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(71) Applicant: **Samsung Electronics Co., Ltd**
Gyeonggi-do 443-742 (KR)

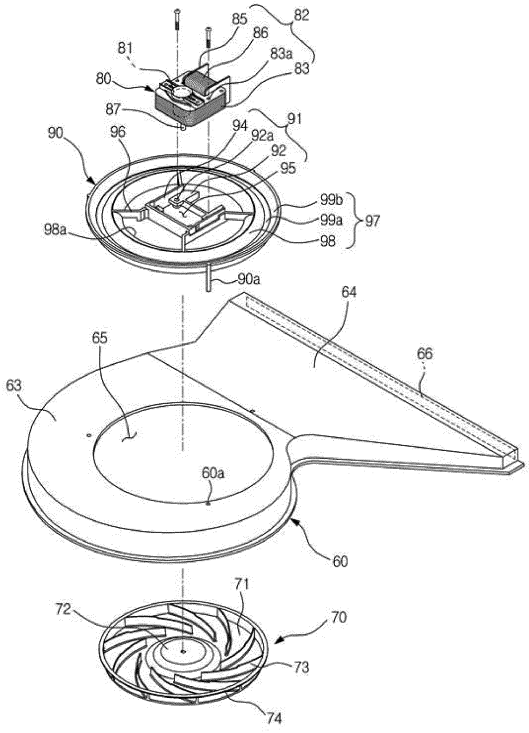
(72) Inventors:
- **Jeong, Sang Jin**
  Gyeonggi-Do (KR)
- **Kwon, Yong Hyun**
  Gyeonggi-do (KR)
- **Lee, Jung Hak**
  Seoul (KR)
- **Jung, Min Gyu**
  Gyeonggi-do (KR)
- **Choi, See Young**
  Gyeonggi-Do (KR)
- **Hyun, Jong Hak**
  Seoul (KR)

(74) Representative: **Walaski, Jan Filip**
Venner Shipley LLP
200 Aldersgate
London
EC1A 4HD (GB)

(54) Cooking appliance

(57) A component chamber cooling structure of an oven which relatively enlarges the inner volume of a cooking chamber by lowering the height of the component chamber is provided. The component chamber cooling structure includes a fan forcibly blowing air of the component chamber, a motor driving the fan, an exhaust duct guiding air of the component chamber to an area in front of the oven, and a support bracket to install the motor at a suction hole of the exhaust duct, the support bracket includes a base unit, a motor combining unit on which a core of the motor is placed, and bridge parts connecting the base unit and the motor combining unit, and the motor combining unit is formed such that the height of the lower end of the core is equal to or lower than the height of the upper end of the exhaust duct.

FIG.3



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Description

[0001] The present invention relates to cooking appliances, particularly but not exclusively to the component chamber cooling structure of an oven.

[0002] In general, an oven is a cooking appliance including a cooking chamber, a heating apparatus generating heat, and a fan circulating the heat generated from the heating apparatus to the inside of the cooking chamber, and thus cooking an object to be cooked.

[0003] A machine chamber, also referred to as a component chamber, is provided above the cooking chamber in which various electronic components operating the oven are disposed, and a component chamber cooling apparatus preventing damage to the electronic components due to heat from the cooking chamber is provided in the component chamber.

[0004] The component chamber cooling apparatus may include an exhaust duct sucking in air from the component chamber and exhausting the sucked air to an area in front of the oven, a fan forcibly blowing the air of the component chamber through the exhaust duct, and a motor driving the fan.

[0005] In order to increase the capacity of the cooking chamber, the height of the cooking chamber needs to be secured and a design to relatively lower the height of the component chamber is required.

[0006] In an aspect of one or more embodiments, there is provided a cooling structure of a component chamber which relatively enlarges the inner volume of a cooking chamber by slimming the component chamber.

[0007] In an aspect of one or more embodiments, there is provided a cooking appliance which includes a cooking chamber to accommodate an object to be cooked, a component chamber provided above the cooking chamber, an exhaust duct including a suction hole, which sucks in air from the component chamber and a discharge hole, which discharges the sucked air to an area in front of the component chamber, a fan forcibly blowing air of the component chamber, a motor including a stator and a rotor, provided above the fan and driving the fan, the stator including a bobbin on which a coil is wound and a core forming a magnetic field according to current applied to the coil, and a support bracket which is provided at the suction hole, and which supports the motor such that a height of a lower end of the core is equal to or lower than a height of an upper end of the exhaust duct.

[0008] The support bracket may include a base unit supported by the exhaust duct around the suction hole, a motor combining unit separated from the base part so that air passes through a gap between the base unit and the motor combining unit, and bridge parts connecting the base unit and the motor combining unit, and the bridge parts may be formed horizontally or be inclined downwardly in a direction from the base unit to the motor combining unit.

[0009] The motor combining unit may include a core support part on which the core is mounted and a core guide part extended upwardly from the core support part so as to form an accommodation space accommodating the core together with the core support part, and a height of an upper end of the core support part may be equal to or lower than the height of the upper end of the exhaust duct.

[0010] The base unit may include a bell-mouthed part to prevent noise of air sucked into the exhaust duct.

[0011] The base unit may further include a planar part extended horizontally to the outside of the bell-mouthed part, and a curved part extended upwardly from the planar part so as to have a gentle inclination and placed on the exhaust duct.

[0012] The radius of the suction hole may be greater than the radius of the fan.

[0013] The support bracket may be integrally formed.

[0014] In an aspect of one or more embodiments, there is provided a cooking appliance which includes a cooking chamber to accommodate an object to be cooked, a component chamber provided above the cooking chamber, a fan forcibly blowing air of the component chamber, a motor including a stator and a rotor, provided above the fan and driving the fan, the stator including a bobbin on which a coil is wound and a core forming a magnetic field according to current applied to the coil, and an exhaust duct to suck in air from the component chamber and to discharge the sucked air to an area in front of the component chamber, the exhaust duct including a motor combining unit which supports the motor such that the height of the lower end of the core is equal to or lower than the height of the upper end of the exhaust duct.

[0015] The exhaust duct may include bridge parts supporting the motor combining unit, and the bridge parts may be formed horizontally or be inclined downwardly in a direction toward the motor combining unit.

[0016] The motor combining unit may include a core support part on which the core is mounted and a core guide part extended upwardly from the core support part so as to form an accommodation space accommodating the core together with the core support part, and a height of an upper end of the core support part may be equal to or lower than the height of the upper end of the exhaust duct.

[0017] The exhaust duct may include a bell-mouthed part forming a suction hole.

[0018] The exhaust duct may be integrally formed.

[0019] These and/or other aspects will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a front view of an oven in accordance with an embodiment;

FIG. 2 is a schematic longitudinal-sectional view of the oven of FIG. 1;

FIG. 3 is an exploded perspective view of a component chamber cooling apparatus of the oven of FIG. 1;

FIG. 4 is a plan view of the component chamber cooling apparatus of the oven of FIG. 1;

FIG. 5 is a cross-sectional view taken along the line I-I of FIG. 4;

FIG. 6 is a cross-sectional view taken along the line II-II of FIG. 4;

FIG. 7 is a view illustrating flow of cool air in the component chamber cooling apparatus of FIG. 1; and

FIG. 8 is an exploded perspective view of a component chamber cooling apparatus of an oven in an embodiment.

[0020] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0021] FIG. 1 is a front view of an oven in an aspect of one or more embodiments, and FIG. 2 is a schematic longitudinal-sectional view of the oven of FIG. 1.

[0022] With reference to FIGS. 1 and 2, an oven 1 in an embodiment includes an inner case 11 in which a cooking chamber 30 is formed, and an outer case 10 connected to the outer surface of the inner case 11 and forming the external appearance of the oven 1.

[0023] The front surface of the cooking chamber 30 is opened so that an object to be cooked may enter and exit the cooking chamber 30, and the opened front surface of the cooling chamber 30 may be opened and closed by a door 20. The door 20 may be rotatably hinged to the lower portion of the inner case 11, and be provided with a handle 21 so as to be easily opened and closed.

[0024] The door 20 may include plural door glasses 22a, 22b, 22c and 22d and a door frame 23 supporting the plural door glasses 22a, 22b, 22c and 22d, and a gap of a designated interval may be formed between the plural door glasses 22a, 22b, 22c and 22d. These gaps form channels 24a, 24b and 24c in which air flows, and air may flow in the upward direction through the channels 24a, 24b and 24c.

[0025] Although this will be described in detail later, air passing through a discharge hole 66 of an exhaust duct 60 located above the channels 24a, 24b and 24c has relatively low pressure, and thus air of the channels 24a, 24b and 24c may be sucked in the upward direction due to a pressure difference and be discharged to an area in front of the oven 1 together with air discharged from the discharge hole 66 of the exhaust duct 60. Through such a configuration, cooling of the door 20 may be executed.

[0026] Racks 32 on which an object to be cooked is placed may be mounted in the cooking chamber 30. The racks 32 may be mounted on guide rails 31 provided on both inner side surfaces of the inner case 11 of the cooking chamber 30.

[0027] At least one heater 33 may be provided in the cooking chamber 30 so as to heat the object to be cooked. Further, circulation fans 35 circulating air of the cooking chamber 30 and circulation motors 34 to drive the circulation fans 35 may be provided in the rear portion of the cooking chamber 30. A fan cover 36 to cover the circulation fans 35 may be provided in front of the circulation fans 35, and through holes 37 through which air flows may be formed on the fan cover 36.

[0028] A control panel 41 displaying various operating information of the oven 1 and inputting the operating information may be provided at the upper portion of the front surface of the outer case 10.

[0029] The oven 1 further includes a component chamber 40 which may accommodate various electronic components 42 and 43 (with reference to FIG. 7) controlling the operation of the oven 1. The electronic components 42 and 43 may include a display circuit board 42 controlling the control panel 41 and a main circuit board 43 controlling the operation of the heater 33 and the circulation motors 34.

[0030] Such a component chamber 40 may be provided above the cooking chamber 30, and an adiabatic material 44 may be provided between the cooking chamber 30 and the component chamber 40.

[0031] Since the electronic components 42 and 43 of the component chamber 40 are very sensitive to heat, a component chamber cooling apparatus 50 cooling the component chamber 40 by circulating air of the component chamber 40 may be provided in the component chamber 40.

[0032] The component chamber cooling apparatus 50 includes the exhaust duct 60 sucking in air from the component chamber 40 and exhausting the air to the area in front of the oven 1, a fan 70 forcibly blowing the air of the component chamber 40, a motor 80 to drive the fan 70, and a support bracket 90 to support the motor 80.

[0033] A suction hole 65 to suck air is formed on the upper portion of the exhaust duct 60, and the discharge hole 66 to discharge air is formed on the front portion of the exhaust duct 60. The discharge hole 66 may discharge air to the area in front of the oven 1. Through such a configuration, the component chamber cooling apparatus 50 may cool the component chamber 40 by sucking in air from the component chamber 40 and discharging the sucked air to the area in front of the oven 1.

[0034] Here, the exhaust duct 60 may be formed in a venturi pipe type having the height which is gradually lowered in the forward direction of the oven 1 and the cross-sectional area which is gradually decreased in the forward direction of the oven 1. Therefore, the speed of air in the exhaust duct 60 may be raised and the pressure of the air in the exhaust duct 60 may be decreased in the forward direction of the oven 1.

[0035] Such a component chamber cooling apparatus 50 may occupy most of the height of the component chamber 40, as shown in FIG. 2. Therefore, in order to increase the capacity of the cooking chamber 30 while uniformly maintaining the overall height of the oven 1, lowering of the height of the component chamber cooling apparatus 50 is required.

[0036] The component chamber cooling apparatus 50

of the oven 1 in accordance with an embodiment is designed to achieve this objective, and a detailed configuration thereof will be described in detail below.

[0037] FIG. 3 is an exploded perspective view of the component chamber cooling apparatus of the oven of FIG. 1, FIG. 4 is a plan view of the component chamber cooling apparatus of the oven of FIG. 1, FIG. 5 is a cross-sectional view taken along the line I-I of FIG. 4, FIG. 6 is a cross-sectional view taken along the line II-II of FIG. 4, and FIG. 7 is a view illustrating flow of cool air in the component chamber cooling apparatus of FIG. 1.

[0038] With reference to FIGS. 3 to 7, the component chamber cooling apparatus 50 in an embodiment includes the exhaust duct 60 guiding air of the component chamber 40 to the area in front of the oven 1, the fan 70 forcibly blowing the air of the component chamber 40, the motor 80 to drive the fan 70, and the support bracket 90 to support the motor 80.

[0039] The exhaust duct 60 includes a scroll part 63, the radius of which is gradually increased in the clockwise direction, and a discharge part 64 formed at the rear portion of the scroll part 63. The suction hole 65 through which air is sucked into the exhaust duct 60 is formed on the upper portion of the scroll part 63, and the discharge hole 66 through which air is discharged to the outside of the exhaust duct 60 is formed on the discharge part 64. Therefore, air sucked into the exhaust duct 60 through the suction hole 65 formed on the upper portion of the exhaust duct 60 may be guided to the discharge part 64 by the scroll part 63 and be discharged to the area in front of the oven through the discharge hole 66. Further, the discharge part 64 may be formed such that the height of the discharge part 64 is gradually lowered and the cross-sectional area of the discharge part 64 is gradually decreased in the direction toward the discharge hole 66 so as to exhibit venturi effects.

[0040] The fan 70 may be a centrifugal fan or a turbo fan which sucks air at the upper portion thereof and discharges air in the radial direction. The fan 70 may be disposed at the inside of the exhaust duct 60. The fan 70 may include a rotary plate 71, a hub 72 protruding upwardly from the center of the rotary plate 71, plural blades 73 formed inwardly from the edge of the rotary plate 71, and a shroud 74 connecting the tips of the upper ends of the plural blades 73.

[0041] The hub 72 may be formed in a conical shape, the radius of which is increased in the downward direction, and may diffuse air sucked through the upper portion thereof in the radial direction. The air diffused in the radial direction by the hub 72 may be discharged to the plural blades 73 in the radial direction of the fan 70.

[0042] The motor 80 generates rotating force to drive the fan 70, and may include a stator 82 and a rotor 81. The stator 82 may include a bobbin 85 on which a coil 86 is wound, and a core 83 generating a magnetic field when current is applied to the coil 86. The rotor 81 may be rotated in one direction by the magnetic field formed by the core 83. One end of a rotary shaft 87 is connected to the rotor 81, and the rotary shaft 87 may be rotated together with the rotor 81. The other end of the rotary shaft 87 is connected to the fan 70.

[0043] Such a motor 80 may be supported by the support bracket 90. The support bracket 90 may include a base unit 97 supported by the exhaust duct 60 around the suction hole 65, a motor combining unit 91 separated from the base part 97 and combined with the motor 80, and bridge parts 96 connecting the base unit 97 and the motor combining unit 91.

[0044] The base unit 97 may have an almost donut shape and be combined with the exhaust duct 60 around the suction hole 65. The base unit 97 may include a bell-mouthed part 98 forming an inner suction hole 98a through which air is sucked into the exhaust duct 60. The bell-mouthed part 98 has an almost arc-shaped cross-section, and may prevent formation of a vortex of air introduced into the exhaust duct 60 and thus reduce noise.

[0045] A planar part 99a extended almost horizontally may be provided at the outside of the bell-mouthed part 98, and a curved part 99b gently inclined may be provided at the outside of the planar part 99a. The support bracket 90 may be supported by the exhaust duct 60 by placing the curved part 99b on the exhaust duct 60 around the suction hole 65.

[0046] Fixing protrusions 90a protruded downwardly are formed on the support bracket 90, fixing holes 6oa into which the fixing protrusions 90a are inserted are formed on the exhaust duct 60, and the support bracket 90 may be combined with the exhaust duct 60 by inserting the fixing protrusions 90a into the fixing holes 6oa.

[0047] As shown in FIGS. 5 and 6, the radius R1 of the suction hole 65 of the exhaust duct 60 may be greater than the radius R2 of the fan 70 in consideration of a space in which the base unit 97 will be disposed.

[0048] The motor combining unit 91 may include a core support part 92 on which the core 83 of the motor 80 is mounted, and a core guide part 94 extended upwardly from the edge of the core support part 92. The core guide part 94 may have three surfaces except for the surface with which the bobbin 85 of the motor 80 is combined. The core support part 92 and the core guide part 94 may form an accommodation space 95 accommodating the core 83.

[0049] Fastening holes 83a may be formed on the stator 83 of the motor 82, and fastening holes 92a corresponding to the fastening holes 83a may be formed on the core support part 92 of the motor combining unit 91. Therefore, the motor 82 may be firmly fastened to the motor combining unit 91 by inserting fastening members, such as screws, into the fastening holes 83a and the fastening holes 92a.

[0050] Since the base unit 97 and the motor combining unit 91 are separated from each other, as described above, the support bracket 90 may include the bridge parts 96 connecting the base unit 91 and the motor combining unit 91. Although this embodiment describes four bridge parts 96, the number of the bridge parts 96 is not

limited thereto but rather may be less than three or more than five.

[0051] As shown in FIGS. 5 and 6, the height H2 of the lower end 84 of the motor core 83 combined with the motor combining unit 91 may be equal to or lower than the height H1 of the upper end 61 of the exhaust duct 60.

[0052] Here, the heights H1 and H2 are set based on a bottom surface 45 of the component chamber, but may be set based on the bottom surface supporting the oven.

[0053] Further, as shown in FIG. 6, the bridge parts 90 may be formed horizontally so that the height H2 of the lower end 84 of the motor core 83 is equal to or lower than the height H1 of the upper end 61 of the exhaust duct 60. Otherwise, although not shown in the drawings, the bridge parts 90 may be inclined downwardly in a direction from the base unit 97 to the motor combining unit 91.

[0054] As described above, by disposing the motor core 83 such that the height H2 of the lower end 84 of the motor core 83 is equal to or lower than the height H1 of the upper end 61 of the exhaust duct 60, the height of the component chamber cooling apparatus 50 occupying most of the height of the component chamber 40 may be generally lowered. Therefore, the height of the component chamber 40 may be lowered, and the capacity of the cooking chamber 30 may be increased by increasing the height of the cooking chamber 30 as much as the lowered height of the component chamber 40.

[0055] Further, by disposing the motor core 83 such that the height H2 of the lower end 84 of the motor core 83 is equal to or lower than the height H1 of the upper end 61 of the exhaust duct 60, the motor 80 and the fan 70 may be close to each other, and thus cooling of the motor 80 may be more effectively carried out.

[0056] Since the motor core 83 is placed on the core support part 92 of the motor combining unit 91, the height H2 of the upper end 93 of the core support part 92 may be equal to the height H2 of the lower end 84 of the motor core 83 combined with the motor combining unit 91. Therefore, in accordance with an embodiment, the height H2 of the upper end 93 of the core support part 92 may be equal to or lower than the height H1 of the upper end 61 of the exhaust duct 60.

[0057] Such a support bracket 90 including the base unit 97, the motor combining unit 91 and the bridge parts 96 may be integrally formed. The support bracket 90 may be integrally formed by injection molding using a resin material.

[0058] FIG. 8 is an exploded perspective view of a component chamber cooling apparatus of an oven in accordance with an embodiment.

[0059] With reference to FIG. 8, a component chamber cooling apparatus 150 of an oven in accordance with an embodiment will be described. A description of components which are substantially the same as an embodiment in Figure 2, for example, will be omitted for convenience.

[0060] The component chamber cooling apparatus 150 in accordance with an embodiment includes a fan 180 forcibly blowing air of a component chamber, a motor 190 driving the fan 180, and an exhaust duct 160 guiding air of the component chamber.

[0061] The fan 180 has the same configuration as the fan 70 in accordance with an embodiment shown in Figure 3,for example, and a detailed description thereof will thus be omitted. The motor 190 also has the same configuration as the motor 80 in accordance with an embodiment shown in Figure 3, and a detailed description thereof will thus be omitted.

[0062] The exhaust duct 160 includes a scroll part 163, the radius of which is gradually increased in the clockwise direction, and a discharge part 164 formed at the rear portion of the scroll part 163. A suction hole 165 through which air is sucked into the exhaust duct 160 may be formed on the upper portion of the scroll part 163, and a discharge hole 166 may be formed at the end of the discharge part 164. Therefore, air sucked into the exhaust duct 160 through the suction hole 165 on the upper portion of the exhaust duct 160 may be guided to the discharge part 164 by the scroll part 163 and be discharged to the outside of the exhaust duct 160 through the discharge hole 166.

[0063] A motor combining unit 167 may include a core support part 168 on which a core 193 of the motor 190 is mounted, and a core guide part 170 extended upwardly from the edge of the core support part 168. The core support part 168 and the core guide part 170 may form an accommodation space accommodating the core 193 of the motor 190.

[0064] Fastening holes i68a may be formed on the core support part 168, fastening holes 193a may be formed on the core 193 of the motor 190, and the motor 190 may be firmly fastened to the motor combining unit 167 by inserting fastening members, such as screws, into the fastening holes 168a and the fastening holes 193a.

[0065] The height of the upper end of the core support part 168 may be equal to or lower than the height of the upper end of the exhaust duct 160. Therefore, the height of the lower end of the motor core 193 placed on the core support part 168 may also be equal to or lower than the height of the upper end of the exhaust duct 160. The effects thereby are equal to those of an embodiment shown in Figure 2, for example, and a detailed description will thus be omitted.

[0066] Further, a bell-mouthed part 173 forming the suction hole 165 and bridge parts 172 supporting the motor combining unit 167 may be provided on the exhaust duct 160.

[0067] The bell-mouthed part 173 has an almost arc-shaped cross-section, and may prevent formation of a vortex of air passing through the suction hole 165 and thus reduce noise. A planar part 174a extended almost horizontally may be provided at the outside of the bell-mouthed part 173, and a curved part 174b gently inclined may be provided at the outside of the planar part 174a.

[0068] One end of each of the bridge parts 172 is con-

nected to the bell-mouthed part 173, the other end of each of the bridge parts 172 is connected to the motor combining unit 167, and thus the bridge parts 172 may support the motor combining unit 167. Here, plural bridge parts 172 may be provided. The bridge parts 172 may be formed almost horizontally, or be inclined downwardly in a direction from the bell-mouthed part 173 to the motor combining unit 167.

[0069] Such an exhaust duct 160 including the motor combining unit 167, the bell-mouthed part 173 and the bridge parts 172 may be integrally formed. The exhaust duct 160 may be formed by injection molding using a resin material.

[0070] As is apparent from the above description, a cooking appliance in accordance with an embodiment slims a component chamber and may thus provide an oven designed such that the capacity of a cooking chamber is increased.

[0071] Further, a motor and a fan are disposed close to each other, and thus cooling of the motor itself may be effectively executed.

[0072] Further, a bell-mouthed part is provided at a suction hole of an exhaust duct, and thus noise may be reduced.

[0073] Although a few embodiments have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. A cooking appliance comprising:

   a cooking chamber to accommodate an object to be cooked;
   a component chamber provided above the cooking chamber;
   an exhaust duct including a suction hole, which sucks in air from the component chamber, and a discharge hole, which discharges the sucked air to an area in front of the component chamber;
   a fan forcibly blowing air of the component chamber;
   a motor including a stator and a rotor, provided above the fan and driving the fan, the stator including a bobbin on which a coil is wound and a core forming a magnetic field according to current applied to the coil; and
   a support bracket which is provided at the suction hole, and which supports the motor such that a height of a lower end of the core is equal to or lower than a height of an upper end of the exhaust duct.

2. The cooking appliance according to claim 1, wherein the support bracket includes a base unit supported by the exhaust duct around the suction hole, a motor combining unit separated from the base part so that air passes through a gap between the base unit and the motor combining unit, and bridge parts connecting the base unit and the motor combining unit,
   wherein the bridge parts are formed horizontally, or are inclined downwardly in a direction from the base unit to the motor combining unit.

3. The cooking appliance according to claim 2, wherein the motor combining unit includes a core support part on which the core is mounted, and a core guide part extended upwardly from the core support part so as to form an accommodation space accommodating the core together with the core support part,
   wherein a height of an upper end of the core support part is equal to or lower than the height of the upper end of the exhaust duct.

4. The cooking appliance according to claim 3, wherein the base unit includes a bell-mouthed part to prevent noise of air sucked into the exhaust duct.

5. The cooking appliance according to claim 4, wherein the base unit further includes a planar part extended horizontally to the outside of the bell-mouthed part, and a curved part extended upwardly from the planar part so as to have a gentle inclination and placed on the exhaust duct.

6. The cooking appliance according to any one of the preceding claims, wherein the radius of the suction hole is greater than the radius of the fan.

7. The cooking appliance according to any one of the preceding claims, wherein the support bracket is integrally formed.

FIG. 1

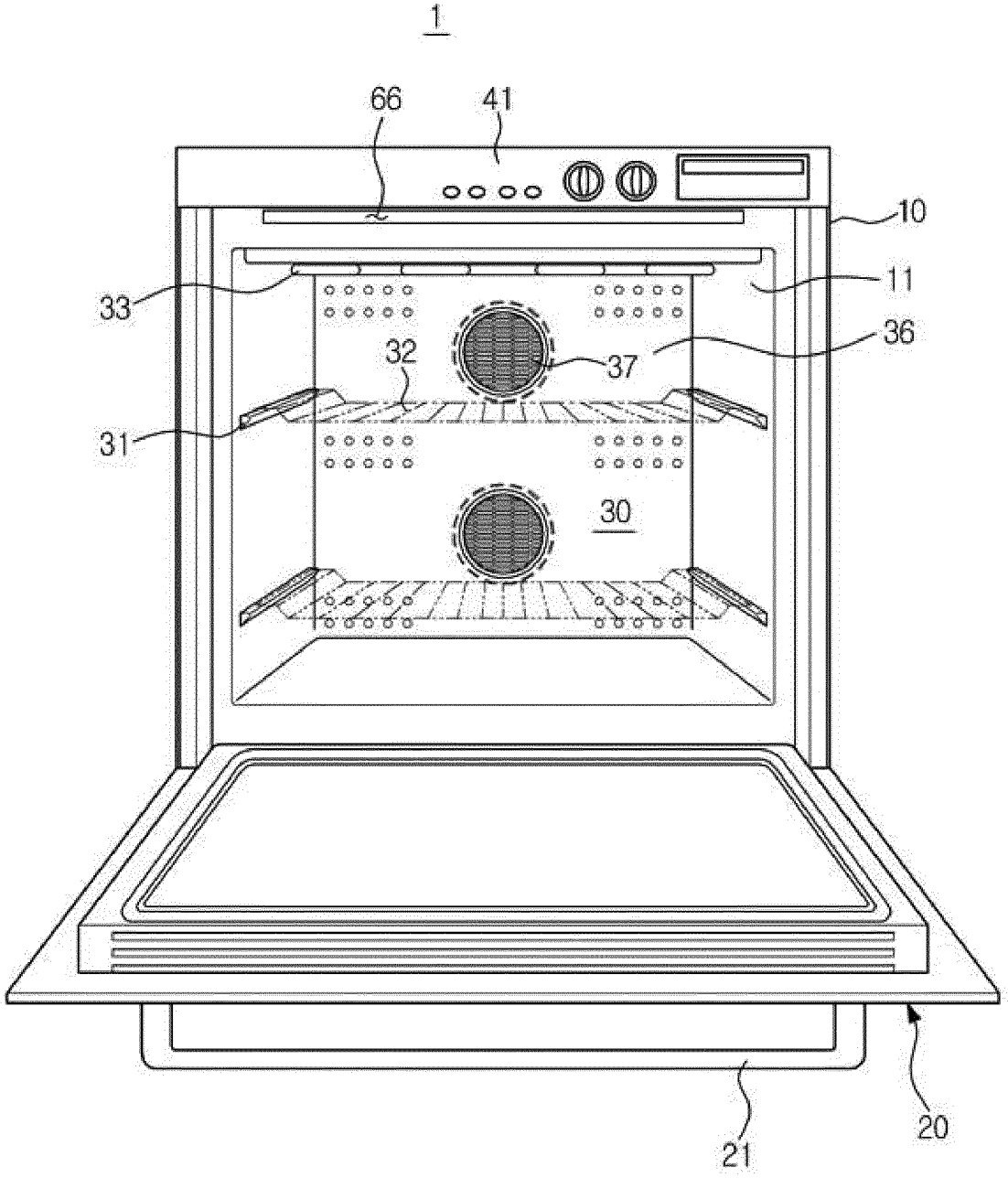

FIG.2

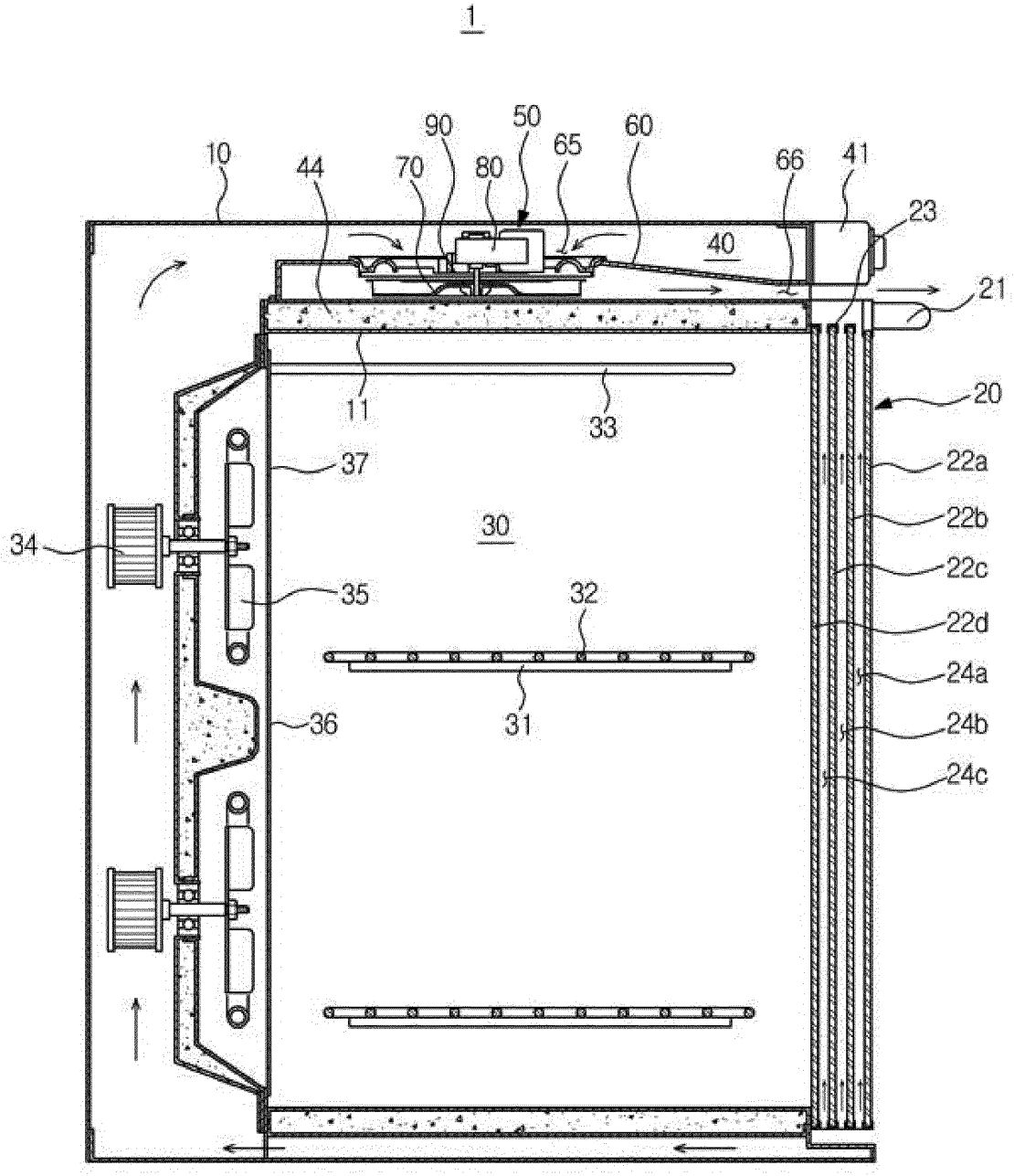
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FIG.3

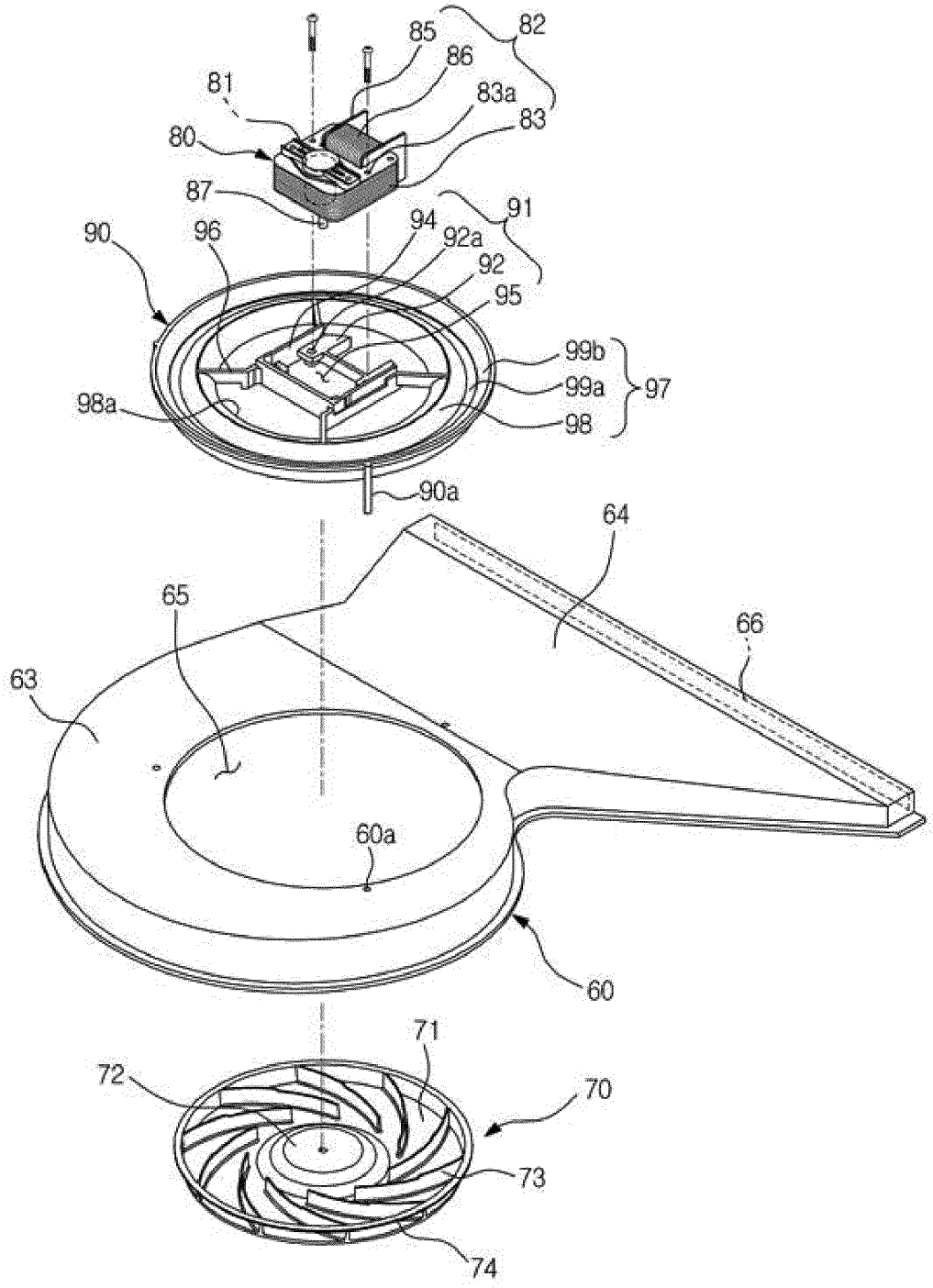
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FIG.4

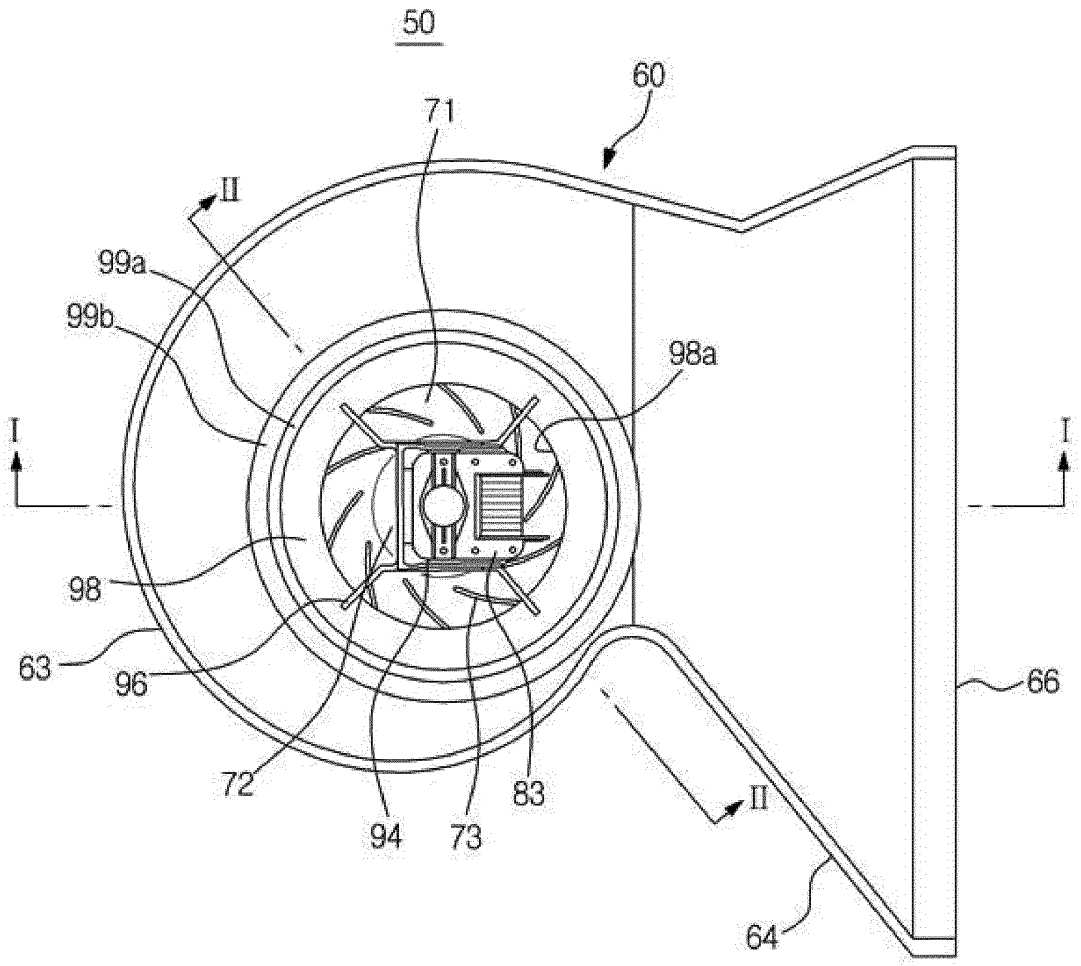

FIG.5

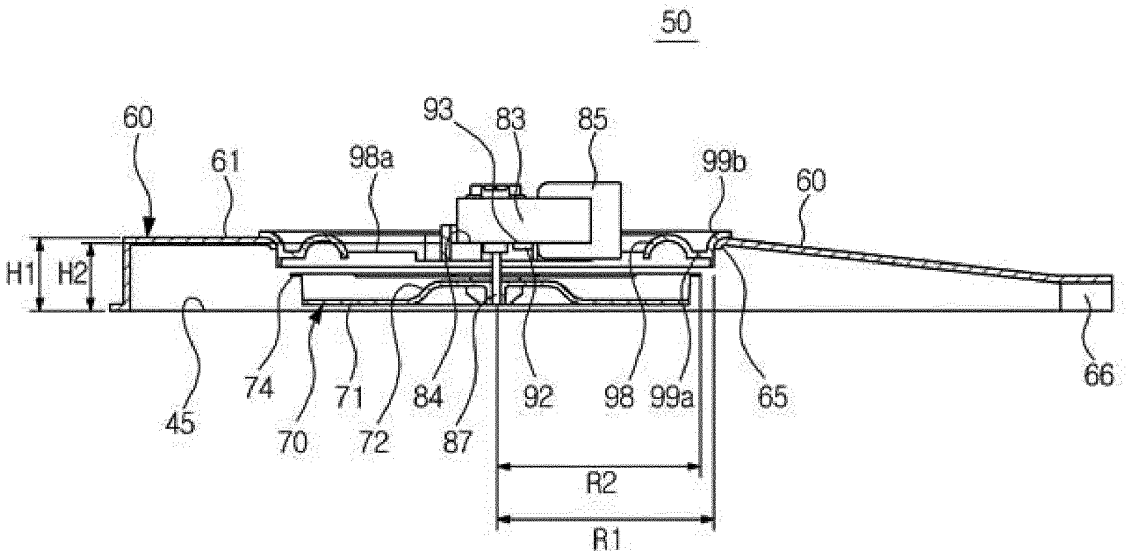
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FIG.6

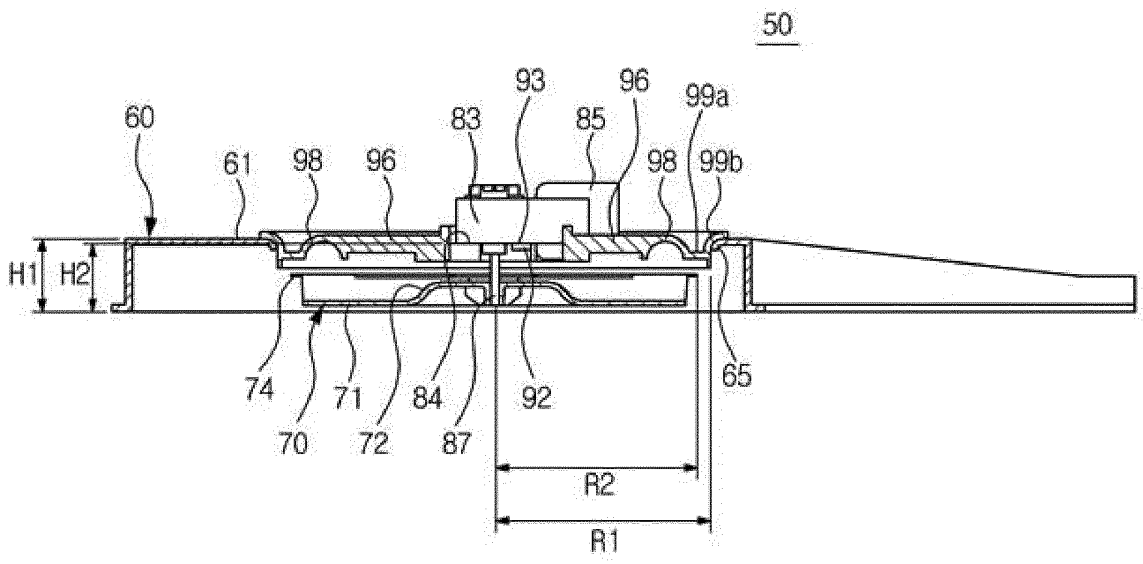
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FIG.7

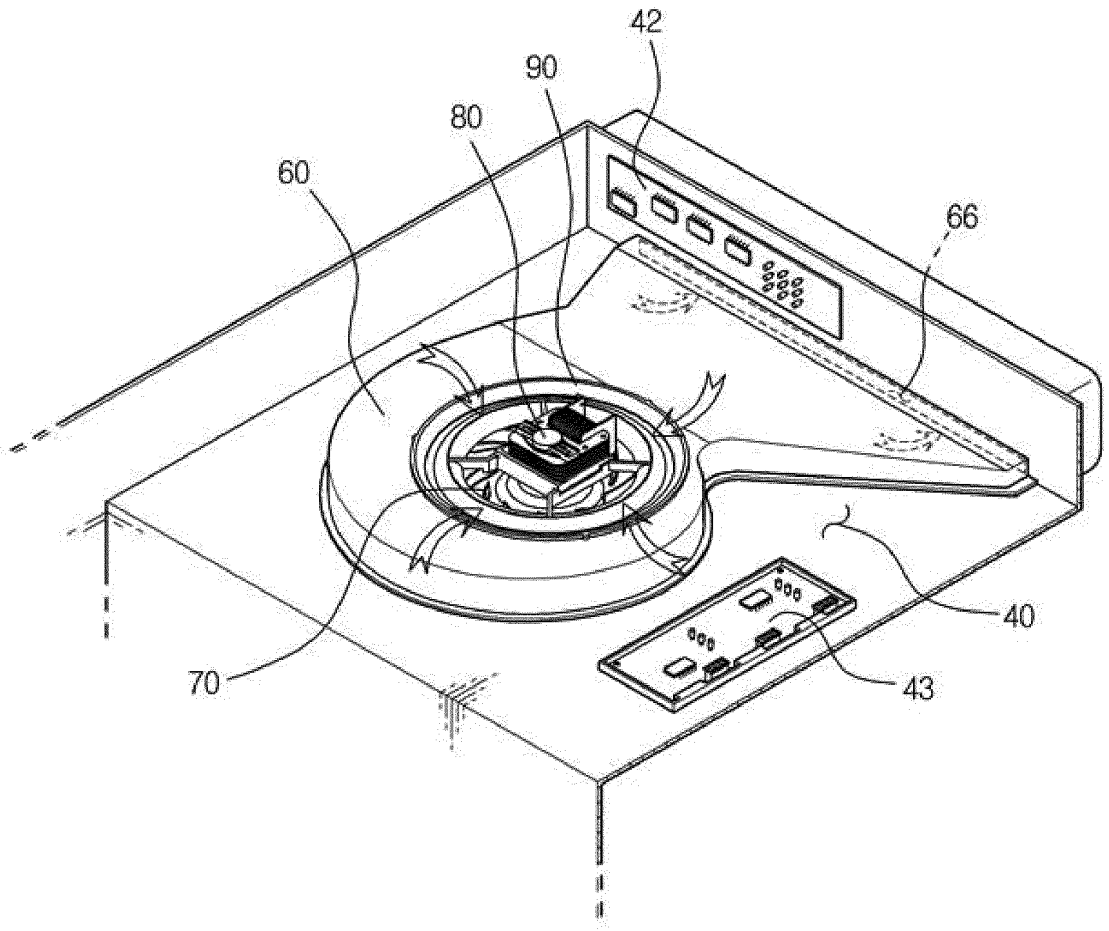
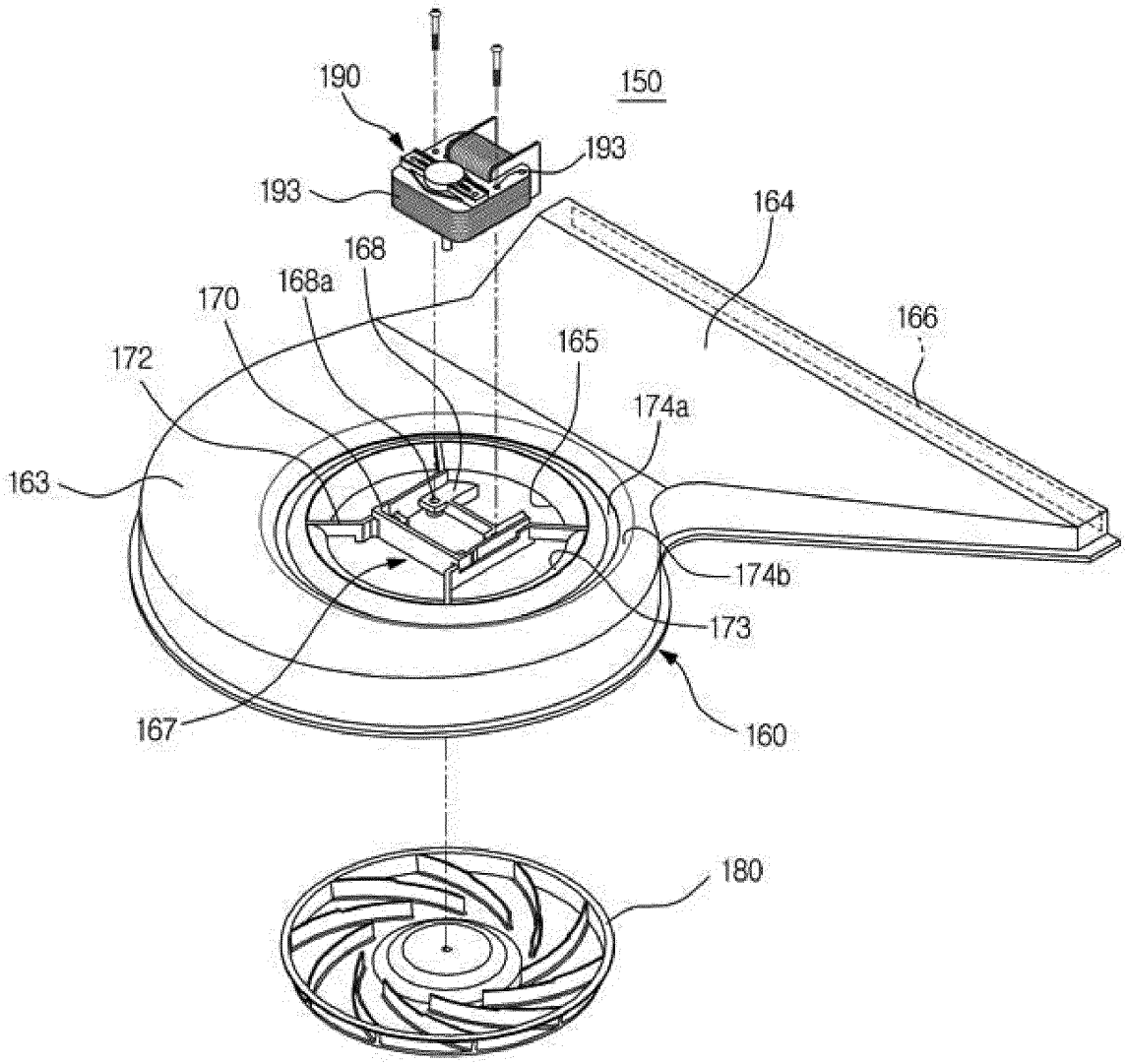


FIG.8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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 2241

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
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X : particularly relevant if taken alone
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L : document cited for other reasons

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EPO FORM 1503 03.82 (P04C01)

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