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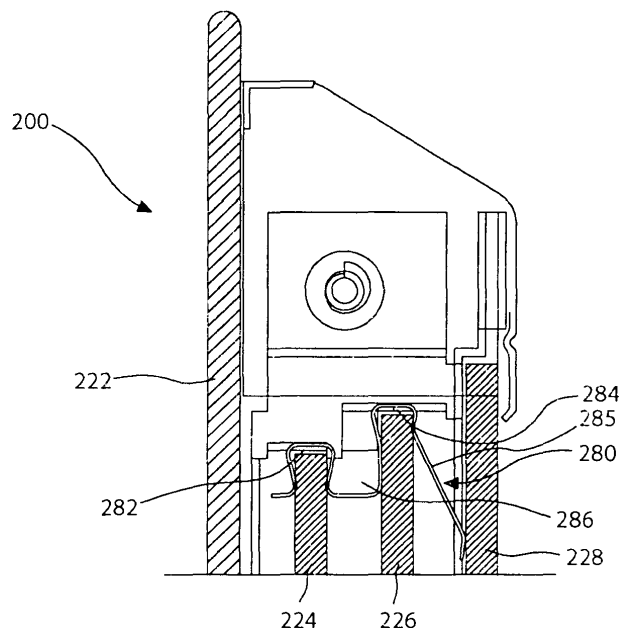
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(54) **Oven with glass supporting structure**

(57) An electric oven includes a door assembly for blocking out heat generated in a cooking chamber. The door assembly includes a front glass defining a front portion of the door assembly, first, second and third inner

glasses disposed in rear of the front glass, a doorframe supporting the front and inner glasses, a plurality of glass guides integrally formed with the doorframe, and a movement preventing spring for receiving the inner glasses to prevent the inner glasses from moving.

FIG. 2



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an oven, and more particularly, to an oven, for example an electric oven, with an improved arrangement for securely supporting a plurality of inner glasses of a door of the oven.

Description of the Related Art

[0002] An oven is a cooking device that uses a variety of heating sources to uniformly bake or roast food.

[0003] An electric oven uses an electric heater to heat food loaded in a cooking chamber, thereby baking or roasting the food. The cooking chamber is provided at a front side of the oven, with an opening that is selectively closed or opened by a door.

[0004] Particularly, the door must be designed fulfilling two important requirements. That is, the door must be designed such that transfer of heat from the cooking chamber to the outside of the door is minimized, while allowing a user to observe the inside of the cooking chamber so that the user can identify the food that is being cooked. In order to allow the user to observe the inside of the cooking chamber, the door incorporates transparent glass. In order to minimize the heat passing through the door, the door is formed from a plurality of adjacent glass panels or panes. Gaps are provided between the glass panels so that air in the gaps functions as an insulating and/or cooling medium. That is, the air in the gaps improves the heat-shielding effect.

[0005] However, when the plurality of the adjacent glass panels are installed, the glass panels may be broken by collision between the panels. Therefore, an additional structure for supporting the plurality of panels is required.

[0006] That is, in order to support the plurality of glass panels, a doorframe fixed on a front glass panel and a fixing bracket fixed on the doorframe while directly supporting the plurality of the glass panels are required.

[0007] Typically, the bracket is screw-coupled to the doorframe, in the course of which the doorframe, which is typically coated with a gloss material may be damaged.

[0008] Furthermore, since residual stress tends to be locally formed on the bracket, the glass panels supported by the bracket may be broken when the heat generated in the cooking chamber is transmitted to the bracket.

[0009] In addition, outer impact caused by the movement of the electric oven may be transmitted to the glass panels and cause damage to the panels.

[0010] Since the doorframe and the bracket supporting the glass panels are typically specially prepared and assembled on a rear-upper end of the structural front glass, manufacturing costs are increased and the assembling process made more troublesome for a worker.

SUMMARY OF THE INVENTION

[0011] Accordingly, the present invention is directed to an oven, for example an electric oven with an improved glass supporting structure, which addresses one or more problems due to limitations and disadvantages of the related art.

[0012] It would be desirable to provide an oven with an improved glass supporting structure that can securely support a plurality of glass panels and minimize vibration.

[0013] It would also be desirable to provide an oven with an improved glass supporting structure that can securely support a plurality of glass panels even when outer impact is applied to the oven.

[0014] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0015] Accordingly, the invention provides a door assembly for an oven, which permits viewing of the inside of the oven, comprising: a front panel defining a front portion of the door assembly; a plurality of inner glass panels; and one or more retaining springs, each spring acting on all of the inner glass panels.

[0016] The invention also provides a door assembly for an oven, which permits viewing of the inside of the oven, comprising:

a front panel defining a front portion of the door assembly;
a plurality of inner glass panels; and at least one door frame component attached to the front panel and adapted to constrain movement of the inner glass panels.

[0017] The invention also provides an electric oven comprising a door assembly for blocking out heat generated in a cooking chamber, characterized in that the door assembly comprises: a front glass defining a front portion of the door assembly; first, second and third inner glasses disposed in rear of the front glass; a doorframe supporting the front and inner glasses; a plurality of glass guides integrally formed with the doorframe; and a movement preventing spring for receiving the inner glasses to prevent the inner glasses from moving.

[0018] In preferred embodiments, each movement preventing or retaining spring receives one or more inner glass panels into receiving portions or grooves of the spring, and a rearmost inner glass panel against an extending portion of the spring.

[0019] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory

and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention.

In the drawings:

Fig. 1 is a front view of an electric oven according to an embodiment of the present invention;

Fig. 2 is a side sectional view of a door depicted in Fig. 1;

Fig. 3 is a perspective view of a spring depicted in Fig. 2;

Fig. 4 is an enlarged perspective view of an assembly of a first inner glass and a doorframe of an electric oven according to an embodiment of the present invention; and

Fig. 5 is an enlarged perspective view of an assembly of first and second inner glasses and a doorframe of an electric oven according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0022] Fig. 1 shows an electric oven according to a preferred embodiment of the present invention.

[0023] Referring to Fig. 1, the electric oven includes a cooking chamber 100 and a door assembly 200 installed on a front portion of the cooking chamber 100 to selectively open and close the cooking chamber 100. The door assembly 200 is pivotally fixed, for example using one or more hinges, on a front-lower end of an oven body within which the cooking chamber 100 is defined. A plurality of heaters are installed in the cooking chamber to heat air in the cooking chamber. The plurality of heaters may be arranged in a variety of formations.

[0024] The present invention provides a structure for safely supporting a plurality of glass panels installed in the door assembly 200.

[0025] The door assembly 200 includes a transparent window 220 having a front glass 22 and a plurality of inner glasses 224, 226 and 228 and a door handle 240 allowing a user to conveniently open and close the door assembly 200.

[0026] A front plate 300 is provided to define a front portion of the cooking chamber 100. A control panel 500

is installed on an upper portion of the front plate 300.

[0027] A chamber cover 120 is provided to define a rear portion of the cooking chamber 100. A convection fan 400 generating air circulations in the cooking chamber 100 is provided in rear of the chamber cover 120 and a convection heater (not shown) is disposed around the convection fan 400.

[0028] The chamber cover 120 is provided, at a central portion, with a plurality of air holes 121 through which air in the cooking chamber 100 is sucked by the convection fan 400 and air heated by the convection heater is fed into the cooking chamber 100 by the convection fan 400.

[0029] Side heaters 600 are installed on both sides walls of the cooking chamber 100 and a bottom heater (not shown) is installed on a bottom of the cooking chamber 100. An electric component chamber (not shown) is provided on a top of the cooking chamber 100.

[0030] A variety of electric components such as a top heater (not shown), a halogen heater (not shown) transmitting radiant heat, and the like may be installed in the electric component chamber. The types of the heaters are not limited to the above case. A variety of other types of heaters may be used.

[0031] By providing a variety of heaters, the output of the electric oven may be increased and controlled to quickly and uniformly cook the food.

[0032] According to a feature of the present invention, the door assembly 200 is designed to minimize the amount of heat generated in the cooking chamber 100 which passes out of the chamber and to securely support the plurality of inner glasses.

[0033] Fig. 2 shows the door assembly depicted in Fig. 1 and Fig. 3 shows a spring depicted in Fig. 2.

[0034] Referring to FIGS. 2 and 3, the door assembly 200 includes a front glass 222 defining a front appearance and first, second and third inner glasses 224, 226 and 228 that define a transparent window 220 installed behind the front glass 222 to reduce the amount of heat generated in the cooking chamber 100 which escapes through the door, and to allow a user to observe the inside of the cooking chamber 100.

[0035] A doorframe component (refer to the reference numeral 260 of FIG. 4) is installed on a rear-upper end of the front glass 222 to securely fix the first, second and third inner glasses 224, 226 and 228. One or more retaining springs, referred to below as movement preventing springs 280, are disposed between and couple, or selectively bear or act upon, the first, second and third inner glasses 224, 226 and 228, so as to reduce vibration of the inner glasses 224, 226 and 228. Each retaining spring preferably comprises an elongate metal strip bent to provide direct coupling between the inner glasses, as shown in Figure 2.

[0036] The movement preventing spring 280 includes a first insertion portion or groove 282 in which the first inner glass 224 is fixedly inserted, a second insertion portion or groove 284 in which the second inner glass 226 is fixedly inserted, and a buffering portion 286 formed

between the first and second insertion portions 282 and 284 to function as a buffer between the first and second insertion portions 282 and 284. Each insertion portion 282, 284 is preferably formed as an arcuate or similar open loop section of the spring 280, with the edge of the inner glass inserted into and retained in the mouth of the open loop.

[0037] The first and second insertion portions 282 and 284 are different in height from each other so that the first and second inner glasses 224 and 226 can be inserted into the first and second insertion portions 282 and 284 at different heights. In other words, the open looped sections are staggered such that, in use, one structure is further from the centre of the door than the other, so that an inner panel further from the front panel can be larger than an outer panel. Since the fixing heights of the inner glasses 224, 226 and 228 are different from each other, the heat dissipation of the heat from the cooking chamber 100 can be more effectively suppressed.

[0038] The first and second insertion portions 282 and 284 extend away from adjacent portions of the spring, and in use away from the centre of the door, in the same direction. The buffering portion 286 effectively forms an open loop which extends in an opposite direction to that of the first and second insertion grooves 282 and 284. Therefore, when the oven is transferred in a state where the first and second inner glasses 224 and 226 have been respectively inserted into the first and second insertion portions 282 and 284 and the vibration is transmitted to the first and second inner glasses 224 and 226, vibration is absorbed by the buffering portion 286, thereby safely maintaining the first and second inner glasses 224 and 226.

[0039] The movement preventing spring 280 further includes an extending portion 285 extending from an end portion of the second insertion portion 284, and is designed to contact the third inner glass 228 to prevent the third inner glass 228 from colliding with the second inner glass 226. An end region of the extending portion 285, which contacts the third inner glass 228, is bent in towards and bears upon the plane of the third inner glass 228 to reduce the likelihood of the third glass 228 from being broken or making noise by the movement preventing spring 280.

[0040] A plurality of the described movement preventing springs 280 may be provided inserted over the edges of the first and second inner glasses. That is, the number of the springs can be properly selected to prevent the inner glasses from colliding with each other.

[0041] A structure for supporting the absolute positions of the glasses will be described hereinafter.

[0042] FIG. 4 shows the first inner glass located in the doorframe component and FIG. 5 shows the first and second inner glasses located in the doorframe component. For clarity, the movement preventing springs are omitted from these Figures.

[0043] Referring to FIGS. 4 and 5, a separate doorframe component 260, fixed on a side portion of the front

glass 222 is installed on each of the left and right sides of the rear surface of the front glass 222. The first and second inner glasses 224 and 226 of the transparent window 220, which help to prevent heat dissipation from the cooking chamber 100, are located in the doorframe components 260. The doorframe 260 may be fixed on the rear surface of the front glass 222 through adhesion, screw-coupling, or other fitting processes.

[0044] Describing the doorframe component 260 in more detail, a side flange 262 is formed on a side surface of the doorframe component 260 to be in parallel with a rear surface of the front glass 222. The side flange 262 increases an area where the doorframe component 260 contacts the front glass 222, thereby helping to securely adhere the doorframe component 260 to the front glass 222 through, for example, an adhesion process.

[0045] A guiding/supporting unit for guiding and supporting the first and second inner glasses 224 and 226 is formed on the side flange 262.

[0046] That is, the guide unit includes first glass guides 264 (only one is shown in the drawing) for guiding and supporting the disposition of a front surface edge of the first inner glass 224 and second glass guides 266 (only one is shown in the drawing) for guiding and supporting the disposition of upper and lower ends of the first inner glass 224. The disposition of left and right side ends of the first inner glass 224 are guided and supported by proximal sidewalls of the doorframe 260.

[0047] Each of the first glass guides 264 is formed by cutting and bending a section of the doorframe component 260. That is, the section is partly cut away from the doorframe component 260 and bent to be in parallel with the rear surface of the front glass 222 so that the front surface edge of the first inner glass 224 can be simply guided and supported thereon. Each of the second glass guides 266 is also formed by cutting and bending another section of the doorframe component 260.

[0048] Since the disposition of the first inner glass 224 is guided and supported by the first and second glass guides 264 and 266 that are formed by sections cut and bent away from the doorframe component 260, it becomes possible to dispose the first inner glass 224 on the first and second glass guides 264 and 266 in a state where the front glass 222 is fixed on the doorframe component 260.

[0049] After the first inner glass 224 is fitted, the second inner glass 226 is fitted. The disposition process of the second inner glass 226 will be described hereinafter in more detail.

[0050] Third glass guides 267 (only one is shown in the drawing) are formed above the respective second glass guides 266 by being bent twice from the doorframe component 260. That is, each of the glass guides 267 has orthogonal first and second bent portions 268 and 269.

[0051] The first bent portions 268 are designed to guide and support upper and lower ends of the second inner glass 226 while the second bent portions 269 are

designed to guide and support a front surface edge of the second glass 226.

[0052] The dispositions of both side ends of the second inner glass 226 are guided and supported by the proximal sidewalls of the doorframe component 260.

[0053] Since the third glass guides 267 are formed above the second glass guide 266, and above the plane of the first glass guides 264 with a predetermined interval therebetween, the first and second inner glasses 224 and 226 are located in the door with a predetermined gap between them. The gap between the first and second inner glasses 224 and 226 functions to block out the heat generated in the cooking chamber. A gap is also defined between the front glass 222 and the first inner glass 224, functioning to block out the heat generated in the cooking chamber.

[0054] In addition, because the guide unit comprised of the first, second and third glass guides 264, 266 and 267 is integrally formed with the inner portion of the doorframe component 260, it is easy to form the same by simply cutting a portion of the doorframe 260 and bending the cut portion.

[0055] A fixing member may be further provided to more securely fix the disposition of the third inner glass 228 in a state where the third inner glass 228 is guided by the doorframe component 260.

[0056] As described above, the second and third glass guides are formed on the doorframe component at different levels from each other, thereby accurately supporting and guiding the dispositions of the inner glasses.

[0057] The operation of the above-described electric oven will be briefly described hereinafter.

[0058] When electric power is applied, the heating elements are heated to transmit heat into the cooking chamber 100. Selectively, a microwave heater may be provided to radiate microwaves. If required, the convection fan 400 is operated to suck the air from the cooking chamber 100 and heat the air. The heated air is fed again to the cooking chamber 100.

[0059] Meanwhile, the heat generated in the cooking chamber 100 is blocked out by the glasses provided on the door assembly 200 not to be dispatched to an external side. Since the glasses are securely supported by the doorframe component and the movement preventing springs 280, the door assembly can work more reliably.

[0060] According to the present invention, since there is no need for a special bracket for guiding and supporting the disposition of the inner glasses, manufacturing costs can be saved and the manufacturing process can be simplified.

[0061] Since the relative positions of the glasses are securely supported by the movement preventing springs, damage to the glasses is protected against.

[0062] Since there is no screw for fixing the glasses, damage to the doorframe component, especially if it is coated with a gloss material, is prevented.

[0063] It will be apparent to those skilled in the art that various modifications and variations can be made in the

present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims.

[0064] For example, the movement preventing spring 280 may be designed such that the third inner glass in addition to the first and second inner glasses can be inserted therein. That is, the movement preventing springs 280 may be designed having a third insertion portion or groove for receiving the third inner glass.

[0065] In addition, the number of glasses may be more or less than four.

[0066] Instead of being made entirely from glass, the front panel of the door assembly may have a glass panel fitted therein.

Claims

1. An oven having a door assembly (200) adapted to reduce heat escaping from a cooking chamber (100), **characterized in that** the door assembly comprises:
 - a front glass (222) defining a front portion of the door assembly;
 - first (224), second (226) and third (228) inner glasses disposed behind the front glass;
 - at least one doorframe component (260) supporting the front and inner glasses;
 - a plurality of glass guides (264, 266, 267, 268) integrally formed with the doorframe component for supporting the inner glasses; and
 - at least one retaining spring for receiving the inner glasses and adapted to constrain movement of the inner glasses.
2. The oven according to claim 1, wherein the retaining spring comprises a first insertion portion (282) in which the first inner glass is fixedly inserted, a second insertion portion (284) in which the second inner glass is fixedly inserted, and a buffering portion (286) formed between the first and second insertion portions to function as a buffer between the first and second insertion portions.
3. The oven according to claim 2, wherein the buffering portion is formed in a groove shape curved in a direction opposite to those of the first and second insertion portions.
4. The oven according to claim 2 or 3, wherein the first and second insertion portions are different in height from each other.
5. The oven according to any one of claims 2 to 4, wherein the retaining spring further comprises an extending portion extending from an extreme end defining the second insertion portion and contacting a

surface of the third inner glass.

6. The oven according to any one of preceding claims, wherein the retaining spring is formed of metal.
7. The oven according to any one of the preceding claims, wherein the glass guides comprise a first glass guide for guiding and supporting a disposition of a front surface edge of the first inner glass.
8. The oven according to any one of the preceding claims, wherein the glass guides comprise a second glass guide for guiding and supporting a disposition of upper and lower ends of the first inner glass.
9. The oven according to any one of the preceding claims, wherein the second glass guide is formed on upper and lower ends of the doorframe component.
10. The oven according to any one of the preceding claims, wherein a disposition of both side ends of at least one of the first and second inner glasses is guided and supported by a proximal sidewall of the doorframe component.
11. The oven according to any one of the preceding claims, wherein the glass guides comprise a third glass guide supporting dispositions of a front surface edge and upper and lower ends of the second inner glass.
12. The oven according to claim 11, wherein the third glass guide is formed on upper and lower ends of the doorframe component.
13. The oven according to claim 11 or 12, wherein the third glass guide comprises a first bent portion for guiding and supporting the upper and lower ends of the second inner glass and a second bent portion for guiding and supporting a front surface edge of the second glass.
14. The oven of any preceding claim, wherein the oven is an electric oven.
15. The oven of any preceding claim, wherein the cooking chamber is defined within an oven body, and further comprising one or more hinges coupling the one or more door frame components to the oven body.
16. A door assembly for an oven, which permits viewing of the inside of the oven, comprising:
 - a front panel (222) defining a front portion of the door assembly;
 - a plurality of inner glass panels (224, 226, 228); and
 - one or more retaining springs (280), each spring

acting on all of the inner glass panels.

17. The door assembly of claim 16, wherein each retaining spring includes one or more insertion portions (282, 284), each insertion portion being adapted to receive therein an edge of one or the inner glass panels.
18. The door assembly of claim 17, wherein each retaining spring comprises at least two consecutive insertion portions.
19. The door assembly of claim 17, wherein an insertion portion spaced further from the front panel 222 extends further from a central region of the door assembly than an insertion portion closer to the front panel 222.
20. The door assembly of claim 19, wherein an inner glass spaced further from the front panel 222 is larger than an inner glass closer to the front panel.
21. The door assembly of any of claims 16 to 20, wherein each retaining spring includes an extending portion (285) extending obliquely away from the front panel 222 and adapted to bear against one of said inner glass panels.
22. A door assembly for an oven, which permits viewing of the inside of the oven, comprising:
 - a front panel (222) defining a front portion of the door assembly;
 - a plurality of inner glass panels (224, 226, 228); and
 - at least one door frame component (260) attached to the front panel (222) and adapted to constrain movement of the inner glass panels.
23. The door assembly of claim 22, wherein the or each door frame component (260) comprises one or more first glass guides (264) adapted to constrain movement of a first of the inner glass panels towards the front panel (222).
24. The door assembly of claim 22 or claim 23, wherein the or each door frame component (260) comprises one or more second glass guides (266) adapted to constrain movement of a first of the inner glass panels perpendicular to the front panel (222).
25. The door assembly of claim 22, 23 or 24, wherein the or each door frame component (260) comprises one or more third glass guides (267, 268) adapted to constrain movement of a second inner glass panel, separated from the front panel by a first inner glass panel, in a direction towards the front panel (222).
26. The door assembly of claim 25, wherein the third

glass guides (267, 268) further constrain movement of the second inner glass panel in a direction perpendicular to the front panel.

27. The door assembly of any of claims 22 to 26 further comprising the features of any of claims 16 to 21. 5

28. An oven comprising the door assembly of any of claims 16 to 26. 10

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FIG. 1

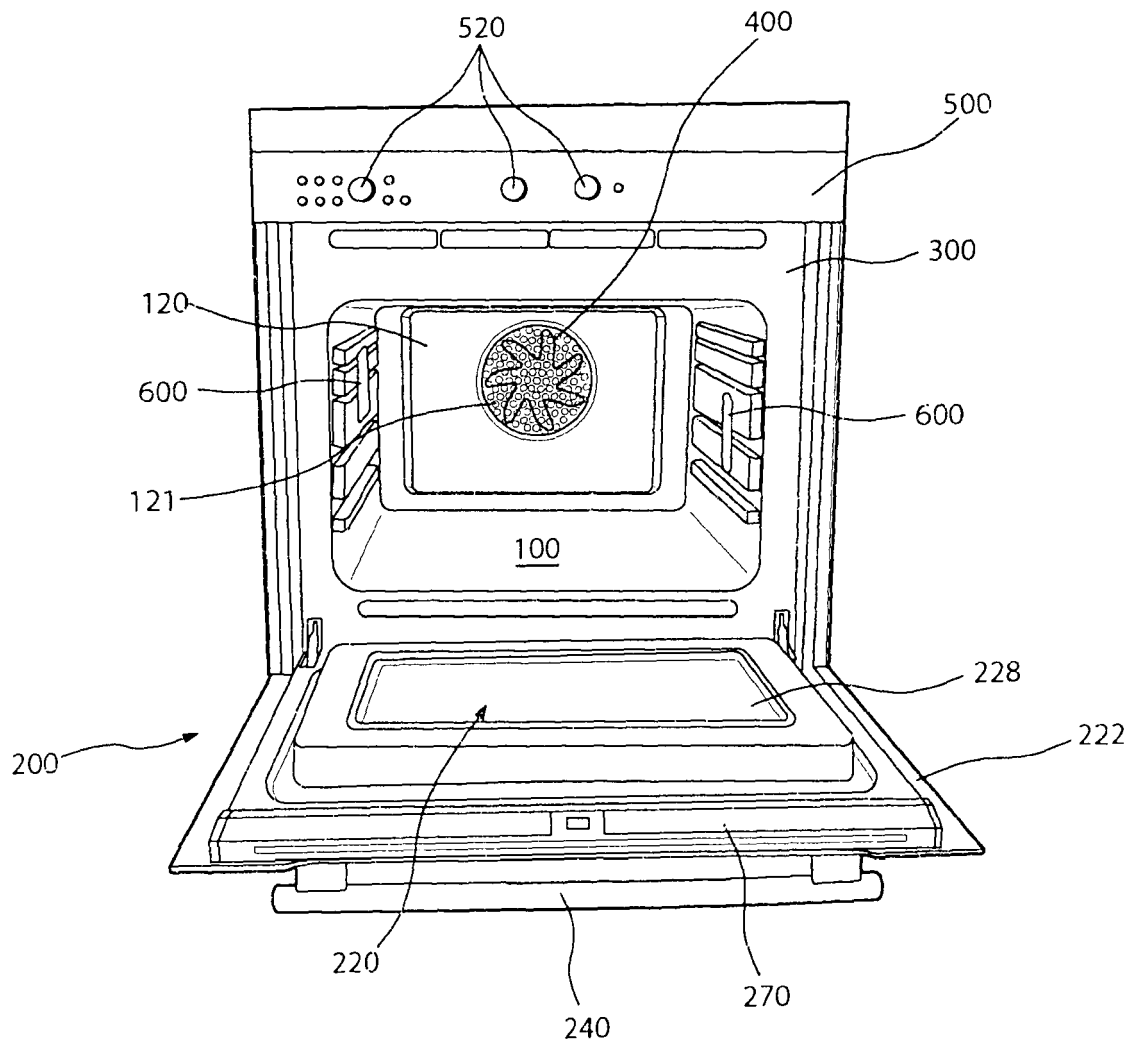


FIG. 2

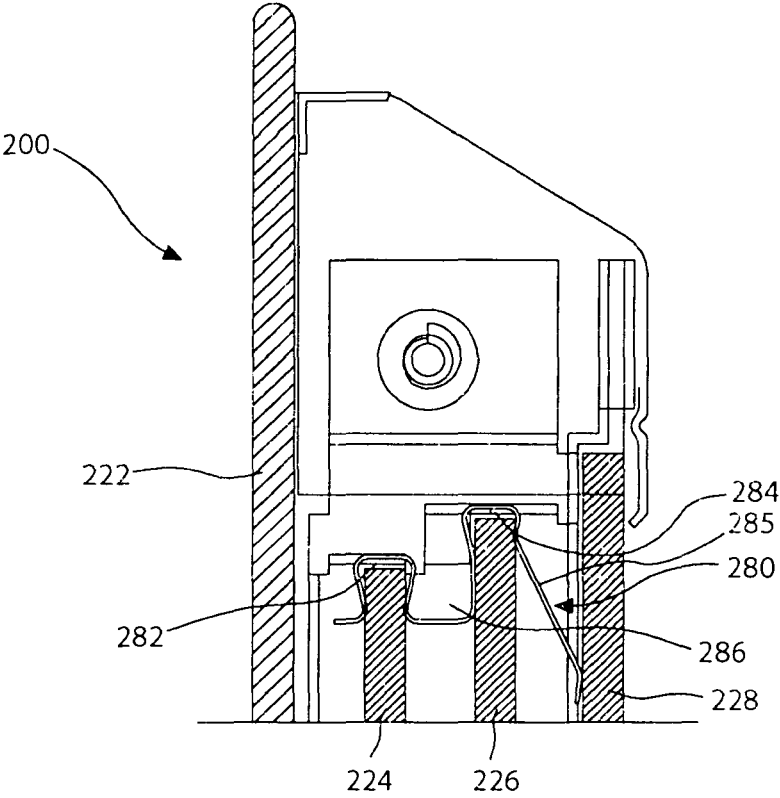


FIG. 3

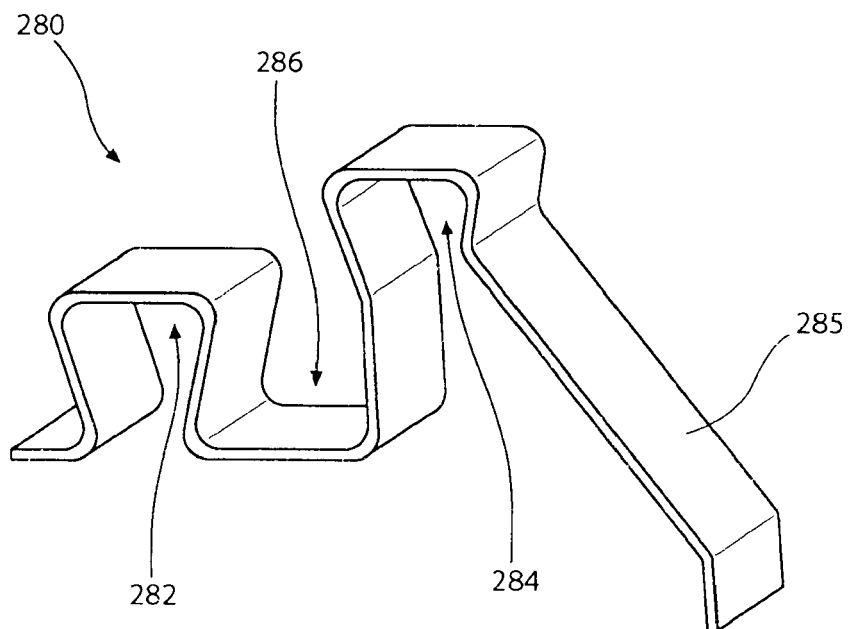


FIG. 4

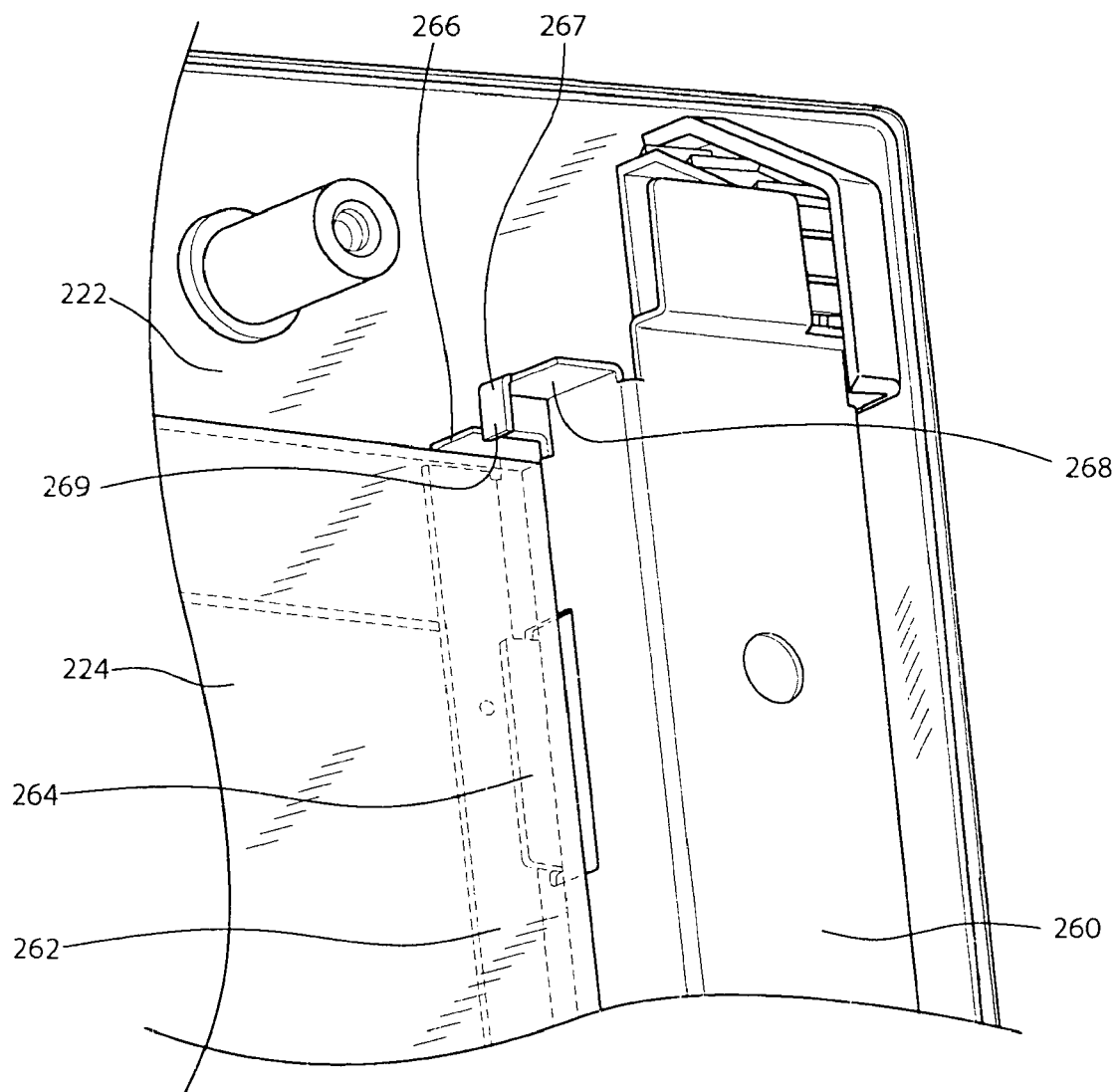


FIG. 5

