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

(11) **EP 4 411 250 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.08.2024 Bulletin 2024/32

(21) Application number: **22901557.3**

(22) Date of filing: **11.10.2022**

(51) International Patent Classification (IPC):
F24C 15/00 *(2006.01)* ***F24C 15/34*** *(2006.01)*
F24C 15/30 *(2006.01)* ***F24C 15/32*** *(2006.01)*
F24C 15/08 *(2006.01)* ***F24C 14/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F24C 14/00; F24C 15/00; F24C 15/08; F24C 15/30; F24C 15/32; F24C 15/34

(86) International application number:
PCT/KR2022/015269

(87) International publication number:
WO 2023/101197 (08.06.2023 Gazette 2023/23)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **01.12.2021 KR 20210169820**

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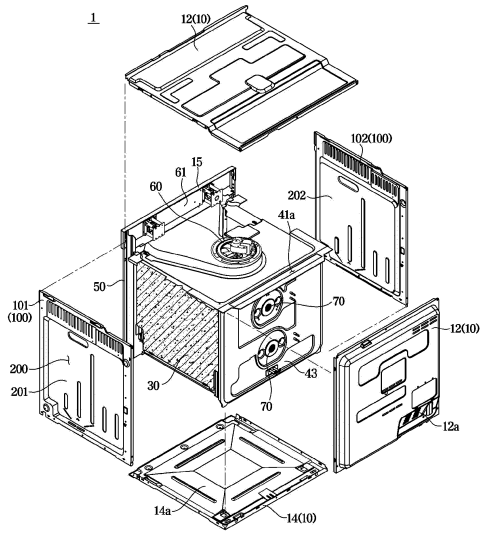
(54) COOKING APPLIANCE

(57) Disclosed herein is a cooking appliance. The cooking appliance, which is a built-in cooking appliance installed in a furniture cabinet, includes an outer housing, an inner housing disposed within the outer housing, and forming a cooking chamber therein, and an insulation layer provided between the inner housing and the outer housing to insulate the inner housing, wherein the outer housing comprises a guide panel located on a lateral side of the inner housing and in contact with an outside of the insulation layer, the guide panel having a recess formed on an outer surface of the outer housing to form a cooling flow path between the furniture cabinet and the outer surface of the outer housing.

FIG. 3



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Description

[Technical Field]

[0001] The disclosure relates to a cooking appliance, and more particularly to a guide panel disposed on one side of a cooking appliance and recessed inwardly.

[Background Art]

[0002] In general, cooking appliances are appliances for heating and cooking an object to be cooked, such as food, which may provide multiple functions related to cooking, such as heating, defrosting, drying, and sterilizing the object to be cooked. Such cooking appliances may include, for example, ovens, such as gas ovens or electric ovens, microwave heating devices (hereinafter referred to as microwave ovens), gas ranges, electric ranges, over the ranges (OTR), and gas or electric grills.

[0003] For example, an oven is an appliance that encloses, heats, and cooks materials, and may typically be classified into electric, gas, and electronic ovens based on their heat source. Electric ovens use an electric heater as the heat source, while gas ovens and microwave ovens use the heat from gas and the frictional heat of water molecules caused by high frequencies, as the heat source, respectively.

[0004] In recent years, ovens are often installed as built-in units, and in this case, it is necessary to ensure that the heat from the oven does not damage the surrounding furniture. This requires the oven to be cooled to reduce the heat transferred from the oven.

[Disclosure]

[Technical Problem]

[0005] One aspect of the present disclosure provides a cooking appliance, which is built-in to a furniture cabinet, capable of protecting the furniture cabinet from the heat of the cooking appliance.

[0006] Further, one aspect of the present disclosure provides a cooking appliance, which is built-in to a furniture cabinet, capable of reducing the temperature of a guide panel facing the furniture cabinet.

[0007] Further, one aspect of the present disclosure provides a cooking appliance that reduces a gap between an insulation layer and an inner housing to achieve a good thermal insulation effect.

[Technical Solution]

[0008] An embodiment of the present disclosure provides a cooking appliance, which is a built-in cooking appliance installed in a furniture cabinet, including an outer housing, an inner housing disposed within the outer housing, and forming a cooking chamber therein, and an insulation layer provided between the inner housing and the outer housing to insulate the inner housing, wherein the outer housing comprises a guide panel located on a lateral side of the inner housing and in contact with an outside of the insulation layer, the guide panel having a recess formed on an outer surface of the outer housing to form a cooling flow path between the furniture cabinet and the outer surface of the outer housing.

[0009] The recess may include a recess inner surface facing the inner housing and a recess outer surface opposite to the recess inner surface, and the recess inner surface may include a shape protruding toward the insulation layer to reduce a gap between the insulation layer and the inner housing, and contact the insulation layer while pressing the insulation layer.

[0010] The recess inner surface may be formed in a size corresponding to a surface of the inner housing facing the recess inner surface.

[0011] The outer housing may further include an upper panel provided on an upper side thereof, the cooking appliance may further include an upper bracket provided on an upper side of the inner housing, and an intake fan provided between the upper panel and the upper bracket, and the guide panel may include an intake hole provided on an upper side of the guide panel to allow air flowing along the cooling flow path to move toward the intake fan.

[0012] A flow passing through the cooling flow path may be formed to move toward the upper side of the guide panel along the recess outer surface, and the flow in the cooling flow path moving toward the upper side of the guide panel may pass through the intake hole, pass through the intake fan, and be discharged to a front side of the cooking appliance.

[0013] The guide panel may include a support surface provided surrounding an outer side of the recess, and the recess may include a contact portion in contact with the insulation layer and an inclined connection portion inclined upwardly from the contact portion toward the support surface to prevent a vortex from occurring in the flow passing through the cooling flow path.

[0014] The contact portion may include a reinforcing rib protruding toward the insulation layer to reinforce the guide panel and to allow the contact portion to further press the insulation layer.

[0015] An outer surface of the reinforcing rib may be recessed toward the insulation layer, and the outer surface of the reinforcing rib may extend upwardly to guide a flow in the cooling flow path upwardly.

[0016] The guide panel may include a spacing protrusion protruding toward an inner surface of the furniture cabinet on the support surface to prevent the inner surface of the furniture cabinet from contacting an outer surface of the guide panel when the cooking appliance is located on an inner side of the furniture cabinet.

[0017] A width of the cooling flow path may be from the recess outer surface to the inner surface of the furniture cabinet.

[0018] The outer housing may further include a lower panel provided on a lower side thereof, the cooking appliance may further include a convection space located between the lower panel and a lower side of the guide panel, and the guide panel may include a convection opening opened upwardly from an inner surface of a lower side of the recess to allow air heated through the convection space to be movable.

[0019] The guide panel may include a guide rib extending downwardly inclined toward the convection opening to guide liquid formed in the cooling flow path to move toward the convection opening.

[0020] The reinforcing rib may include a first reinforcing rib provided on an upper side of the convection opening, a second reinforcing rib adjacent to the left side of the first reinforcing rib, and a third reinforcing rib adjacent to the right side of the first reinforcing rib, and the guide rib may include a first guide rib extending downwardly inclined from a lower side of the second reinforcing rib toward a lower side of the first reinforcing rib, and a second guide rib extending downwardly inclined from a lower side of the third reinforcing rib toward the lower side of the first reinforcing rib.

[0021] The outer housing may include a lower panel having a laterally downwardly inclined surface to allow the liquid moved through the convection opening to be collected.

[0022] A width of the cooking chamber may be a width of the outer housing minus the depth protruding inwardly from the recess inner surface, the thickness of the insulation layer, and the thickness of the inner housing.

[0023] Further, an embodiment of the present disclosure provides a cooking appliance including an inner housing having a cooking chamber therein, an insulation layer, at least a portion of which is positioned abutting an outer side of the inner housing and at least a portion of which is positioned forming an air gap and arranged to be deformable, and an outer housing including a guide panel that protrudes in a direction facing the insulation layer and presses against the insulation layer from an outer side of the inner housing to an inner side of the insulation layer to reduce the air gap.

[0024] The recess may include a recess inner surface facing the inner housing and a recess outer surface opposite to the recess inner surface, and the recess inner surface may include a shape protruding toward the insulation layer to reduce a gap between the insulation layer and the inner housing, and contact the insulation layer while pressing the insulation layer.

[0025] The cooking appliance may further include an upper bracket provided on an upper side of the inner housing, and an intake fan provided between the upper panel and the upper bracket, and the guide panel may include an intake hole provided on an upper side of the guide panel to allow air flowing along the cooling flow path to move toward the intake fan.

[0026] Further, an embodiment of the present disclosure provides a cooking appliance including an outer housing, an insulation layer positioned abutting an inner side of the outer housing, an inner housing positioned abutting an inner side of the insulation layer and including a cooking chamber therein, wherein the outer housing includes a guide panel having a shape in which a portion of the outer housing protrudes toward the insulation layer, and the size of the cooking chamber is determined by a width of the outer housing minus a depth at which the guide panel protrudes.

[0027] The cooking appliance may include a reinforcing rib protruding toward the insulation layer to reinforce the guide panel.

[Advantageous Effects]

[0028] According to various embodiments of the present disclosure, the cooking appliance can protect the furniture cabinet from the heat of the cooking appliance by positioning the guide panel at a distance from the furniture cabinet.

[0029] According to various embodiments of the present disclosure, the cooking appliance can reduce the temperature of the guide panel facing the furniture cabinet by means of the cooling channels created by the guide panel being recessed inwardly towards the inner housing.

[0030] According to various embodiments of the present disclosure, the cooking appliance can achieve a good thermal insulation effect by reducing the gap between the insulation layer and the inner housing, because the guide panel may protrude towards the insulation layer against which the guide panel abuts to allow the insulation layer to be pressed against the inner housing.

[Description of Drawings]

[0031]

FIG. 1 is a perspective view of a cooking appliance and a furniture cabinet with a door removed, according to an embodiment of the present disclosure.

FIG. 2 is a cross-sectional view of the cooking appliance of FIG. 1 with the door added.

FIG. 3 is an exploded perspective view of the cooking appliance of FIG. 1 disassembled.

FIG. 4 is a perspective view of the cooking appliance of FIG. 1 showing a rear panel disassembled and showing a flow path.

FIG. 5 is a cross-sectional view of the cooking appliance and the furniture cabinet based on a state in which the cooking appliance of FIG. 1 is accommodated in the furniture cabinet.

FIG. 6 is an enlarged view of portion A of FIG. 5.

FIG. 7 is a perspective view showing the guide panel of FIG. 1.

FIG. 8 is a side view of the guide panel of FIG. 7, showing a flow as viewed from the side.

FIG. 9 is a cross-sectional view showing a cross-section of the guide panel of FIG. 7 taken along the line X-X'.

FIG. 10 is a perspective view showing an experiment in which the temperature of the cooking appliance of FIG. 1 is measured.

[Modes of the Invention]

[0032] Embodiments described in the disclosure and configurations shown in the drawings are merely examples of the embodiments of the disclosure and may be modified in various different ways at the time of filing of the present application to replace the embodiments and drawings of the disclosure.

[0033] In addition, the same reference numerals or signs shown in the drawings of the disclosure indicate elements or components performing substantially the same function.

[0034] Also, the terms used herein are used to describe the embodiments and are not intended to limit and/or restrict the disclosure. The singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. In this disclosure, the terms "including", "having", and the like are used to specify features, numbers, steps, operations, elements, components, or combinations thereof, but do not preclude the presence or addition of one or more of the features, numbers, steps, operations, elements, components, or combinations thereof.

[0035] It will be understood that, although the terms "first", "second", "primary", "secondary", etc., may be used herein to describe various elements, but elements are not limited by these terms. These terms are only used to distinguish one element from another element. For example, without departing from the scope of the disclosure, a first element may be termed as a second element, and a second element may be termed as a first element. The term of "and/or" includes a plurality of combinations of relevant items or any one item among a plurality of relevant items.

[0036] In the following detailed description, the terms of "front", "forward", "rear", "backward", "top", "bottom", "upper", "lower", "left", and "right" may be defined by the drawings, but the shape and the location of the component is not limited by the term.

[0037] Hereinafter, various embodiments according to the disclosure will be described in detail with reference to the accompanying drawings.

[0038] FIG. 1 is a perspective view showing a cooking appliance with a door removed and a furniture cabinet according to an embodiment of the present disclosure.

[0039] As shown in FIG. 1, a cooking appliance 1 may be accommodated in an inner side 2a of a furniture cabinet (e.g., a storage cabinet, kitchen cabinet, or the like). This type of cooking appliance 1 may be referred to as a built-in type. The inner side 2a of the furniture cabinet may have a shape corresponding to the shape of the cooking appliance 1. However, the present disclosure is not limited thereto, and the size of an inner side of the furniture cabinet 2 may be larger than that of the cooking appliance 1.

[0040] The cooking appliance 1 described below is not necessarily limited to the built-in cooking appliance 1. However,

for ease of description, the cooking appliance 1 is assumed and described to be built-in inside the furniture cabinet 2.

[0041] The cooking appliance 1 may include an outer housing 10 forming an exterior thereof. The outer housing 10 may include a guide panel 100 facing the furniture cabinet 2 on a side of the cooking appliance 1. Further details will be described below.

[0042] FIG. 2 is a cross-sectional view showing the cooking appliance of FIG. 1 with the door added.

[0043] As shown in FIG. 2, the cooking appliance 1 may include the outer housing 10. The cooking appliance 1 may include an inner housing 20 disposed within the outer housing 10 and forming a cooking chamber 21 therein. An object to be cooked (i.e., food) may be placed in the inner housing 20. Since a front side of the inner housing 20 is open, food may be loaded into the cooking chamber 21 therethrough.

[0044] A door 50 may be openably coupled to the front side of the inner housing 20. The door 50 may be coupled to the outer housing 10 by a hinge.

[0045] A control panel 15 may be disposed on a front upper side of the inner housing 20. The control panel 15 may display various information about the cooking appliance 1 and enable operation of the cooking appliance 1.

[0046] An insulation layer (also referred to as a thermal insulation layer) 30 may be disposed on the outside of the inner housing 20. The insulation layer 30 may be provided using a material having excellent thermal insulation performance. The insulation layer 30 may be formed on the inner housing 20 by foaming. Alternatively, the insulation layer 30 may be provided in the form of a plate made of Styrofoam material.

[0047] To prevent heat generated in the cooking chamber 21 from escaping to the outside, and to prevent a user from being burned by contact with a surface of the outer housing 10 due to an increase in temperature of the surface of the outer housing 10, a surface of the inner housing 20 may be surrounded by the insulation layer 30.

[0048] The insulation layer 30 may be provided in contact with an outer surface of the inner housing 20. In particular, the insulation layer 30 and the outer surface of the inner housing 20 may be in close contact with each other. However, due to manufacturing constraints, an air gap or gap may be formed between the insulation layer 30 and the outer surface of the inner housing 20. The gap may allow the heat generated in the cooking chamber 21 to may be released to the outside. The release of heat to the outside may reduce the efficiency of the cooking chamber 21, and in the case of the cooking appliance 1 built into the furniture cabinet 2, may cause carbonization of an inner surface 2b of the cabinet 2b. To ensure good thermal insulation of the cooking appliance 1, it is therefore necessary to reduce the gap.

[0049] The cooking appliance 1 may be an oven or a microwave oven. For example, in the case where the cooking appliance 1 is an oven, a heat source may be a heater (not shown). In the case where the cooking appliance 1 is a microwave oven, the heat source may be a magnetron (not shown). For ease of description, the following description assumes that the cooking appliance 1 is an oven, but is not limited thereto.

[0050] In the case of the oven, it may be equipped with a self-cleaning function. The self-cleaning function may include operating a plurality of heaters (not shown) to heat the cooking chamber 21 to a high temperature in the range of about 460°C to 480°C to burn contaminants inside the cooking chamber 21 in order to facilitate cleaning of the inside of the cooking chamber 21. When the self-cleaning function of the cooking appliance 1 is performed, contaminants, such as oil stains, food residues, and the like stuck to an inner wall of the cooking chamber 21 may be easily removed as the contaminants are burned.

[0051] However, with the self-cleaning function, the temperature of the cooking chamber 21 may rise to a high temperature, and therefore it is even more necessary to prevent the temperature from being transferred to the inner surface 2b of the furniture cabinet, which may be provided outside the cooking appliance 1.

[0052] On the outside of the insulation layer 30, a bracket 40 may be provided to divide a space between the insulation layer 30 and the outer housing 10. Because the inner housing 20 may have a cuboidal shape, the insulation layer 30 surrounding the inner housing 20 may include an upper insulation layer 35, a lower insulation layer 36, a left insulation layer 33, a right insulation layer 34, a front insulation layer 30, and a rear insulation layer 32 on the upper, lower, left, right, front, and rear sides, respectively. The outside of the insulation layer 30 may be provided with the bracket 40 in contact with the insulation layer 30.

[0053] FIG. 3 is an exploded perspective view of the cooking appliance of FIG 1.

[0054] As shown in FIG. 3, the outer housing 10 may include a front panel 11 located at the front, a rear panel 12 located at the rear, an upper panel 13 located at the upper side, and a lower panel 14 located at the lower side. The outer housing 10 may have a cuboidal shape to allow the user to use its space efficiently.

[0055] When viewing the lower side of the upper panel 13 of the outer housing 10, an upper bracket 41 may be provided on the upper side of the inner housing 20. More particularly, the upper insulation layer 35 may be provided on the upper side of the inner housing 20, and the upper bracket 41 in contact with the upper insulation layer 35 may be provided on an upper side of the upper insulation layer 35.

[0056] An intake fan 60 may be provided on an upper side of the upper bracket 41 to draw in air. In other words, the intake fan 60 may be disposed between the upper bracket 41 and the upper panel 13 of the outer housing 10. The intake fan 60 may be provided as a centrifugal fan, but is not limited thereto. The intake fan 60 may draw in air from the outside and discharge the drawn-in air forwardly. In particular, the intake fan 60 may discharge air into a space between the

control panel 15 and the door 50.

[0057] An intake fan housing 61 may be provided on the outside of the intake fan 60 to protect the intake fan 60. Accordingly, the intake fan 60 may be received and positioned on the inside of the intake fan housing 61.

[0058] A rear bracket 43 may be provided on a front side of the rear panel 12 of the outer housing 10. The rear bracket 43 may be coupled to a circulation fan 70. The circulation fan 70 may be provided in two, arranged up and down. The rear panel 12 may be provided with a circulation hole 12a. The circulation hole 12a may be provided on a lower side of the rear panel 12. Air may be introduced between the rear panel 12 and the rear bracket 43 through the circulation hole 12a.

[0059] The upper bracket 41 may extend up to the rear panel 12. A communication opening 41a extending from side to side may be provided at a rear side of the upper bracket 41. The communication opening 41a may be connected to a space between the rear panel 12 and the rear bracket 43. Air introduced through the circulation hole 12a may move through the communication opening 41a toward the intake fan 70.

[0060] A lower bracket 42 may be provided on an upper side of the lower panel 14. The lower insulation layer 36 may be located between the lower bracket 42 and a lower side of the inner housing 20. A space between the lower bracket 42 and the lower insulation layer 36 may be referred to as a convection space 14b. In other words, the convection space 14b may be defined to be located between the lower panel 14 and a lower side of the guide panel 100, which will be described later.

[0061] Since a heater, or the like may be positioned on a lower side of the cooking chamber 21, heat generated by the heater may be released to the lower side. The heat may travel through the convection space 14b.

[0062] The heat in the convection space 14b may be released to the outside by following a flow moving to the circulation fan 70 through a convection opening 150 provided in the guide panel 100, which will be described later. Further details thereof will be described later.

[0063] The outer housing 10 may include the guide panel 100 on a lateral side. The guide panel 100 may include a first guide panel 101 located on the left side and a second guide panel 102 located on the right side. The first guide panel 101 and the second guide panel 102 may have the same shape.

[0064] The guide panel 100 may be in direct contact with the outside of the insulation layer 30. Since the outside of the guide panel 100 may be the furniture cabinet 2, a cooling flow path 230 may be formed between the guide panel 100 and the furniture cabinet 2. The guide panel 100 may include a recess 200 that is recessed towards the insulation layer 30.

[0065] The recess 200 may include a recess inner surface 201 facing the inner housing 20 and an outer surface opposite thereto. The inner surface 201 may be a surface in contact with the insulation layer 30.

[0066] The guide panel 100 in which the recess 200 is formed may be regarded as protruding towards the inner housing 20. Accordingly, it may be appreciated that the recess inner surface 201 has a shape protruding toward the insulation layer 30 and contacts the insulation layer 30 while pressing the insulation layer 30, to reduce the gap formed between the insulation layer 30 and the inner housing 20.

[0067] The recess inner surface 201 may be formed in a size corresponding to a surface of the inner housing 20 facing the recess inner surface 201. Accordingly, the recess inner surface 201 may uniformly and completely press against the insulation layer 30, thereby minimizing a gap formed on a surface in contact with the inner housing 20.

[0068] By providing the recess 200, the guide panel 100 may be positioned spaced apart from the furniture cabinet 2. Accordingly, less heat may be transferred to the furniture cabinet 2. The deeper the recess 200 is, the more the guide panel 100 may be spaced away from the furniture cabinet 2, and thus the less heat may be transferred to the furniture cabinet 2.

[0069] In other words, it can be seen that the provision of the recess 200 allows the guide panel 100 to be spaced apart from the furniture cabinet 2 and has the effect of pressing the guide panel 100 against the insulation layer 30, while also functioning to form the cooling flow path 230.

[0070] In the following, a flow path that may be formed in the cooking appliance 1 will be described.

[0071] FIG. 4 is a perspective view of the cooking appliance 1 of FIG. 1 in which the rear panel 12 is disassembled and a flow path is shown.

[0072] As shown in FIG. 4, the cooking appliance 1 may be provided with the cooling flow path 230 and a circulation flow path 231.

[0073] As discussed above, the cooling flow path 230 may be provided by the circulation fan 70 provided on the upper side of the upper bracket.

[0074] The air between the furniture cabinet 2 and the guide panel 100 may move upward along an outer surface of the guide panel 100 when the circulation fan 70 operates. In other words, a flow passing through the cooling flow path 230 may move towards an upper side of the guide panel 100 along a recess outer surface 202.

[0075] The guide panel 100 may include an intake hole 120 on the upper side thereof. The intake hole 120 may be provided correspondingly between the upper bracket where the circulation fan 70 is located and the upper panel 13 of the outer housing 10. As a result, the air moving upward may move to the intake fan 60 through the intake hole 120.

[0076] The air moving the intake fan 60 may be discharged forward. Such a flow path may be referred to as the cooling

flow path 230.

[0077] Here, the intake hole 120 may include a first intake hole 121 and a second intake hole 122 provided in a region formed with a step from a region where the first intake hole 121 is formed. Electrical components (not shown) may be provided inside the intake hole 120, and the sizes of the electrical components provided inside the first intake hole 121 and the second intake hole 122 may be different. When the intake hole 120 is located adjacent to the electrical components, the air passing through the intake hole 120 may cool the electrical components more effectively, so that it is preferable for the intake hole 120 to be located adjacent to the electrical components. Accordingly, the region in which the first intake hole 121 is provided and the region in which the second intake hole 122 is provided may be formed with a step depending on the size of the electrical components facing each other.

[0078] The circulation flow path 231 may be created by the circulation fan 70 and the intake fan 60 located at the rear where the rear bracket is located.

[0079] The rear panel 12 of the outer housing 10 may include the circulation hole 12a, so that when the circulation fan 70 is operated, air may be drawn into an inside of the outer housing 10 through the circulation hole 12a.

[0080] The drawn-in air may move upward through the space between the rear bracket and the rear panel 12.

[0081] Since the circulation fan 70 provided on the upper side may draw in air, the air moved upward may move towards the circulation fan 70 through the communication opening 41a provided in the upper bracket 41.

[0082] The air moving towards the circulation fan 70 may be discharged forward. Such a flow path may be referred to as the circulation flow path 231.

[0083] The temperature of the outer housing 10 may be lowered by the cooling flow path 230 and the circulation flow path 231. As a result, carbonization of the furniture cabinet 2 in contact with the outer housing 10 may be prevented. Furthermore, the temperature of electrical components located on the flow paths may be lowered through the cooling flow path 230 and the circulation flow path 231.

[0084] FIG. 5 is a cross-sectional view of the cooking appliance and the furniture cabinet based on a state in which the cooking appliance of FIG. 1 is accommodated in the furniture cabinet. FIG. 6 is an enlarged view of portion A of FIG. 5.

[0085] As shown in FIGS. 5 and 6, the cooking appliance 1 may be accommodated in the furniture cabinet (e.g., kitchen cabinet) 2.

[0086] When the cooking appliance 1 is accommodated in the furniture cabinet 2, the width of the cooling flow path 230 as described above may be from the recess outer surface 202 to the inner surface 2b of the furniture cabinet.

[0087] To secure the width of the cooling flow path 230 and to prevent an inner surface of the furniture cabinet 2 from contacting the outer surface of the guide panel 100 when the cooking appliance 1 is positioned on the inner side of the furniture cabinet 2, the guide panel 100 may include spacing protrusions 140 protruding towards the inner surface of the furniture cabinet 2 on a support surface 130.

[0088] In other words, it may be difficult for the furniture cabinet 2 to contact the guide panel 100 except by contacting the spacing protrusions 140. This is because the spacing protrusions 140 are the most outwardly protruding portions of the guide panel 100. As a result, the furniture cabinet 2 may be positioned in point contact with the spacing protrusions 140 and spaced apart from the remaining portion of the guide panel 100.

[0089] The spacing protrusions 140 may include a first spacing protrusion 141 formed on an upper side portion of the guide panel 100, and a second spacing protrusion 142 formed on a lower side portion of the guide panel 100. The first spacing protrusion 141 and the second spacing protrusion 142 may be arranged diagonally. This may allow for a desired amount of spacing from the furniture cabinet 2 to be achieved with a small number of spacing protrusions 140. Accordingly, a separate process for forming the spacing protrusions 140 may be avoided.

[0090] The width of the cooking chamber 21 may be the width of the outer housing 10 minus the depth at which the recess 200 is recessed inwardly, the thickness of the insulation layer 30, and the thickness of the inner housing 20. In other words, the width of the cooking chamber 21 may be the width of the outer housing 10 minus the depth at which a contact portion 210, which will be described later, protrudes, the thickness of the insulation layer 30, and the thickness of the inner housing 20.

[0091] Accordingly, the width of the cooking chamber 21 may be determined by adjusting the depth of the recess 200. The shallower the depth of the recess 200, the greater the width of the cooking chamber 21 may be. As a result, the cooking chamber 21 may have a larger volume.

[0092] FIG. 7 is a perspective view showing the guide panel of FIG. 1. FIG. 8 is a side view showing the flow when the guide panel of FIG. 7 is viewed from the side. FIG. 9 is a cross-sectional view showing a cross-section of the guide panel of FIG. 7 taken along the line X-X'.

[0093] As shown in FIGS. 7 to 9, the recess 200 may be provided in the guide panel 100.

[0094] The guide panel 100 may include the support surface 130 provided surrounding an outer side of the recess 200.

[0095] The recess 200 may include the contact portion 210 in contact with the insulation layer 30. The contact portion 210 may have a planar shape.

[0096] The recess 200 may include an inclined connection portion 220 connecting the contact portion 210 and the support surface 130. The inclined connection portion 220 may be inclined upwardly from the contact portion 210 towards

the support surface 130. If the contact portion 210 and the support surface 130 are connected by a step without an inclination, a flow in the cooling flow path 230 passing through the step may form vortices. This would result in a loss of energy in the flow, which may impede the movement of the flow. The recess 200 may prevent vortices from occurring in the flow passing through the cooling flow path 230 via the inclined connection portion 220.

[0097] The contact portion 210 may include one or more reinforcing ribs 110 that protrude towards the insulation layer 30 to reinforce the guide panel 100. As the reinforcing ribs 110 protrude towards the insulation layer 30, the insulation layer 30 may be further pressed against the inner housing 20. As a result, the gap provided between the inner housing 20 and the insulation layer 30 may be further reduced, thereby ensuring excellent insulation of the cooking appliance 1.

[0098] An outer surface of the reinforcing ribs 110 may be recessed toward the insulation layer 30. Because the guide panel 100 may have the shape of a plate, a non-protruding surface may be recessed in the protruding direction while forming the reinforcing ribs 110.

[0099] The reinforcing ribs 110 may extend upwardly. Accordingly, the outer surface of the reinforcing ribs 110 may also extend upwardly. As the direction of the cooling flow path 230 moves from the lower side to the upper side, the outer surface of the reinforcing ribs 110 may serve to guide such a flow path.

[0100] The guide panel 100 may include the convection opening 150 on the lower side thereof. The convection opening 150 may be provided on the inclined connection portion 220 of the recess 200.

[0101] The convection opening 150 may be in communication with the convection space 14b located between the lower panel 14 of the outer housing 10 and the lower bracket 42. As a result, air containing heat in the convection space 14b may be discharged to the outside through the convection opening 150. Air discharged to the outside may move along the cooling flow path 230. In other words, heat in the convection space 14b may be released through the convection opening 150.

[0102] When the hot air on the guide panel 100 is cooled, for example for reasons such as when the cooking appliance 1 is turned off, a liquid may form. Alternatively, the guide panel 100 may include a handle 170 for a user to grip when moving the cooking appliance 1, and as the handle 170 may have the shape of an opening, the liquid may flow out through the handle 170. The liquid may damage the furniture cabinet 2 or cause the cooking appliance 1 to be damaged. It is therefore necessary to drain the formed liquid to the outside. To this end, a method may be used in which the formed liquid is collected in a certain space, and when the cooking appliance 1 is operated and heated, the liquid may be vaporized and then discharged to the outside.

[0103] The guide panel 100 may include one or more guide ribs 160 that are inclined downward and extend toward the convection opening 150 to guide the liquid formed in the cooling flow path 230 to move toward the convection opening 150.

[0104] More particularly, when the reinforcing ribs 110 include a first reinforcing rib 111 provided on an upper side of the convection opening 150, a second reinforcing rib 112 adjacent to the left side of the first reinforcing rib 111, and a third reinforcing rib 113 adjacent to the right side of the first reinforcing rib 111, the guide ribs 160 may include a first guide rib 161 extending downwardly inclined from a lower side of the second reinforcing rib 112 toward a lower side of the first reinforcing rib 111 and a second guide rib 162 extending downwardly inclined from a lower side of the third reinforcing rib 113 toward the lower side of the first reinforcing rib 111.

[0105] The downwardly inclined first and second guide ribs 161 and 162 may allow flowing liquid to flow along a downward inclination and into the convection opening 150 when the flowing liquid contacts the upper side of the guide ribs 160.

[0106] Furthermore, the guide ribs 160 may further include a third guide rib 163, which has an inverted V-shape, provided on the lower side of the first reinforcing rib 111. When the flowing liquid comes into contact with the highest position of the third guide rib 163, the third guide rib 163 may be inclined downwardly on both sides, allowing the flowing liquid to flow down the inclination and into the convection opening 150.

[0107] In other words, along the guide ribs 160, the formed liquid may move toward the convection opening 150. The liquid passing through the convection opening 150 may move toward the lower panel 14 of the outer housing 10.

[0108] The lower panel 14 of the outer housing 10 may include an inclined surface 14a that slopes downwardly laterally to allow liquid moved through the convection opening 150 to collect. Accordingly, the moved liquid may be collected in a lateral direction of the lower panel 14.

[0109] In short, the formed liquid may be collected in the lateral direction of the lower panel 14 so as not to cause any problems, and then, when the cooking appliance 1 is operated and heat is generated, the collected liquid may be evaporated and discharged to the outside.

[0110] Hereinafter, an experiment of measuring the temperature change of the furniture cabinet 2 in which the cooking appliance 1 of the present disclosure is placed will be described.

[0111] FIG. 10 is a perspective view showing an experiment of measuring the temperature of the cooking apparatus of FIG. 1.

[0112] As shown in FIG. 10, an experiment was carried out to measure the temperature of the two sides and the bottom of the furniture cabinet 2.

[0113] The furniture cabinet 2 was made of 20 mm thick plywood with a blackened surface. The input voltage was applied at 1.15 times the rated input voltage.

[0114] The temperature of the cooking chamber 21 was set at 420°C. It was assumed that the cooking appliance 1 was operating in a self-cleaning mode.

[0115] The results of the experiment are as follows.

[table 1]

Temperature of furniture cabinet (°C)	Left side	1	45.9
		2	53.4
		3	38.4
		4	59.7
		5	65.9
		6	59.4
		7	47.5
		8	36.9
		9	35.5
	Bottom	12	65.2
		13	51.7
		14	39.1
		15	60
		16	67.6
		17	59.1
		18	58
		19	45
		20	43.9
	Right side	21	52.5
		22	57.6
		23	34.7
		24	77.8
		25	77.1
		26	50.6
		27	38.7
		28	63.1
		29	36.4

[0116] The experimental data shows the highest temperature measured at each point.

[0117] The highest temperature in the entire zone was 77.8°C measured at zone 24. This is a temperature lower than 93°C at which carbonization of wood is known to begin.

[0118] Therefore, it can be seen from this that the carbonization of the furniture cabinet 2 may be prevented by applying the present disclosure.

[0119] While the present disclosure has been particularly described with reference to exemplary embodiments, it should be understood by those of skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the present disclosure.

Claims

1. A cooking appliance installed as a built-in into a furniture cabinet, comprising:

   an outer housing;
   an inner housing disposed within the outer housing, and forming a cooking chamber therein; and
   an insulation layer provided between the inner housing and the outer housing to insulate the inner housing;
   wherein the outer housing comprises a guide panel located on a lateral side of the inner housing and in contact with an outside of the insulation layer, the guide panel having a recess formed on an outer surface of the outer housing to form a cooling flow path between the furniture cabinet and the outer surface of the outer housing.

2. The cooking appliance of claim 1, wherein

   the recess includes a recess inner surface facing the inner housing and a recess outer surface opposite to the recess inner surface, and
   the recess inner surface includes a shape protruding toward the insulation layer to reduce a gap between the insulation layer and the inner housing, and contact the insulation layer while pressing the insulation layer.

3. The cooking appliance of claim 2, wherein the recess inner surface is formed in a size corresponding to a surface of the inner housing facing the recess inner surface.

4. The cooking appliance of claim 1, wherein

   the outer housing further includes an upper panel provided on an upper side thereof,
   the cooking appliance further includes an upper bracket provided on an upper side of the inner housing, and an intake fan provided between the upper panel and the upper bracket, and
   the guide panel includes an intake hole provided on an upper side of the guide panel to allow air flowing along the cooling flow path to move toward the intake fan.

5. The cooking appliance of claim 4, wherein

   a flow passing through the cooling flow path is formed to move toward the upper side of the guide panel along the recess outer surface, and
   the flow in the cooling flow path moving toward the upper side of the guide panel passes through the intake hole, passes through the intake fan, and is discharged to a front side of the cooking appliance.

6. The cooking appliance of claim 1, wherein the guide panel includes a support surface provided surrounding an outer side of the recess, and
   the recess includes a contact portion in contact with the insulation layer and an inclined connection portion inclined upwardly from the contact portion toward the support surface to prevent a vortex from occurring in the flow passing through the cooling flow path.

7. The cooking appliance of claim 1, wherein the contact portion includes a reinforcing rib protruding toward the insulation layer to reinforce the guide panel and to allow the contact portion to further press the insulation layer.

8. The cooking appliance of claim 7, wherein

   an outer surface of the reinforcing rib is recessed toward the insulation layer, and
   the outer surface of the reinforcing rib extends upwardly to guide a flow in the cooling flow path upwardly.

9. The cooking appliance of claim 6, wherein the guide panel includes a spacing protrusion protruding toward an inner surface of the furniture cabinet on the support surface to prevent the inner surface of the furniture cabinet from contacting an outer surface of the guide panel when the cooking appliance is located on an inner side of the furniture cabinet.

10. The cooking appliance of claim 9, wherein a width of the cooling flow path is from the recess outer surface to the inner surface of the furniture cabinet.

11. The cooking appliance of claim 8, wherein

the outer housing further includes a lower panel provided on a lower side thereof,
the cooking appliance further comprising a convection space located between the lower panel and a lower side of the guide panel, and
the guide panel includes a convection opening opened upwardly from an inner surface of a lower side of the recess to allow air heated through the convection space to be movable.

12. The cooking appliance of claim 11, wherein the guide panel includes a guide rib extending downwardly inclined toward the convection opening to guide liquid formed in the cooling flow path to move toward the convection opening.

13. The cooking appliance of claim 12, wherein

the reinforcing rib includes a first reinforcing rib provided on an upper side of the convection opening, a second reinforcing rib adjacent to the left side of the first reinforcing rib, and a third reinforcing rib adjacent to the right side of the first reinforcing rib,
the guide rib includes a first guide rib extending downwardly inclined from a lower side of the second reinforcing rib toward a lower side of the first reinforcing rib, and a second guide rib extending downwardly inclined from a lower side of the third reinforcing rib toward the lower side of the first reinforcing rib.

14. The cooking appliance of claim 12, wherein the outer housing includes a lower panel having a laterally downwardly inclined surface to allow the liquid moved through the convection opening to be collected.

15. The cooking appliance of claim 2, wherein a width of the cooking chamber is a width of the outer housing minus the depth protruding inwardly from the recess inner surface, the thickness of the insulation layer, and the thickness of the inner housing.

FIG. 1

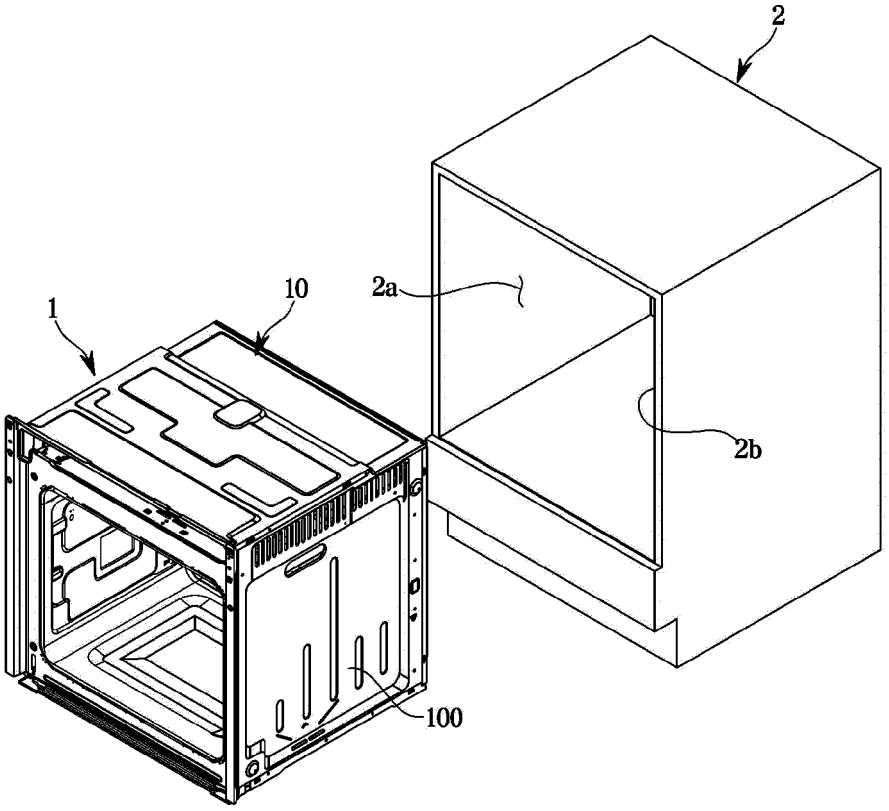
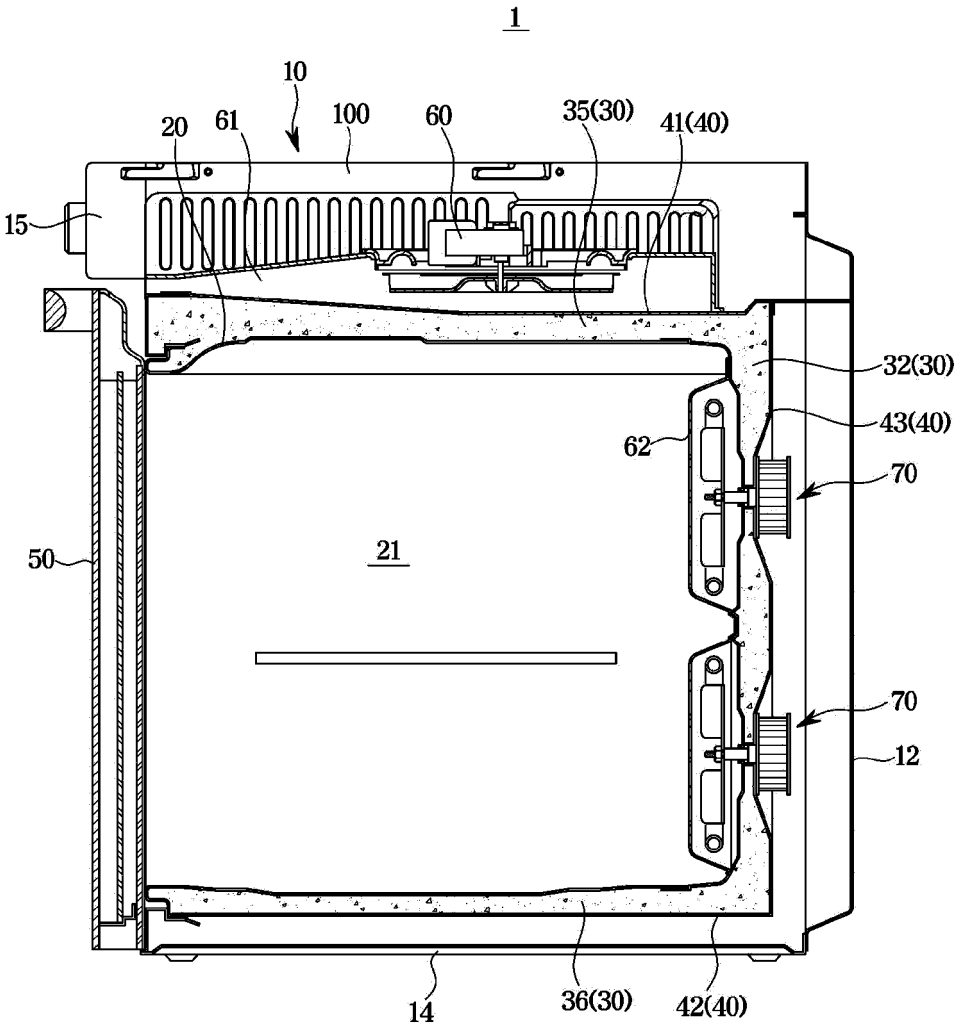


FIG. 2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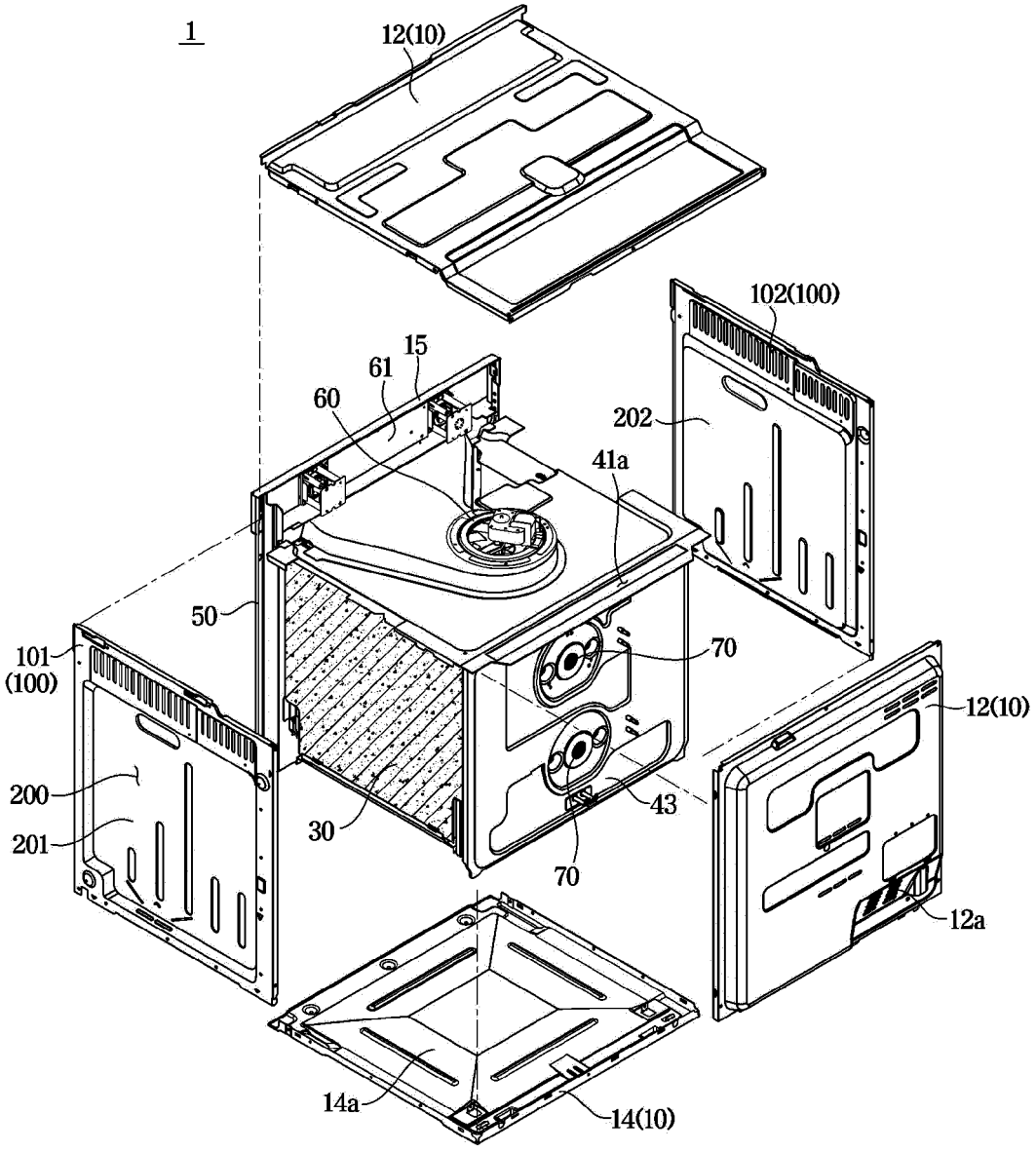
42(40)

FIG. 3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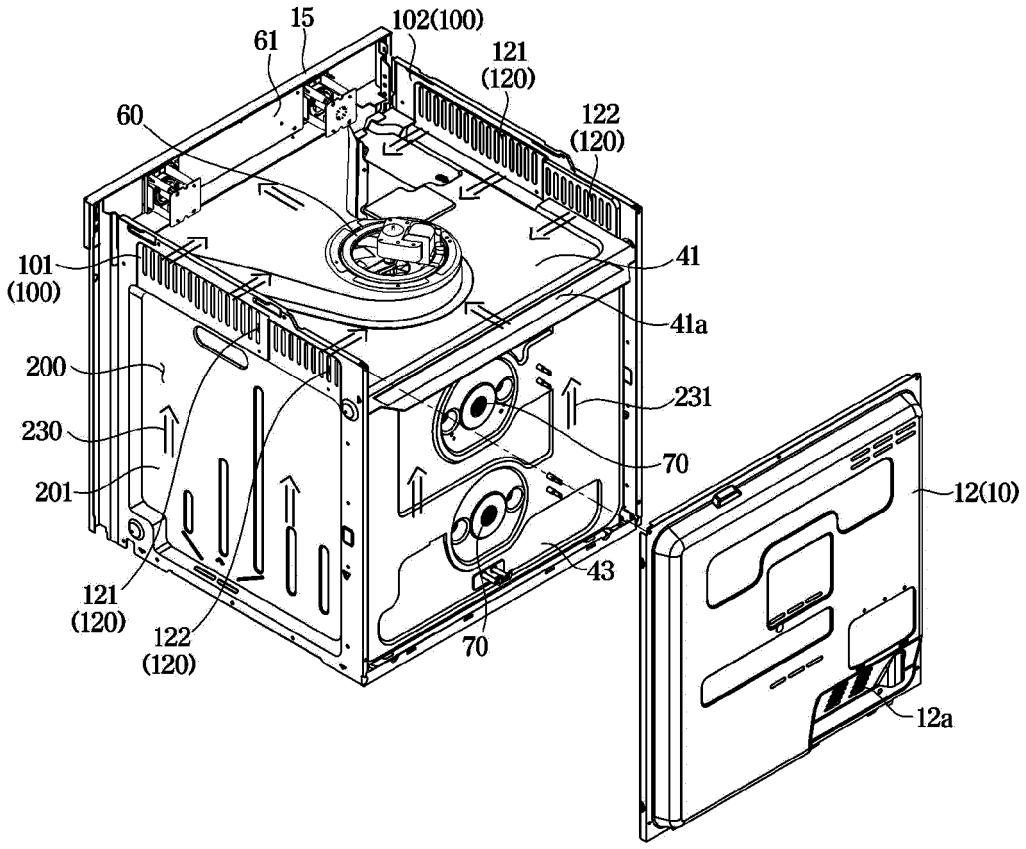
14a
14(10)

FIG. 4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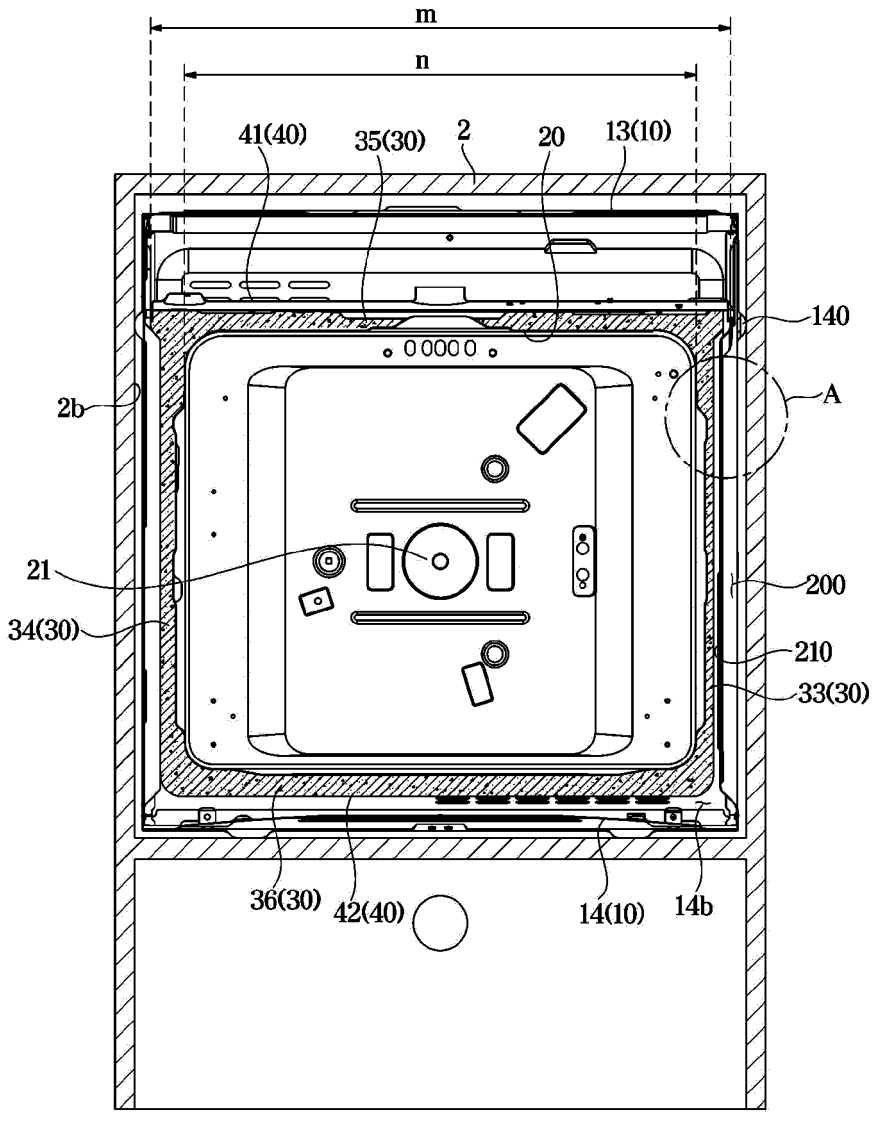
70
12a

FIG. 5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14b

FIG. 6

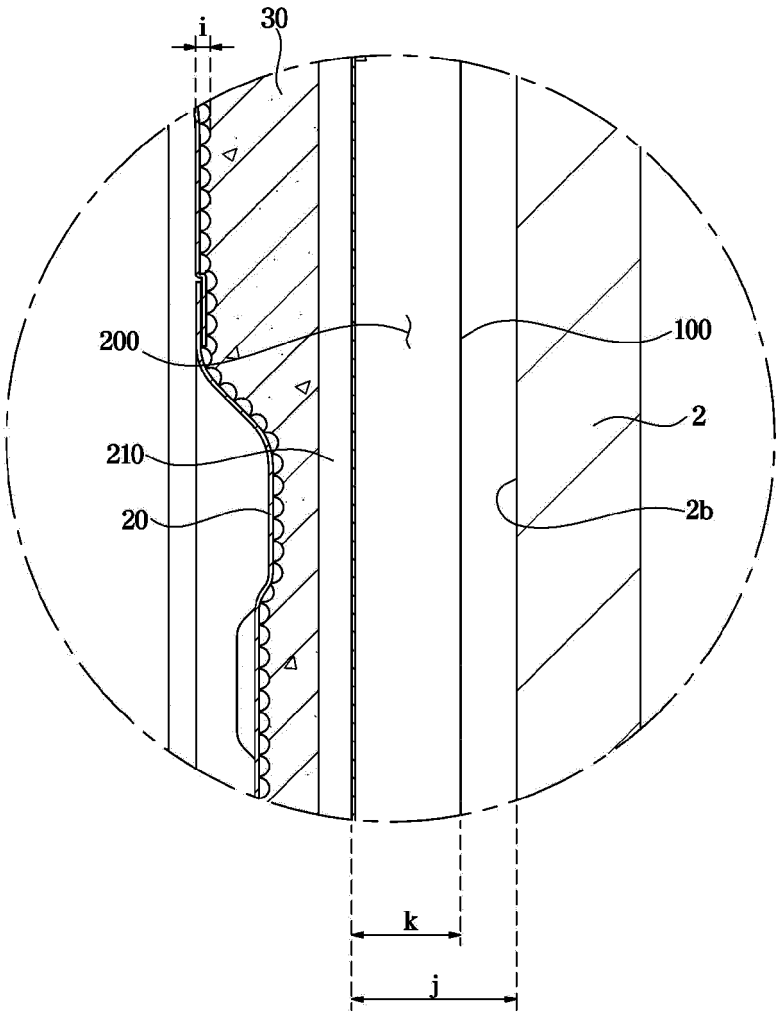

FIG. 7

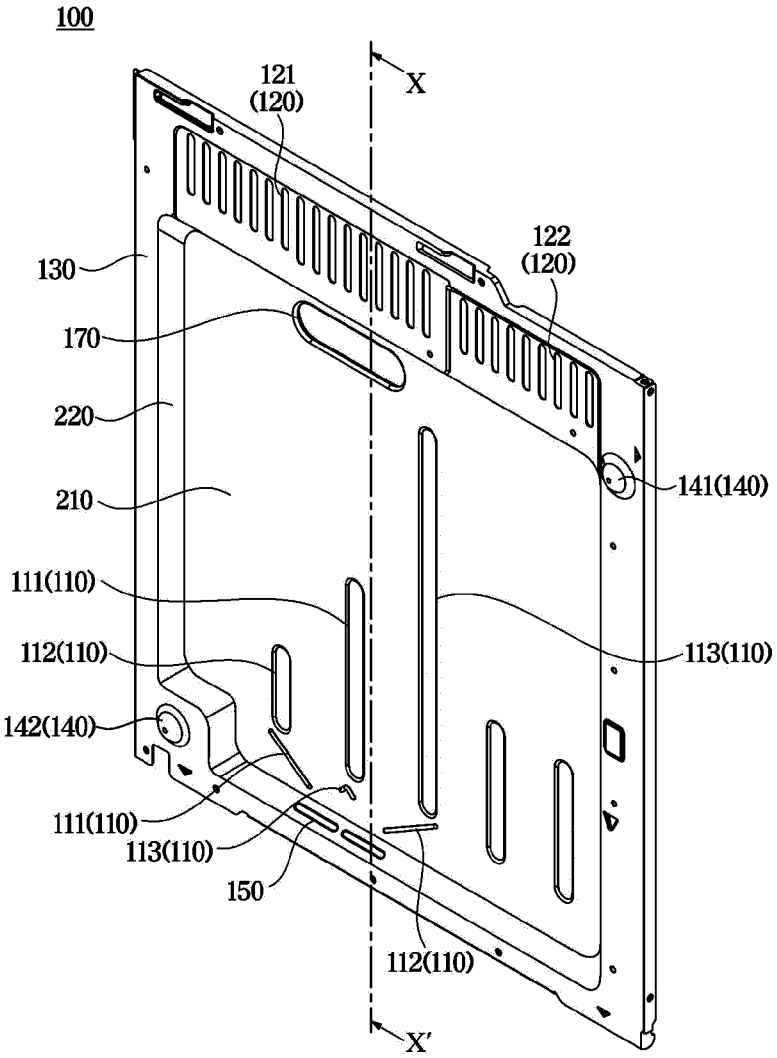
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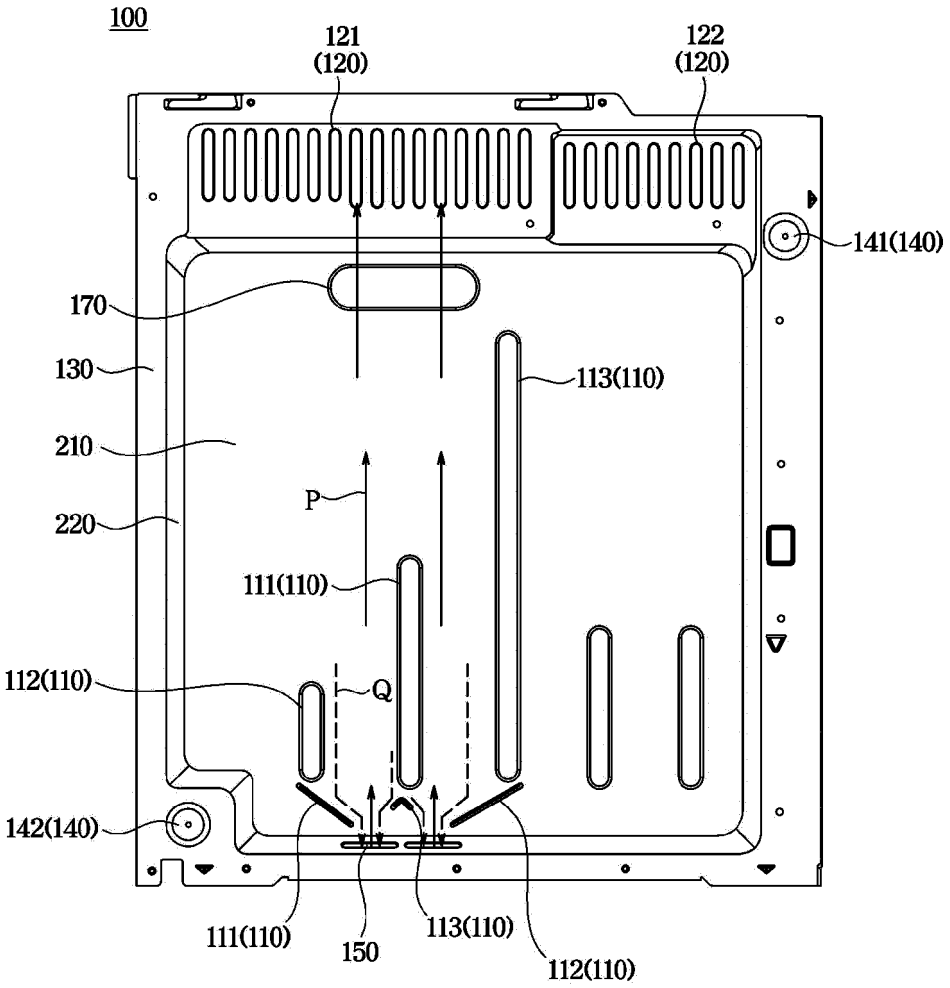
FIG. 8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112(110)

FIG. 9

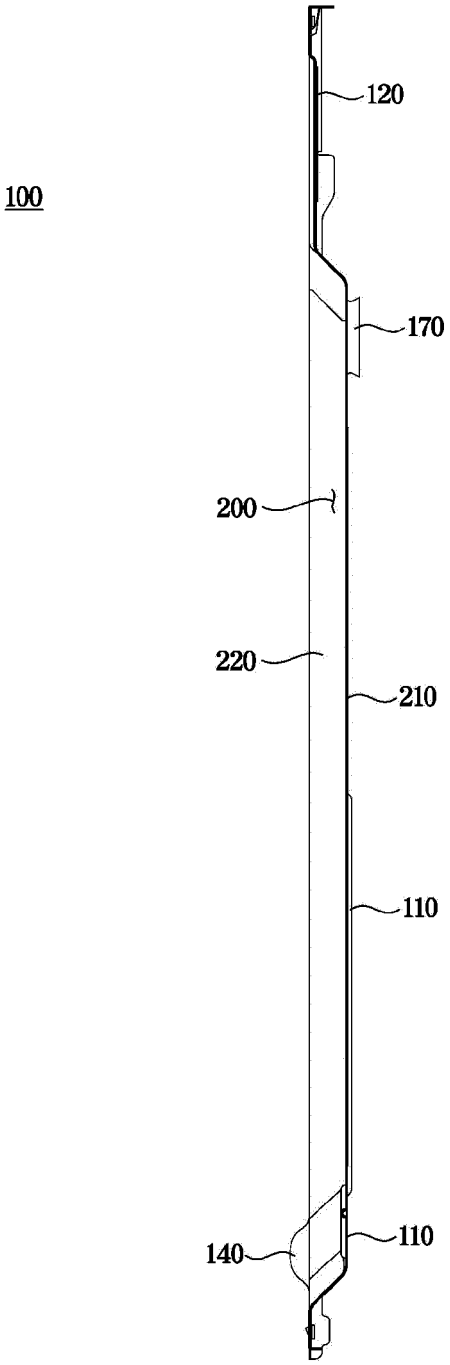
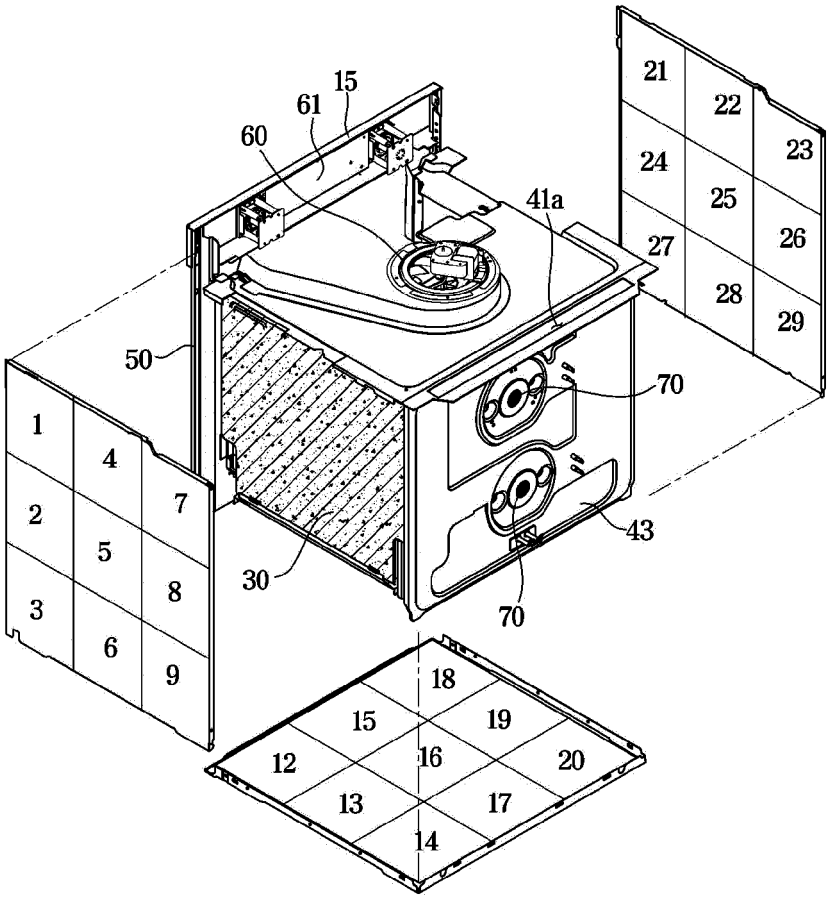


FIG. 10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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/015269

A. CLASSIFICATION OF SUBJECT MATTER

F24C 15/00(2006.01)i; **F24C 15/34**(2006.01)i; **F24C 15/30**(2006.01)i; **F24C 15/32**(2006.01)i; **F24C 15/08**(2006.01)i; **F24C 14/00**(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24C 15/00(2006.01); A47B 77/08(2006.01); F24C 1/00(2006.01); F24C 15/12(2006.01); F24C 15/32(2006.01); F24C 15/34(2006.01); F24C 7/04(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 조리기기(cooking appliance), 빌트인(built in), 단열층(insulation layer), 패널(panel), 하우징(housing), 냉각유로(cooling path), 리세스(recess)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2006-0035904 A (LG ELECTRONICS INC.) 27 April 2006 (2006-04-27) See paragraphs [0029], [0034], [0044] and [0049] and figures 2-5.	1-5,15
A		6-14
Y	KR 10-1531062 B1 (LG ELECTRONICS INC.) 23 June 2015 (2015-06-23) See paragraphs [0017] and [0020] and figures 1 and 3.	1-5,15
Y	KR 10-2016-0011993 A (SAMSUNG ELECTRONICS CO., LTD.) 02 February 2016 (2016-02-02) See paragraphs [0034], [0040]-[0041], [0055]-[0056] and [0062] and figures 3 and 9-10.	4-5
A	JP 5460229 B2 (HITACHI APPLIANCES INC.) 02 April 2014 (2014-04-02) See paragraphs [0023]-[0026] and figures 1-3.	1-15
A	US 2008-0185942 A1 (ELKASEVIC et al.) 07 August 2008 (2008-08-07) See paragraphs [0052]-[0053] and figure 12.	1-15

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 February 2023	**08 February 2023**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/015269

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		KR 10-2211731 B1	03 February 2021
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US 2008-0185942 A1	07 August 2008	US 7762250 B2	27 July 2010

Form PCT/ISA/210 (patent family annex) (July 2022)