(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 905 545 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
10.06.2020 Bulletin 2020/24

(51) Int Cl.:
F24C 15/20 *(2006.01)*

(21) Application number: **15151862.8**

(22) Date of filing: **20.01.2015**

(54) **An electric oven assembly**

Elektrische Ofenanlage

Ensemble de four électrique

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR

(30) Priority: **20.01.2014 GB 201400934**

(43) Date of publication of application:
12.08.2015 Bulletin 2015/33

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Printed by Jouve, 75001 PARIS (FR)

Description

[0001] This invention relates to improvements in electric oven assemblies, in particular to fan assisted electric ovens.

[0002] Electric ovens are well known, and in general comprise an oven cavity, with walls typically formed from pressed metal sheets and a door, that is surrounded by insulation material contained within a main body. The main body may contain more than one such cavity, and is sometimes topped with a heating plate to allow food to be cooked in pans or trays placed on the heating plate.

[0003] The temperature inside the cavity it raised using one or more electric heating elements that are located inside the cavity or within a chamber that is connected to cavity, or even in the walls of the cavity. A fan helps to circulate the heated air around the cavity to minimise the generation of localised hot spots. Experiments have shown that an electric oven can achieve high levels of efficiency

To minimise the amount of fuel (electricity) needed to achieve the desired temperatures during use of the oven, considerable effort is made to eliminate holes through which the heat can escape. Common areas are the seal of the door to the oven walls and production holes, for instance at the corners of pressed sheets used to form the walls. A side effect of this sealing is that steam produced in the cooking process is trapped in the cavity. On opening the door this steam can suddenly "burst" out which could burn the user if care is not taken. For instance, commonly cooked foods such as frozen oven chips contain large amounts of water and will produce correspondingly large amounts of steam during cooking.

[0004] EP 0 598 211 A1 discloses an oven according to the preamble of claim 1.

[0005] An object of the present invention is to ameliorate the problems associated with well sealed oven cavities.

[0006] According to a first aspect the invention provides an electric oven assembly comprising:

an oven cavity having walls and a door,
insulation material surrounding the cavity
one or more electric heating elements that are operable to heat the inside the cavity ;
a vent which is in communication with the inside of the cavity through which steam can pass that has been produced inside the cavity at times when the door is closed; and
a closure means that controls the passage of steam through the vent, when closed the closure means sealing off the vent to prevent the release of hot air and steam from the cavity and when open the closure means permitting the escape of hot air and steam from the cavity through the vent.

[0007] Providing a vent through which steam can escape, even when the oven door is closed, reduces the risk of the user being burnt as the door is open. At the same time, providing a means for closing the vent at times when a lot of steam is not being produced, such as on initial heating and warm up of the cavity prior to use to heat food items or when the foodstuff does not contain a lot of water, ensures that valuable heat energy is not lost from the cavity through the vent.

[0008] The vent may comprise a hollow channel, such as a pipe, that has one open end in communication with the inside of the cavity and an opposite open end that is in communication with the air outside of the cavity. The pipe may be located outside of the cavity.

[0009] Alternatively, the vent may simply comprise an opening cut into one or more walls (side, base or top) of the oven cavity through which steam can pass and which is selectively blocked by the closure means.

[0010] The oven may comprise a main body having a base, sides and front and back walls, the cavity and insulation being located inside the main body, the free end of the vent being positioned so that the escaping steam is able to vent outside of the main body. The vent may be arranged so that steam escapes the main body at a safe location away from the door of the cavity so that escaping steam does not inconvenience a user, e.g. at the rear of the chassis towards the top of the oven.

[0011] The closure means is adapted to open automatically when the temperature inside the cavity or the vent reaches a first predefined temperature and to close automatically when the temperature drops to a second predefined temperature. The first and second predefined temperatures may be same or the first may be higher than the second giving a degree of hysteresis.

[0012] The closure means may comprise a variable throttle. This may have two positions, fully open and fully closed and move between the two rapidly. Alternatively it may be capable of holding any position between fully open and fully closed to provide fine control of the amount that the vent is open.

[0013] The throttle may comprise a valve such as a slide valve or butterfly valve. It may comprise a flap which moves relative to the vent.

[0014] The closure means may include an actuator that causes the throttle or choke to move thereby to open and close the closure means.

[0015] The actuator may comprise a bimetallic strip that is exposed to the heated air in the cavity or vent. This will enable the vent to open and close automatically.

[0016] The closure means may alternatively of additionally be adapted to be moved from an open to a closed position and vice versa manually. Thus, a user operable means may be provided which can be pushed or pulled to move the flap. Alternatively, the closure may be powered and a means for allowing the user to cause the power to move the closure may be provided. For instance, a solenoid may be provided that is operated when a user presses a button or other operating means.

[0017] The closure means may open and close in response to a signal from a timer. For instance, when the

oven is first switched on it may be assumed that it will take a defined time to reach a temperature at which steam may be produced, and during until that time has elapsed the closure means may be closed, opening after the time has elapsed. This time may be set as a function of the power applied to the heating element or elements and perhaps also the size of the cavity.

[0018] Where the closure means operates automatically, it may be possible to manually override it. For example, two throttles may be provided one operating automatically and the other manually.

[0019] The closure means may be located inside the cavity or outside of the cavity.

[0020] The oven may include a fan which in use causes the air inside the cavity to circulate around the cavity. The oven may include a control circuit that enables a user to set the temperature within the cavity by controlling the flow of current from a power supply through the at least one heating element.

[0021] The oven may include more than one cavity, in which case each may be provided with a respective vent and an associated closure means. This allows each cavity to be individually vented. This will allow more economical operation of multiple ovens by only venting each cavity when needed or wanted.

[0022] The electric oven assembly may comprise a part of a range style cooker, which may include multiple oven assemblies and a hotplate. It may form part of other styles of cooker, for instance those intended to be built into kitchen furniture are referred to commonly as integrated appliances.

[0023] There will now be described, by way of example only, several embodiments of the present invention with reference to the accompanying drawings of which:

Figure 1 is a front view of a representative range cooker that falls within the scope of the present invention;

Figure 2 is a cross sectional view from the front of one oven assembly of the range cooker of Figure 1;

Figure 3 is an enlarged view of a first arrangement of a closure means that may be provided in the oven assembly of Figure 2;

Figure 4 is an enlarged view of a second arrangement of a closure means that may be provided in the oven assembly of Figure 2;

Figure 5 is an enlarged view of a third arrangement of a closure means that may be provided in the oven assembly of Figure 2;

[0024] As shown in Figure 1, a range style cooker 1 comprises a main body 2 or chassis which is generally box like with left and right walls, a rear wall and a front wall, all formed as pressed steel panels. The base of the chassis is supported on adjustable legs (not shown) hidden behind a plinth 3. At the top of the front wall is a control panel 4 which carries knobs 5 enabling a user to operate the oven. The top of the chassis is finished with a hotplate 6 having multiple heating zones. Range style cookers of this form are widely known, and typically have a width of between 60 and 150cm, with a depth of around 60cm for compatibility with standard unit sizes in a fitted style kitchen.

[0025] In this example, the main body 2 of the appliance contains three oven cavities of differing shapes and internal volumes, each of which is located behind an insulated door 7 that is sealed around its edge to an opening in the front wall of the main body. Of course, there may be as few as one cavity in the main body, depending on the size of cavity required and the size of the main body.

[0026] One of the cavities is shown in cross section in Figure 2. The cavity 8 comprises a box 9 made up of substantially rectangular pressed steel walls. The box 9 is surrounded by an insulating material 10 such as mineral wool. Within the rear wall of the cavity 9 is a circular opening 11 with an electric fan 12 and behind the fan is a heating element 13. The element 13 is a resistive heating element which heats the surrounding air as current is passed through it, and the fan blows this heated air around the cavity. The oven in this configuration is a so called fan assisted electric oven.

[0027] The cavity 9 is sealed apart from an opening at the front which is in register with the door, and a vent 14 which is connected to an opening in a wall of the cavity. The vent is separate from the door, by which we mean that air can pass through the vent even when the door is closed. As shown the vent is in the base but it could be located in any of the walls and a preferred location might be towards the top left area (when viewed looking into the cavity) of the oven back wall. The vent in this example comprises a pipe 14 that extends away from the opening 15, but could simply comprise the opening with the pipe being omitted. The function of the pipe is to guide hot air and steam that passes through the opening towards an outlet in the main body. The vent is provided with a closure means 16. This is shown in general in Figure 2 and Figures 3 to 5 of the accompanying drawings show three possible different arrangements of closure means. In each case the closure means is located inside the oven cavity where it can be easily accessed for maintance, inspection or replacement as required.

[0028] In each case, the closure means 16 provides an important function of preventing air from escaping through the vent at times when there is unlikely to be any steam present in the oven cavity, while being able to open to allow steam to escape when needed.

[0029] Being able to block off the vent with a closure means ensures that heat is not wasted during initial heating of the cavity. At that time, it can be assumed that there is no build up of steam in the cavity as the temperatures are too low for steam to be produced. Direct heat

loss from the cavity is therefore reduced which in turn reduces the amount of energy needed to heat the cavity and any food stuff in the cavity. During the warm up phase, the electric element is typically held on full power for long periods and at this time reducing heat loss can provide a substantial improvement in efficiency.

[0030] Figure 3 shows a first closure means 20 that corresponds with the opening 15. It comprises a plunger type valve 21 that is terminated at one end with a pad 22 that rests against the side walls of the vent opening when the temperature in the cavity is low (i.e. below about 90 degrees). The sides walls define the seat of the valve. The pad 22 is connected to a valve stem 23 that is surrounded by a spring 24. The spring 24 at one end presses on the rear of the pad 22, opposed to the opening, and at the other presses on a support bracket 25. The spring 24 therefore acts to press the valve pad onto the side wall of the opening to keep it firmly closed.

[0031] The stem 23 passes through an opening in the support bracket, and the end of the stem opposed to the pad is provided with a stopper 26 that has a larger width than the stem. Between the stopper 26 and the support bracket 25 are a stack of bimetallic washers 27. The washers function as an actuator that cause the pad to be pulled away from the opening as the temperature exceeds a predetermined value of, perhaps, 90 degrees or so.

[0032] Each washer 27 comprises a bimetallic disk that will deform as the temperature rises, and this deformation of the washers effectively varies the height of the stack.

[0033] Figure 4 shows an alternative closure means 30. This comprises a throttle comprising a pad 31 that rests against the side wall of the opening 15 in the cavity 9. A lever or arm 32 extends from the pad to one end of a bimetallic strip 33. The other end of the bimetallic strip 33 is fixed to a support bracket 34. At low tempertures as shown in Figure 4(a) the pad closes the opening 15. As the temperature rises above a predefined threshold of, say, 90 degrees, the bimetallic strip 33 will start to bend and this causes the pad 31 to move away from the opening. This is shown in Figure 4(b).

[0034] Figure 5 shows an alternative arrangement of a closure means 40. This differs from those of Figure 3 and 4 in that the actuator is no longer automatic, requiring manual intervention to move the closure means from a closed condition to an open condition.

[0035] As shown, the closure means 40 comprises a slide plate 41 that is located in guide rails 42. The slide plate has a hole 43 in it that is complimentary to the opening 15 and can be slid along the rails 42 between a position in which the plate closes off the opening 15 and a position in the hole 43 is aligned with the opening 15 and thus allows steam to pass through. One end of the plate 41 is secured to a spring 44 that tends to pull the plate to the closed position, and the other end of the plate 41 is connected to a handle 45 through a cable 46. An operator can manually open and close the vent by pulling and pushing the handle.

Claims

1. An electric oven assembly comprising:

   an oven cavity (8) having walls and a door, insulation material (10) surrounding the cavity one or more electric heating elements (13) that are operable to heat the inside the cavity ;
   a vent (14) which is in communication with the inside of the cavity through which steam can pass that has been produced inside the cavity at times when the door is closed; and
   a closure (16) that controls the passage of steam through the vent, when closed the closure means sealing off the vent to prevent the release of hot air and steam from the cavity and when open the closure means permitting the escape of hot air and steam from the cavity through the vent **characterised in that** the closure means is adapted to open automatically when the temperature inside the cavity or the vent reaches a first predefined temperature and to close automatically when the temperature drops to a second predefined temperature.

2. An electric oven assembly according to claim 1 in which the vent comprises a hollow channel, such as a pipe, that has one open end in communication with the inside of the cavity and an opposite open end that is in communication with the air outside of the cavity, the closure means selectively blocking a part of the channel.

3. An electric oven according to claim 1 in which the vent comprises an opening cut into one or more walls (side, base or top) of the oven cavity through which steam can pass and which is selectively blocked by the closure means.

4. An electric oven according to any preceding claim in which the closure means comprises a variable throttle.

5. An electric oven according to claim 4 in which the variable throttle comprises a slide valve or butterfly valve or a flap.

6. An electric oven according to claim 4 or claim 5 in which the closure means includes an actuator that causes the throttle or choke to move thereby to open and close the closure means.

7. An electric oven according to claim 6 in which the actuator comprises a bimetallic strip (33) that is exposed to the heated air in the cavity or vent.

8. An electric oven according to any preceding claim in which the closure means may be moved from an

open to a closed position and vice versa manually.

Patentansprüche

1. Elektrische Ofenanlage, umfassend: einen Ofenhohlraum (8) mit Wänden und einer Tür, den Hohlraum umgebendes Dämmmaterial (10), ein oder mehrere elektrische Heizelemente (13), die betrieben werden können, um das Innere des Hohlraums zu heizen; eine Lüftungsöffnung (14), die in Verbindung mit dem Inneren des Hohlraums ist und durch die Dampf passieren kann, der im Inneren des Hohlraums zu Zeiten erzeugt wurde, wenn die Tür geschlossen ist; und einen Verschluss (16), der das Passieren des Dampfs durch die Lüftungsöffnung steuert, wobei das Verschlussmittel im geschlossenen Zustand Lüftungsöffnung abdichtet, um die Freisetzung von heißer Luft und Dampf aus dem Hohlraum zu verhindern, und das Verschlussmittel im offenen Zustand das Entweichen von heißer Luft und Dampf aus dem Hohlraum zulässt, **dadurch gekennzeichnet, dass** das Verschlussmittel angepasst ist, um sich automatisch zu öffnen, wenn die Temperatur im Inneren des Hohlraums oder der Belüftungsöffnung eine erste vordefinierte Temperatur erreicht, und sich automatisch zu schließen, wenn die Temperatur auf eine zweite vordefinierte Temperatur fällt.

2. Elektrische Ofenanlage nach Anspruch 1, wobei die Belüftungsöffnung einen Hohlkanal, wie beispielsweise ein Rohr, umfasst, der ein offenes Ende in Verbindung mit dem Inneren des Hohlraums und ein entgegengesetztes offenes Ende in Verbindung mit der Luft außerhalb des Hohlraums aufweist, wobei das Verschlussmittel selektiv einen Teil des Kanals blockiert.

3. Elektrische Ofenanlage nach Anspruch 1, wobei die Belüftungsöffnung eine in eine oder mehrere Wände (Seite, Unterseite oder Oberseite) des Ofenhohlraums geschnittene Öffnung umfasst, durch die Dampf passieren kann und die selektiv durch das Verschlussmittel blockiert wird.

4. Elektrische Ofenanlage nach einem der vorstehenden Ansprüche, wobei das Verschlussmittel eine verstellbare Drosselvorrichtung umfasst.

5. Elektrische Ofenanlage nach Anspruch 4, wobei die verstellbare Drosselvorrichtung ein Schieberventil oder ein Drosselventil oder eine Drosselklappe umfasst.

6. Elektrische Ofenanlage nach Anspruch 4 oder Anspruch 5, wobei das Verschlussmittel ein Stellglied beinhaltet, das bewirkt, dass sich die Drosselvorrichtung oder Drossel bewegt, um dadurch das Verschlussmittel zu öffnen und zu schließen.

7. Elektrische Ofenanlage nach Anspruch 6, wobei das Stellglied einen Bimetallstreifen (33) umfasst, der der geheizten Luft im Hohlraum oder der Entlüftungsöffnung ausgesetzt ist.

8. Elektrische Ofenanlage nach einem der vorangehenden Ansprüche, wobei das Verschlussmittel manuell von einer offenen in eine geschlossene Position und umgekehrt bewegt werden kann.

Revendications

1. Ensemble de four électrique comprenant : une cavité de four (8) ayant des parois et une porte, un matériau isolant (10) entourant la cavité, un ou plusieurs éléments chauffants électriques (13) qui peuvent être actionnés pour chauffer l'intérieur de la cavité; un évent (14) qui est en communication avec l'intérieur de la cavité à travers lequel peut passer de la vapeur qui a été produite à l'intérieur de la cavité aux moments où la porte est fermée ; et une fermeture (16) qui commande le passage de la vapeur à travers l'évent, lorsqu'il est fermé, le moyen de fermeture fermant hermétiquement l'évent pour empêcher la libération d'air chaud et de vapeur depuis la cavité et lorsqu'il est ouvert, le moyen de fermeture permettant l'échappement d'air chaud et de vapeur depuis la cavité à travers l'évent **caractérisé en ce que** le moyen de fermeture est adapté pour s'ouvrir automatiquement lorsque la température à l'intérieur de la cavité ou de l'évent atteint une première température prédéfinie et pour se fermer automatiquement lorsque la température descend à une deuxième température prédéfinie.

2. Ensemble de four électrique selon la revendication 1, dans lequel l'évent comprend un canal creux, tel qu'un tuyau, qui a une extrémité ouverte en communication avec l'intérieur de la cavité et une extrémité ouverte opposée qui est en communication avec l'air à l'extérieur de la cavité, le moyen de fermeture bloquant sélectivement une partie du canal.

3. Four électrique selon la revendication 1, dans lequel l'évent comprend une ouverture découpée dans une ou plusieurs parois (côté, base ou haut) de la cavité du four à travers laquelle la vapeur peut passer et qui est sélectivement bloquée par le moyen de fermeture.

4. Four électrique selon l'une quelconque des revendications précédentes, dans lequel le moyen de fermeture comprend un papillon variable.

5. Four électrique selon la revendication 4, dans lequel le papillon variable comprend une vanne à tiroir ou une vanne papillon ou un volet.

6. Four électrique selon la revendication 4 ou la revendication 5, dans lequel le moyen de fermeture comprend un actionneur qui amène le papillon ou l'étrangleur à se déplacer pour ouvrir et fermer le moyen de fermeture.

7. Four électrique selon la revendication 6, dans lequel l'actionneur comprend une bande bimétallique (33) qui est exposée à l'air chauffé dans la cavité ou l'évent.

8. Four électrique selon l'une quelconque des revendications précédentes, dans lequel le moyen de fermeture peut être déplacé d'une position ouverte à une position fermée et vice versa manuellement.

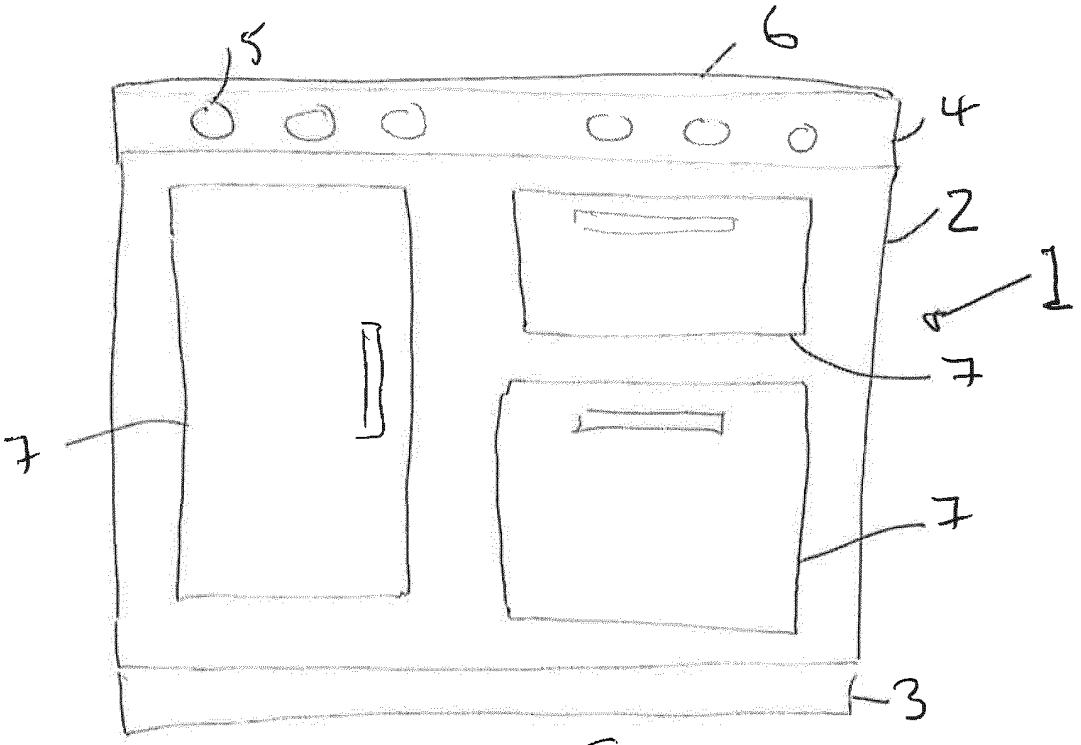


Fig 1

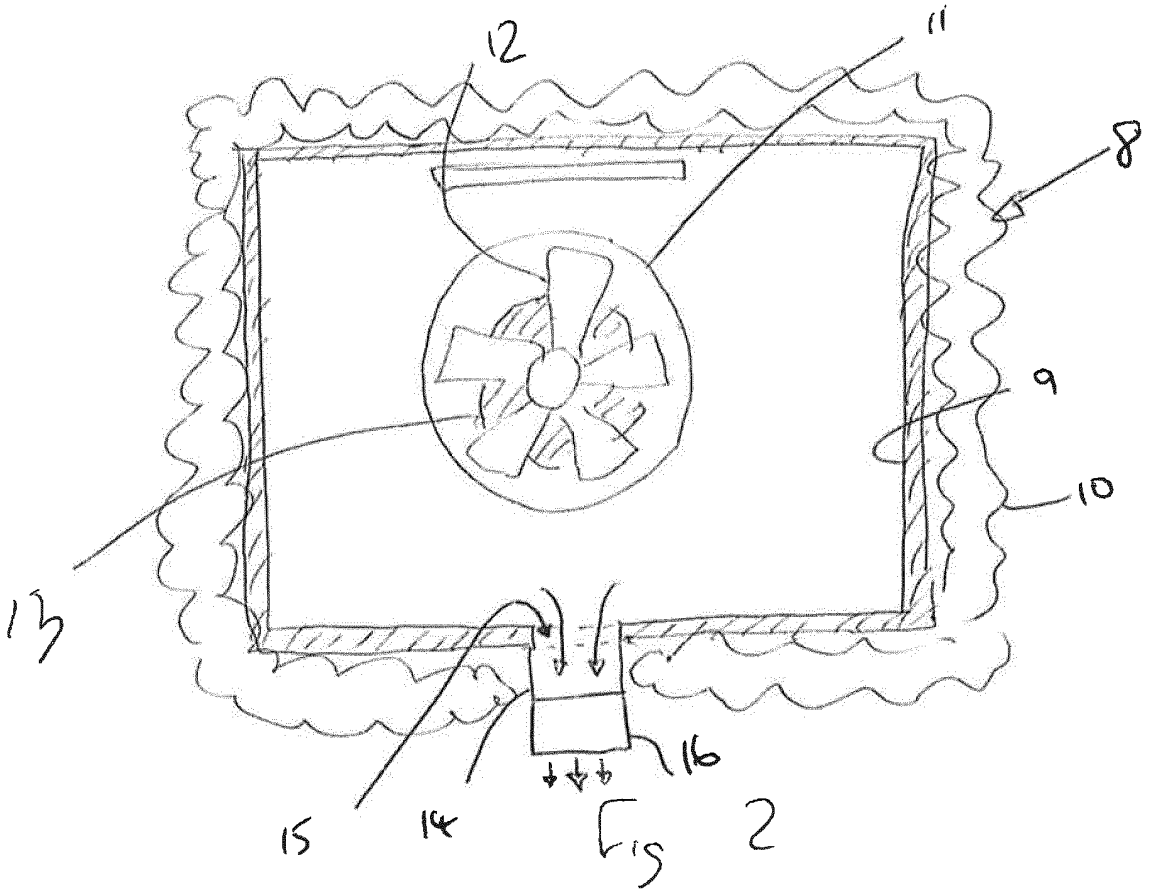


Fig 2

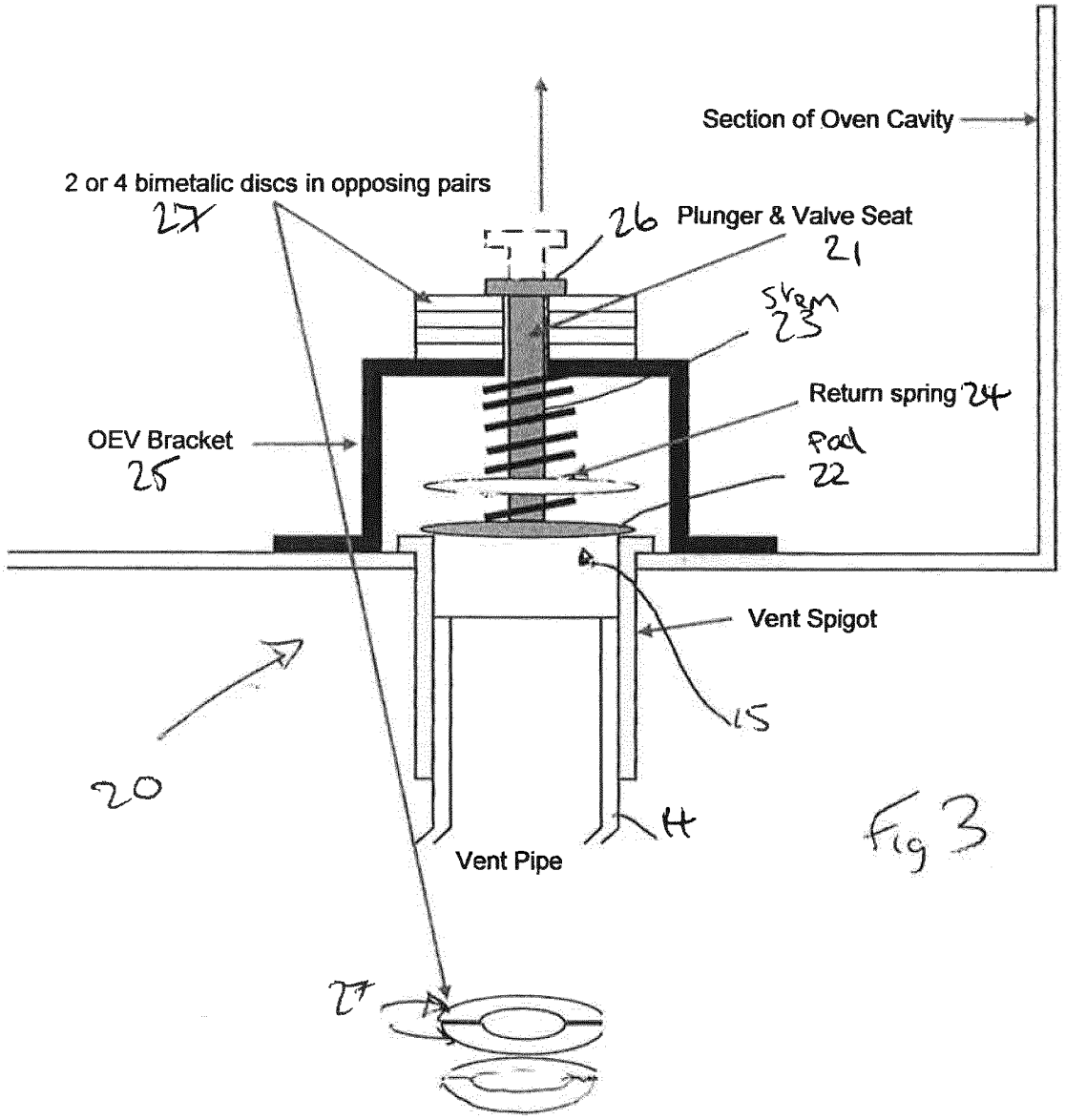

Section of Oven Cavity
2 or 4 bimetalic discs in opposing pairs
27
26
Plunger & Valve Seat
21
Stem
23
Return spring 24
OEV Bracket
25
Pad
22
Vent Spigot
15
20
H
Vent Pipe
27

Fig 3

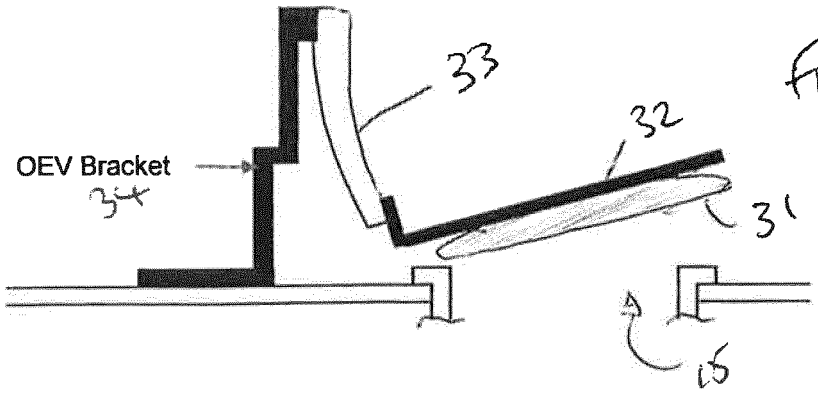

33
32
OEV Bracket
34
31
15

Fig 4 (b)

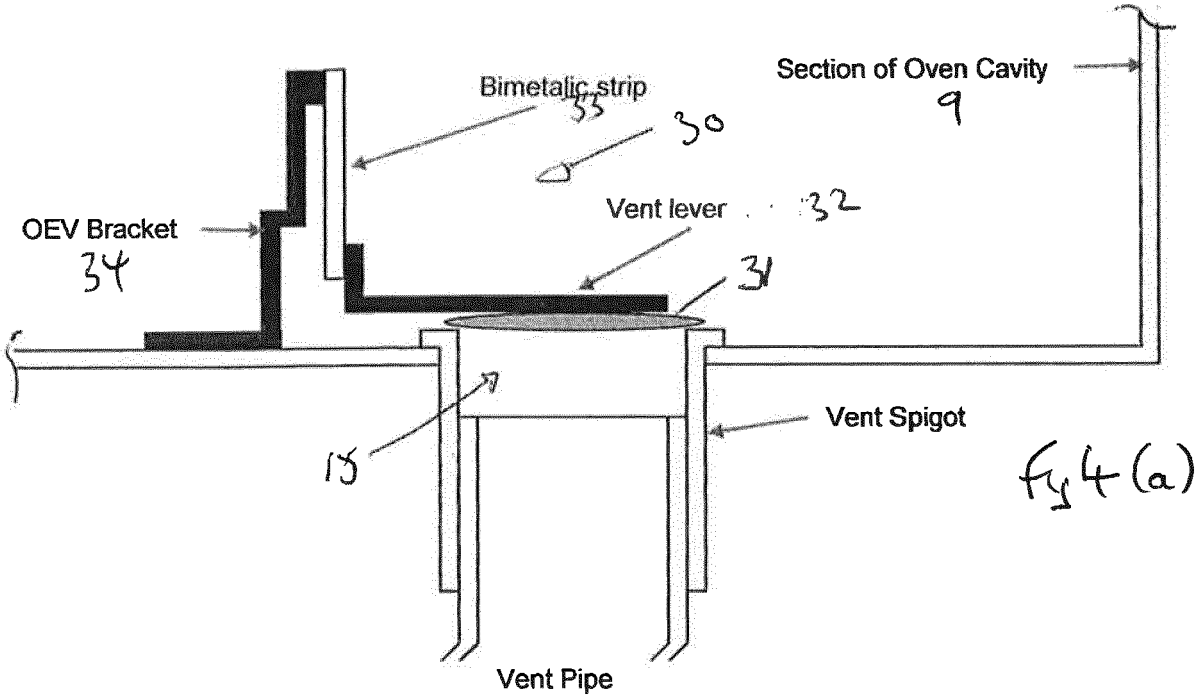

Section of Oven Cavity
9
Bimetalic strip
33
30
Vent lever
32
OEV Bracket
34
31
Vent Spigot
15
Vent Pipe

Fig 4 (a)

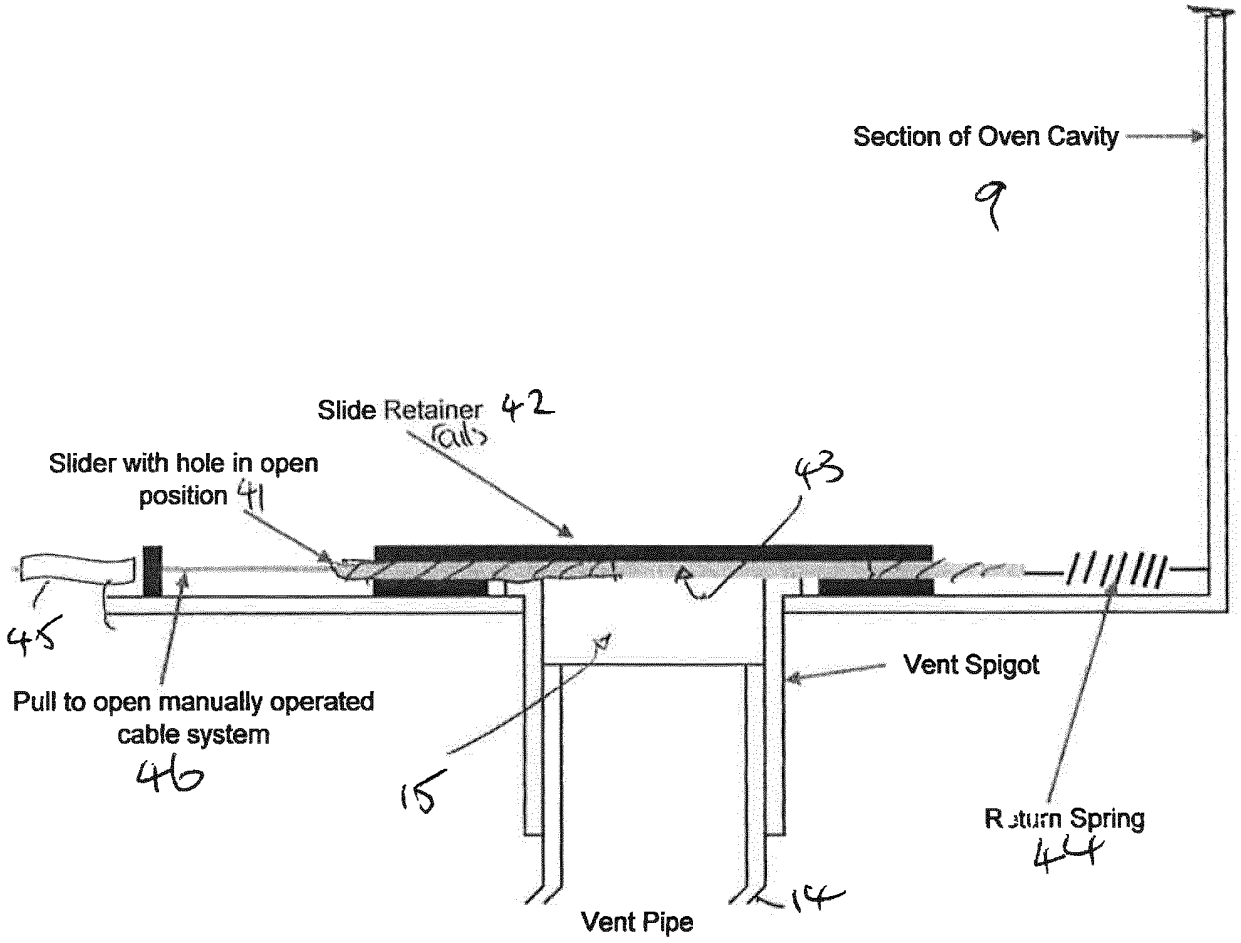

Section of Oven Cavity
9
Slide Retainer rails 42
Slider with hole in open position 41
43
45
Pull to open manually operated cable system
46
15
Vent Spigot
Return Spring
44
Vent Pipe
14

Fig 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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