

(19)



(11)

EP 2 333 424 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
05.09.2018 Bulletin 2018/36

(51) Int Cl.:
F24C 15/00 ^(2006.01) **F24C 15/04** ^(2006.01)

(21) Application number: **09015285.1**

(22) Date of filing: **10.12.2009**

(54) **A VENTED OVEN DOOR FOR A DOMESTIC COOKING OVEN**

HERDTÜR MIT BELÜFTUNG FÜR EINEN HAUSHALTSHERD

PORTE VENTILÉE POUR FOUR DE CUISSON DOMESTIQUE

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR**

(43) Date of publication of application:
15.06.2011 Bulletin 2011/24

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EP-A2- 1 731 843 US-A- 5 918 589**

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Description

[0001] The present invention relates to a vented oven door for a domestic cooking oven according to the preamble of claim 1. Further, the present invention relates to a domestic cooking oven with a vented oven door according to the preamble of claim 7.

The vented oven door of the cooking oven allows low temperatures at the outer side of the oven door, so that there is no danger of being burnt for the user of the cooking oven. The heat transfer from an inner glass panel being in contact with the oven cavity to an outer glass panel being in contact with the ambient is a combination of three different heat transfer modes. There is heat radiation from the surfaces of the inner glass panel, heat convection within the inner space of the oven door and heat conduction within the glasses of the glass panels. When a door channel inside the oven door is connected to a cooling channel, then a forced convection cools down the glass panels. The cooling channel sucks cool air from the ambient through the inner space of the oven door. For example, the cooling channel may be arranged on the top wall of the oven cavity and the cool air streams upwards through the inner space of the oven door.

EP 1 972 855 A1 discloses a cooking oven with an air cooled oven door. The oven door includes an inner and outer door channel. The inner door channel is connected to the suction side of air moving means, so that an air flow rises through said inner door channel to a suction duct of the air moving means. Then the air stream is blown out by the air moving means, wherein said air stream passes an upper end of the outer door channel without passing through the outer door channel.

[0002] However, the hot surfaces of the glass panel being in direct with the oven cavity are cooled down, so that also the oven cavity is undesirably cooled down. This results in low cooking performances and high energy consumption.

EP 0 964 208 A1 discloses a cooking oven with an air cooled oven door including an inner and an outer door channel. The inner and outer door channels are connected to the same components in each case. According to one embodiment the inner and outer door channels are both connected to a suction of a cooling channel. According to another embodiment the inner and outer door channels are both connected to the ambient and an exhaust of the cooling channel. EP 1 726 883 A1 describes a cooking oven having at least three glass panels forming two air passages for cooling the door.

[0003] US 5 918 589 describes a broil oven with a door having a door partition which splits the incoming air so that the inner air goes through the oven door near the oven cavity. A portion of the airflow travels on the front side of the partition and exits the door through a plurality of slits.

[0004] EP 1 731 843 A2 describes an oven that is capable of discharging hot air generated when cooling a door and heat generated in a cooking chamber through

the lower end of the door.

[0005] It is an object of the present invention to provide an improved vented oven door for a domestic cooking oven, which allows an efficient cooling down of the oven door and prevents high energy consumption.

The object of the present invention is achieved by the vented oven door for a domestic cooking oven according to claim 1.

According to the present invention at least one upper opening of at least one inner door channel is connected or connectable to the ambient on the one hand and an exhaust of the cooling channel on the other hand in the closed state of the oven door, so that an inner air stream from the inner door channel is entrained by the air from the exhaust and runs into the ambient.

The main idea of the present invention is the forced heat convection in the outer door channel of the oven door on the one hand and the entrainment of the air stream from the inner door channel by the air stream from the cooling channel on the other hand. Additionally, the air stream from the inner door channel is driven by the natural heat convection flow due to the temperature gradient. This constellation allows an intensive cooling process in the outer portion of the oven door and prevents an intensive cooling down of the inner side of oven door, so that energy can be saved.

[0006] According to a preferred embodiment of the present invention the oven door comprises a door cap defining at least one upper opening of the outer door channel. In a similar way, the oven door may comprise a door cap defining at least one upper opening of the inner door channel. The door cap is producible by low costs.

[0007] Preferably, at least one of the door channels is aligned along a vertical direction. Further, at least one of the door channels may span nearly the complete width of the oven door. This contributes to an efficient cooling down.

[0008] For example, the glass panels are arranged plane-parallel. Alternatively, the glass panels may be slanted, so that the cross section of the door channels can vary.

[0009] The object of the present invention is further achieved by a domestic cooking oven according to claim 7.

[0010] The domestic cooking oven according to the present invention comprises a vented oven door and a cooling channel with air moving means, at least one suction and at least one exhaust, the cooking oven comprises at least one oven door as described above.

[0011] Preferably, the cooling channel is arranged on a top wall of an oven cavity.

[0012] Novel and inventive features of the present invention are set forth in the appended claims.

[0013] The present invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a schematic sectional side view of an

upper portion of a vented oven door for a domestic oven according to a preferred embodiment of the present invention, and

FIG 2 illustrates the schematic sectional side view of the upper portion of the vented oven door with pictured airstreams according to the preferred embodiment of the present invention.

[0014] FIG 1 illustrates a schematic sectional side view of an upper portion of a vented oven door 10 for a domestic oven according to a preferred embodiment of the present invention. In FIG 1 the oven door 10 is a closed state.

[0015] The oven door 10 includes an outer glass panel 12, a central glass panel 14 and an inner glass panel 16. In this example, the outer glass panel 12, the central glass panel 14 and the inner glass panel 16 are arranged plane-parallel to each other. An outer door channel 18 is arranged between the outer glass panel 12 and the central glass panel 14. In a similar way, an inner door channel 20 is arranged between the central glass panel 14 and the inner glass panel 16. The outer door channel 18 and the inner door channel 20 are aligned along vertical directions within the oven door 10. Preferably, the outer door channel 18 and the inner door channel 20 span nearly the complete width of the oven door 10.

[0016] A door cap 22 is arranged on the upper side of the oven door 10. The structure of the door cap 22 defines the upper openings of the outer door channel 18 and the inner door channel 20. The upper opening of the outer door channel 18 is substantially directed to the inner side of the oven door 10. In contrast, the upper opening of the inner door channel 20 is directed to the outer side of the oven door 10 and to the ambient.

[0017] A cooling channel with air moving means is arranged on the top wall of the oven cavity. A suction 24 and an exhaust 26 of the cooling channel are arranged above an opening of the oven cavity. In the closed state of the oven door 10 the suction 24 of the cooling channel is arranged besides the upper end of said oven door 10. Further, the exhaust 26 of the cooling channel is arranged above the upper end of the oven door 10 in the closed state of said oven door 10. Preferably, the suction 24 and the exhaust 26 of the cooling channel span nearly the complete width of the oven door 10.

[0018] In the closed state of the oven door 10 the upper opening of the outer door channel 18 is connected to the suction 24 of the cooling channel. This structure results in forced heat convection. Air from the ambient is sucked by the air moving means upwards through the outer door channel 18, so that in particular an outer portion of the oven door is cooled down.

[0019] In contrast, the upper opening of the inner door channel 20 is connected to the ambient on the one hand and to the exhaust 26 of the cooling channel on the other in the closed state of the oven door 10. This constellation results in an entrainment of the air from the inner door

channel 20 by the air stream from the exhaust 26. Thus, the air from the inner door channel 20 is entrained to the ambient.

[0020] The more intensive heat convection occurs in the outer door channel 18 than in the inner door channel 20. This allows an efficient cooling down of the oven door 10 on the one hand and prevents an intensive cooling down of the inner side of the oven door 10.

[0021] FIG 2 illustrates the schematic sectional side view of the upper portion of the vented oven door 10 with pictured airstreams 28, 30 and 32 according to the preferred embodiment of the present invention. FIG 2 clarifies the runs of the airstreams 28, 30 and 32 form the oven door 10 and in the cooling channel. FIG 2 shows the same sectional side view of the upper portion of the oven door 10 as in FIG 1.

An outer air stream 28 from the outer door channel 18 runs into the suction 24 of the cooling channel. Said outer air stream 28 is driven by the air moving means of the cooling channel, so that forced heat convection occurs in the outer door channel 18. An inner air stream 30 from the inner door channel 20 runs into the ambient, wherein said inner air stream 30 is entrained by a cooling air stream 32 from the exhaust 26. Said cooling air stream 32 is driven by the air moving means of the cooling channel.

In this constellation more heat convection occurs in the outer door channel 18 than in the inner door channel 20. This allows the efficient cooling down of the oven door 10 on the one hand and prevents the intensive cooling down of the inner side of oven door 10.

A simplified variation of the present invention would be an oven door without the outer door channel 18. The oven door according to said variation includes only the central glass panel 14, the inner glass panel 16, the inner channel 20 and optionally the door cap 22. The cooling effect will be obtained by the entrainment of the inner air stream 30 and by the natural convection flow in the inner channel 20.

List of reference numerals

[0022]

10	oven door
12	outer glass panel
14	central glass panel
16	inner glass panel
18	outer door channel
20	inner door channel
22	door cap
24	suction
26	exhaust
28	outer air stream
30	inner air stream
32	cooling air stream

Claims

1. A vented oven door for a domestic cooking oven, wherein:

- the oven door (10) comprises at least three glass panels (12, 14, 16),
 - the inner space of the oven door (10) is subdivided into at least two door channels (18, 20) by the at least three glass panels (12, 14, 16), and
 - at least one upper opening of at least one outer door channel (18) is connected or connectable to a suction (24) of a cooling channel with air moving means in a closed state of the oven door (10), so that an outer air stream (28) from the outer door channel (18) runs into the suction (24) of the cooling channel,

characterized in that

- at least one upper opening of at least one inner door channel (20) is connected or connectable to the ambient on the one hand and an exhaust (26) of the cooling channel on the other hand in the closed state of the oven door (10), so that an inner air stream (30) from the inner door channel (20) is entrained by the air from the exhaust (26) and runs into the ambient.

2. The vented oven door according to claim 1,

characterized in that

the oven door (10) comprises a door cap (22) defining at least one upper opening of the outer door channel (18).

3. The vented oven door according to claim 1 or 2,

characterized in that

the oven door (10) comprises a door cap (22) defining at least one upper opening of the inner door channel (20).

4. The vented oven door according to any one of the preceding claims,

characterized in that

at least one of the door channels (18, 20) is aligned along a vertical direction.

5. The vented oven door according to any one of the preceding claims,

characterized in that

at least one of the door channels (18, 20) span nearly the complete width of the oven door (10).

6. The vented oven door according to any one of the preceding claims,

characterized in that

the glass panels (12, 14, 16) are arranged plane-parallel.

7. A domestic cooking oven comprising a vented oven

door and a cooling channel with air moving means, at least one suction (24) and at least one exhaust (26),

characterized in that

the cooking oven comprises at least one oven door (10) according to any one of the claims 1 to 6.

8. The domestic cooking oven according to claim 7,

characterized in that

the cooling channel is arranged on a top wall of an oven cavity.

Patentansprüche

1. Herdtür mit Belüftung für einen Haushaltsherd, wobei:

- die Herdtür (10) mindestens drei Glasplatten (12, 14, 16) aufweist,

- der Innenraum der Herdtür (10) durch die mindestens drei Glasplatten (12, 14, 16) in mindestens zwei Türkanäle (18, 20) unterteilt ist, und

- mindestens eine obere Öffnung von mindestens einem äußeren Türkanal (18) mit einer Ansaugung (24) eines Kühlkanals mit Luftbewegungsmitteln in einem geschlossenen Zustand der Herdtür (10) verbunden oder verbindbar ist, sodass ein Außenluftstrom (28) vom äußeren Türkanal (18) in die Ansaugung (24) des Kühlkanals läuft,

dadurch gekennzeichnet, dass

- mindestens eine obere Öffnung von mindestens einem inneren Türkanal (20) im geschlossenen Zustand der Herdtür (10) mit der Umgebung auf der einen Seite und einem Auslass (26) des Kühlkanals auf der anderen Seite verbunden oder verbindbar ist, sodass ein Innenluftstrom (30) vom inneren Türkanal (20) durch die Luft vom Auslass (26) mitgenommen wird und in die Umgebung läuft.

2. Herdtür mit Belüftung nach Anspruch 1,

dadurch gekennzeichnet, dass

die Herdtür (10) eine Türkappe (22) aufweist, die mindestens eine obere Öffnung des äußeren Türkanals (18) definiert.

3. Herdtür mit Belüftung nach einem der Ansprüche 1 oder 2,

dadurch gekennzeichnet, dass

die Herdtür (10) eine Türkappe (22) aufweist, die mindestens eine obere Öffnung des inneren Türkanals (20) definiert.

4. Herdtür mit Belüftung nach einem der vorhergehenden Ansprüche,

dadurch gekennzeichnet, dass

mindestens einer der Türkanäle (18, 20) entlang einer vertikalen Richtung ausgerichtet ist.

5. Herdtür mit Belüftung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass
mindestens einer der Türkanäle (18, 20) nahezu die vollständige Breite der Herdtür (10) überspannt.
6. Herdtür mit Belüftung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass
die Glasplatten (12, 14, 16) planparallel angeordnet sind.
7. Haushaltsherd, aufweisend eine Herdtür mit Belüftung und einen Kühlkanal mit Luftbewegungsmitteln, mindestens einer Ansaugung (24) und mindestens einem Auslass (26),
dadurch gekennzeichnet, dass
der Herd mindestens eine Herdtür (10) nach einem der Ansprüche 1 bis 6 aufweist.
8. Haushaltsherd nach Anspruch 7,
dadurch gekennzeichnet, dass
der Kühlkanal an einer oberen Wand eines Herdhohlraums angeordnet ist.

Revendications

1. Porte ventilée pour four de cuisson domestique,
- la porte de four (10) comprenant au moins trois panneaux de verre (12, 14, 16),
- l'espace interne de la porte de four (10) étant divisé en au moins deux canaux de porte (18, 20) par les au moins trois panneaux de verre (12, 14, 16), et
- au moins une ouverture supérieure d'au moins un canal de porte externe (18) étant ou pouvant être reliée à une aspiration (24) d'un canal de refroidissement avec un moyen de déplacement d'air dans un état fermé de la porte de four (10), de sorte qu'un courant d'air externe (28) provenant du canal de porte externe (18) s'écoule dans l'aspiration (24) du canal de refroidissement,
caractérisé en ce que
- au moins une ouverture supérieure d'au moins un canal de porte interne (20) est ou pouvant être reliée à l'air ambiant d'une part et à un échappement (26) du canal de refroidissement d'autre part dans l'état fermé de la porte de four (10), de sorte qu'un courant d'air interne (30) provenant du canal de porte interne (20) soit entraîné par l'air provenant de l'échappement (26) et s'écoule dans l'air ambiant.

2. Porte ventilée pour four selon la revendication 1,
caractérisée en ce que
la porte de four (10) comprend un capuchon de porte (22) définissant au moins une ouverture supérieure du canal de porte externe (18).
3. Porte ventilée pour four selon la revendication 1 ou 2,
caractérisée en ce que
la porte de four (10) comprend un capuchon de porte (22) définissant au moins une ouverture supérieure du canal de porte interne (20).
4. Porte ventilée pour four selon l'une quelconque des revendications précédentes,
caractérisée en ce que
au moins l'un des canaux de porte (18, 20) est aligné le long d'une direction verticale.
5. Porte ventilée pour four selon l'une quelconque des revendications précédentes,
caractérisée en ce que
au moins l'un des canaux de porte (18, 20) couvre presque toute la largeur de la porte de four (10).
6. Porte ventilée pour four selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les panneaux de verre (12, 14, 16) sont disposés sur le plan parallèle.
7. Four de cuisson domestique comprenant une porte de four ventilée et un canal de refroidissement avec un moyen de déplacement d'air, au moins une aspiration (24) et au moins un échappement (26),
caractérisé en ce que
le four de cuisson comprend au moins une porte de four (10) selon l'une quelconque des revendications 1 à 6.
8. Four de cuisson domestique selon la revendication 7,
caractérisé en ce que
le canal de refroidissement est disposé sur une paroi supérieure d'une cavité de four.

FIG 1

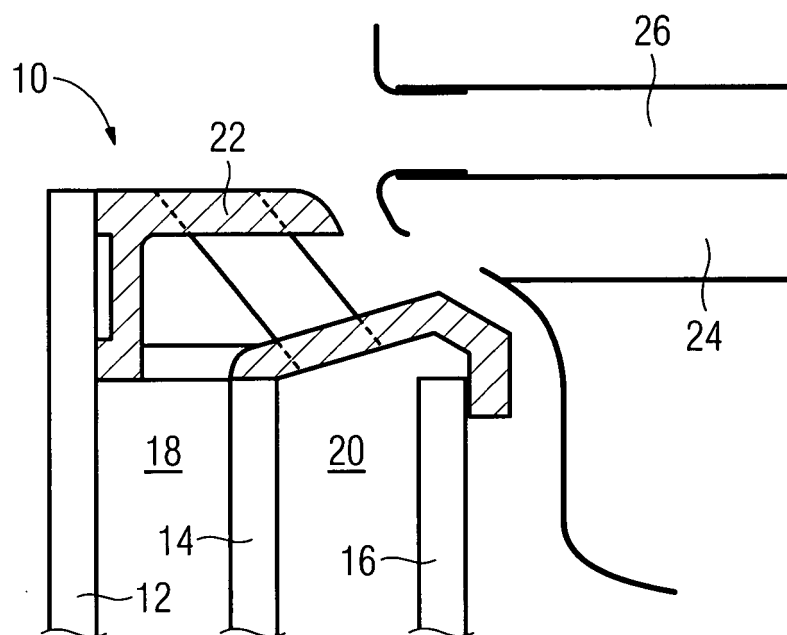
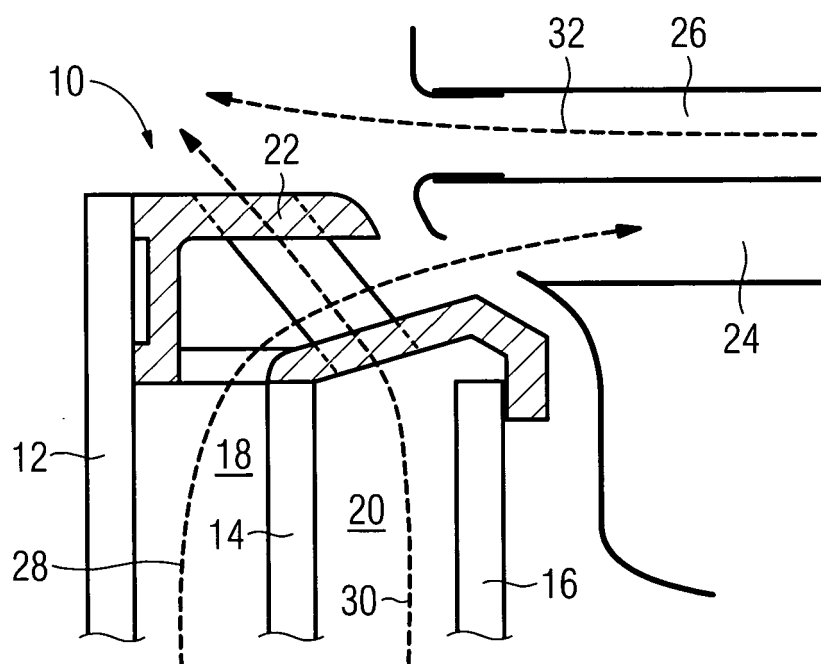


FIG 2



REFERENCES CITED IN THE DESCRIPTION

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