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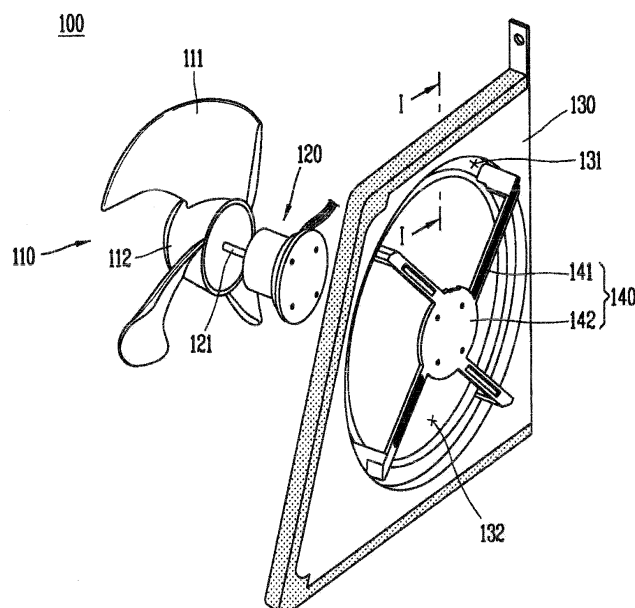
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(54) Fan Module

(57) A fan module (100) is provided. The fan module is configured to dissipate heat from, e.g., a compressor and a condenser disposed in a machine room of the refrigerator. The fan module includes a fan (110), a shroud (130) having a receiving hole (132) positioned around the fan, a fan mounting portion (140) coupled to a rear

surface of the shroud on which the fan is mounted, the rear surface facing a downstream airflow direction of the fan, and a concave recess (131) provided on a rear surface of the shroud and circling the receiving hole. The fan module prevents noise caused by air passing through the receiving hole and prevents flow loss.

Fig. 2



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Description

[0001] The present invention relates to a fan module, and more particularly, to a fan module that may dissipate heat from, *inter alia*, a compressor and a condenser provided in a machine room of a refrigerator.

[0002] Generally, a refrigerator serves to store food with a low temperature in a frozen state or a cooled state according to the kind of food to be stored.

[0003] Cool air supplied into the refrigerator is generated as a refrigerant performs a heat exchange operation, and is continuously supplied into the refrigerator as the refrigerant repeatedly performs a cycle operation, e.g., compression-condensation-expansion-evaporation. The cool air is uniformly transmitted to inside of the refrigerator by convection, and serves to preserve food inside the refrigerator with a desired temperature.

[0004] A refrigerating cycle device is provided at one side of the refrigerator separately from storage spaces such as a cooling chamber and a freezing chamber. Generally, compression and condensation processes are performed by a compressor and a condenser disposed in a machine room provided at a lower side of a rear surface of the refrigerator.

[0005] During the compression and condensation processes, heat has to be dissipated. To this end, a fan module configured to dissipate heat is provided at the machine room.

[0006] However, the fan module of related art refrigerators has the following problems.

[0007] First, the fan module is provided with a shroud having a ventilation opening adjacent to an outer edge of a fan, for flowing of air. However, the flowing of air passing through the ventilation opening causes noise and the air passed through the ventilation opening is leaked in a radial direction of the fan. Accordingly, there is a need for providing a shroud capable of preventing noise and flow loss.

[0008] Second, the fan module is provided with a tube axial fan and a motor for driving the fan. A rotation shaft of the motor and a center of the ventilation opening are aligned to be concentric with each other thus preventing the fan from interfering with the shroud when the fan is rotated. However, the aligning process is time consuming and requires high concentration by an operator. Accordingly, there is a need for providing a fan module that can easily align the rotation shaft of the motor and the center of the ventilation opening in a concentric manner.

[0009] Third, the fan module is provided with a lead wire connected to an external power source so as to supply power to the motor. The lead wire is positioned in a flow field by the tube axial fan, which causes flow resistance, and thus noise is generated and flow loss occurs. Accordingly, there is a need for providing a structure for properly positioning the lead wire.

[0010] Therefore, a feature of the present invention is to provide a fan module which prevents noise and flow loss by providing a shroud having a modified ventilation

opening.

[0011] Another feature of the present invention is to provide a fan module having a construction that easily aligns a rotation shaft of a motor and a center of a ventilation opening in a concentric manner.

[0012] Still another feature of the present invention is to provide a fan module having a structure that prevents a flow interference caused by a lead wire that supplies a power to a motor.

[0013] To achieve these and other features, as embodied and broadly described herein, there is provided a fan module which may include a fan, a shroud having a receiving hole positioned around the fan, a fan mounting portion coupled to a rear surface of the shroud on which the fan is mounted, the rear surface facing a downstream airflow direction of the fan, and a concave recess provided on the rear surface of the shroud and circling the receiving hole.

[0014] In a non-limiting embodiment, the concave recess has a semicircular cross-section.

[0015] In another non-limiting embodiment, the concave recess may include a side rib adjacent an outer edge of the fan extending in an axial direction of the fan.

[0016] In a further non-limiting embodiment, a convex ring is provided on a front surface of the shroud in an upstream airflow direction of the fan circling the receiving hole.

[0017] In yet another non-limiting embodiment, the fan may include a hub, a plurality of blades provided in a radial direction of the hub, and a motor received in the hub so as to rotate the fan, wherein, the motor may be configured as an outer rotor type motor.

[0018] In still a further non-limiting embodiment, a circuit board supplying a signal to the motor may be coupled to a lower portion of the motor to be molded.

[0019] In a non-limiting embodiment, the fan mounting portion may include a motor supporting portion to which the motor is mounted, and a plurality of spokes configured to couple the motor supporting portion to the shroud, wherein a rotation shaft of the motor is aligned at a center of the receiving hole and the motor and the motor supporting portion are coupled to each other.

[0020] In another non-limiting embodiment, the fan module may include a protruding portion provided at a lower portion of the motor, and a motor mounting portion provided at the motor supporting portion coupled to the protruding portion such that the rotation shaft of the motor is provided at the center of the receiving hole.

[0021] In yet another non-limiting embodiment, the fan module may include a recess portion provided at a lower portion of the motor, and a motor mounting portion provided at the motor supporting portion coupled to the recess portion such that the rotation shaft of the motor is provided at the center of the receiving hole.

[0022] In a further non-limiting embodiment, the plurality of spokes are spaced from each other by a constant angle therebetween. The plurality of spokes may extend in a length direction that is offset from the center of the

motor supporting portion as well. Further, each spoke may extend in the length direction such that each spoke does not overlap any other spoke.

[0023] In still a further embodiment, the motor supporting portion is provided with a wire draw-out portion configured to draw out a lead wire of the motor.

[0024] The wire draw-out portion may be configured as a cut-out portion of an edge of the motor supporting portion in a central direction of the motor supporting portion.

[0025] In another non-limiting embodiment, the motor supporting portion is provided with a locking portion configured to prevent the lead wire of the motor from being moved.

[0026] In still another non-limiting embodiment, at least one of the plurality of spokes is provided with a receiving recess extending in a length direction configured to receive the lead wire.

[0027] While the present invention is described herein as being used with refrigeration systems, it is not limited to such applications. In this regard, the present invention further contemplates use of the fan assembly in, but not limited to computer systems, HVAC systems, automotive applications, alone, and other known cooling and heating systems.

[0028] The foregoing features of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

[0029] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate preferred embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

[0030] FIG. 1 is a diagram showing a machine room of a refrigerator having a fan module in accordance with a first non-limiting embodiment of the present invention;

[0031] FIG. 2 shows an exploded view of a fan module in accordance with the first non-limiting embodiment of the present invention;

[0032] FIG. 3 is a sectional view taken along line I-I in FIG. 2 in accordance with a first non-limiting embodiment of the present invention;

[0033] FIG. 4 shows a diagram of a non-limiting variation of FIG. 3;

[0034] FIG. 5 shows a diagram of another non-limiting variation of FIG. 3;

[0035] FIG. 6 shows a sectional view of a motor in a fan module in accordance with a second non-limiting embodiment of the present invention;

[0036] FIG. 7 shows a sectional view of a concentric unit in a fan module in accordance with the second non-limiting embodiment of the present invention;

[0037] FIG. 8 shows a diagram of a non-limiting variation of FIG. 5;

[0038] FIG. 9 shows a diagram of spokes and a wire

draw-out portion in a fan module in accordance with a third non-limiting embodiment of the present invention; and

[0039] FIG. 10 shows a sectional view of the spokes in FIG. 9.

[0040] Description will now be given in detail of a fan module for a refrigerator in accordance with the non-limiting embodiments of the present invention, with reference to the accompanying drawings. Although some embodiments are illustrated herein, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the scope of the principles of the present invention.

[0041] A fan module in accordance with a first non-limiting embodiment of the present invention will now be described in detail with reference to accompanying drawings.

[0042] First, a configuration of a machine room of a refrigerator having a fan module in accordance with this embodiment will be described.

[0043] FIG. 1 is a diagram showing a machine room of a refrigerator having a fan module in accordance with the first non-limiting embodiment of the present invention.

[0044] Referring to FIG. 1, a machine room 10 of a refrigerator 1 includes a compressor 40, condenser 30 and a fan module 100 for radiating heat therefrom. The machine room 10 further includes a refrigerant pipe 50 connecting the compressor 40 and the condenser 30. The machine room 10 is covered with a machine room cover 20.

[0045] The compressor 40 is configured to compress a refrigerant to become a gas refrigerant of high pressure and high temperature and then transmits it to the condenser 30.

[0046] Since the compressor 40 causes vibration and noise while performing a compressing process, a dust proof device may be provided on an installation surface of the compressor 40.

[0047] The condenser 30 is configured to condense the gas refrigerant of the high pressure and high temperature transmitted from the compressor 40 into a liquid refrigerant of high pressure and low temperature. Accordingly, heat is outwardly radiated during the condensing process, which results in mounting of the fan module 100.

[0048] The fan module 100 serves to condense the refrigerant flowing in the condenser 30 by generating airflow.

[0049] The machine room cover 20 is provided with vents 21 for flowing in and out external air.

[0050] A position of the vents 21 may be approximately adjusted according to a disposition of the fan module 100.

[0051] The fan module 100 is disposed between the compressor 40 and the condenser 30 in FIG. 1, however the fan module 100 may be disposed at a right side of the condenser 30 in FIG. 1.

[0052] Next, the fan module for the refrigerator in accordance with the first non-limiting embodiment of the present invention will be described in detail with refer-

ence to FIGS. 2 and 3.

[0053] FIG. 2 is an exploded view showing the fan module in accordance with the first non-limiting embodiment of the present invention; FIG. 3 is a sectional view taken along line I-I in FIG. 2, and FIGS. 4 and 5 are diagrams showing non-limiting variations of FIG. 3.

[0054] Referring to FIG. 2, the fan module 100 in accordance with this embodiment includes a fan 110, a motor 120 for rotating the fan, and a shroud 130 for mounting the motor 120 thereat and receiving the fan 110 therein.

[0055] The fan 110 may be a tube axial fan through which air flows in and out in an axial direction of its rotation shaft.

[0056] The fan 110 includes a hub 112 positioned at a center thereof and a plurality of blades 111 positioned around the hub in a radial direction.

[0057] The motor is received in the hub 112 of the fan 110 and is mounted at the shroud 130 thus providing the fan 110 with a rotational force.

[0058] The shroud 130 is provided with a receiving hole 132 therein configured to receive the fan 110 and thus to guide airflow generated by the rotation of the fan 110.

[0059] The shroud 130 has an external end portion configured as a plate member in correspondence to a longitudinal section of the machine room 10 of the refrigerator.

[0060] Accordingly, the airflow caused by the fan 110 is generated through the receiving hole 132.

[0061] A fan mounting unit 140 is coupled onto a rear surface of the shroud 130 so as to mount the fan 110 thereat and support it.

[0062] The fan mounting unit 140 includes a motor supporting portion 142 to which the motor 120 mounted to the fan 110 is coupled, and spokes 141 connecting the motor supporting portion 142 and the rear surface of the shroud 130 to each other.

[0063] The number of spokes 141 provided may be any suitable number of spokes such that the motor supporting portion 142 is firmly coupled to the shroud 130. Four spokes 141 are provided in FIG. 2.

[0064] In this embodiment, a concave recess 131 is opened in a downstream airflow direction of the fan 110 is provided at an end portion of the receiving hole 132 adjacent an outer edge of the fan. The concave recess 131 extends radially around an interior of the shroud 130 and defines the end portion of the receiving hole 132.

[0065] In other words, the concave recess 131 is entirely formed at a circumference of the receiving hole 132, on the rear surface of the shroud 130.

[0066] The concave recess will be described in detail with reference to FIG. 3.

[0067] Referring to FIG. 3, the concave recess 131 may be configured as a recess provided at the end portion of the receiving hole disposed to be adjacent to the outer edge of the fan 110.

[0068] The concave recess 131 may be configured such that the recess is open in the downstream airflow direction of the fan 110, i.e., an outlet direction of the

shroud 130.

[0069] The concave recess 131 prevents air that passes through the fan 110 from leaking in the radial direction of the fan 110. The concave recess 131 also reduces noise caused by flowing of the leaking air.

[0070] In other words, the air passed through the fan 110 and then leaking in the radial direction of the fan 110 flows into the concave recess 131 and then circulates in the concave recess 131. Accordingly, in a normal state, the air leaking in the radial direction of the fan 110 after passing through the fan 110 interferes with the air circulating in the concave recess 131.

[0071] That is, the concave recess 131 is capable of preventing the air passed through the fan 110 from leaking in the radial direction of the fan 110 and thus reduces noise generation.

[0072] Here, it is enough to prevent the flow loss and reduce the noise by providing the concave recess 131 configured as a recess opened in the downstream airflow direction of the fan 110, however, for a convenient fabrication, its section may also be formed in any suitable shape including a semicircular shape.

[0073] In an embodiment shown in FIG. 4, a convex ring 133 is provided on a front surface of the shroud 130 along the end portion of the receiving hole 132. The convex ring 133 is provided adjacent the concave recess 131 in an upstream airflow direction of the fan 110.

[0074] The convex ring 133 is convexly provided on a counter surface of the end portion of the receiving hole for forming the concave recess 131, namely, on the front surface of the shroud 130, in the upstream airflow direction of the fan 110.

[0075] Accordingly, the air effectively flows into the fan 110, and thus reduces noise caused by the air inflow.

[0076] In an embodiment shown in FIG. 5, a side portion 134 may be provided at an inner side of the concave recess 131 and the convex ring 133. The side portion 134 defines at least a part of the end portion of the receiving hole 132 adjacent to the outer edge of the fan 110 and extends in the downstream airflow direction of the fan 110.

[0077] Accordingly, this configuration further effectively prevents air that passes through the fan 110 flowing in the downstream direction thereof from leaking back into the fan 110.

[0078] The concave recess 131 and the convex ring 133 may be integrally formed during a fabrication process by providing the receiving hole 132 having the end portion roundedly curved. In this regard, the concave recess 131 and the convex ring 133 extend along a circumferential direction defining the receiving hole 132.

[0079] A fan module 200 in accordance with the second non-limiting embodiment of the present invention will now be described in detail with reference to accompanying drawings. Wherein the configuration and the description of the second non-limiting embodiment is the same as that of the first non-limiting embodiment, discussion of the same will be omitted.

[0080] FIG. 6 is a sectional view showing a motor in the fan module 200 in accordance with the second non-limiting embodiment of the present invention.

[0081] Referring to FIG. 6, a motor 220 of the fan module in this embodiment includes a rotor, a stator 222, and a circuit board 251 for transmitting an electric signal to the stator 222. The motor 220 may be configured as an outer rotor type motor in which the rotor is disposed at the outside of the stator 222.

[0082] The stator 222 is received in a hub of a fan (such as hub 112 of fan 110). Accordingly, this configuration reduces a space for the fan 110 and the motor 220.

[0083] The circuit board 251 is positioned at a lower side of the stator 222. In this embodiment, the circuit board 251 may be molded by any suitable water proof substance 250, such as a thermoplastic resin, in a coupled state with the stator 222.

[0084] Accordingly, even when the circuit board 251 is exposed to a humid environment (such as due to a defrosting process by an evaporator), the circuit board 251 is protected from moisture, thereby providing operational stability of the fan module in a variety of environmental conditions.

[0085] In FIG. 6 and FIG. 7, reference numeral 228 denotes a bearing portion of a rotation shaft 221. Reference numeral 227 denotes a coupling hole for mounting the motor 220 to a motor supporting portion 242, and reference numeral 229 denotes a separation preventing pin for preventing the rotation shaft 221 from being separated while being rotated.

[0086] The fan module 200 in accordance with this embodiment includes a concentric unit 260 allowing the motor 220 to be coupled to the motor supporting portion 242 and the rotation shaft 221 of the fan to be provided at the center of a receiving hole (such as the receiving hole 132).

[0087] The concentric unit 260 will now be described in detail with reference to FIGS. 7 and 8.

[0088] FIG. 7 is a sectional view showing the concentric unit 260 of the fan module 200 for the refrigerator in accordance with the second non-limiting embodiment of the present invention, and FIG. 8 is a diagram showing a non-limiting variation of FIG. 7.

[0089] In this embodiment and referring to FIG. 7, a fan mounting portion 240 includes the motor mounting portion 242 configured to receive and couple the motor 220 of the fan 210, and a plurality of spokes 241 configured to couple the motor supporting portion 242 to a shroud 230 having a concave recess 231.

[0090] Further, the concentric unit 260 is provided so as to guide the rotation shaft 221 of the motor 220 into alignment at the center of a receiving hole (such as the receiving hole 132) as the motor 220 and the motor supporting portion 242 are coupled to each other.

[0091] In other words, the concentric unit 260 provides a protruding portion 262 protruding from the lower portion of the motor 220 and a motor mounting portion 261 provided at the motor supporting portion 242 in correspond-

ence to the protruding portion 262.

[0092] Here, the motor mounting portion 261 may be configured as a recess, a through hole, or the like.

[0093] By coupling the protruding portion 262 and the motor mounting portion 261 to each other, the rotation shaft 221 of the motor 220 are provided at the center of the receiving hole (such as the receiving hole 132). Thus, there is no requirement for any additional operations and structures to align the rotation shaft 221 and the receiving hole (such as the receiving hole 132) to be concentric with each other, thereby reducing manufacturing time and enhancing productivity of the fan module.

[0094] In addition, displacement of the rotation shaft 221 due to vibration of the motor 220 never occurs, thereby preventing interference between the receiving hole 232 and a blade 211 of the fan 210.

[0095] The concentric unit 260 may be also provided as shown in FIG. 8.

[0096] Referring to FIG. 8, the concentric unit 260 includes a recess portion 261 formed at the lower portion of the motor 220 and a motor mounting portion 262 provided at the motor supporting portion 242 in correspondence to the recess portion 261 and allowing the rotation shaft 221 of the motor 220 to be provided at the center of the receiving hole 232 (in a concentric manner) by being coupled to the recess portion 261.

[0097] The motor mounting portion 262 may be configured as a protruding portion 262 in correspondence to the recess portion 261.

[0098] While one concentric unit 260 is provided in this embodiment, the present invention contemplates including a fan module having a plurality of concentric units 260 so as to enhance an accuracy of the fan module 200.

[0099] That is, as a plurality of the protruding portions 262 and a plurality of the recess portions 261 are provided, the rotation shaft 221 of the motor 220 may be maintained in a concentric manner with the center of the receiving hole 232 even when any one of the plurality of protruding portions 262 and the recess portions 261 is abraded.

[0100] A fan module in accordance with the third non-limiting embodiment of the present invention will now be described in detail with reference to accompanying drawings. Wherein the configuration and the description of the third non-limiting embodiment is the same as that of the first and second non-limiting embodiments, discussion of the same will be omitted.

[0101] A fan module 300 in accordance with this embodiment includes spokes 341 configured to prevent a shroud 330 from being shaken by rotation of a motor (such as motor 120), and a wire draw-out portion 343 configured to draw out a lead wire 344 for supplying a power to the motor (such as motor 120).

[0102] First, the spokes 341 and the wire draw-out portion 343 in accordance with this non-limiting embodiment will be described in detail with reference to FIGS. 9 and 10.

[0103] FIG. 9 is a diagram showing the spokes 341

and the wire draw-out portion 343 in the fan module 300 in accordance with the third non-limiting embodiment of the present invention, and FIG. 10 is a sectional view showing the spokes 341 in FIG. 9.

[0104] Referring to FIGS. 9 and 10, the plurality of spokes 341 in this embodiment are spaced from each other by a constant angle therebetween.

[0105] The plurality of spokes 341 extend in a length direction from a motor supporting portion 342. The plurality of spokes are offset from a center portion of the motor supporting portion 342. Each spoke 341 may extend tangentially from an outer diameter of the motor supporting portion 342. More particularly, each spoke 341 extending in the length direction does not overlap any other spoke 341.

[0106] Accordingly, this configuration effectively prevents the shroud 330 from being shaken or experiencing vibration caused by the rotation of the motor 320.

[0107] The motor supporting portion 342 includes the wire draw-out portion 343, which is configured to draw out the lead wire 344 of the motor 320.

[0108] The wire draw-out portion 343 is configured as a cut-out portion of an edge of the motor supporting portion 342 in a central direction of the motor supporting portion 342.

[0109] Accordingly, the lead wire 344 is not exposed to airflow generated by a fan 310 and is drawn out to a rear surface of the motor supporting portion 342, thereby preventing flow loss or noise.

[0110] The motor supporting portion 342 may be further provided with a locking portion 346 configured to prevent the lead wire 344 of the motor 320 from being moved.

[0111] Accordingly, the locking portion 346 prevents the lead wire 344 from being exposed to the airflow.

[0112] Furthermore, at least one of the spokes 341 may be provided with a receiving recess 345 provided in a length direction configured to receive the lead wire 344 therein.

[0113] The receiving recess 345 may be provided with a plurality of locking protrusions at an opened end of the receiving recess 345 so as to prevent the lead wire 344 from being separated therefrom.

[0114] Accordingly, the receiving recess 345 effectively prevents the flow loss or the noise that would otherwise be caused by the lead wire 344.

[0115] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0116] As the present inventive features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

[0117] One or more embodiments of the disclosure may be referred to herein, individually and/or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any particular invention or inventive concept. Moreover, although specific embodiments have been illustrated and described herein, it should be appreciated that any subsequent arrangement designed to achieve the same or similar purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all subsequent adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the description.

Claims

1. A fan nodule comprising:
 - a fan;
 - a shroud having a receiving hole positioned around the fan;
 - a fan mounting portion coupled to a rear surface of the shroud on which the fan is mounted, the rear surface facing a downstream airflow direction of the fan; and
 - a concave recess provided on the rear surface of the shroud and circling the receiving hole.
2. The fan module of claim 1, wherein the concave recess has a semicircular cross-section.
3. The fan module of claim 1 or 2, wherein a side rib of the concave recess adjacent to an outer edge of the fan extends in an axial direction of the fan.
4. The fan module of claim 1, 2 or 3, wherein a convex ring is provided on a front surface of the shroud in an upstream airflow direction of the fan circling the receiving hole.
5. The fan module of any of claims 1 to 4, wherein the fan comprises:
 - a hub;
 - a plurality of blades provided in a radial direction

- of the hub; and
a motor received in the hub so as to rotate the fan,
wherein, the motor is configured as an outer rotor type motor.
6. The fan module of claim 5, wherein a circuit board supplying a signal to the motor is coupled to the motor to be molded.
7. The fan module of claim 5 or 6, wherein the fan mounting portion comprises: a motor supporting portion to which the motor is mounted, and a plurality of spokes configured to couple the motor supporting portion to the shroud, wherein a rotation shaft of the motor is aligned at a center of the receiving hole and the motor and the motor supporting portion are coupled to each other.
8. The fan module of claim 7, further comprising:
a protruding portion provided at a lower portion of the motor; and
a motor mounting portion provided at the motor supporting portion coupled to the protruding portion such that the rotation shaft of the motor is provided at the center of the receiving hole.
9. The fan module of claim 7 or 8, further comprising:
a recess portion provided at a lower portion of the motor; and
a motor mounting portion provided at the motor supporting portion coupled to the recess portion such that the rotation shaft of the motor is provided at the center of the receiving hole.
10. The fan module of claim 7, 8 or 9, wherein the plurality of spokes are spaced from each other by a constant angle therebetween.
11. The fan module of claim 10, wherein each of the plurality of spokes extends in a length direction that is offset from the center of the motor supporting portion.
12. The fan module of claim 11, wherein each spoke extending in the length direction does not overlap any other spoke.
13. The fan module of any of claims 7 to 12, wherein the motor supporting portion is provided with a wire draw-out portion configured as a cut-out portion of an edge of the motor supporting portion in a central direction of the motor supporting portion to draw out a lead wire of the motor.
14. The fan module of claim 13, wherein the motor supporting portion is provided with a locking portion configured to prevent the lead wire of the motor from being moved.
15. The fan module of claim 13 or 14, wherein at least one of the plurality of spokes is provided with a receiving recess extending in a length direction configured to receive the lead wire.

Fig. 1

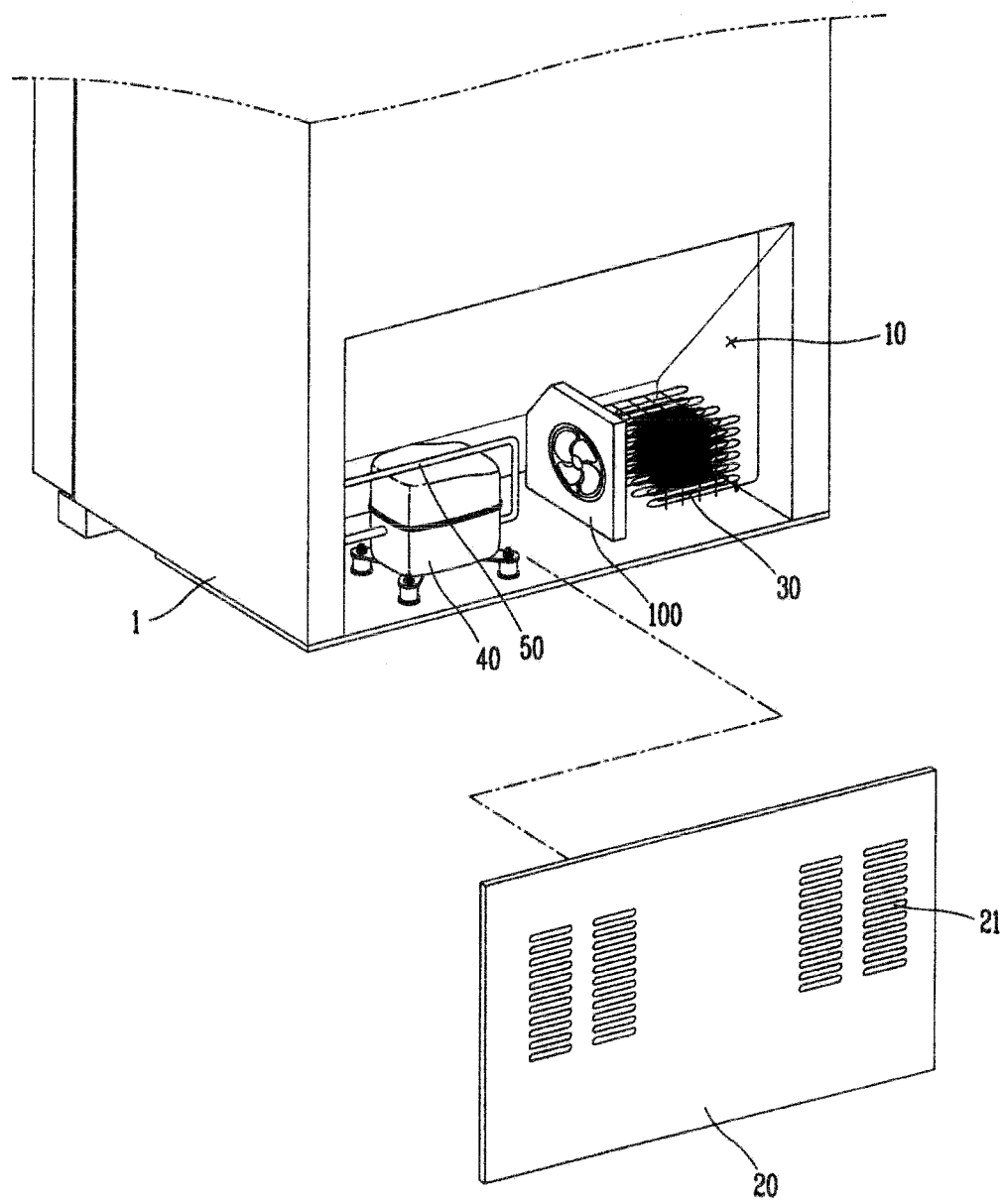


Fig. 2

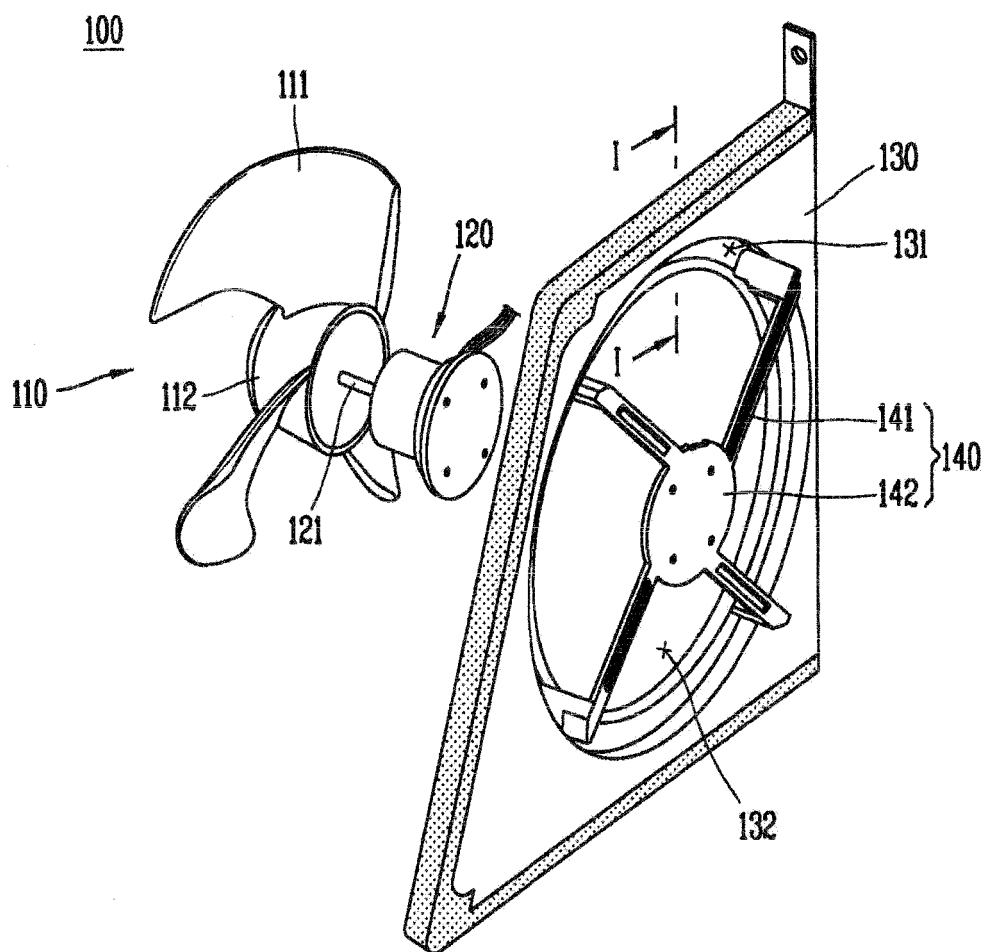


Fig. 3

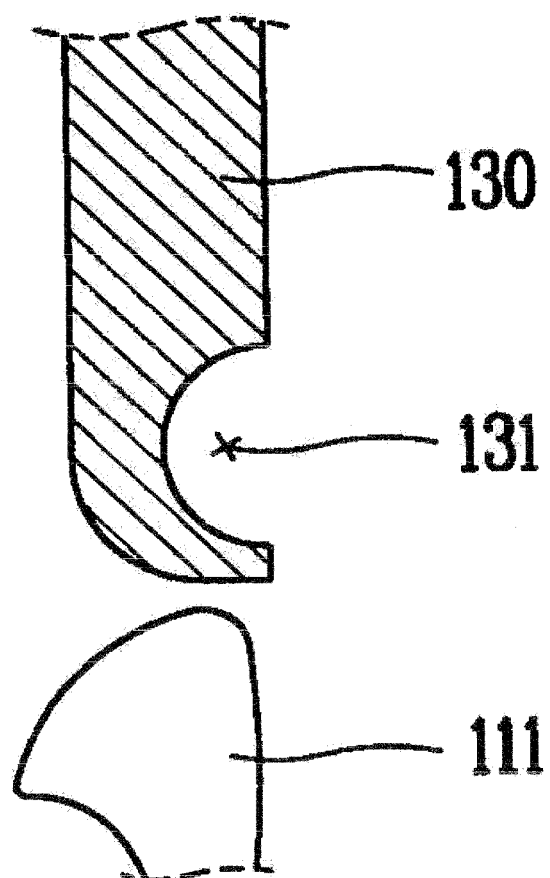


Fig. 4

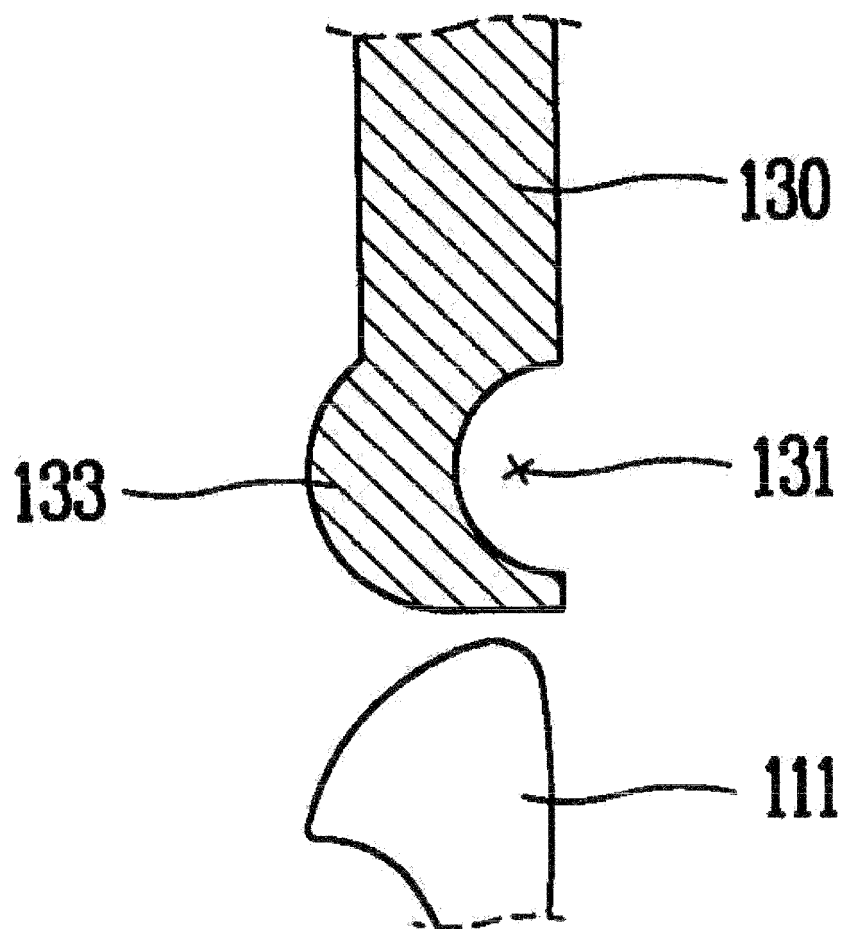


Fig. 5

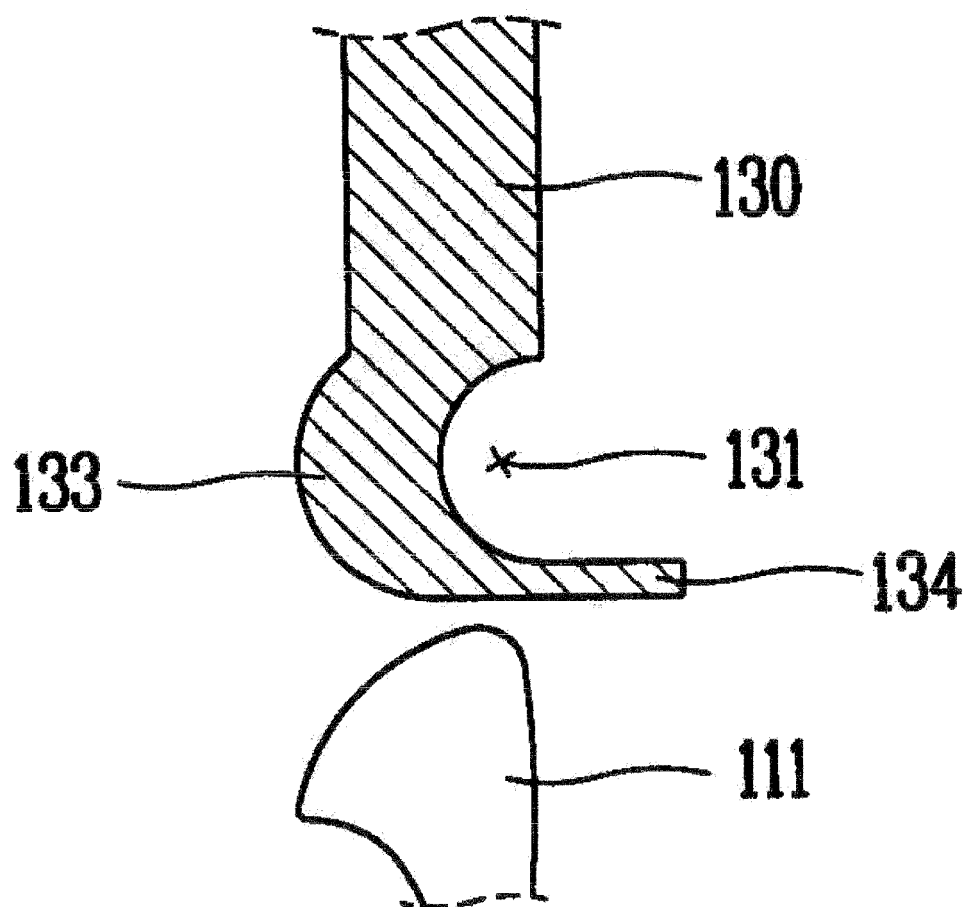


Fig. 6

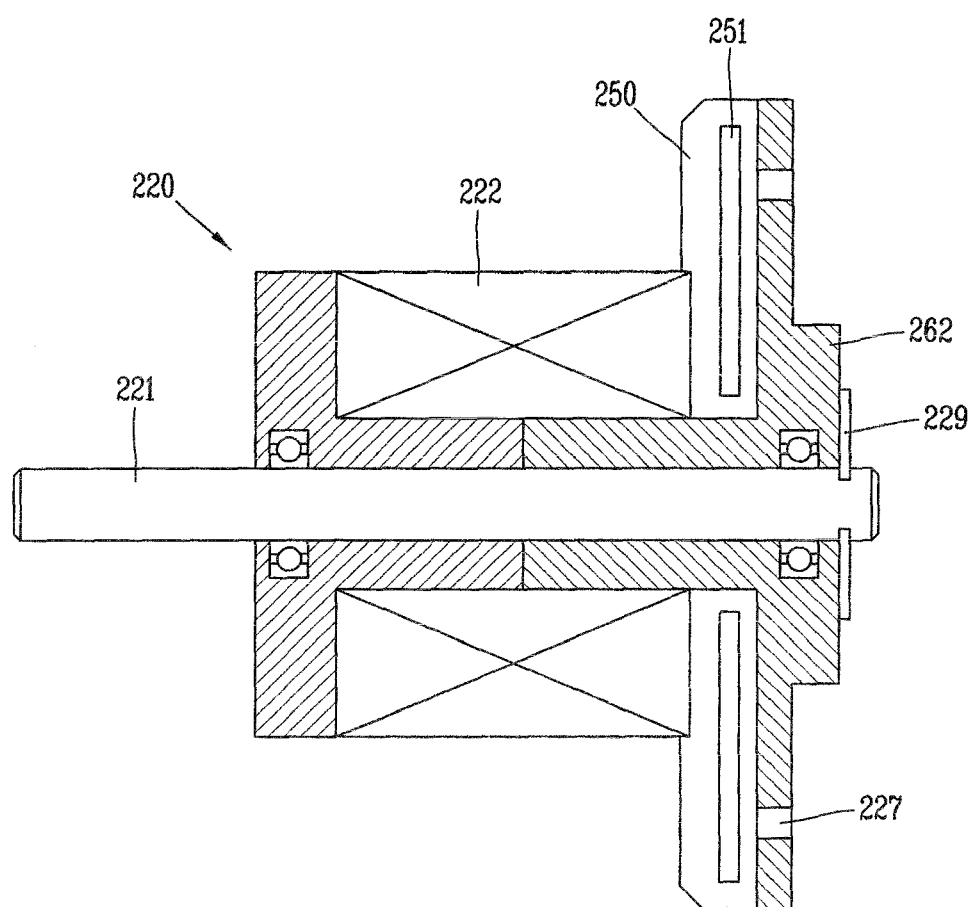


Fig. 7

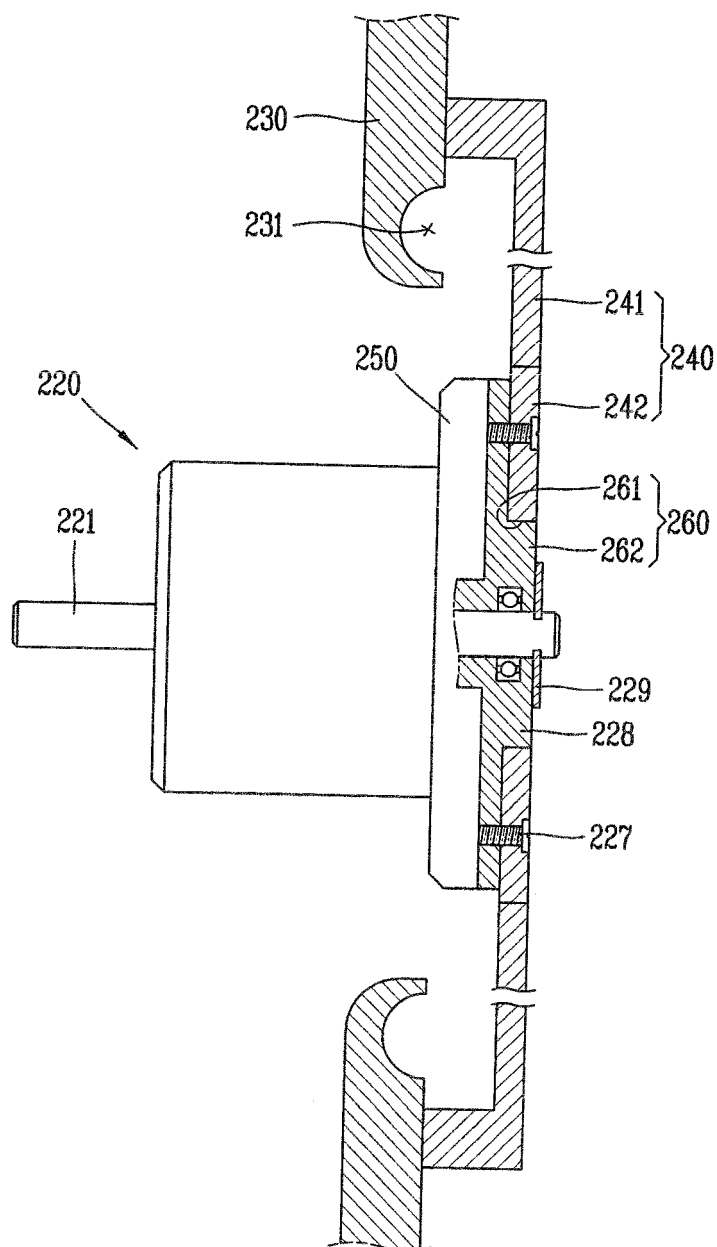


Fig. 8

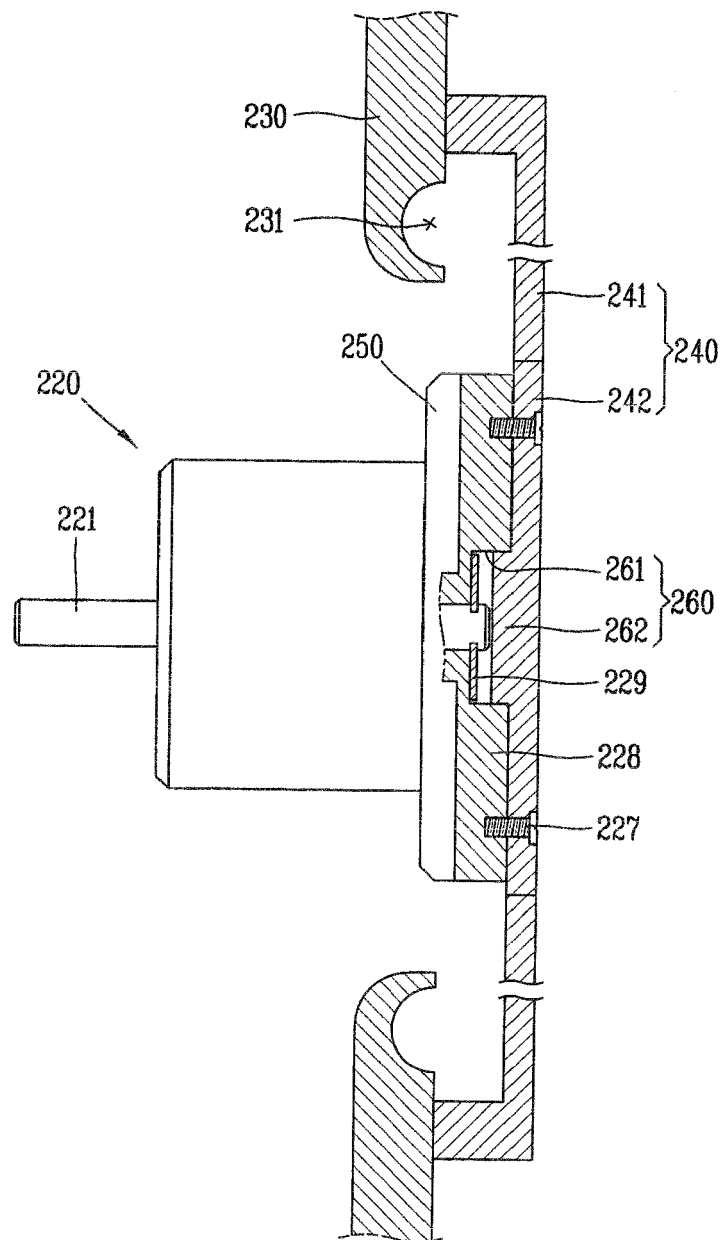


Fig. 9

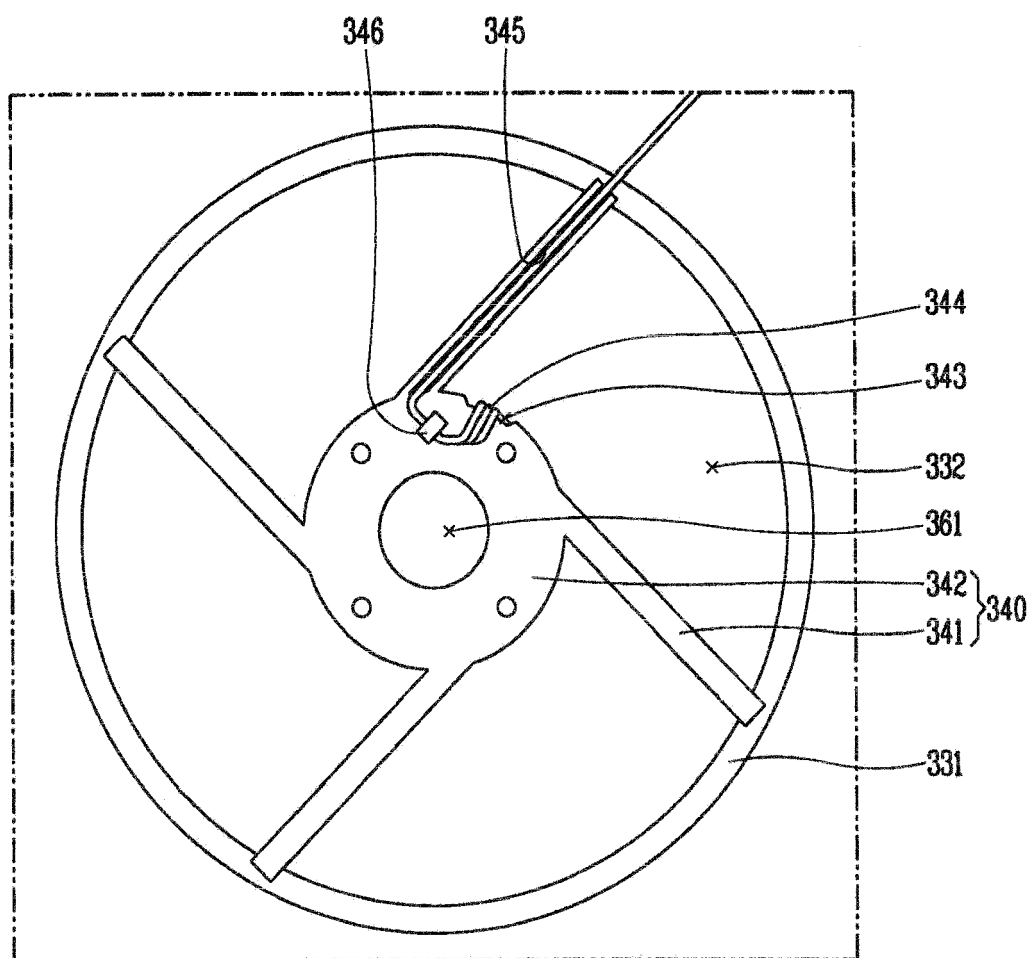
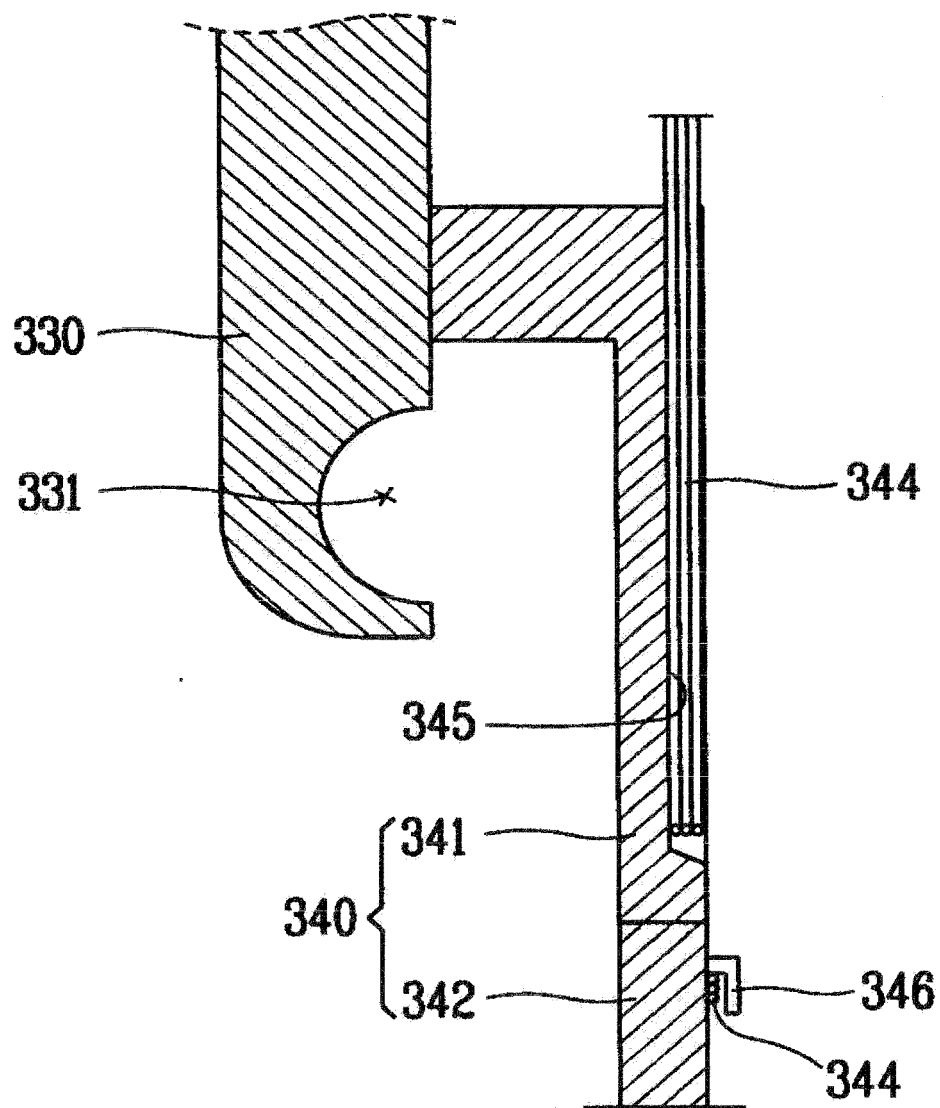


Fig. 10





EUROPEAN SEARCH REPORT

Application Number
EP 08 17 0719

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 6 676 371 B1 (BROWN DANIEL J [US]) 13 January 2004 (2004-01-13) * column 2, line 6 - last line * * figures 1-3 * -----	1-15	INV. F04D29/52
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