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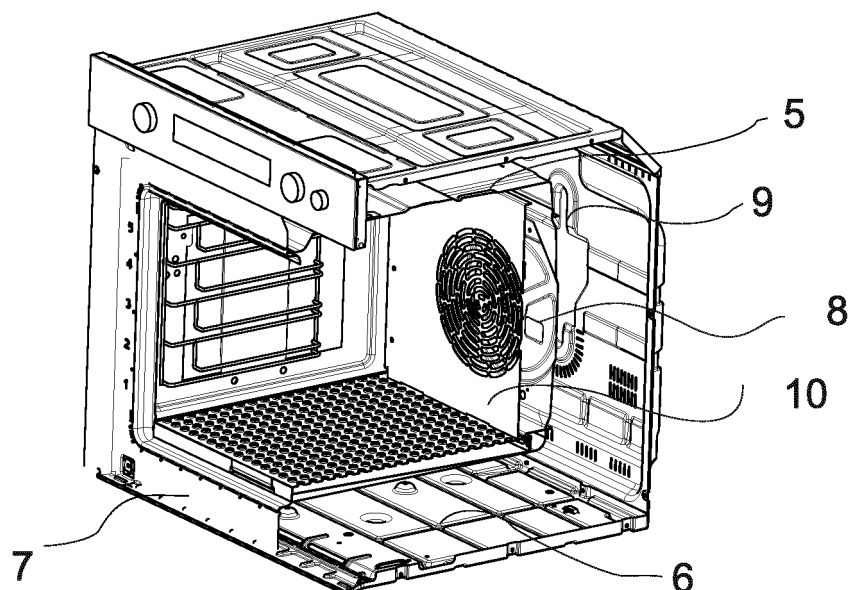
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OVEN HAVING AIR IMPINGEMENT JETS AND A LIQUID COLLECTING TRAY

- (57)

The present invention relates to an oven (1) comprising an oven compartment (11) which is defined by the side walls (2, 3), a rear wall (4), an upper wall (5), a lower wall (6) and a front wall (7) and wherein the food-stuffs to be cooked are placed by means of a cooking member; a lower plate (14) which is provided on the lower wall (6); a plurality of jet nozzles (15) which are arranged on said lower plate (14) in successive rows and columns; a plurality of slits (16) which are positioned among said jet nozzles (15); and a hidden tray (17) which is positioned under the lower plate (14) and which collects the liquids flowing through said slits (16).

Figure 4



## Description

### Technical Field

**[0001]** The present invention relates to an oven wherein the dirt on the oven base can be cleaned in household ovens with air impingement jet technology.

### State of the Art

**[0002]** Today, the air impingement jet technology is used in ovens for various cooking applications. In the ovens with air impingement jet technology, high-speed jets of hot air impinge a foodstuff vertically and/or impinge cooking members or trays carrying foodstuffs. Hot air jets are delivered by means of nozzles. Said nozzles are generally placed on the upper and lower walls of the oven so as to be perpendicular to the foodstuff. In said ovens, high-speed jets of hot air impinge the foodstuff, thus providing more homogeneous heat distribution rates or shorter cooking times.

**[0003]** One of the most common problems in state of the art household ovens with air impingement jet technology is the cleaning of the bottom of the oven which is contaminated during the cooking of the foodstuff. This problem especially arises while placing the tray or oven accessories into the oven or removing the same from the oven after the cooking process. One of the most common problems is that oil or foodstuff liquids can easily spill onto the base due to the fact that the tray becomes both heavy and hot and slips on the wire rack during the cooking process performed with accessories such as Pyrex, etc. While the dirt on the floor can be cleaned manually after the cooking process in conventional ovens, this is not possible in the ovens with the air impingement jet technology with nozzles.

**[0004]** In the ovens with the air impingement jet technology, the problem of cleaning the bottom surface of the oven if anything or oil spills during cooking due to the nozzles on the bottom arises. Difficult-to-clean substances such as sauce or oil flowing from the lower nozzle openings collect on the oven bottom, causing the problem of the dirt burning or sticking due to the direct contact with the hot surface. Since the user cannot directly reach this surface, the problem of failing to clean the same arises.

**[0005]** In the state of the art Patent Application No. WO2010135693A1, an oven is disclosed, a jet nozzle which accelerates the hot air and which converts the airflow to create a relatively thin thermal boundary layer of hot air on the surface of foodstuff or any other material placed in the airflow. However, there is no explanation regarding the cleaning of jet nozzles and oven bottom in the ovens with the air impingement technology.

### Brief Description of the Invention

**[0006]** The aim of the present invention is the realization

of an oven comprising an air impingement jet technology which eliminates the problem of the liquids, which spill from the foodstuffs while said foodstuffs are being loaded into/unloaded from the oven, being burnt or getting stuck on the oven bottom due to high temperatures, thus providing ease of cleaning.

**[0007]** Another aim of the present invention is the realization of an oven comprising an air impingement jet technology which eliminates the problem of the speed of the air, delivered by the nozzles close to the front wall of the oven, being low and hence the problem of nonhomogeneous cooking on the foodstuff surface.

**[0008]** Another aim of the present invention is the realization of an oven comprising an air impingement jet technology which eliminates the problem, encountered in the state of the art, of the air losing speed while flowing from the rear side of the oven towards the front side thereof, which increase the flow speed of air towards the front side of the oven and which prevents the loss in speed and heat at the front wall region of the oven.

**[0009]** Another aim of the present invention is the realization of an oven comprising an air impingement jet technology which eliminates the problem of the airtightness of the plates, whereon the nozzles are provided, being deteriorated due to the frequent detachment of the plates.

**[0010]** The oven realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises an oven compartment which is defined by side walls, a rear wall, an upper wall, a lower wall and a front wall and wherein the foodstuffs to be cooked are placed by means of a cooking member; a lower plate which is provided on the lower wall; and a plurality of jet nozzles which are arranged in successive rows and columns on said lower plate. Said oven comprises a plurality of slits which are positioned between said jet nozzles and a hidden tray which is positioned under the lower plate and which collects liquids that may flow through said slits.

**[0011]** In an embodiment of the present invention, the oven comprises the slits which are positioned in a disordered manner in various places on the lower plate.

**[0012]** In another embodiment of the present invention, the oven comprises the slits which are arranged as successive rows and columns on the lower plate so as to cover the entire surface.

**[0013]** In another embodiment of the present invention, the oven comprises the slits which are arranged as successive rows and columns among the jet nozzles in an area corresponding to the center region of the lower plate.

**[0014]** In an embodiment of the present invention, the oven comprises the slits which are configured so as to have different or same dimensions.

**[0015]** In an embodiment of the present invention, the oven comprises a gap which is provided between the hidden tray and the lower plate and through which the hot air passes.

**[0016]** In an embodiment of the present invention, the

oven comprises a hidden tray the height of which, depending on the arrangement thereof, decreases from the rear wall towards the front wall.

**[0017]** In an embodiment of the present invention, the oven comprises a hidden tray wherein the ratio of the front height thereof to the rear height thereof is between 0.3 and 0.8.

**[0018]** In an embodiment of the present invention, the oven comprises a fan sheet metal which is mounted to the rear wall by being screwed at the corners thereof and which has at least one mounting housing at the contact point thereof with the edge of the lower plate.

**[0019]** In an embodiment of the present invention, the oven comprises at least one claw which is provided on the surface of the lower plate which is in contact with the fan sheet metal and which is fitted into said at least one mounting housing.

**[0020]** In an embodiment of the present invention, the oven comprises a catch which is provided on the side of the lower plate facing the front wall and which enables the lower plate to be mounted to the hidden tray, and a connection member which receives said catch and which is positioned on the hidden tray.

**[0021]** In an embodiment of the present invention, the oven comprises a fan sheet metal which is mounted to the rear wall by being screwed at the corners thereof and which has at least one mounting housing at the contact point thereof with the edge of the lower plate; at least one claw which is provided on the surface of the lower plate which is in contact with the fan sheet metal and which is fitted into said at least one mounting housing; a catch which is provided on the side of the lower plate facing the front wall and which enables the lower plate to be mounted to the hidden tray; and a connection member which receives said catch and which is positioned on the hidden tray.

**[0022]** Said figures are:

**Figure 1:** is the front perspective view of the view having the air impingement technology of the present invention.

**Figure 2:** is the top perspective view of the lower plate, the jet nozzle and the slits in the oven having the air impingement technology of the present invention.

**Figure 3:** is the front perspective view of the hidden tray positioned under the lower plate.

**Figure 4:** is the front perspective view showing the air flow in the oven compartment of the oven having the air impingement technology of the present invention.

**Figure 5:** is the front perspective view showing the assembled and disassembled state of the fan sheet metal and the lower plate in the oven having the air

impingement technology of the present invention.

**Figure 6:** is the front perspective view showing the assembled and disassembled state of the lower plate and the hidden tray in the oven having the air impingement technology of the present invention.

**[0023]** The following numerals are referred to in the description of the present invention:

1. Oven
2. Side wall
3. Side wall
4. Rear wall
5. Upper wall
6. Lower wall
7. Front wall
8. Fan
9. Heater
10. Fan sheet metal
- 10.1 Mounting housing
11. Oven compartment
12. Oven shelf
13. Upper plate
14. Lower plate
- 14.1 Claw
- 14.2 Catch
15. Jet nozzle
16. Slit
17. Hidden tray
- 17.1 Connection member
- h1: tray front height
- h2: tray back height

#### Detailed Description of the Invention

**[0024]** The oven (1) of the present invention comprises

a pair of side walls (2, 3); a rear wall (4); an upper wall (5); a lower wall (6); and a front wall (7). The front wall (7) comprises a door. A control panel is provided, which can be placed above, below or next to the door. An arm (not shown in the figures) is positioned on the door so as to open the door from bottom to top, from top to bottom, from left to right or from right to left. The oven (1) comprises a fan (8) which is positioned on the rear wall (4), and a circular heater (9) which is disposed around the fan (8). A fan sheet metal (10) which is mounted on the rear wall (4) by being screwed at the corners is provided in front of said fan (8) and the heater (9).

**[0025]** In an embodiment of the present invention, the oven (1) comprises an oven compartment (11) which is defined by the side walls (2, 3), a rear wall (4), an upper wall (5), a lower wall (6) and a front wall (7). An oven shelf (12) is supported by any support member so as to be placed in the oven compartment (11). In an embodiment of the present invention, the oven shelf (12) is a standard oven grill. In an embodiment of the present invention, support members are positioned on the side walls (2, 3) so as to align with each other and face each other. The oven shelf (12) is placed on said support members and is positioned in the oven compartment (11). In different embodiments of the present invention, a large number of oven shelves (12) can be placed in the oven compartment (11) parallel to each other in the horizontal plane with a certain space therebetween.

**[0026]** In an embodiment of the present invention, the oven (1) comprises an upper plate (13) which is placed under the upper wall (5) and a lower plate (14) which is placed on the lower wall (6). Said upper plate (13) and lower plate (14) comprise a plurality of jet nozzles (15) arranged thereon in rows and columns. Said jet nozzles (15) are configured to transmit hot or cold impingement air towards the oven shelf (12) at a high speed. Relatively hot air entering the middle region of the fan sheet metal (10) passes through the fan (8) and the heater (9) so as to be accelerated after passing through the upper plate (13) and the lower plate (14) to be directed onto the foodstuff surface. In the present invention, the jet nozzles (15) are shaped so as to form a flow pattern which enhances heat transfer on the surface of the foodstuff. In an embodiment of the present invention, the jet nozzle (15) is circular and has a cross-section narrowing down from the surface of the lower plate (14) upwards. Thus, a more homogeneous and high heat transfer distribution is obtained, which enables the foodstuffs to be cooked homogeneously and more quickly in the oven (1).

**[0027]** In an embodiment of the present invention, the oven (1) comprises a plurality of slits (16) which are positioned in successive rows and columns among the plurality of jet nozzles (15) on the lower plate (14) so as to allow the passage of liquids which may flow from the foodstuffs; and a hidden tray (17) which is positioned under the lower plate (14) and which collects the liquids flowing through said slits (16). There is a gap between said hidden tray (17) and the lower plate (14) through

which hot air passes. The grease and foodstuff liquids flowing through said slits (16) are collected in the hidden tray (17) disposed under the lower plate (14). Thus, since grease and foodstuff liquids do not come into direct contact with the hidden heater on the lower wall (6), the problem of said liquids being burnt or being difficult to clean is prevented.

**[0028]** In an embodiment of the present invention, in the oven (1), when viewed from the front wall (7), the lower plate (14) has an inclination towards the rear wall (4). Thus, the liquids from the foodstuffs remaining on the surface of the lower plate (14) are directed to the slits among the jet nozzles, and from there to the hidden tray (17). Moreover, said slits (16) provide an exit for the air, thus strengthening the weak air flow region among the jet nozzles (15).

**[0029]** In an embodiment of the present invention, the slits (16) are positioned on the lower plate (14) so as to remain among the jet nozzles (15) at certain intervals. Said slits (16) can be positioned on the lower plate (14) in a disordered manner.

**[0030]** In another embodiment of the present invention, said slits (16) are arranged as successive rows and columns on the lower plate (14) so as to cover the entire surface.

**[0031]** In another embodiment of the present invention, said slits (16) are arranged as successive rows and columns among the jet nozzles (15) in an area corresponding to the center region of the lower plate (14). In an embodiment of the present invention, said slits (16) are configured so as to have different or same dimensions in order to enable the hot air to be dispersed in a homogeneous speed.

**[0032]** In an embodiment of the present invention, the jet nozzles (15) through which the air exits may have the same or different dimensions. The dimensions of the jet nozzles (15) can also be adjusted to provide a homogeneous distribution of hot air.

**[0033]** In an embodiment of the present invention, the height of the hidden tray (17) disposed under the lower plate (14) decreases from the rear wall (4) towards the front wall (7) depending on the placement. The ratio of the front height (h1) of the hidden tray (17) to the rear height (h2) thereof is between 0.3 and 0.8. Thus, the flow of hot air passing between the hidden tray (17) and the lower plate (14) increases towards the front wall (7) and offers a more homogeneous air distribution. Consequently, the air flow difference between the rear wall (4) and the front wall (7) of the oven (1) is reduced. This ensures that the foodstuff in the tray or cooking member is cooked evenly.

**[0034]** In an embodiment of the present invention, the side walls (2, 3) comprise at least two carrier members with at least one on each side wall (2, 3) in a positioned aligned with the hidden tray (17) and the lower plate (14) so as to allow the placement of the hidden tray (17) and the lower plate (14). In an embodiment of the present invention, the carrier member is a rail system.

**[0035]** The hidden tray (17) and the lower plate (14) are required to be removed and cleaned periodically. In an embodiment of the present invention, the hidden tray (17) and the lower plate (14) are removed and cleaned separately as shown in Figure 6. There is at least one mounting housing (10.1) on the surface of the fan sheet metal (10) which is in contact with the edge of the lower plate (14). On the surface of the lower plate (14) in contact with the fan sheet metal (10), there is at least one claw (14.1) to be fitted into said at least one mounting housing (10.1). When the lower plate (14) having the jet nozzles (15) is desired to be cleaned, the claw (14.1) on the lower plate (14) is removed from the mounting housing (10.1) on the fan sheet metal (10), and the lower plate (14) is cleaned separately. On the part of the hidden tray (17) facing the front wall (7), there is a connection member (17.1) which enables the hidden tray (18) to be gripped and pulled out of the oven compartment (11) by being pulled. Thus, the hidden tray (17) is taken out of the oven compartment (11) and cleaned by means of this sliding structure.

**[0036]** In another embodiment of the present invention, the hidden tray (17) and the lower plate (14) are removed and cleaned together. As seen in Figure 6, the bottom plate (14) is mounted to the hidden tray (17) by engaging a catch (14.2), which is positioned on the part of the lower plate (14) facing the front wall (7), with the connection member (17.1) positioned on the part of the hidden tray (17) facing the front wall (7) so as to correspond to the catch (14.2). In an embodiment of the present invention, the connection of said catch (14.2) is provided by a spring mechanism. Said spring mechanism has a structure which can be gripped by the user by hand. The user takes out the hidden tray (17) and the lower plate (14) by holding this spring mechanism. Then, he/she separates the hidden tray (17) and the lower plate (14) from each other by lifting the catch (14.2). After being cleaned, the hidden tray (17) and the lower plate (14) are connected to each other outside and placed in the oven compartment (11).

**[0037]** In another embodiment of the present invention, the mounting of the lower plate (14) and the fan sheet metal (10) to each other by means of at least one claw (14.1) fitted into at least one mounting housing (10.1) as well as the mounting of the lower plate (14) to the hidden tray (17) by means of a catch (14.2) engaging with the connection member (17.1) can be used together in the same embodiment without changing the above-described embodiments.

## Claims

1. An oven (1) **comprising** an oven compartment (11) defined by the side walls (2, 3), a rear wall (4), an upper wall (5), a lower wall (6) and a front wall (7), a lower plate (14) provided on the lower wall (6); and a plurality of jet nozzles (15) arranged on said lower plate (14), **characterized by** a plurality of slits (16)

positioned among the jet nozzles (15), and a hidden tray (17) positioned under the lower plate (14) which collects the liquids flowing through said slits (16).

2. An oven (1) according to Claim 1, **characterized in that** the slits (16) are positioned on the lower plate (14) in a disordered manner.
3. An oven (1) according to Claim 1, **characterized in that** the slits (16) are arranged as successive rows and columns on the lower plate (14) so as to cover the entire surface.
4. An oven (1) according to Claim 1, **characterized in that** the slits (16) are arranged as successive rows and columns among the jet nozzles (15) in an area corresponding to the center region of the lower plate (14).
5. An oven (1) according to any one of Claims 1 to 4, **characterized in that** the slits (16) are configured so as to have different or same dimensions.
6. An oven (1) according to any one of Claims 1 to 5, **characterized in that** a gap is provided between the hidden tray (17) and the lower plate (14) for allowing the passage of the hot air.
7. An oven (1) according to any one of the above claims, **characterized in that** the height of the hidden tray (17) decreases from the rear wall (4) towards the front wall (7) depending on the placement.
8. An oven (1) according to any one of the above claims, **characterized by** a hidden tray (17) wherein the ratio of the front height (h1) thereof to the rear height (h2) thereof is between 0.3 and 0.8.
9. An oven (1) according to any one of the above claims, **characterized by** a fan sheet metal (10) which is mounted to the rear wall (4) by being screwed at the corners thereof and which has at least one mounting housing (10.1) at the contact point thereof with the edge of the lower plate (14).
10. An oven (1) according to Claim 9, **characterized by** at least one claw (14.1) which is provided on the surface of the lower plate (14) which is in contact with the fan sheet metal (10) and which is fitted into said at least one mounting housing (10.1).
11. An oven (1) according to any one of Claims 1 to 8, **characterized by** a catch (14.2) which is provided on the side of the lower plate (14) facing the front wall (7) and which enables the lower plate (14) to be mounted to the hidden tray (17), and a connection member (17.1) which receives said catch (14.2) and which is positioned on the hidden tray (17).

12. An oven (1) according to any one of Claims 1 to 8,  
**characterized by** a fan sheet metal (10) which is  
mounted to the rear wall (4) by being screwed at the  
corners thereof and which has at least one mounting  
housing (10.1) at the contact point thereof with the  
edge of the lower plate (14); at least one claw (14.1)  
which is provided on the surface of the lower plate  
(14) which is in contact with the fan sheet metal (10)  
and which is fitted into said at least one mounting  
housing (10.1); a catch (14.2) which is provided on  
the side of the lower plate (14) facing the front wall  
(7) and which enables the lower plate (14) to be  
mounted to the hidden tray (17); and a connection  
member (17.1) which receives said catch (14.2) and  
which is positioned on the hidden tray (17).
13. An oven (1) according to any one of the above claims,  
**characterized by** the air impingement jet technology.

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Figure 1

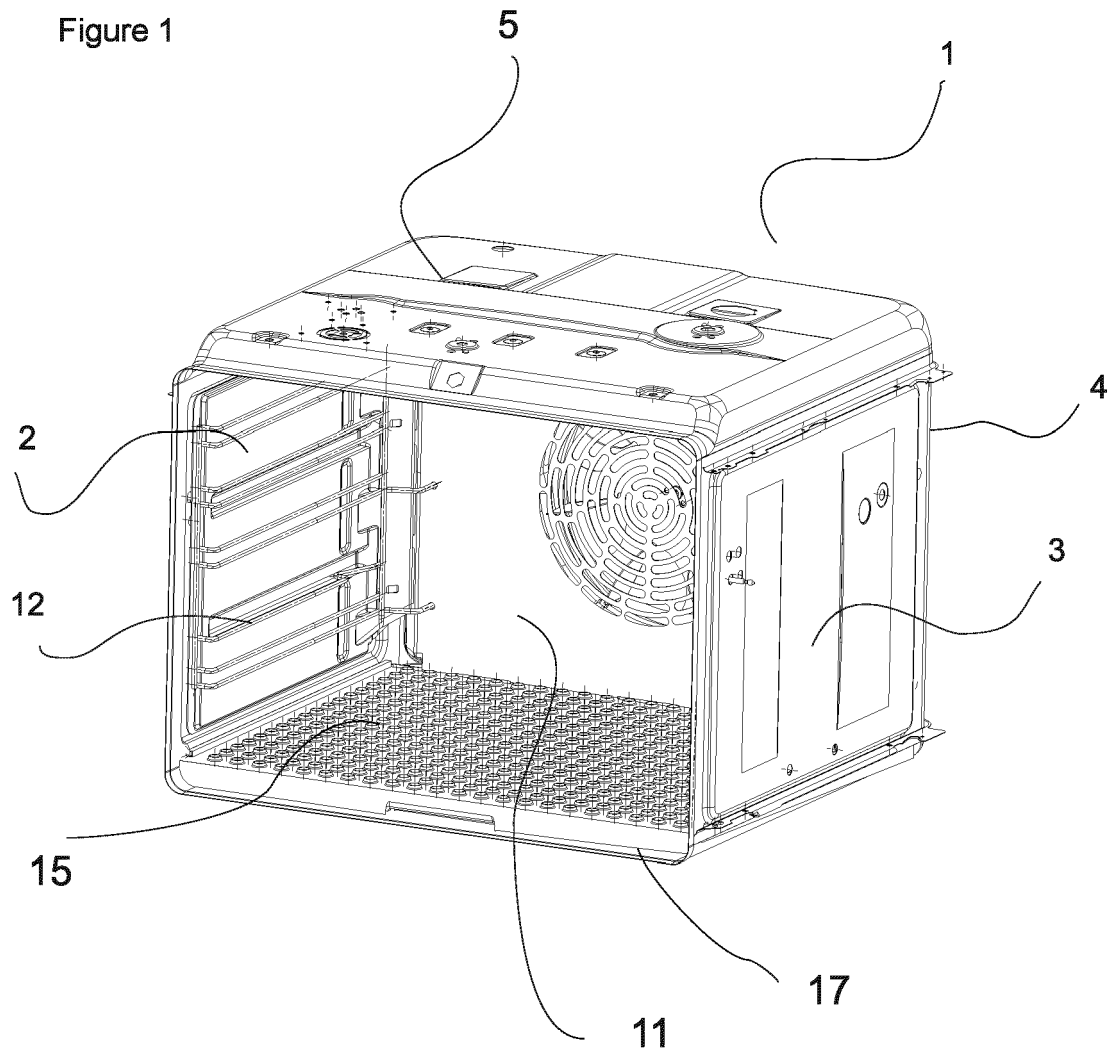


Figure 2

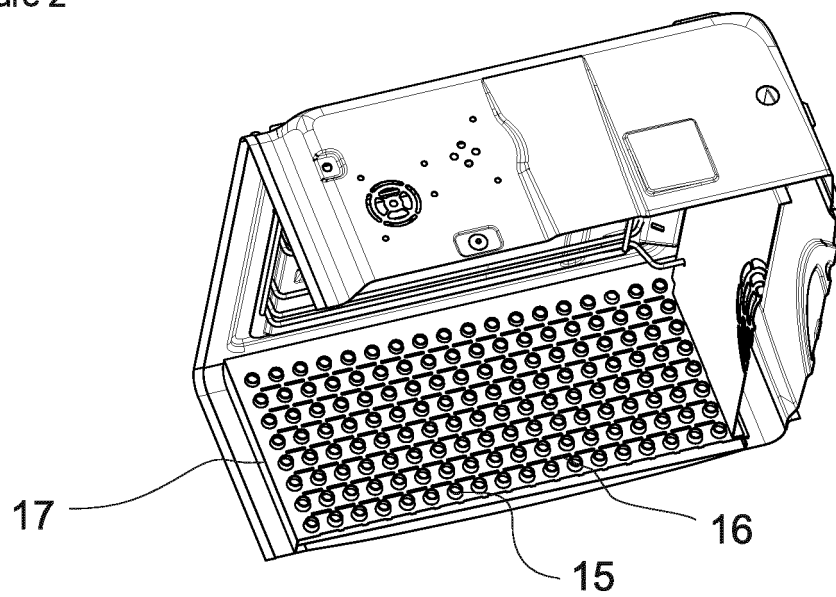


Figure 3

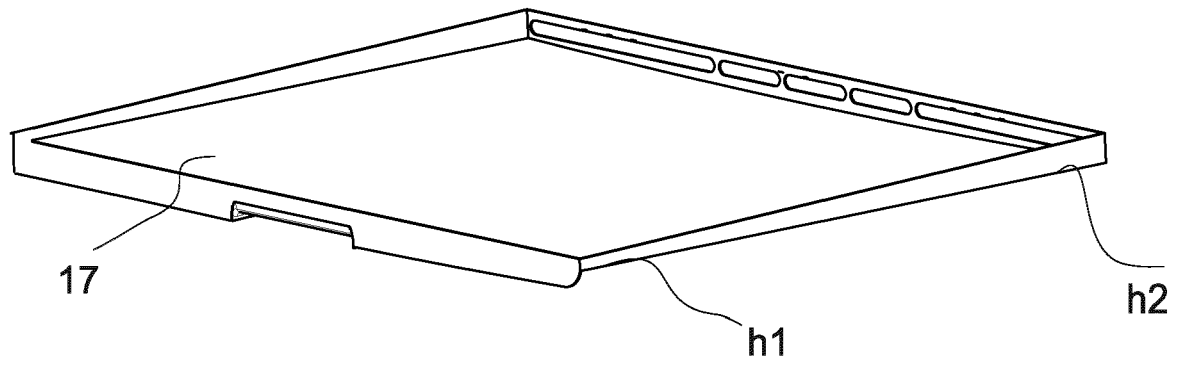


Figure 4

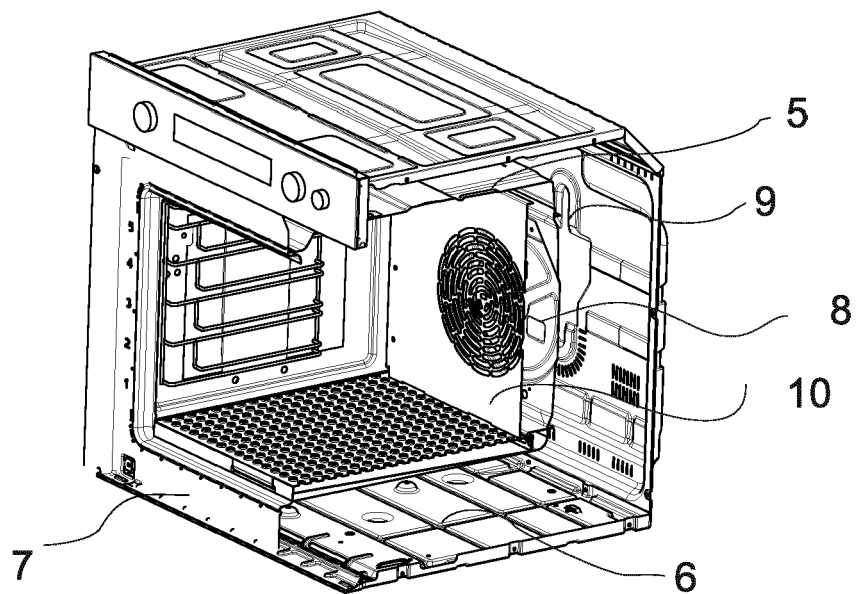




Figure 5

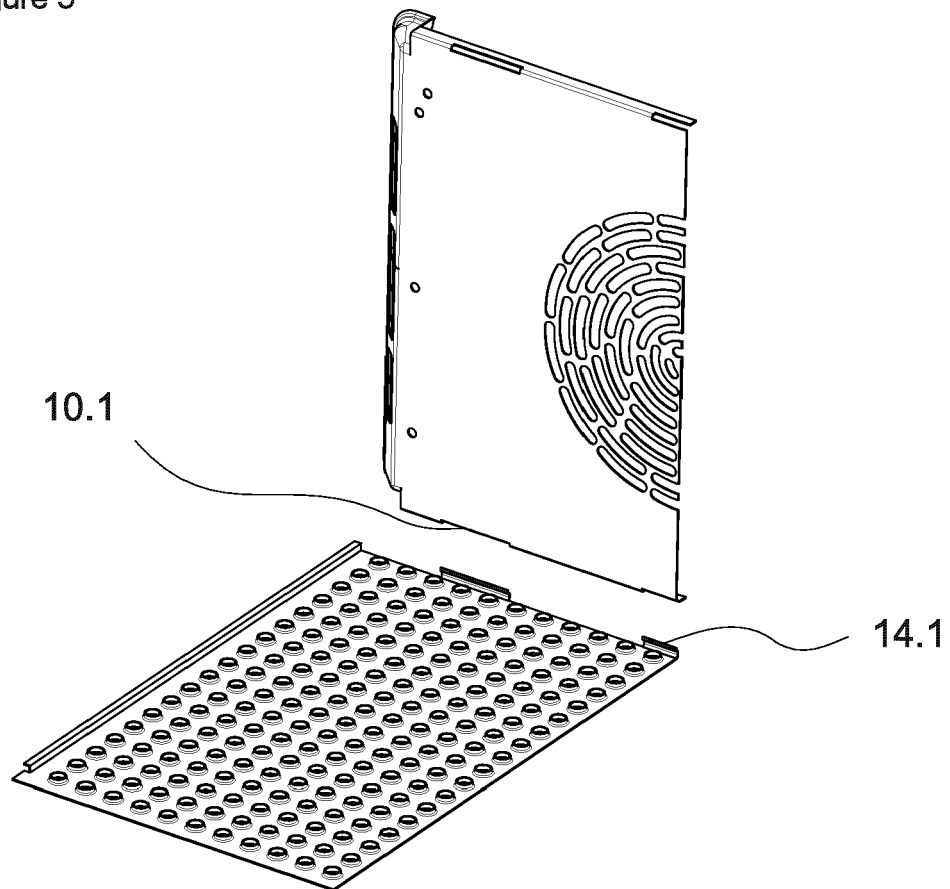
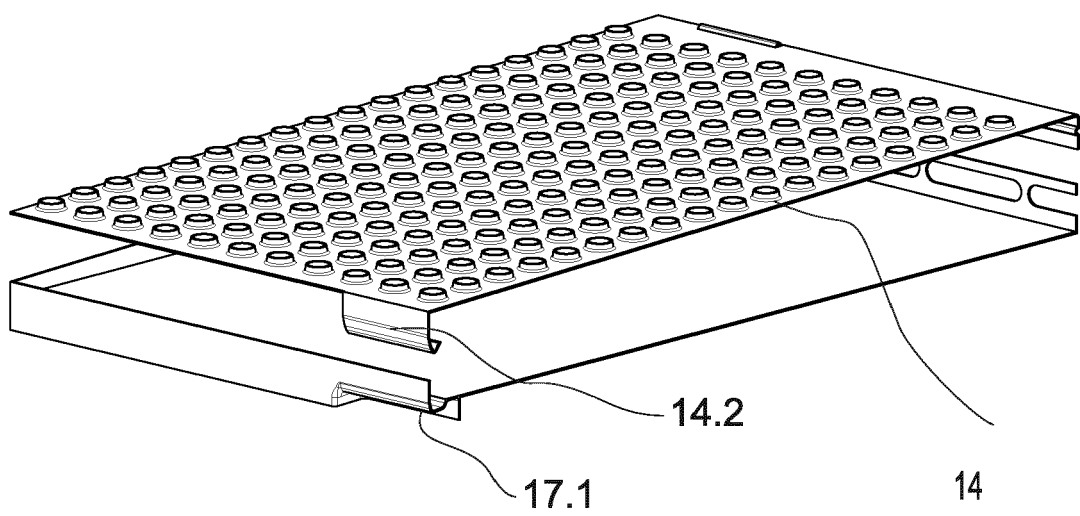


Figure 6





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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                            |                                                                                                                                                                                                                                                                              |                                         |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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**REFERENCES CITED IN THE DESCRIPTION**

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