959 A2

Description

[0001] The present invention relates to a domestic baking oven incorporating a convection assembly with an electric heater, which is provided with a flat support for the electric heater resistor assembled in combination with an air fan for the heat distribution in the baking chamber.

Prior art

[0002] Domestic baking ovens, fitted with an electric heater assembly in the baking chamber, of the type for the convection of the heat generated by a circular-shaped electrical heating resistor, which is associated with a fan mounted at the centre of the rear wall of the chamber, are already known. The fan distributes the air heated by the resistor all round the baking chamber, for which purpose additional walls in the chamber form a cooled air intake duct towards the resistor and one or more ducts for impelling the air heated in its flow towards the chamber by the resistor. These heater assemblies are fitted in the oven chamber by means of the separate individual fixing of component of the heater assembly, the fan, the resistor and its electrical connector, a support bracket for the resistor insulated electrically from the metallic casing of the oven, and the additional walls forming the forced air ducts. Examples of this type of baking oven are those disclosed in WO-02/39021-A1 and in EP-319373-A1.

[0003] Also known is a domestic baking oven that incorporates a forced air heater, as that disclosed in EP-852317-A1, whose electrical heating resistor is the type with a thick film deposited on several flat panels, which are arranged in the baking chamber in front of the convector fan and, in addition, form the forced hot air flow delivering and distribution ducts. This construction of the convection ducts needs various flat supports for the resistors, which have to be installed in a succession in the oven carrying out a mounting operation separate from that of the fan.

[0004] In known ovens the components comprised in the convection heater are supplied separately for assembly of the oven, being further fixed individually to the metal structure of the oven, and special means are required for fixing each component, such as for the fan and the resistor panels as well as for the electrical connectors.

Disclosure of the invention

[0005] The object of the present invention is a domestic baking oven with a forced convection heater assembly, comprising a convection fan, an annular resistor and a flat support for the heating resistor coupled to the convection fan, in order to be directly installed as a single sub-assembly on the rear wall of the baking chamber.

[0006] The heater assembly according to the invention is formed as a separate supply unit, including the convection fan, one or more flat resistors in thermal contact with a panel supporting the resistors which is traversed by the air flow generated from the baking chamber by the fan, and the electrical connection means, so that for its installation it is handled as a single sub-assembly separate from the oven structure, which permits its installation in different domestic baking oven models by means of a single connection device between the fan and the heater panel, which in turn acts as a support for the single heater assembly, fixed directly to the rear wall of the chamber by means of quick-fixing accessories and without the use of additional walls for forming the forced hot air flow force and distribution ducts.

[0007] In respect of the known forced convection heaters that use several panels with flat or thick film resistors, the heater assembly of the invention has the advantage of being provided with a single resistor substrate-panel, which is completely flat and economical to manufacture, besides providing efficient heating as the circulating air is heated against the two opposing faces of the flat substrate-panel.

[0008] Compared with known forced convection heaters using ring-shaped tubular type heating resistors it is an advantage of the heater assembly of the invention that its flat resistor has low thermal mass, so that the baking chamber is saved from an excessive rise in temperature due to thermal inertia and at the same time rapid heating of the chamber is generated by means of a small electrical output.

Description of the drawings

[0009]

Figure 1 is a front view of a convection heater assembly installed in a baking oven.

Figure 2 is a cross-sectional view of the heater assembly according to line II-II in figure 1.

Detailed description of an embodiment of the invention

[0010] In reference to FIGS. 1 and 2, one embodiment of the baking oven 1 comprises a baking chamber 3 formed by means of a vertical rear oven wall 2 and a number of adjacent metallic walls 2a, and a heater assembly 4 fixed on said rear wall 2 in order to generate a flow of forced hot air distributed all round chamber 3. The heater assembly 4 comprises a radial blade fan 8 driven by a motor 9 a rotary fan shaft 10 forcing the hot air delivery flow 6, a heater support panel 11, 12 in the form of a flat plate with two sides, a front one 11a and a rear one 11b, bearing on one of them a flat heating resistor 12 in thermal contact with the respective face 11a, 11b, and a single connecting and support device 7 fixed to the rear wall 2, all of them installed as a single sub-assembly 7-12, including the means for electrical con-

nection 16 as well.

[0011] The heater panel 11, 12 carrying the heating resistor 12 is preferably structured as a substantially flat substrate strip 11, on either the front face 11a or rear face 11b of which there is placed in thermal contact a flat resistor or preferably deposited a thick film heating resistor 12, in order to improved thermal transmission to the substrate-panel 11, which is made of a metal sheet coated with an electrical insulating layer which is at the same time a good thermal conductor.

[0012] The heater assembly 4 is mounted on the rear wall 2 of the oven solely by means of the connecting device 7, which is fixed directly to the rear wall 2 of the chamber by means of screws or quick-fastening accessories of the turn-and-lock type, not shown in the drawings. The connecting device 7 is made up of a circular central plate 7a which is placed in contact with the rear wall 2, and from its periphery there project a number of radial arms 13 extended in the form of a funnel widening in the direction of the chamber 3, leaving air flow openings 14 between them. The central plate 7a is crossed by the rotary shaft 10 of the fan securing it, for purposes of supporting the fan 8 and its motor 9 in the heater assembly.

[0013] The substrate-panel carrying the heating resistor 12 is substantially ring-shaped with an outside diameter referred to in figure 1 as "De", and it is made of a metal sheet, such as of stainless steel having a high strength for coupling to the connecting device 7. The annular substrate 11 has a central opening 11c with a diameter "D1" on the edge of which it is supported, connected to the radial arm ends 13a of said coupling device 7, the substrate 11 positioned on a plane parallel to that of rotation of the blades 8 and separated from the rear wall 2 by a space of width "W". The length of the fan shaft 10 crossing the space "W" determines an equivalent separation distance between the plane of the blades 8 and the rear wall 2.

[0014] Between both the rear wall 2 of the oven and the substrate 11, are formed the force flow ducts for a part of the hot air flow supply, which is first directed at the baking chamber 3 by way of the hollows 14 between two radial support arms 13, on the rear face 11b of the heating panel 11,12, and then distributed by way of the peripheral space between the heater assembly 4 and the adjacent walls 2a of the oven. On account of their diameter "Df" smaller than the diameter "Di" of the opening 11c, the circular periphery of the rotary blades 8 is substantially interposed inside the heater panel 11,12, so that a portion of the hot air flow 6 is due to the central intake air flow 5 sucked by the fan 8, which runs over the front face 11a of the heater panel.

[0015] The heater assembly 4 is installed as a single supply sub-assembly on the rear wall 2 of the oven by means of a single operation for fitting the whole heater assembly 4, including the fan motor 9 and its thermal insulation from the oven walls. For mounting the heater assembly 4 is inserted from the mouth of the chamber passing the motor 9 to the outside of the oven. The opening 15 in the rear wall 2 required for this operation has a diameter larger than the diameter "Dm" of motor 9. The central support plate 7a has a diameter "Ds" larger than the through-hole opening 15 in the wall, so it is placed in contact with the rear wall 2 internally. Owing to this arrangement of the heater assembly 4 on the rear wall 2, the electrical connection cables 16 of the heating resistor are run to the outside of the oven by way of the intermediate space "W", guided on the radial arms 13 of the support, thus terminating the heater assembly 4 installation operation in the chamber 3 of the oven.

Claims

1. Domestic baking oven provided with an electric assembly (4) for heating the oven chamber (3) of the type employing the convection of a hot air flow (6) generated by way of a flat ring-shaped electrical resistor (12), the baking oven (1) comprising a rear wall (2) and a number of adjacent chamber walls (2a), a convection fan (8,9,10) having a motor (9) and a rotary shaft (10) mounted in the centre of the rear wall (2), at least one panel (11) for supporting the heating resistor (12), and means (7a,13a) for connecting the fan (8,9,10) and the heater panel (11,12) to said chamber walls (2,2a), wherein a hot air flow (6) is forced and distributed across the chamber (3) by means of a duct made up of said chamber walls (2,2a) and the heater panel (11,12), **characterised in that** the heater assembly (4) is provided with a single panel (11,12) for supporting the heating resistor (12), which is substantially flat and arranged parallel to said rear wall (2), being separated from the latter by a given space width W, and with a device (7) for coupling both the fan (8) and its motor (9) and the heater panel (11,12), as a single support means of the heater assembly (4) on the oven walls (2,2a), whereby the heater assembly (4) is built as a subassembly (7-10) mounted as a whole in a single operation directly on the rear wall (2) of the chamber.

2. The baking oven of claim 1, wherein said device (7) for coupling and supporting the heater assembly (4) is provided with a central plate (7a) fixed to the rear wall (2) of the chamber, and with means (7a,13,14) for coupling the heater panel (11,12) to said central plate (7a) separated from the latter by said space width "W", so forming a duct for impelling an air flow between said rear wall (2) and the heater panel (11,12).

3. The baking oven of claim 1, wherein said device (7) coupling and supporting the heater assembly (4) is provided with a central plate (7a) fixed to the rear wall (2) of the chamber and with a number of radial

arms (13) extended in the direction of the chamber (3) supporting the heater panel (11,12) separated by said space width "W" from the rear wall, forming a duct for impelling said air flow (6) between said rear wall (2) and the heater panel (11,12).

4. The baking oven of claim 1, wherein said heater panel (11,12) has a central opening (11c) in which the radial convection fan (8) blade rotation plane is interposed, separated from the rear wall (2) by its rotary shaft (10) for forcing the air flow (6) up against both faces of the heater panel (11,12).

5. The baking oven of claim 1, wherein said heater panel (11,12) takes the form of flat plate provided with a central opening (11c) for the interposition of the fan (8) rotation blades and a peripheral edge (13a) for its support by means of said heater assembly coupling device (7).

6. The baking oven of claim 1, wherein said heater panel (11,12) supporting the heating resistor (12) takes the form of a metallic substrate-sheet (11) with two front (1a) and rear (11b) heating surfaces and the heating resistor (12) is the type comprising a thick film deposited on a surface (11a,11b), and with a central opening (11c) in the heating substrate in which the rotation plane of the fan (8) blades is interposed, so the air flow (5,6) generated by the fan (8) is heated on both surfaces (11a, 11b) of the substrate-sheet.

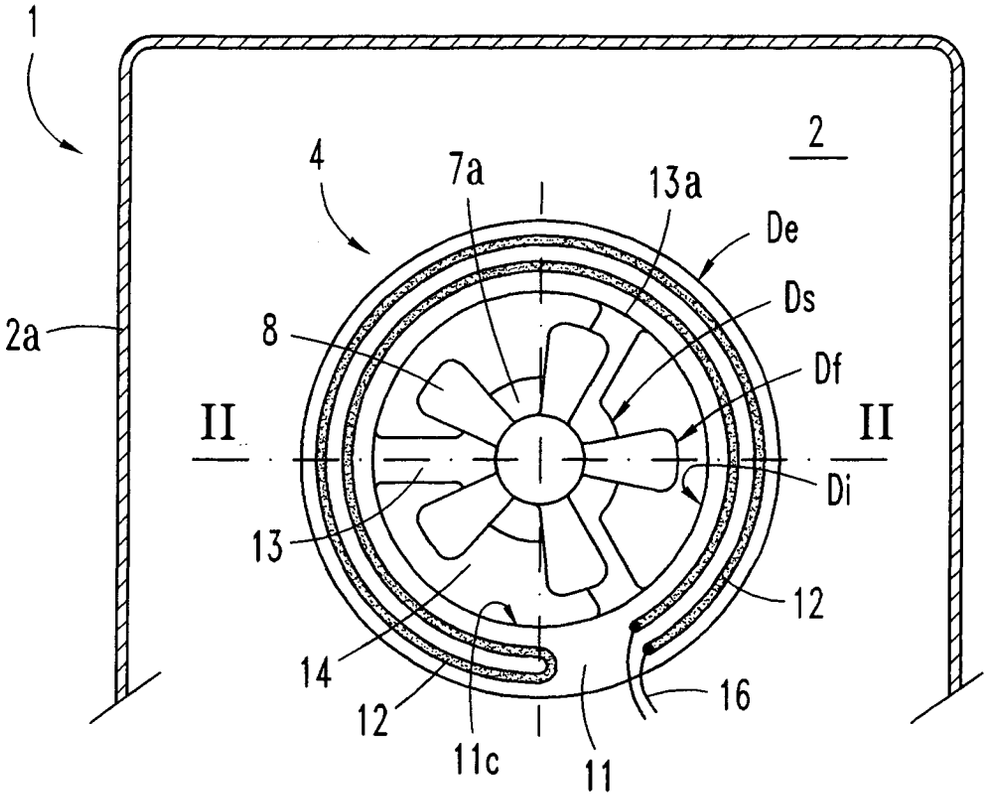
1
2
4
7a
13a
De
Ds
Df
Di
2a
8
II
II
13
12
14
12
11c
11
16

FIG. 1

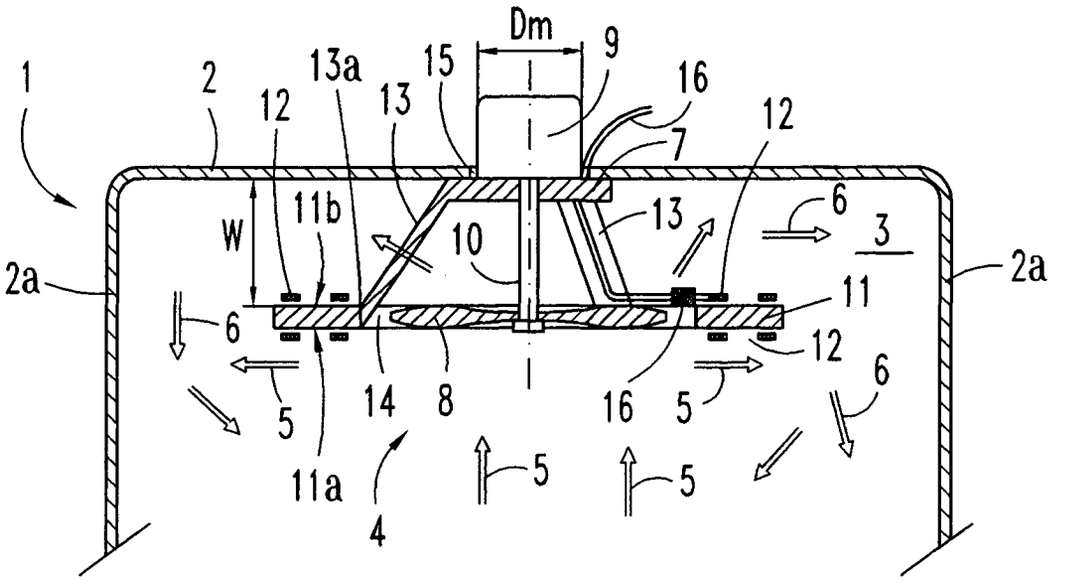
Dm
9
1
2
13a
15
16
12
13
12
7
6
3
W
11b
10
13
2a
2a
11
6
12
5
14
8
16
5
6
11a
4
5
5

FIG. 2