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(54) **AN OVEN COMPRISING A FAN COVERING PLATE**

OFEN MIT EINER GEBLÄSEABDECKPLATTE

FOUR COMPORTANT UNE PLAQUE DE RECOUVREMENT DE VENTILATEUR

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## Description

**[0001]** The present invention relates to an oven wherein the warm air blown by the fan is provided to be effectively sent to the cooking chamber.

**[0002]** In ovens wherein the baking process is performed by way of convection at least one heater and a fan are situated. The oven casing, which is formed by the walls surrounding the cooking chamber wherein the baking process is performed, is divided into two compartments by means of a fan covering plate located in front of the rear wall. The fan and the heater are disposed into the compartment that is between the casing rear wall and the fan covering plate. The warm air, which is heated by the heater and moved by the fan, is transmitted to the cooking chamber through the blow openings situated on the fan covering plate, and by means of the suction holes, the air transmitted to the cooking chamber is aspirated again to the fan compartment that is between the fan covering plate and the casing rear wall and thus, the food is provided to be baked. Until being taken into the cooking chamber, the warm air moved by the fan is exposed to turbulence effects and edge losses between the fan covering plate and the casing rear wall. As a result of this, the flow rate of the circulating air decreases and therefore, the baking efficiency is reduced. For increasing the cooking quality, a homogeneous air distribution inside the oven is required to be provided, and therefore, air is required to be blown with controlled direction and flow rate from the fan covering plate into the cooking chamber. When the air is not blown in a controlled manner, regional burns on the food or problems of not being baked occur.

**[0003]** In the state of the art, the direction of the air, which is blown to the cooking chamber through the openings (7') on the fan covering plate (6'), differs with respect to the direction of rotation of the fan (4'). For example, when the fan (4') rotates clockwise (Figure 1), the openings (7') which are at the right of the fan (4') blow downwards and the openings (7') which are at the left of the fan (4') blow upwards, and similarly, when the fan (4') rotates counterclockwise (Figure 2), the openings (7') which are at the right of the fan (4') blow upwards and the openings (7') that is at the left of the fan (4') blow downwards; and in both situations, they blow to right and left, and the air output in undesired directions generating from the direction of rotation of the fan (4') decreases the baking quality.

**[0004]** In the state of the art German Patent Application No DE102004047993, in an oven, embossment-formed air-guidance elements, which are formed on the oven rear wall and which guide the flow of air that is formed by the fan and that is blown into the oven through the openings on the fan covering plate, are explained. The air blown by the fan is guided directly to the cooking chamber by the air-guidance elements which are formed on the rear wall of the casing and which block the flow path. The air-guidance elements are positioned after the opening, which is on the fan covering plate, with respect to

the direction of the air flow. The air flow is guided into the cooking chamber by being impacted to the air-guidance elements after passing through the opening. Further prior art is disclosed by EP1970635.

**[0005]** The aim of the present invention is the realization of an oven comprising a fan covering plate which provides the warm air blown by the fan to be guided in the desired direction onto the trays in the cooking chamber.

**[0006]** The oven realized in order to attain the aim of the present invention is explicated in the claims.

**[0007]** Inside the casing, the oven comprises a fan covering plate which separates the compartment wherein the fan is situated and the cooking chamber wherein the baking process is performed by disposing the trays therein, and on the fan covering plate, more than one opening is situated which provides the air moved by the fan to be transmitted to the cooking chamber.

**[0008]** The oven of the present invention comprises guiding means which are located on the fan covering plate and which are formed by performing a deep drawing process on the fan covering plate towards the fan compartment side behind it, and which are positioned slightly before the openings on the flow path of the air, that is moved by the fan at the rear surface of the fan covering plate with respect to the direction of rotation of the fan, and which partially surround the openings.

**[0009]** The guiding means consist of a diverter section which inclines towards the opening with an acute angle in comparison to the plane of the fan covering plate and with a slight incline, and which moves the air flow away from the plane of the fan covering plate right before it reaches the opening; and a support member section which extends almost vertically to the plane of the fan covering plate near the opening.

**[0010]** Being before the opening in the flow direction, the guiding means is positioned near the opening such that a certain distance such as a few millimeters will remain between the support member section and the opening edge. This distance between the guiding means and the opening edge is calculated depending on the inclination angle and the height of the guiding means in order that the air flow is blown to the cooking chamber by getting it as close to the axis of the opening as possible.

**[0011]** In another embodiment of the present invention, horizontal guiding means which extend between the opening and the upper or lower wall of the fan covering plate, and vertical guiding means which extend between the side edge of the opening and the side wall of the fan covering plane are located on the fan covering plate of the oven.

**[0012]** In another embodiment of the present invention, one vertical guiding means is joined with each horizontal guiding means from their one end each, and they form an L-shaped embossment which extends from the fan covering plate towards the fan compartment side. In this embodiment, while the fan covering plate is produced, guiding means are formed on the fan covering plate by

a single deep drawing process, which is performed such that it will form an L-shape.

**[0013]** The guiding means decreases the air flows in undesired directions which are blown from the fan compartment into the cooking chamber through the openings, and thus, by providing a homogeneous baking, burnt or unbaked areas are prevented from occurring.

**[0014]** The oven realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the schematic view illustrating the air output through the openings on the fan covering plate by the clockwise rotation of the fan in an oven in the prior art.

Figure 2 - is the schematic view illustrating the air output through the openings on the fan covering plate by the counterclockwise rotation of the fan in an oven in the prior art.

Figure 3 - is the schematic view of the oven of the present invention.

Figure 4 - is the front perspective view of the oven casing and the fan covering plate at its rear side.

Figure 5 - is the detailed view of the guiding means located on the fan covering plate.

Figure 6 - is the schematic view of cross-section C - C in Figure 4.

**[0015]** The elements illustrated in the figures are numbered as follows:

- 1 - Oven
- 2 - Casing
- 3 - Cooking chamber
- 4 - Fan
- 5 - Fan compartment
- 6 - Fan covering plate
- 7 - Opening
- 8, 108 - Guiding means
- 9 - Diverter
- 10 - Support member

**[0016]** The oven (1) comprises a casing (2), a cooking chamber (3) which is located inside this casing (2) and wherein the trays the foods to be baked are placed in, are disposed, a heater (not illustrated in the figures) which provides the air in the cooking chamber (3), to be heated, a fan (4) which is located at the side the rear wall of the casing (2) is situated in, and which moves the heated air, a fan compartment (5) wherein the heater and the fan (4) are disposed, a fan covering plate (6) which separates the cooking chamber (3) and the fan compartment (5) inside the casing (2), and more than one opening (7) which is located on the fan covering plate (6) and which provides the air (F) moved by the fan (4) to be transmitted to the cooking chamber (3). By means of the suction holes (D), the air (F) transmitted to the cooking chamber (3) is aspirated again to the fan compartment (5) that is be-

tween the fan covering plate (6) and the casing (2) rear wall (Figure 3).

**[0017]** The oven (1) of the present invention comprises more than one guiding means (8, 108)

- which is located on the fan covering plate (6) and which is formed by performing a deep drawing process on the fan covering plate (6) towards the fan compartment (5) side,
- which is positioned slightly before the openings (7) on the flow path of the air (F), that moves forward at the rear surface of the fan covering plate (6) by being moved by the fan (4) with respect to the direction of rotation of the fan (4), and which partially surrounds the openings (7) (Figures 4, 5)

**[0018]** The guiding means (8, 108) has

- a diverter (9) which inclines towards the opening (7) with an acute angle (A) in comparison to the plane of the fan covering plate (6) and with a slight incline, and which moves the air (F) flow away from the plane of the fan covering plate (6) before it reaches the opening (7), and
- a support member (10) which extends almost vertically to the plane of the fan covering plate (6) near the opening (7) and which supports the diverter (9), and which has a height (H) that is determined by the length (L) and the angle (A) of the diverter (9) in the direction of the fan covering plate (6) (Figure 6).

**[0019]** Since the guiding means (8, 108) is positioned before the opening (7) with respect to the flow direction of the air (F), the air (F), which is moved by the fan (4), performs a flow in parallel to the plane of the fan covering plate (6) by contacting the rear surface of the fan covering plate (6) and in the flow direction, encounters the diverter (9) before reaching the opening (7). Before reaching the opening (7), the air (F) is moved away from the plane of the fan covering plate (6) gradually by following the shape of the diverter (9). Thus, no blocks remain in front of the air (F) flow which moves forward by following the diverter (9) and which comes right across the opening (7) by passing over the diverter (9). By the effect of the pressure difference between the cooking chamber (3) and the fan compartment (5), in other words, due to the pressure difference between the front side and the rear side of the opening (7), the air (F) flows directly to the opening (7) and exits through the opening (7) almost vertically with the desired angle and is transmitted to the cooking chamber (3). Since the diverter (9) inclines towards the opening (7) with a small incline, for example with an inclination angle (A) of less than 45 degrees to the fan covering plate (6), it provides the continuity of the air (F) flow and does not form a barrier whereto the air (F) flow will directly hit, and the turbulence losses, which can occur by the effect of a direct impact in the flow direction of the air (F), are minimized.

**[0020]** In an embodiment of the present invention, the guiding means (8, 108) is positioned near the opening (7) such that a certain distance (B) will remain between the support member (10) and the opening (7) edge (Figure 6). The distance (B) between the support member (10) and the opening (7) edge depends on the inclination angle (A) of the diverter (9) and on the height (H) of the support member (10) and is calculated such that it will get the air (F) flow, which is directed to the opening (7) by leaving the surface of the diverter (9), as close to the axis (X) of the opening (7) as possible.

**[0021]** In another embodiment of the present invention, the oven (1) comprises

- more than one horizontal guiding means (8) which extends between the opening (7) and the upper or lower wall of the fan covering plate (6), and which decreases the components of the air (F) flow exiting through the opening (7) in the vertical direction (Z), and
- more than one vertical guiding means (108) which extends between the opening (7) edge and the side wall of the fan covering plate (6), and which decreases the air (F) flow components that exit through the opening (7) in the horizontal direction (Y) and that are blown to right and left (Figures 4, 5).

**[0022]** In another embodiment of the present invention, the horizontal guiding means (8) and the vertical guiding means (108) are joined from their one end each, and they form an L-shaped embossment which extends from the fan covering plate (6) towards the fan compartment (5) side (Figures 4, 5). In this embodiment, while the fan covering plate (6) is produced, both the horizontal guiding means (8) and the vertical guiding means (108) are simultaneously formed on the fan covering plate (6) by a single deep drawing process, which is performed such that it will form an L-shape.

**[0023]** The guiding means (8, 108), which are joined in an L-shape, decrease the undesired air (F) flow components, which are blown upwards and downwards (vertical) or to right and left (horizontal) towards the cooking chamber (3) through the opening (7), and thus, provide the air (F) to get close to the axis (X) of the opening (7) and to be blown to the cooking chamber (3) almost vertically to the plane of the fan covering plate (6). The L-shaped guiding means (8, 108) guide the air (F), which hits the upper, lower and side walls of the fan covering plate (6) and turns back, particularly around the openings (7), which are situated at the corner portions of the fan covering plate (6), and thus, the guiding means (8, 108) provide the air (F) to be blown through the opening (7) in the desired direction (X) (Figure 5).

**[0024]** In the oven (1) of the present invention, when the fan (4) rotates clockwise, the horizontal guiding means (8), which are situated at the right side of the fan covering plate (6) when viewed from the front, extend towards the upper side of the openings (7), and the ver-

tical guiding means (108) extend from the right edge of the openings (7) downwards. The horizontal guiding means (8), which are situated at the left side of the fan covering plate (6), extend towards the lower side of the openings (7), and the vertical guiding means (108) extend from the left edge of the openings (7) upwards.

**[0025]** On the plane, which is vertical to the rotational axis of the fan (4), depending on the direction of rotation of the fan (4), velocity vectors in the vertical (Z) and horizontal directions (Y) are formed in different areas of the fan covering plate (6). By means of the embossment-formed guiding means (8, 108) extending towards the fan compartment (5), the desired air (F) flow distribution is provided on the fan covering plate (6), and the air (F) flow in the aimed direction and amount is provided by the undesired velocity vectors being absorbed. Thus, by providing a homogenous baking in the oven (1), burnt or unbaked areas are prevented from occurring.

**[0026]** It is to be understood that the present invention is not limited to the embodiments disclosed above and an expert in the technique can easily introduce different embodiments. These should be considered within the scope of the protection postulated by the claims of the present invention.

## Claims

1. An oven (1) comprising
  - a casing (2),
  - a cooking chamber (3) which is located inside this casing (2) and wherein the trays the foods to be baked are placed in, are disposed,
  - a fan (4) which is located at the side the rear wall of the casing (2) is situated in, and which moves the heated air,
  - a fan compartment (5) wherein the fan (4) is disposed,
  - a fan covering plate (6) which separates the cooking chamber (3) and the fan compartment (5) inside the casing (2),
  - more than one opening (7) which is located on the fan covering plate (6) and which provides the air (F) moved by the fan (4) to be transmitted to the cooking chamber (3),
  - more than one guiding means (8, 108)

which is located on the fan covering plate (6) which is positioned before the openings (7) on the flow path of the air (F), that moves forward at the rear surface of the fan covering plate (6) by being moved by the fan (4) with respect to the direction of rotation of the fan (4), and which partially surrounds the openings (7),

**characterized by** the guiding means (8, 108) which is formed by performing a deep drawing process on the fan covering plate (6) towards the fan compart-

ment (5) side and which has a diverter (9) which inclines towards the opening (7) with an acute angle (A) in comparison to the plane of the fan covering plate (6) and with a slight incline, and which moves the air (F) flow away from the plane of the fan covering plate (6) before it reaches the opening (7), and that has a support member (10) which extends almost vertically to the plane of the fan covering plate (6) near the opening (7) and which supports the diverter (9).

2. An oven (1) as in Claim 1, **characterized by** the guiding means (8, 108) which has a diverter (9) that inclines towards the opening (7) with an inclination angle (A) of less than 45 degrees to the fan covering plate (6).
3. An oven (1) as in any one of the above Claims, **characterized by** the guiding means (8, 108) which is positioned near the opening (7) such that a certain distance (B) will remain between the support member (10) and the opening (7) edge.
4. An oven (1) as in any one of the above Claims, **characterized by** more than one horizontal guiding means (8) which extends between the opening (7) and the upper or lower wall of the fan covering plate (6), and by more than one vertical guiding means (108) which extends between the opening (7) edge and the side wall of the fan covering plate (6).
5. An oven (1) as in Claim 4, **characterized by** the horizontal guiding means (8) and the vertical guiding means (108) which are joined from their one end each and thus, which form an L-shaped embossment that extends from the fan covering plate (6) towards the fan compartment (5) side.

#### Patentansprüche

1. Ofen (1), umfassend  
ein Gehäuse (2),  
eine Garungskammer (3), die in diesem Gehäuse (2) angeordnet ist und in dem die Bleche, in denen sich die zu backenden Lebensmittel befinden, angeordnet sind,  
ein Gebläse (4), das an der Seite angeordnet ist, auf der sich die Rückwand des Gehäuses (2) befindet, und das die erwärmte Luft bewegt,  
ein Gebläsefach (5), in dem das Gebläse (4) angeordnet ist,  
eine Gebläseabdeckplatte (6), die die Garungskammer (3) und das Gebläsefach (5) im Gehäuse (2) trennt,  
mehrere Öffnungen (7), die an der Gebläseabdeckplatte (6) angeordnet sind und dafür sorgen, dass die Luft (F), die von dem Gebläse (4) bewegt wird,

an die Garungskammer (3) übertragen wird, mehrere Führungsmittel (8, 108),

die an der Gebläseabdeckplatte (6) angeordnet sind,  
die vor den Öffnungen (7) im Strömungsweg der Luft (F) angeordnet sind, die sich an der Rückseitenfläche der Gebläseabdeckplatte (6) nach vorne bewegt, indem sie vom Gebläse (4) in Bezug auf die Drehrichtung des Gebläses (4) bewegt wird, und  
die die Öffnungen (7) teilweise umgeben,

**dadurch gekennzeichnet, dass** das Führungsmittel (8, 108) durch Vorformen eines Tiefziehprozesses an der Gebläseabdeckplatte (6) zur Seite des Gebläsefachs (5) hin gebildet ist und einen Umlenker (9) aufweist, der im Vergleich zu einer Ebene der Gebläseabdeckplatte (6) mit einem spitzen Winkel (A) und einer leichten Neigung zur Öffnung (7) hingeneigt ist, und der den Strom der Luft (F) von der Ebene der Gebläseabdeckplatte (6) fort bewegt, bevor er die Öffnung (7) erreicht, und der ein Trägerelement (10) aufweist, das sich vertikal zur Ebene der Gebläseabdeckplatte (6) in der Nähe der Öffnung (7) erstreckt und das den Umlenker (9) trägt.

2. Ofen (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Führungsmittel (8, 108) einen Umlenker (9) aufweist, der mit einem Neigungswinkel (A) von weniger als 45 Grad zur Gebläseabdeckplatte (6) zu der Öffnung (7) hingeneigt ist.
3. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Führungsmittel (8, 108) in der Nähe der Öffnung (7) angeordnet ist, derart, dass ein bestimmter Abstand (B) zwischen dem Trägerelement (10) und der Kante der Öffnung (7) verbleibt.
4. Ofen (1) nach einem der vorangehenden Ansprüche, **gekennzeichnet durch** mehrere horizontale Führungsmittel (8), die sich zwischen der Öffnung (7) und der oberen oder unteren Wand der Gebläseabdeckplatte (6) erstrecken, und **durch** mehrere vertikale Führungsmittel (108), die sich zwischen der Kante der Öffnung (7) und der Seitenwand der Gebläseabdeckplatte (6) erstrecken.
5. Ofen (1) nach Anspruch 4, **dadurch gekennzeichnet, dass** das horizontale Führungsmittel (8) und das vertikale Führungsmittel (108) jeweils von ihrem einen Ende aus verbunden sind und daher eine L-förmige Erhebung aufweisen, die sich von der Gebläseabdeckplatte (6) zur Seite des Gebläsefachs (5) erstreckt.

## Revendications

1. Un four (1) comprenant
  - un boîtier (2),
  - une chambre de cuisson (3) qui est située dans le boîtier (2) et dans laquelle les plaques dans lesquelles les aliments à cuire sont placés sont disposées,
  - un ventilateur (4) qui est situé au côté où la paroi arrière du boîtier (2) est située, et qui déplace l'air chauffé,
  - un compartiment de ventilateur (5) dans lequel le ventilateur (4) est disposé,
  - une plaque de recouvrement de ventilateur (6) qui sépare la chambre de cuisson (3) et le compartiment de ventilateur (5) dans le boîtier (2),
  - plus d'une ouverture (7) qui est située sur la plaque de recouvrement de ventilateur (6) et qui permet à l'air (F) déplacé par le ventilateur (4) d'être transmis dans la chambre de cuisson (3), plus d'un moyen de guidage (8, 108),
  - qui est situé sur la plaque de recouvrement de ventilateur (6)
  - qui est positionné avant les ouvertures (7) sur la voie d'écoulement de l'air (F) qui se déplace vers l'avant à la surface arrière de la plaque de recouvrement de ventilateur (6) en étant déplacé par le ventilateur (4) par rapport à la direction de rotation du ventilateur (4), et
  - qui entoure partiellement les ouvertures (7),

**caractérisé par** le moyen de guidage (8, 108) qui est formé en effectuant l'emboutissage profond sur la plaque de recouvrement de ventilateur (6) vers le côté du compartiment de ventilateur (5) et qui présente un déflecteur (9) qui penche vers l'ouverture (7) avec un angle aigu (A) par rapport au plan de la plaque de recouvrement de ventilateur (6) et avec une légère inclinaison, et qui déplace l'air (F) écoulant à partir du plan de la plaque de recouvrement de ventilateur (6) avant qu'il atteigne l'ouverture (7), et qui présente un élément de support (10) qui s'étend presque perpendiculairement au plan de la plaque de recouvrement de ventilateur (6) à proximité de l'ouverture (7) et qui supporte le déflecteur (9).
2. Un four (1) selon la Revendication 1, **caractérisé par** le moyen de guidage (8, 108) qui présente un déflecteur (9) qui penche vers l'ouverture (7) avec un angle d'inclinaison (A) de moins de 45 degrés par rapport à la plaque de recouvrement de ventilateur (6).
3. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le moyen de guidage (8, 108) qui est positionné à proximité de l'ouverture (7) de telle sorte qu'une certaine distance

(B) reste entre l'élément de support (10) et le bord de l'ouverture (7).

4. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé par** plus d'un moyen de guidage horizontal (8) qui s'étend entre l'ouverture (7) et la paroi supérieure ou inférieure de la plaque de recouvrement de ventilateur (6), et par plus d'un moyen de guidage vertical (108) qui s'étend entre le bord de l'ouverture (7) et la paroi latérale de la plaque de recouvrement de ventilateur (6).
5. Un four (1) selon la Revendication 4, **caractérisé par** le moyen de guidage horizontal (8) et le moyen de guidage vertical (108) qui sont joints à partir d'une extrémité chacune et donc, qui forment un gaufrage en L qui s'étend à partir de la plaque de recouvrement de ventilateur (6) vers le côté du compartiment de ventilateur (5).

Figure 1

PRIOR ART

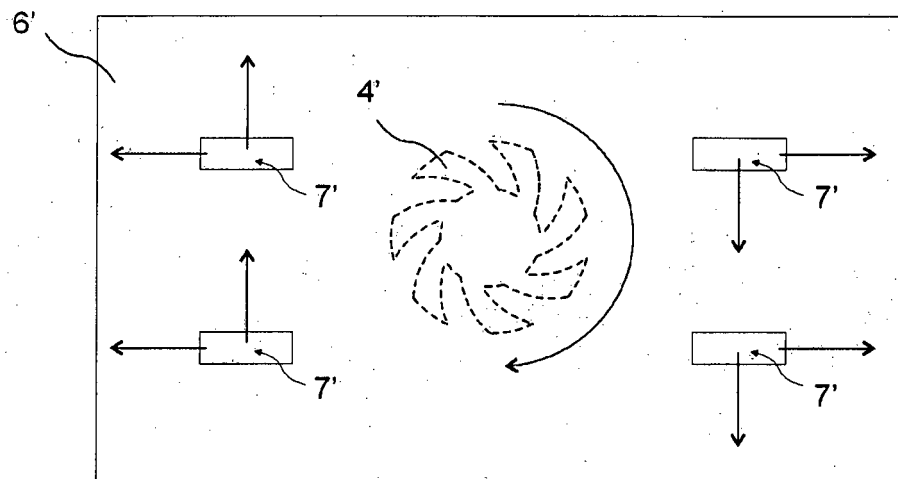


Figure 2

PRIOR ART

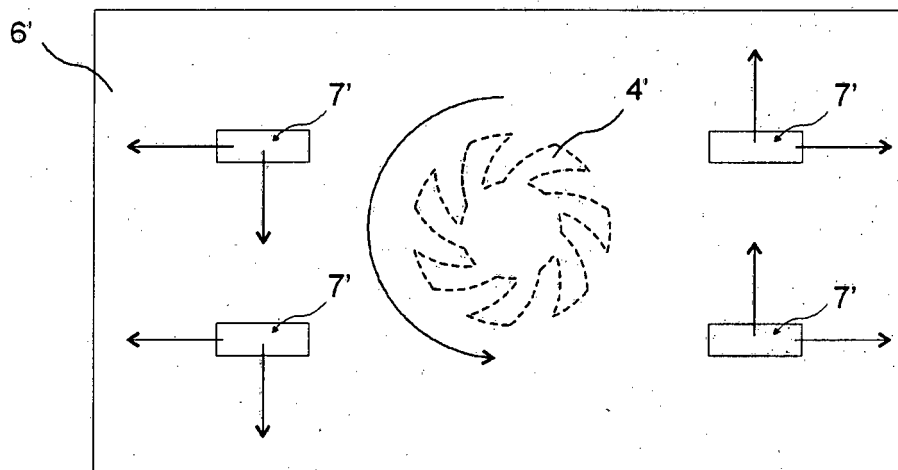


Figure 3

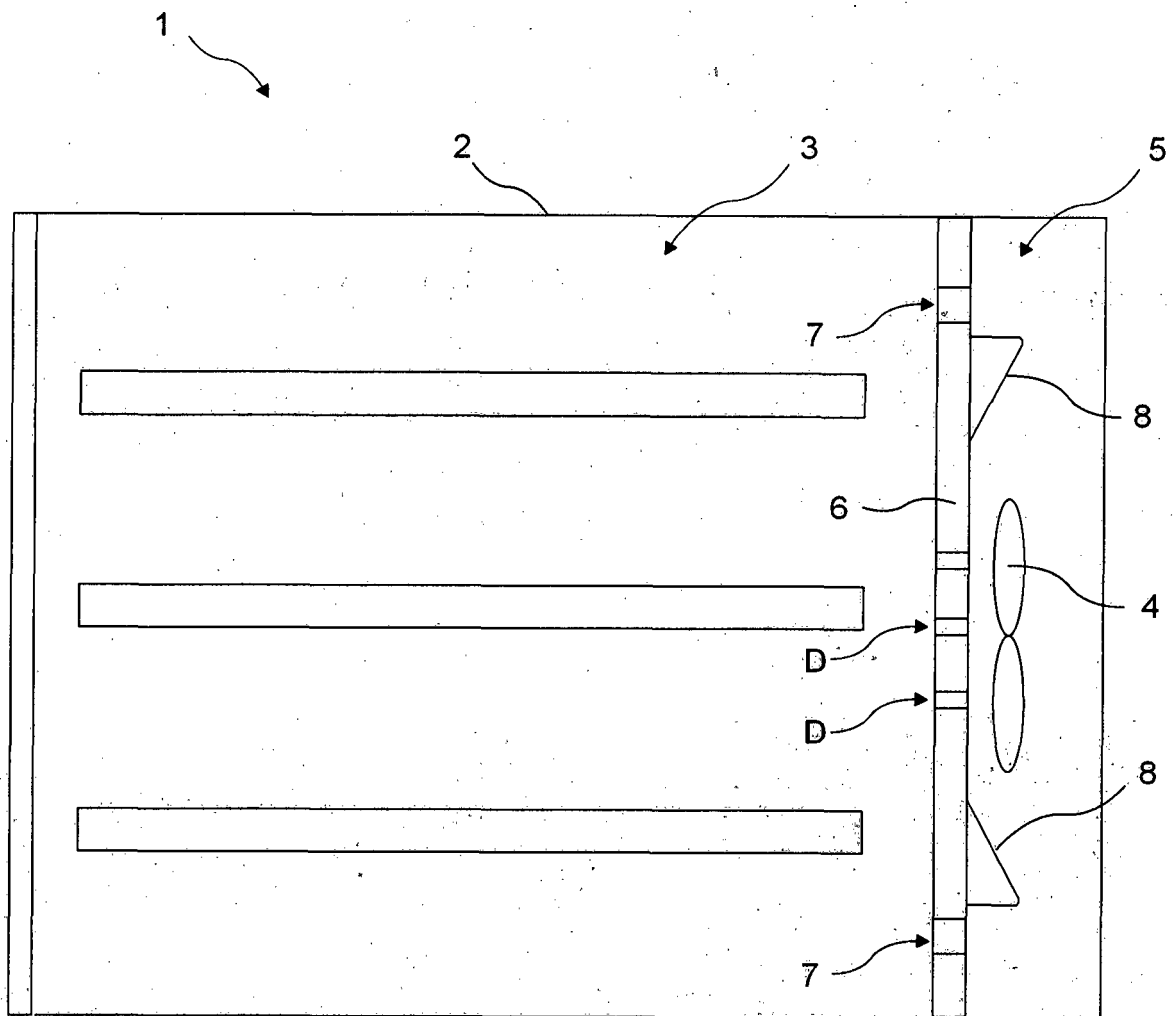




Figure 4

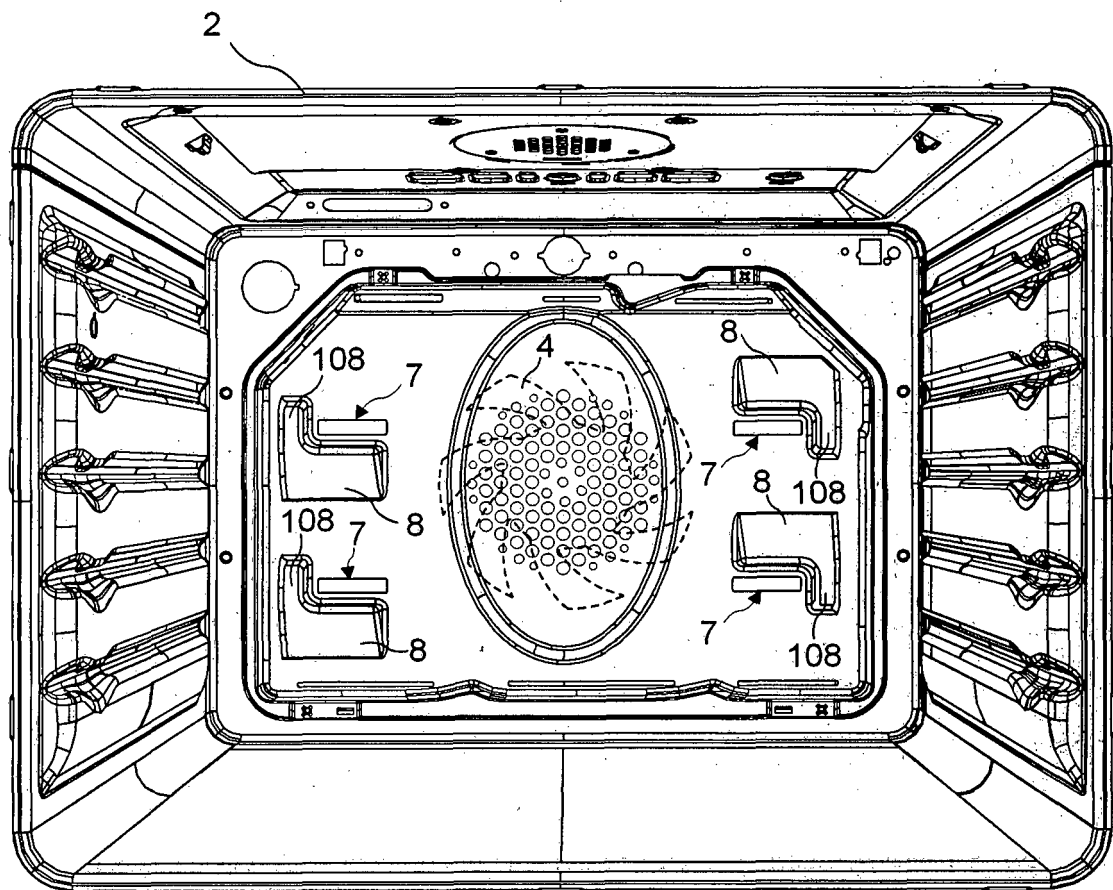
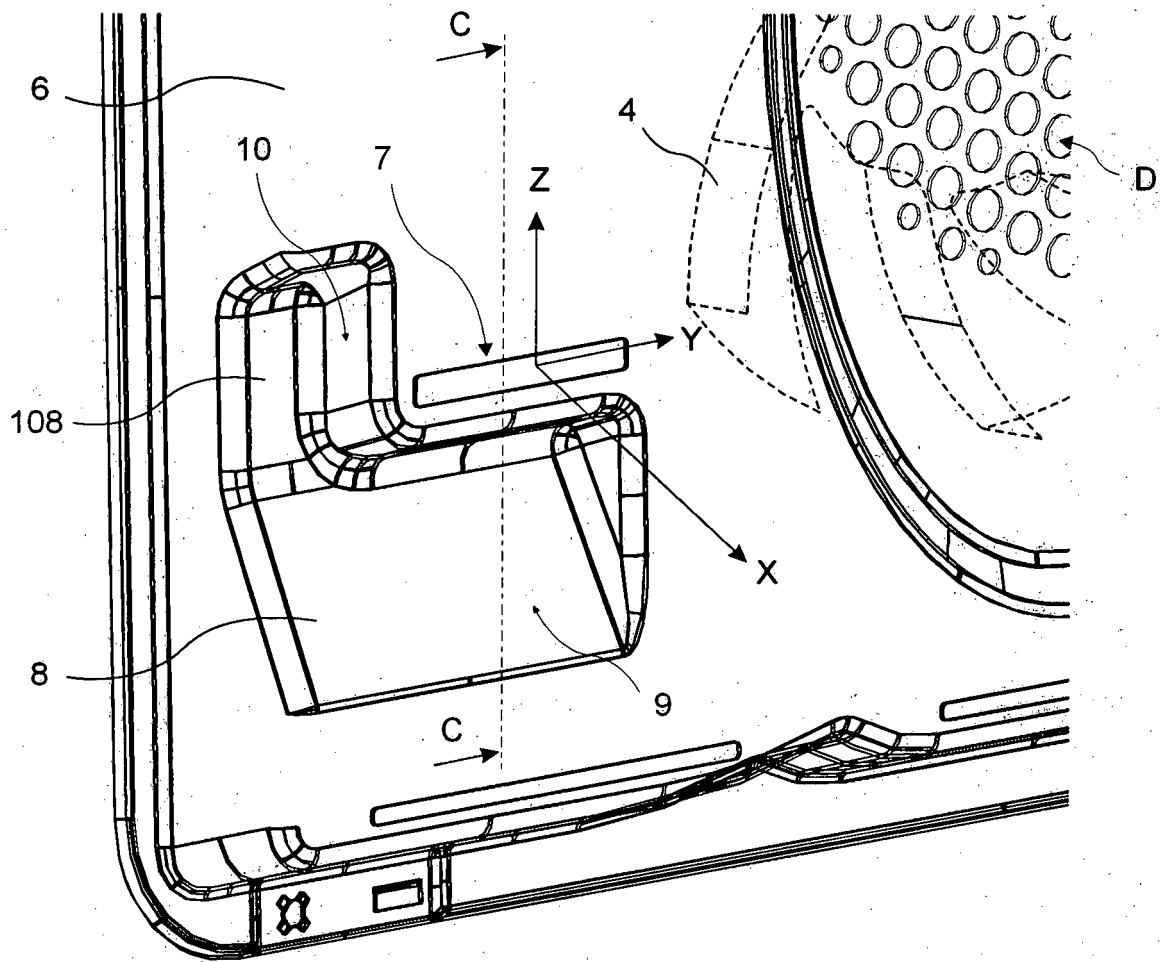
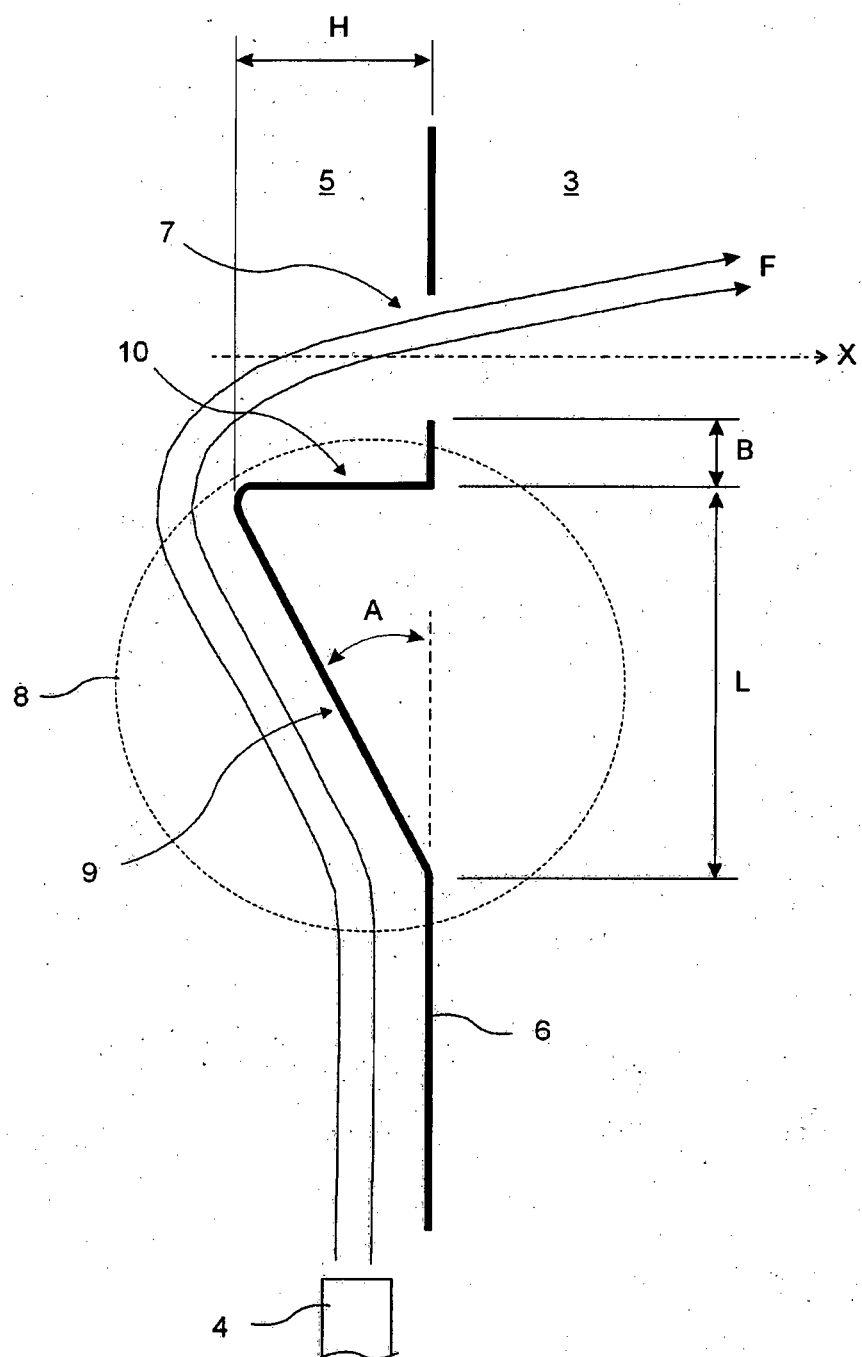


Figure 5



### Figure 6



**REFERENCES CITED IN THE DESCRIPTION**

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