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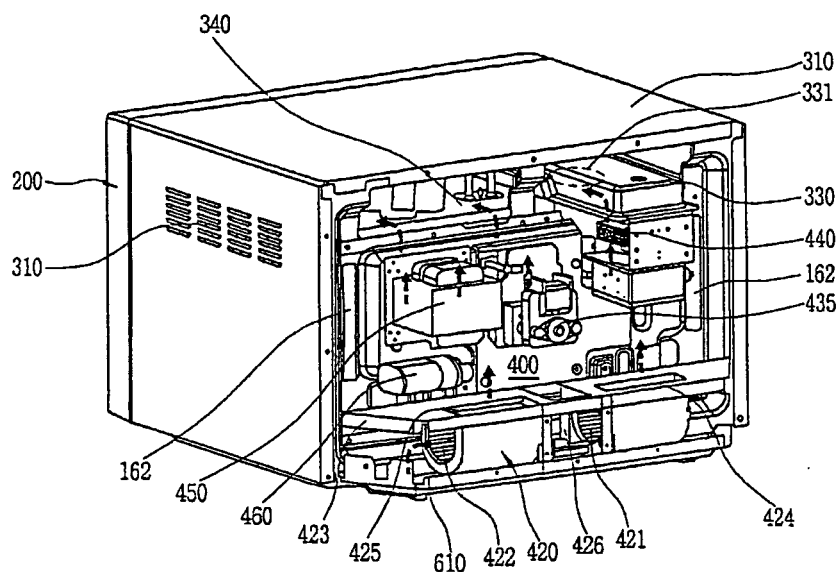
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(54) **Cooking apparatus**

(57) The present invention relates to a cooking apparatus, comprising a cooking cavity (100), and a component room located at the rear side of the cooking cavity (100) provided with a plurality of components used for a cooking process in the cooking cavity, a rear frame (160)

provided at the rear side of the cooking cavity (100), an external case (310) connected to the rear frame (160) so as to encompass the top and both sides of the cooking cavity (100), and a cover (410) connected to the rear frame (160) or the external case (310) to define the component room behind the cooking cavity (100).

[Fig. 2]



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## Description

### Technical Field

[0001] The present invention relates in general to a cooking apparatus, more specifically, to a cooking apparatus that uses a magnetron and a heater and is provided with an extended cooking cavity in height and width by installing the components at the rear space of the cooking cavity.

### Background Art

[0002] Korean Patent Application Laid-Open No. 2005-0083504 discloses a typical example of a cooking apparatus that has major components inclusive of a magnetron, a high voltage transformer, a high voltage capacitor, and a cooling fan provided at one side of a cooking cavity. Korean Patent Application Laid-Open No. 2006-0037003 discloses a cooking apparatus that has major components inclusive of a magnetron, a high voltage transformer, and a high voltage capacitor installed at the upper side of a cooking cavity and accommodates a convection heater assembly at the rear wall of the cooking cavity. Korean Utility Model Application Laid-Open No. 1999-0010444 discloses a cooking apparatus that has major components inclusive of a magnetron, a high voltage transformer, and a cooling fan and an operating panel provided at the lower side of a cooking cavity.

[0003] In addition, Korean Utility Model Application Laid-Open No. 1998-0016489 discloses a cooking apparatus, which has major components inclusive of a magnetron, a high voltage transformer and a cooling fan installed at a side wall of a cooking cavity and which is provided with a cooling flow path starting from the upper wall of the cooking cavity to a lateral side thereof.

[0004] Korean Patent Application Laid-Open No. 1998-0053939 discloses a door of a microwave oven used as a typical example of cooking apparatuses, in which the door is provided with a door frame for blocking microwaves and a choke cover surrounding the door frame.

[0005] Korean Patent Application Laid-Open No. 1995-0003729 discloses a cooking apparatus that has a cooking flow path starting from a lateral side of a cooking cavity, going via the bottom side of the cooking cavity, to the door.

[0006] Korean Patent Application Laid-Open No. 2004-0108050 discloses an example of an operating panel for use in a cooking apparatus, in which the operating panel is provided with a glass-touch keyboard using static electricity.

### Disclosure of Invention

### Technical Problem

[0007] It is an object of the present invention to provide

a cooking apparatus having a cooking cavity with an increased height and width by efficiently using the rear space of the cooking apparatus.

[0008] Another object of the present invention is to provide a cooking apparatus making an efficient use of the rear space of the cooking apparatus which accommodates a convection heater assembly.

[0009] Another object of the present invention is to provide a cooking apparatus that has heating elements such as a magnetron, a high voltage transformer and a high voltage capacitor installed at the rear space of the cooking apparatus and that has a capability of cooling them effectively.

[0010] Still another object of the present invention is to provide a cooking apparatus which has a cooling fan installed at the lower portion of the rear space of the cooking apparatus, thereby creating a cooling flow path, and which has major components installed on the cooling flow path for cooling.

[0011] Yet another object of the present invention is to provide a cooking apparatus which uses a rack or a plate instead of a turn table and takes advantage of the rear space of the cooking apparatus so that the height, width and depth of the cooking cavity can be adjusted.

### Technical Solution

[0012] To achieve the above objects and advantages, there is provided a cooking apparatus, comprising: a cooking cavity; and a component room located at the rear side of the cooking cavity and provided with a plurality of components used for a cooking process in the cooking cavity. Through this structure, the cooking apparatus has an expanded cooking cavity with an increased height and width. Although the modification of the cooking cavity of a conventional cooking apparatus is restricted by a circular turntable therein, the use of a rack or a plate instead of the turntable may resolve such restriction.

[0013] In another aspect of the present invention, the cooking apparatus comprises a cooling fan located at the lower side of the component room to cool at least part of the plurality of components. Through this structure, the plurality of components located at the rear side of the cooking cavity can be cooled more effectively.

[0014] In another aspect of the present invention, the cooking comprises a cooling fan located at the lower side of the component room to cool the plurality of the components, the cooling fan being positioned below the plurality of components. Through this structure, the components located at the rear side of the cooking cavity can be cooled effectively.

[0015] In another aspect of the present invention, the plurality of components comprise a magnetron and the cooking cavity is provided with a port communicating with the magnetron at the upper surface of the cooking cavity. Through this structure, microwaves can be effectively supplied to the cooking apparatus using a plate instead of a turntable and the rear space with limited spare room

due to the installation of the plurality of components can be utilized efficiently as well.

**[0016]** In another aspect of the present invention, the plurality of components comprise at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor. Through this structure, large volume components can be arranged at the rear side of the cooking cavity, resultantly providing the cooking apparatus with an expanded cooking cavity with an increased height and width.

**[0017]** In another aspect of the present invention, the cooking apparatus comprises a cooling fan located along the width direction of the component room to cool the plurality of components. Through this structure, the plurality of components located at the rear side of the cooking cavity can be cooled effectively.

**[0018]** In another aspect of the present invention, the cooking apparatus comprises a cooling fan located in the component room to cool the plurality of components and generating separate forced flows for cooling at least two of the plurality of components. Through this structure, the components required of a cooling process, each being dispersedly located due to its large volume, can be cooled effectively, efficiently, and selectively.

**[0019]** In another aspect of the present invention, the plurality of components comprise at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor; and the apparatus further comprises a cooling fan located in the component room to cool the plurality of components and generating separate forced flows for cooling at least two of the plurality of components.

**[0020]** In another aspect of the present invention, there is provided a cooking apparatus, comprising: a cooking cavity provided with an air flow inlet at a lateral side thereof; a fan located at the rear side of the cooking cavity and generating an air flow; and an air flow guide guiding the air flow generated from the fan to the air flow inlet. Through this structure, air flow can be more effectively guided into the cooking cavity by utilizing the fan located at the rear side of the cooking cavity.

**[0021]** In another aspect of the present invention, the air flow guide is extended from the rear side of the cooking cavity towards the air flow inlet.

**[0022]** In another aspect of the present invention, there is provided a cooking apparatus, comprising: a cooking cavity; a component room located at the rear side of the cooking cavity and having a plurality of components that include a magnetron and at least one of a convection heater assembly, a high voltage transformer, and a high voltage capacitor; a cooling fan located at the lower side of the component room to cool at least part of the plurality of components and generating a flow; and a flow guide guiding the flow to the magnetron. Through this structure, the magnetron can be cooled effectively.

**[0023]** In another aspect of the present invention there is provided a cooking apparatus, comprising: a cooking cavity; and a cooling fan located at the rear of the cooking

cavity and along the width direction of the cooking cavity. Through this structure, the components located along the width direction of the cooking cavity can be cooled effectively.

5 **[0024]** In another aspect of the present invention, the cooking apparatus comprises a plurality of components located over the cooling fan at the rear of the cooking cavity and provided with at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor.

10 **[0025]** In another aspect of the invention, there is provided a cooking apparatus, comprising: a cooking cavity; an upper space located over the cooking cavity; a rear space located behind the cooking cavity; a door covering the cooking cavity and the upper space; and a cooling fan located at the lower side of the rear space and generating a flow. Through this structure, it is possible to arrange components necessary for a cooking process in the cooking cavity in the upper space and the rear space, and to cool the components effectively.

20 **[0026]** In another aspect to the present invention, the door is provided with an opening that communicates with the upper space. Through this structure, the door can be cooled with the cooling fan.

25 **[0027]** In another aspect to the present invention, the cooking apparatus comprises a heater provided at the upper space and heating the cooking cavity. Through this structure, it is possible to utilize the upper space and to cool the upper space effectively by the cooling fan.

30 **[0028]** In another aspect of the present invention, there is provided a cooking apparatus, comprising: a cooking cavity; an upper space located over the cooking cavity; a rear space located behind the cooking cavity; a door covering the cooking cavity and the upper space; and a control panel located at the region of the door covering the upper space. As the control panel is installed at the door and necessary components are located in the upper space and the rear space, the cooking cavity can be expanded in height and width.

35 **[0029]** In another aspect of the present invention, the cooking apparatus comprises a cooling fan located at the lower side of the rear space and generating a flow. Through this structure, the rear space, the upper space and/or the door can be cooled effectively.

40 **[0030]** In another aspect of the present invention, the cooking apparatus comprises a partition wall formed across the rear space, communicating with the rear space over the partition wall, and preventing the flow from traveling from the rear space over the partition wall to the cooling fan. Through this structure, it is possible to form a flow toward the rear space, the upper space and/or the door. One thing to be careful here is that such a partition wall may have a structure capable of blocking at least part of the flow in a reverse direction.

45 **[0031]** In another aspect of the present invention, the cooking apparatus comprises a relay substrate located at the upper space and cooperating with the control panel. Through this structure, the relay substrate with a large

volume and a low height can be effectively installed at a place other than the door with limited space and the rear space with many components.

[0032] In another aspect of the present invention, the cooking apparatus comprises a convection heater assembly, a magnetron, a high voltage transformer, and a cooling fan located at the rear space, respectively and a first heater, a second heater and a port located around the upper space, respectively, the first heater being located inside the cooking cavity, the second heater being located outside the cooking cavity, and the port being located to communicate the cooking cavity with the magnetron. This structure is one of preferred embodiments of the present invention.

[0033] In another aspect of the present invention, the cooking apparatus comprises a relay substrate located at the upper space and cooperating with the control panel.

[0034] In another aspect of the present invention, there is provided a cooking apparatus, comprising: a cooking cavity; an upper space located over the cooking cavity; lateral spaces located on both sides of the cooking cavity; and a rear frame attached to the rear of the cooking cavity and provided with a cooling fan at the lower side thereof and an opening communicating with the upper space.

[0035] In another aspect of the present invention, there is provided a cooking apparatus, comprising: a cooking cavity; an upper space located over the cooking cavity; lateral spaces located on both sides of the cooking cavity; and a rear frame attached to the rear of the cooking cavity and provided with a cooling fan at the lower side thereof and an opening communicating with the lateral spaces.

[0036] Additional and/or other aspects and advantages of the present invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

### Brief Description of the Drawings

[0037] The above aspects and features of the present invention will be more apparent by describing certain embodiments of the present invention with reference to the accompanying drawings, in which:

FIG. 1 is an exploded schematic view of the main structure of a cooking apparatus according to the present invention;

FIG. 2 schematically shows an example of the rear space of a cooking apparatus according to the present invention; and

FIGS. 3 and 4 schematically show other examples of the rear space of a cooking apparatus according to the present invention.

### Mode for the Invention

[0038] The present invention will be described in detail

herein below with reference to the accompanying drawings.

[0039] FIG. 1 is an exploded schematic view of the main structure of a cooking apparatus in accordance with the present invention, showing a cooking cavity 100, a door 200, an upper space 300 located over the cooking cavity 100, a rear space 400 located at the rear of the cooking cavity 100, lateral spaces 500 located on both sides of the cooking cavity 100, and a lower space 600 located under the cooking cavity 100.

[0040] The cooking cavity 100 is a space for cooking food, and is defined by an inner case 110. A heater 120 is provided at the upper portion of the inside of the cooking cavity 100, and a plate or a rack 130 is placed inside the cooking cavity 100. The inner case 110 includes an inlet (not shown) and an outlet 111 formed on the sides for forming an air flow path to remove heat and smell inside the cooking cavity 100. An example of the heater 120 is a sheath heater. The use of the plate 130 in replacement of a circular turn table brings change to width and length (depth) of the cooking cavity 100, the modification of which is restricted by the turn table. At one side of the cooking cavity 100 is provided a guide 140 for guiding the plate 130. In addition, at the front and rear sides of the cooking cavity 100 are provided a front frame 150 and a rear frame 160, respectively, and the front frame 150 has an opening 151 for forming a flow path between the upper space 300 and the door 200. The rear frame 160 also has an opening 161 formed at the upper side for communication with the rear space 400.

[0041] The lower portion of the door 200 is hinged to the cooking cavity 100 so that the door 200 can open and close the cooking cavity 100. The door 200 is formed to cover the cooking cavity 100 and the upper space 200. The door 200 is composed of a handle 210, a front plate 220, an input sensing unit 230, a door panel 240, a control panel 250, a middle plate 260, a bracket 270, a door frame 280, and a choke cover 290.

[0042] The handle 210 is a part that a user uses to open or close the door 200, and can be fixed to the front plate 220 by bolts (not shown). Desirably, the handle 210 has at least one channel (not shown) formed inside along its longitudinal direction in a manner that the channel is communicated with outside, so that the total weight can be reduced and the amount of heat transferred to the user from the cooking cavity 100 during cooking can be minimized.

[0043] The front plate 220 is desirably made of a transparent glass for the user to be able to see the inside of the cooking cavity 100, and a display unit (not shown) including buttons may be attached or coated thereto, the buttons being used for the user to select a cooking course or for the indication of an operating status of the cooking apparatus.

[0044] The input sensing unit 230 is a part that recognizes which button is selected by the user. In the case that the input sensing unit 230 is located at the rear of the front plate 220 made of glass, it can be composed of

a glass touch unit and serve as an electrostatic sensor. The glass touch unit can be attached to the front plate 220 using a tape. The input sensing unit 230 is located at the upper region of the door 200 facing the upper space 300 of the cooking cavity 100, and this structure ensures a broader cooking cavity and helps the user easily see the inside of the cooking cavity 100 without hindrance.

**[0045]** The door panel 240 is a part that fixes other components 220, 250 and the like of the door 200, and has an opening 241 for the user to see the inside of the cooking cavity 100. Moreover, the door panel 240 has in its lower side an outlet (not shown) through which the flow traveling along a cooling flow path extended from a cooling fan 420 (to be described) to the door 200 via the upper space 300 is discharged.

**[0046]** The control panel 250 is a part for controlling the overall operation of the cooking apparatus according to a user input. To this end, it cooperates with the input sensing unit 230 and a relay substrate 350 (to be described), and is fixed to the door panel 240 from the rear side of the input sensing unit 230. Desirably, the control panel 250 is provided with a light-emitting source such as an LED (light emitting diode), and irradiates the light emitted from the light-emitting source to the display unit (not shown).

**[0047]** The middle plate 260 is a part fixed to the door panel 240, while being spaced out from the front plate 220 and the door frame 280, respectively. Its primary function is to block heat transfer from the cooking cavity 100 to the front frame 220 and the handle 210. Desirably, the middle plate 260 is installed at the door panel 240 so that a flow generated from the cooling fan 420 (to be described) enters the door 200 via the rear space 400 and the upper space 300 and then travels between the middle plate 260 and the front plate 220 under the guidance of a bracket 270 (to be described). Such a flow vents through the outlet (not shown) of the door panel 240.

**[0048]** The bracket 270 is fixed to the door panel 240 from the rear side of the control panel 250. It serves to protect the input sensing unit 230 and the control panel 250, each including electronic components, against heat and microwaves from the cooking cavity 100 and against the flow by the cooling fan 420, and guides the flow to travel between the door panel 240 and the front plate 220.

**[0049]** The door frame 280 is accommodated in the door panel 240, and serves to block leakage of microwaves to the outside of the cooking apparatus.

**[0050]** The choke cover 290 is a cover for the door 200 located towards the cooking cavity 100, and has an opening 291 formed on its upper side in correspondence to the opening 151 of the front frame 150. The opening 291 is preferably composed of tiny holes in order to prevent food or foreign substances from getting into the door 200 while the door 200 is being open.

**[0051]** The upper space 300 is a space over the cooking cavity 100 defined by an external case 310, and includes a heater 320, a waveguide 330, an insulating up-

per plate 340, and a relay substrate 350. Optionally, a lamp (not shown) for lightening the cooking cavity 100 may be provided as well.

**[0052]** The external case 310 has a shape that encompasses the top and both sides of the cooking cavity 100 at a distance away, and is connected to the front frame 150 and the rear frame 160. If necessary, it may have an outlet 311 so that a flow having traveled around the cooking cavity 100 and the heating elements installed in the cooking apparatus can be vented to the outside.

**[0053]** An example of the heater 320 is a halogen heater. Since such a heater 320 is influenced by microwaves, unlike the heater 120 formed of a sheath heater, the heater 320 is installed at the upper side of the inner case 110 so as to provide heat downwardly into the cooking cavity 100 from above.

**[0054]** The waveguide 330 is extended from the rear space 400 to the upper space 300, and serves to provide microwaves generated from a magnetron (not shown) to the cooking cavity 100. To do this, at the upper surface of the cooking cavity 100 is provided a port 331 (see FIG. 2).

**[0055]** The insulating upper plate 340 prevents heat generated by the heater 120 housed in the inner case 110 from transferring to the upper space 300, and has a shape that covers the upper portion of the cooking cavity 100 except for the heater 320 and the waveguide 330.

**[0056]** The relay substrate 350 is mounted on the insulating upper plate 340 from one side of the upper space 300, and interworks with the control panel 250 to operate components inclusive of the magnetron (to be described) placed at the rear space 400.

**[0057]** FIG. 2 schematically shows an example of the rear space of a cooking apparatus according to the present invention. Referring to FIGS. 1 and 2, the rear space 400 is a space behind the cooking cavity 100 defined by the cover 410, and includes a cooling fan 420, a convection heater assembly 430, and heating elements such as a magnetron 440, a high voltage transformer 450, and a high voltage capacitor 460, together building a component room of the cooking apparatus.

**[0058]** The cover 410 is connected to the rear frame 160 or the outer case 310 so as to cover the upper space 300 and the rear space 400, and its lower portion is connected to a base 610. At the lower portion of the cover 410 or the base 610 is provided an inlet 411 for air inflow to the cooling fan 420.

**[0059]** The cooling fan 420 is located at the lower portion of the rear space 400 along the width direction thereof, and includes flow-generating units 421 and 422 on both sides to cool the components installed at the upper side. As the rear space 400, the upper space 300 and the door 200 are built in a way to be communicated, the entire area of the cooking apparatus can be cooled by means of the cooling fan 420. In addition, the cooling fan 420 is provided with a partition wall 423 for preventing the flow generated by the cooling fan 420 from flowing back to the cooling fan 420. The partition wall 423 has

openings 424 and 425 formed on both sides in a manner to make the flow go up to the upper portion of the rear space 400. At the space 426 between the flow-generating units 421 and 422 is provided a motor (not shown) for driving the flow-generating units 421 and 422.

**[0060]** FIGS. 3 and 4 schematically show other application examples of the rear space of a cooking apparatus according to the present invention. Referring to FIGS. 1-4, the rear space is provided, in addition to the structure shown in FIG. 2, with a flow guide 441 for guiding air flow to the magnetron 440, and an flow guide 442 for guiding the air flow coming out of the magnetron 440 to the inlet 112 that is formed on the lateral face of the cooking cavity 100. This structure, especially the flow guide 442, makes it possible to guide the air flow generated from the cooling fan 420 into the cooking cavity 100 stably and efficiently, and to effectively cool the magnetron, one of core components.

**[0061]** The convection heater assembly 430 includes a fan 431, a heater 432, an inner heater cover 433, an outer heater cover 434, and a motor 435. Desirably, a heat insulating material (not shown) is placed between the inner heater cover 433 and the outer heater cover 434. Such a convection heater assembly 430 must have the motor 435. Since the motor 435 is installed being protruded backwardly from the rear space 400, the rear space 400 must have a room that is deep enough at least to accommodate the motor 435. Based on the attention to this space, such a large volume component 440, 450, and/or 460 among the major components used in the operation of the cooking apparatus can be placed in the rear space 400. In this way, even though part of the cooking cavity 100 in the longitudinal direction is sacrificed, the cooking cavity 100 is expanded in the lateral and vertical directions. Also, by using a plate instead of a turntable, a cooking apparatus according to the present invention can change the height, width and depth of the cooking cavity 100. Also, by placing the cooling fan 420 at the lower portion of the rear space 400, a cooking apparatus according to the present invention can utilize the rear space 400 and can cool the heating elements 440, 450, and/or 460 as well. Also, by providing the cooling fan 420 at the lower portion of the rear space 400 and building the rear space 400, the upper space 300, the door 200, the cooking cavity 100, and the lateral spaces 500 to be communicated with one another, the whole part of a cooking apparatus according to the present invention can be effectively cooled by the cooling fan 420. Also, as the cooling fan 420 is installed along the width direction of the rear space 400, the heating elements such as the convection heater assembly 430, the magnetron 440, the high voltage transformer 450, and the high voltage capacitor 460, which are provided in the rear space 400, can be cooled effectively, the flow can be traveled to the upper space 300, the lateral spaces 500 and the cooking cavity 100 and be vented through an outlet 611 formed on the base at the lower portion of the cooking cavity 100. Also, by providing the partition wall

423 and the openings 424 and 425, a cooking apparatus according to the present invention can form the flow path and flow and cool the heating elements, effectively and selectively. Also, the rear frame 160 may further comprise an opening 162 for communicating the lateral space 500. The opening 162 enables a direct air flow from the rear space 400 to the lateral space 500 and creates air flow to both sides of the rear space 400, thereby promoting the cooling process and the air flow onto both sides of the rear space 400.

**[0062]** The magnetron 440, the high voltage transformer 450, and the high voltage capacitor 460 are major components used in the operation of the cooking apparatus, each generating a lot of heat. The magnetron 440 is placed above the opening 424, while the high voltage transformer 450 and the high voltage capacitor 460 are placed above the opening 425. The arrangement of these heating elements can be changed.

**[0063]** The lateral spaces 500 are spaces on both sides of the cooking cavity 100 defined by the outer case 100, and they desirably communicate with the upper space 300, the rear space 400, and the lower space 600, and also with the cooking cavity 100 through the inlet 112 and the outlet 111. The flow generated from the cooling fan 420 travels from the rear space 400, the upper space 300, the cooking cavity 100, the lateral spaces 500, and eventually to the lower space 600. At this time, the flow traveling the upper space 300 and heading to the lateral space 500 can guide the flow that came out of the cooking cavity 100 through the outlet 111 to the lower space 600.

**[0064]** The lower space 600 is a space below the cooking cavity 100 defined by the base 610. The base 610 is connected to the front frame 150 and the rear frame 160 to support the cooking apparatus, and includes the outlet 611 so as to exhaust the flow originated from the cooling fan 420 and the smell and heat generated in the cooking cavity 100. Even though the lower space 600 is defined by the rear frame 160 from the rear side, the base 610 is connected to the cover 410 over the rear frame 160. Therefore, the base 610 also functions as a member for limiting the lower portion of the rear space 400. The location of the outlet 611 is not particularly limited, so it can be on the side of the outlet 111, or preferably at the center of the base 610 to give a sufficiently long flow path. Since hot air flow is vented through the outlet 611, the cooking apparatus should not be placed on a kitchen appliance that is sensitive to heat. To protect such a kitchen appliance from any damages due to overheated air, a plate (not shown) may be connected to the base 610 at a distance so that heat may be exhausted in the lateral directions.

**[0065]** As explained so far, according to a cooking apparatus of the present invention, the height and width of the cooking cavity can be expanded by utilizing the rear space of the cooking apparatus.

**[0066]** Also, according to a cooking apparatus of the present invention, the rear space provided with the convection heater assembly can be utilized effectively.

**[0067]** Also, according to a cooking apparatus of the present invention, it is possible to arrange heating elements such as the magnetron, the high voltage transformer, and the high voltage capacitor in the rear space and to cool them effectively.

**[0068]** Also, according to a cooking apparatus of the present invention, the cooling fan is provided at the lower portion of the rear space of the cooking apparatus, and can cool the major components by placing them on the cooling flow path generated by the cooling fan.

**[0069]** Also, according to a cooking apparatus of the present invention, by using the rack or the plate instead of the turntable and by utilizing the rear space of the cooking apparatus, it becomes possible to adjust the height, width and depth of the cooking cavity.

**[0070]** Although the preferred embodiment of the present invention has been described, it will be understood by those skilled in the art that the present invention should not be limited to the described preferred embodiment, but various changes and modifications can be made within the spirit and scope of the present invention as defined by the appended claims.

#### IT FOLLOWS A LIST OF EMBODIMENTS:

**[0071]** A cooking apparatus, comprising:

a cooking cavity; and  
a component room located at the rear side of the cooking cavity and provided with a plurality of components used for a cooking process in the cooking cavity.

**[0072]** The cooking apparatus as set forth in embodiment 1, further comprising:

a cooling fan located at the lower side of the component room to cool at least part of the plurality of components.

**[0073]** The cooking apparatus as set forth in embodiment 1, further comprising:

a cooling fan located at the lower side of the component room to cool the plurality of the components, the cooling fan being positioned below the plurality of components.

**[0074]** The cooking apparatus as set forth in embodiment 1, wherein the plurality of components comprise a magnetron and the cooking cavity is provided with a port communicating with the magnetron at the upper surface of the cooking cavity.

**[0075]** The cooking apparatus as set forth in embodiment 1, wherein the plurality of components comprise at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor.

**[0076]** The cooking apparatus as set forth in embodi-

ment 1, further comprising:

a cooling fan located along the width direction of the component room to cool the plurality of components.

**[0077]** The cooking apparatus as set forth in embodiment 1, further comprising:

a cooling fan located in the component room to cool the plurality of components and generating separate forced flows for cooling at least two of the plurality of components.

**[0078]** The cooking apparatus as set forth in embodiment 1, wherein the plurality of components comprise at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor; and

wherein the apparatus further comprises a cooling fan located in the component room to cool the plurality of components and generating separate forced flows for cooling at least two of the plurality of components.

**[0079]** A cooking apparatus, comprising:

a cooking cavity provided with an air flow inlet at a lateral side thereof;

a fan located at the rear side of the cooking cavity and generating an air flow; and

an air flow guide guiding the flow generated from the fan to the air flow inlet.

**[0080]** The cooking apparatus as set forth in embodiment 9, wherein the air flow guide is extended from the rear side of the cooking cavity towards the air flow inlet.

**[0081]** A cooking apparatus, comprising:

a cooking cavity;

a component room located at the rear side of the cooking cavity and having a plurality of components that include a magnetron and at least one of a convection heater assembly, a high voltage transformer, and a high voltage capacitor;

a cooling fan located at the lower side of the component room to cool at least part of the plurality of components and generating a flow; and

a flow guide guiding the flow to the magnetron.

**[0082]** A cooking apparatus, comprising:

a cooking cavity; and

a cooling fan located at the rear of the cooking cavity and along the width direction of the cooking cavity.

**[0083]** The cooking apparatus as set forth in embodiment 12, further comprising:

a plurality of components located over the cooling fan at the rear of the cooking cavity and provided

with at least two of a convection heater assembly, a magnetron, a high voltage transformer, and a high voltage capacitor.

A cooking apparatus, comprising:

a cooking cavity;  
an upper space located over the cooking cavity;  
a rear space located behind the cooking cavity;  
a door covering the cooking cavity and the upper space; and a cooling fan located at the lower side of the rear space and generating a flow.

**[0084]** The cooking apparatus as set forth in embodiment 14, wherein the door is provided with an opening that communicates with the upper space.

**[0085]** The cooking apparatus as set forth in embodiment 14, further comprising:

a heater provided in the upper space and heating the cooking cavity.

**[0086]** A cooking apparatus, comprising:

a cooking cavity;  
an upper space located over the cooking cavity;  
a rear space located behind the cooking cavity;  
a door covering the cooking cavity and the upper space; and  
a control panel located at the region of the door covering the upper space.

**[0087]** The cooking apparatus as set forth in embodiment 17, further comprising:

a cooling fan located at the lower side of the rear space and generating a flow.

**[0088]** The cooking apparatus as set forth in embodiment 18, further comprising:

a partition wall formed across the rear space, communicating with the rear space over the partition wall, and preventing the flow from traveling from the rear space over the partition wall to the cooling fan.

**[0089]** The cooking apparatus as set forth in embodiment 17, further comprising:

a relay substrate provided at the upper space and cooperating with the control panel.

**[0090]** The cooking apparatus as set forth in embodiment 17, further comprising:

a convection heater assembly, a magnetron, a high voltage transformer, and a cooling fan located at the rear space, respectively; and  
a first heater, a second heater and a port located

around the upper space, respectively, the first heater being located inside the cooking cavity, the second heater being located outside the cooking cavity, and the port being located to communicate the cooking cavity with the magnetron.

**[0091]** The cooking apparatus as set forth in embodiment 21, further comprising:

a relay substrate located at the upper space and cooperating with the control panel.

**[0092]** A cooking apparatus, comprising:

a cooking cavity;  
an upper space located over the cooking cavity;  
lateral spaces located on both sides of the cooking cavity; and  
a rear frame attached to the rear of the cooking cavity and provided with a cooling fan at the lower side thereof and an opening communicating with the upper space.

**[0093]** A cooking apparatus, comprising:

a cooking cavity;  
an upper space located over the cooking cavity;  
lateral spaces located on both sides of the cooking cavity; and  
a rear frame attached to the rear of the cooking cavity and provided with a cooling fan at the lower side thereof and an opening communicating with the lateral spaces.

## Claims

1. A cooking apparatus, comprising:

a cooking cavity (100); and  
a component room located at the rear side of the cooking cavity (100) and provided with a plurality of components used for a cooking process in the cooking cavity,

**characterized in that** the cooking apparatus further comprises:

a rear frame (160) provided at the rear side of the cooking cavity (100),  
an external case (310) connected to the rear frame (160) so as to encompass the top and both sides of the cooking cavity (100), and  
a cover (410) connected to the rear frame (160) or the external case (310) to define the component room behind the cooking cavity (100).

2. The cooking apparatus as set forth in claim 1, further

comprising:

a cooling fan (420) provided at the lower side of the rear frame (160) to cool at least part of the plurality of components, the cooling fan (420) being positioned below the plurality of components.

3. The cooking apparatus as set forth in claim 1, wherein the plurality of components comprise a magnetron (440) and the cooking cavity (100) is provided with a port communicating with the magnetron (440) at the upper surface of the cooking cavity (110).

4. The cooking apparatus as set forth in claim 1, wherein the plurality of components comprise at least two of a convection heater assembly (430), a magnetron (440), a high voltage transformer (450), and a high voltage capacitor (460).

5. The cooking apparatus as set forth in claim 1, further comprising:

a cooling fan (420) provided along the width direction of the lower side of the rear frame (160) in the component room to cool the plurality of components.

6. The cooking apparatus as set forth in claim 1, further comprising:

a cooling fan (420) provided at the lower side of the rear frame (160) in the component room to cool the plurality of components and generating separate forced flows for cooling at least two of the plurality of components.

7. The cooking apparatus as set forth in any one of claims 1 to 6, further comprising an air flow inlet (112) provided at a lateral side of the cooking cavity (100), a fan (420) located at the rear side of the cooking cavity (100) and generating an air flow and an air flow guide (442) guiding the flow generated from the fan (420) to the air flow inlet (112).

8. The cooking apparatus as set forth in claim 7, wherein the air flow guide (442) is extended from the rear side of the cooking cavity (100) to a magnetron (440) located in the component room and then from the magnetron (440) towards the air flow inlet (112) on a lateral side of the cooking cavity (100).

9. The cooking apparatus as set forth in any one of claims 1 to 8, wherein the plurality of components include a magnetron (440) and at least one of a convection heater assembly (430), a high voltage transformer (450) and a high voltage capacitor (460), a cooling fan is provided at the lower side of the rear

frame (160) in the component room to cool at least part of the plurality of components and generating a flow and a flow guide (441) guides the flow to the magnetron (440).

10. The cooking apparatus as set forth in any one of claims 1 to 9, further comprising a front frame (150) provided at the front side of the cooking cavity (100), wherein an upper space (300) is defined by the front frame (150), the rear frame (160) and the external case (310) over the cooking cavity (100) and a door (200) covers the cooking cavity (100) and the front frame (150).

11. The cooking apparatus as set forth in claim 10, wherein the door (200) is provided with an opening (291) that communicates with the upper space (300) through an opening (151) of the front frame (150).

12. The cooking apparatus as set forth in claim 10 or 11, further comprising a rear space (400) corresponding to the component room and located behind the cooking cavity (100) so that the cover (410) can cover the upper space (300) and the rear space (400) by connecting the rear frame (160) or the outer case (310); and a control panel (250) located at the region of the door covering the front frame (150).

13. The cooking apparatus as set forth in claim 12, further comprising:

a cooling fan (420) provided at the lower side of the rear frame (160) in the rear space (400) and generating a flow to the above of the rear space (400), and

a partition wall (423) formed across the rear space (400), communicating with the rear space (400) over the partition wall (423) and preventing the flow from traveling from the rear space (400) over the partition wall (423) to the cooling fan (420).

14. The cooking apparatus as set forth in claim 12, further comprising:

a convection heater assembly (430), a magnetron (440), a high voltage transformer (450), and a cooling fan (420) located at the rear space, respectively; and

a first heater (120), a second heater (320) and a port located around the upper space (300), respectively, the first heater (120) being located inside the cooking cavity (100), the second heater (320) being located outside the cooking cavity (100), and the port being located to communicate the cooking cavity (100) with the magnetron (440).

15. The cooking apparatus as set forth in any one of claims 1 to 14, further comprising:

an upper space (300) defined by the external case (310) over the cooking cavity (100);  
lateral spaces (500) defined by the external case (310) on both sides of the cooking cavity (100);  
and  
a rear space (400) defined by the cover (410) behind the cooking cavity (100) so as to correspond to the component room,

wherein the rear frame (160) includes an opening (161, 162) so that the rear space (400) can communicate with the upper space (300) and/or the rear space (400) can communicate with the lateral spaces (500).

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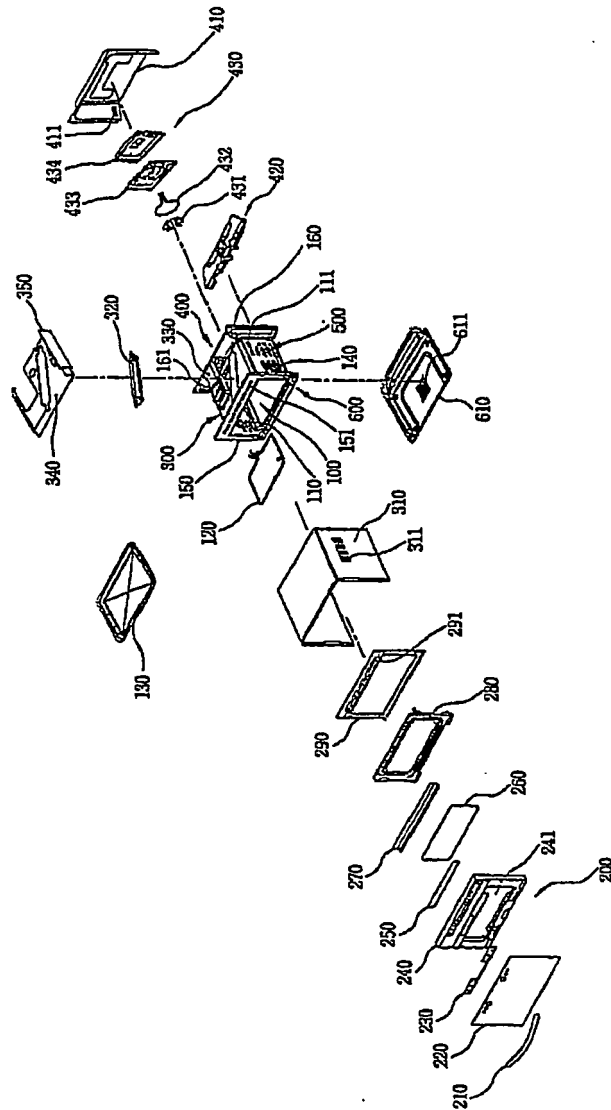
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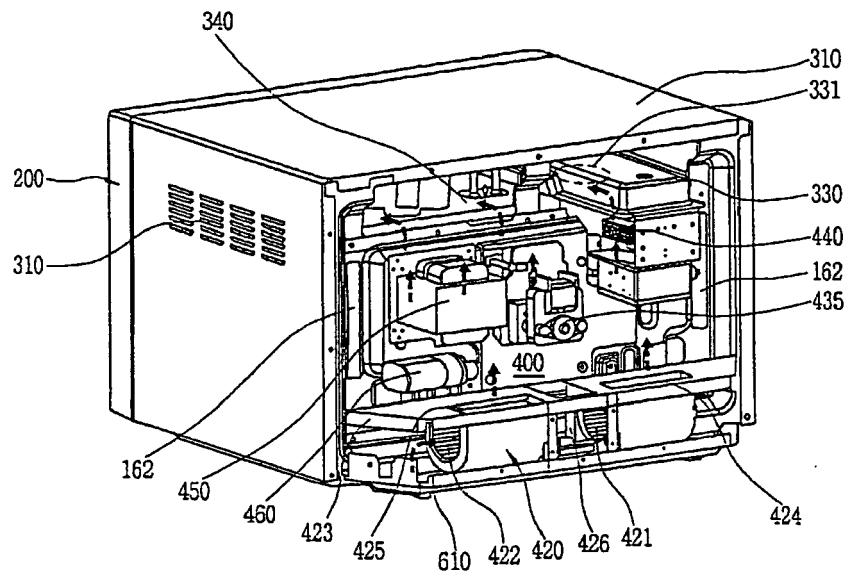
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55

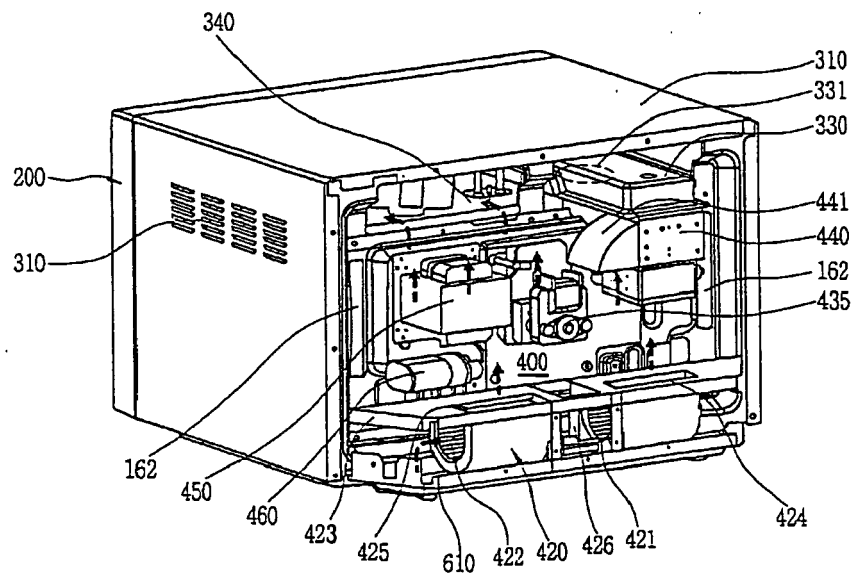
[Fig. 1]



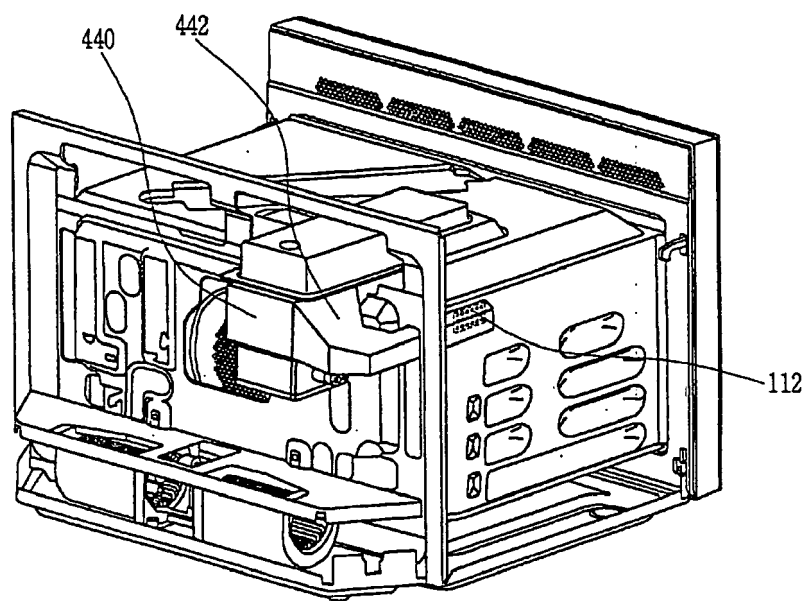
[Fig. 2]



[Fig. 3]



[Fig. 4]





## EUROPEAN SEARCH REPORT

Application Number  
EP 10 00 7344

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                              |                                                                                                                                                                                                                                                                                       |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC) |
| X                                                                                                                                                                                                                                                      | FR 2 773 209 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 2 July 1999 (1999-07-02)<br>* page 5, line 13 - page 6, line 13;<br>figure 1 *                             | 1                                                                                                                                                                                                                                                                                     | INV.<br>H05B6/64<br>H05B6/80            |
| X                                                                                                                                                                                                                                                      | EP 0 768 809 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 16 April 1997 (1997-04-16)<br>* column 3, line 22 - line 43; figure 1 *<br>* column 4, line 29 - line 32 * | 1                                                                                                                                                                                                                                                                                     |                                         |
| X                                                                                                                                                                                                                                                      | EP 0 653 900 A (MATSUSHITA ELECTRIC IND CO LTD [JP]) 17 May 1995 (1995-05-17)<br>* column 12, line 43 - column 14, line 10;<br>figure 8 *                    | 1                                                                                                                                                                                                                                                                                     |                                         |
| A                                                                                                                                                                                                                                                      | FR 2 609 159 A (GAGGENAU WERKE [DE])<br>1 July 1988 (1988-07-01)<br>* page 6, line 5 - line 30; figure 2 *                                                   | 1-15                                                                                                                                                                                                                                                                                  |                                         |
| A                                                                                                                                                                                                                                                      | US 4 132 878 A (TACHIKAWA HAJIME ET AL)<br>2 January 1979 (1979-01-02)<br>* column 3, line 41 - line 64; figure 3 *                                          | 1-15                                                                                                                                                                                                                                                                                  |                                         |
| A                                                                                                                                                                                                                                                      | EP 1 615 471 A (SAMSUNG ELECTRONICS CO LTD [KR]) 11 January 2006 (2006-01-11)<br>* paragraphs [0015], [0016], [0019];<br>figures 1-3 *                       | 1-15                                                                                                                                                                                                                                                                                  | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|                                                                                                                                                                                                                                                        |                                                                                                                                                              |                                                                                                                                                                                                                                                                                       | H05B<br>F24C                            |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                              |                                                                                                                                                                                                                                                                                       |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                              |                                                                                                                                                              | Date of completion of the search<br>26 August 2010                                                                                                                                                                                                                                    | Examiner<br>Gea Haupt, Martin           |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                              | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                         |

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 00 7344

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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26-08-2010

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| FR 2773209                                | A1 | 02-07-1999          | CN 1230663 A               | 06-10-1999          |
|                                           |    |                     | GB 2334871 A               | 01-09-1999          |
| EP 0768809                                | A2 | 16-04-1997          | CN 1151496 A               | 11-06-1997          |
|                                           |    |                     | DE 69633100 D1             | 16-09-2004          |
|                                           |    |                     | DE 69633100 T2             | 28-07-2005          |
|                                           |    |                     | JP 9126469 A               | 16-05-1997          |
|                                           |    |                     | US 5726429 A               | 10-03-1998          |
| EP 0653900                                | A  | 17-05-1995          | CN 1108374 A               | 13-09-1995          |
|                                           |    |                     | DE 69419480 D1             | 19-08-1999          |
|                                           |    |                     | DE 69419480 T2             | 13-04-2000          |
|                                           |    |                     | US 5525782 A               | 11-06-1996          |
| FR 2609159                                | A  | 01-07-1988          | DE 3644435 A1              | 07-07-1988          |
|                                           |    |                     | GB 2200019 A               | 20-07-1988          |
| US 4132878                                | A  | 02-01-1979          | JP 1167067 C               | 08-09-1983          |
|                                           |    |                     | JP 52103735 A              | 31-08-1977          |
|                                           |    |                     | JP 57061976 B              | 27-12-1982          |
| EP 1615471                                | A  | 11-01-2006          | JP 3977383 B2              | 19-09-2007          |
|                                           |    |                     | JP 2006003073 A            | 05-01-2006          |
|                                           |    |                     | KR 20050120474 A           | 22-12-2005          |
|                                           |    |                     | US 2006000827 A1           | 05-01-2006          |

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- KR 20050083504 [0002]
- KR 20060037003 [0002]
- KR 19990010444 [0002]
- KR 19980016489 [0003]
- KR 19980053939 [0004]
- KR 19950003729 [0005]
- KR 20040108050 [0006]