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

(11) EP 2 295 814 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.03.2011 Bulletin 2011/11

(51) Int Cl.:
F04D 25/06 *(2006.01)*

(21) Application number: **09010289.8**

(22) Date of filing: **10.08.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(71) Applicant: **Sunonwealth Electric Machine Industry Co., Ltd.**
Kaohsiung,
Taiwan R.O.C. (TW)

(72) Inventor: **Horng, Alex**
Lingya District
Kaohsiung (TW)

(74) Representative: **Köhler, Walter et al**
Louis, Pöhlau, Lohrentz
Patentanwälte
Postfach 30 55
90014 Nürnberg (DE)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Heat-dissipating fan

(57) A heat-dissipating fan (1, 2, 3, 4) includes a housing (10) having a peripheral wall (11) defining a compartment (12) receiving a shaft seat (13). The peripheral wall (11) includes a wire-guiding slot (16) in communication with the compartment (12). A base (20, 20a, 20b, 20c) is coupled to the housing (10) and includes a coil unit (21) and a connection port (22) electrically connected to the coil unit (21). The connection port (22) faces the wire-guiding slot (16). A power line (30) includes a first end connected to the connection port (22) and a second end extending through the wire-guiding slot (16). An impeller (40) includes a hub (41), a shaft (411) mounted to the hub (41) and coupled to the shaft seat (13), and a permanent magnet (412) mounted to the hub (41). The permanent magnet (412) faces the coil unit (21). The connection port (22) is located on a reference line (L) passing through the shaft seat (13) and the wire-guiding slot (16). A distance between the connection port (22) and the wire-guiding slot (16) is shortened to enhance assembling convenience of the power line (30).

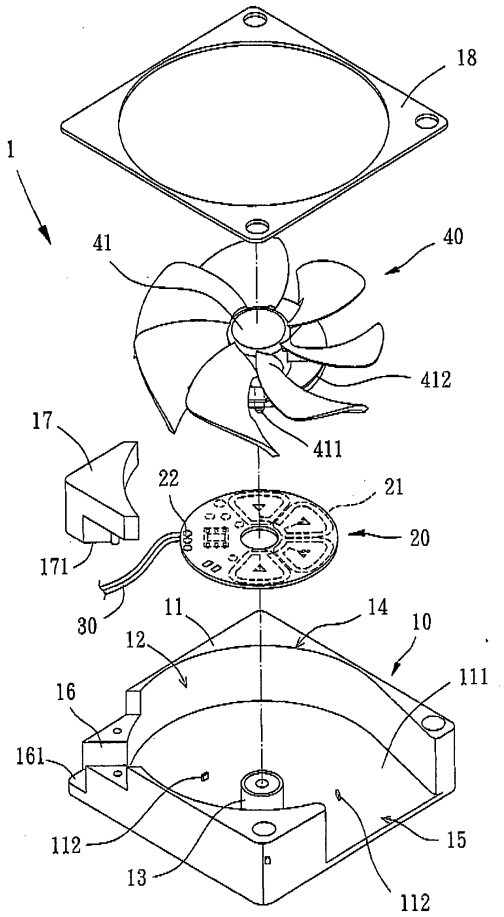

FIG. 5

EP 2 295 814 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a heat-dissipating fan and, more particularly, to a heat-dissipating fan allowing easy assembly of a power line.

2. Description of the Related Art

[0002] Heat-dissipating fans generally include a power line for connection with an external power source for driving the heat-dissipating fans. The position for fixing the power line must be carefully arranged to avoid the power line from being loosened or being entangled in an impeller of the heat-dissipating fan. However, the power line in most of the currently available heat-dissipating fans winds in a complex manner and, thus, causes inconvenience to assembly.

[0003] FIG. 1 shows a conventional heat-dissipating fan 70 including a wire-positioning mechanism 71. The wire-positioning mechanism 71 includes a bottom 711, two support portions 712, and two stop portions 713. A power line 72 winds through the bottom 711, the support portions 712, and the stop portions 713. Although the power line 72 can be reliably positioned by the wire-positioning mechanism 71, an end of the power line 72 must be extended from under the heat-dissipating fan 70 to the outside and then wind through the bottom 711, the support portions 712, and the stop portions 713 in sequence, increasing difficulties to assembly of the power line 72. Furthermore, the wire-positioning mechanism 71 is complex and, thus, increases the overall costs of the heat-dissipating fan 70.

[0004] FIGS. 2 and 3 show another conventional heat-dissipating fan 8 including a housing 81, a stator seat 82, an impeller 83, and a lid 84. The housing 81 includes a compartment 811 and a channel 812 in communication with the compartment 811. The stator seat 82 is mounted in the compartment 811 and has a connection port 821 connected to a power line 822. The impeller 83 is rotatably coupled to the stator seat 82 and has a permanent magnet 831. The lid 84 includes a tab 841 that extends into the channel 812 when the lid 84 is coupled to the housing 81. During assembly of the power line 822, an end of the power line 822 winds through the channel 812 to the outside for connection with an external power source. The tab 841 presses against and, thus, positions the power line 822. However, the connection port 821 does not face the channel 812 and is spaced from the channel 812 by a distance. After the power line 822 is connected to the connection port 821, the power line 822 must wind through the distance in the compartment 811 before the power line 822 exits the housing 81 via the channel 812, increasing difficulties in winding the power line 822 and leading to inconvenience to assembly. Furthermore, the power line 822 is liable to be entangled into the impeller 83 during operation of the heat-dissipating fan 80, for the power line 822 winds through a considerable distance in the compartment 811 of the housing 81. Furthermore, the connection port 821 of the stator seat 82 is located below the permanent magnet 831 of the impeller 83, such that a spacing D must be preserved between a bottom edge of the permanent magnet 831 and the stator seat 82 for receiving the power line 822 and the connection port 821, such as a welding point, for the purposes of assuring smooth rotation of the impeller 83. However, the spacing D causes a limitation to the reduction in the overall axial height of the heat-dissipating fan 80. As a result, it is difficult to achieve light, compact design of the heat-dissipating fan 80.

[0005] FIG. 4 shows a further conventional heat-dissipating fan 90 including a base 91 having a peripheral wall. A block 92 is mounted in a wire-guiding channel 911 formed in a corner of the peripheral wall. A power line 93 of the heat-dissipating fan 90 winds through a distance in the base 91 to a position aligned with the wire-guiding channel 911 and then exits the base 91 via the wire-guiding channel 911 for connection with an external power source. The block 92 presses against and, thus, positions the power line 93. Although the wire-guiding channel 911 is formed in the corner of the base 91 to shorten the winding distance of the power line 93 in the base 91, the connection port of the stator of the heat-dissipating fan 90 for driving an impeller 94 does not face the wire-guiding channel 911. Thus, the power line 93 still has to winds through the distance in the base 91 before the power line 93 reaches the wire-guiding channel 911, increasing difficulties in winding the power line 93 and leading to inconvenience to assembly.

[0006] Thus, a need exists for a heat-dissipating fan allowing easy assembly of a power line.

SUMMARY OF THE INVENTION

[0007] An objective of the present invention is to provide a heat-dissipating fan avoiding difficulties and inconvenience in the assembly of the power line.

[0008] Another objective of the present invention is to provide a heat-dissipating fan with a reduced axial height.

[0009] In a first aspect, a heat-dissipating fan according to the preferred teachings of the present invention includes a housing having a peripheral wall defining a compartment. A shaft seat is provided in the compartment. The peripheral wall includes a wire-guiding slot in communication with the compartment. A base is coupled to the housing. The base includes a coil unit and a connection port electrically connected to the coil unit. The connection port faces the wire-guiding slot of the housing. A power line includes a first end connected to the connection port and a second end extending through the wire-guiding slot. An impeller includes a hub, a shaft mounted to the hub, and a permanent magnet mounted to the hub. The shaft is coupled to the shaft seat, and the

permanent magnet faces the coil unit. The connection port is located on a reference line passing through the shaft seat and the wire-guiding slot. A distance between the connection port and the wire-guiding slot is shortened to enhance assembling convenience of the power line.

[0010] In preferred forms, the connection port of the base is located outside of a rotational area of the permanent magnet, and the connection port is intermediate an outer periphery of the permanent magnet and an inner peripheral face of the peripheral wall of the housing. Thus, a spacing between the permanent magnet and the base can be shortened, for the connection port and the power line are not located in the spacing. Thus, the axial height of the heat-dissipating fan can be reduced.

[0011] In preferred forms, a positioning member is engaged in the wire-guiding slot. The wire-guiding slot includes a first pressing surface. The positioning member includes a second pressing surface. The power line is clamped between the first and second pressing surfaces, reliably positioning the power line. The first pressing surface of the wire-guiding slot includes a first stepped portion, and the second pressing surface of the positioning member includes a second stepped portion facing and engaged with the first stepped portion, preventing the power line from being pulled off the power connection port. The wire-guiding slot is located in a corner of the peripheral wall of the housing. The housing includes a bottom wall formed inside the peripheral wall and defining the compartment. A plurality of catches is formed on the bottom wall and located in the compartment. The base is mounted in the compartment and abuts the bottom wall. The catches engage with an outer periphery of the base. The coil unit is formed on a face of the base by layout to shorten an axial length of the base.

[0012] In another aspect, a heat-dissipating fan according to the preferred teachings of the present invention includes a housing having a peripheral wall defining a compartment. A shaft seat is provided in the compartment. The peripheral wall includes a wire-guiding slot in communication with the compartment. A base is coupled to the housing. The base includes a coil unit and a connection port electrically connected to the coil unit. An extension extends radially outward from an outer periphery of the base towards the wire-guiding slot. The connection port is formed on a face of the extension. A power line includes a first end connected to the connection port and a second end extending through the wire-guiding slot. An impeller includes a hub, a shaft mounted to the hub, and a permanent magnet mounted to the hub. The shaft is coupled to the shaft seat. The permanent magnet faces the coil unit. The extension and the connection port are located on a reference line passing through the shaft seat and the wire-guiding slot. By such an arrangement, the connection port is closer to the wire-guiding slot, allowing the power line to be more easily extended through the wire-guiding slot, further enhancing the assembling convenience of the power line.

[0013] In a further aspect, a heat-dissipating fan according to the preferred teachings of the present invention includes a housing having a peripheral wall defining a compartment. A shaft seat is provided in the compartment. The peripheral wall includes a wire-guiding slot in communication with the compartment. A base is coupled to the housing. The base includes a layout board and a drive circuit board electrically connected to the layout board. The layout board includes a coil unit, and the drive circuit board includes a connection port electrically connected to the coil unit. The connection port faces and is adjacent to the wire-guiding slot of the housing. A power line includes a first end connected to the connection port and a second end extending through the wire-guiding slot. An impeller includes a hub, a shaft mounted to the hub, and a permanent magnet mounted to the hub. The shaft is coupled to the shaft seat. The permanent magnet faces the coil unit. The connection port is located on a reference line passing through the shaft seat and the wire-guiding slot. By such an arrangement, the connection port is adjacent to the wire-guiding slot and away from the rotational area of the impeller, enhancing the assembling convenience of the power line, preventing the power line from being entangled into the impeller, and reducing the axial height of the heat-dissipating fan.

[0014] The present invention will become clearer in light of the following detailed description of illustrative embodiments of this invention described in connection with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The illustrative embodiments may best be described by reference to the accompanying drawings where:

FIG 1 shows a bottom view of a conventional heat-dissipating fan.

FIG 2 shows an exploded, perspective view of another conventional heat-dissipating fan.

FIG 3 shows a cross sectional view of the heat-dissipating fan of FIG 2.

FIG 4 shows an exploded, perspective view of a further conventional heat-dissipating fan.

FIG. 5 shows an exploded, perspective view of a heat-dissipating fan of a first embodiment according to the preferred teachings of the present invention.

FIG 6 shows a top view of the heat-dissipating fan of FIG 5.

FIG. 7 shows an exploded, perspective view of a heat-dissipating fan of a second embodiment according to the preferred teachings of the present invention.

FIG. 8 shows a top view of the heat-dissipating fan of FIG. 7.

FIG 9 shows a cross sectional view of the heat-dissipating fan of FIG 7.

FIG 10 shows an exploded, perspective view of a heat-dissipating fan of a third embodiment according

to the preferred teachings of the present invention.

FIG. 11 shows a top view of the heat-dissipating fan of FIG 10.

FIG. 12 shows an exploded, perspective view of a heat-dissipating fan of a fourth embodiment according to the preferred teachings of the present invention.

FIG. 13 shows a top view of the heat-dissipating fan of FIG. 12.

FIG 14 shows an enlarged, partial, cross sectional view illustrating positioning of a power line by a positioning member of a heat-dissipating fan according to the preferred teachings of the present invention.

[0016] All figures are drawn for ease of explanation of the basic teachings of the present invention only; the extensions of the figures with respect to number, position, relationship, and dimensions of the parts to form the preferred embodiments will be explained or will be within the skill of the art after the following teachings of the present invention have been read and understood. Further, the exact dimensions and dimensional proportions to conform to specific force, weight, strength, and similar requirements will likewise be within the skill of the art after the following teachings of the present invention have been read and understood.

[0017] Where used in the various figures of the drawings, the same numerals designate the same or similar parts. Furthermore, when the terms "first", "second", "third", "inner", "outer", "end", "radial", "axial", "height", and similar terms are used herein, it should be understood that these terms have reference only to the structure shown in the drawings as it would appear to a person viewing the drawings and are utilized only to facilitate describing the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] A heat-dissipating fan of a first embodiment according to the preferred teachings of the present invention is shown in FIGS. 5 and 6 and designated 1. The heating-dissipating fan 1 includes a housing 10, a base 20, a power line 30, and an impeller 40. The housing 10 includes a peripheral wall 11 defining a compartment 12. A shaft seat 13 is provided in the compartment 12. The housing 10 further includes an air inlet 14 and an air outlet 15 both in communication with the compartment 12. The housing 10 shown in FIGS. 5 and 6 is of a type for a blower fan. However, the housing 10 can be of a type for an axial flow fan. The peripheral wall 11 includes a wire-guiding slot 16 in communication with the compartment 12. Preferably, the wire-guiding slot 16 is located in a corner of the peripheral wall 11 of the housing 10. A reference line L passes through the shaft seat 13 and the wire-guiding slot 16. The housing 10 further includes a bottom wall 111 formed inside the peripheral wall 11 and defining the compartment 12. A plurality of catches 112 is formed on the bottom wall 111 and located in the compartment 12.

[0019] The base 20 is mounted in the compartment 12 and preferably coupled to the shaft seat 13. The base 20 abuts the bottom wall 111, and the catches 112 engage with an outer periphery of the base 20 to fix the base 20 in place. The base 20 includes a coil unit 21 and a connection port 22 electrically connected to the coil unit 21. Preferably, the coil unit 21 is formed on a face of the base 20 by layout or other suitable provisions to reduce an axial height of the base 20. Preferably, the connection port 22 includes one or more connections. The connection port 22 faces the wire-guiding slot 16 of the housing 10. Furthermore, the connection port 22 is located on the reference line L. Namely, the shaft seat 13, the wire-guiding slot 16, and the connection port 22 are located on the reference line L, shortening the distance between the connection port 22 and the wire-guiding slot 16.

[0020] An end of the power line 30 is connected to the connection port 22 of the base 20. The other end of the power line 30 is extended beyond the housing 10 via the wire-guiding slot 16 for connection with an external power source. Thus, the power line 30 can supply electric current to,the coil unit 21 of the base 20 for driving the impeller 40. A positioning member 17 is engaged in the wire-guiding slot 16. In the preferred form shown in FIGS. 5 and 6, the wire-guiding slot 16 includes a first pressing surface 161, and the positioning member 17 includes a second pressing surface 171. After the power line 30 is extended through the wire-guiding slot 16, the positioning member 17 is engaged in the wire-guiding slot 16 so that the power line 30 is clamped between the first and second pressing surfaces 161 and 171, enhancing the positioning effect for the power line 30. Thus, undesired disengagement of the end of the power line 30 from the connection port 22 is avoided. In a preferred form shown in FIG. 14, the first pressing surface 161 of the wire-guiding slot 16 includes a first stepped portion 162, and the second pressing surface 171 of the positioning member 17 includes a second stepped portion 172 engaged with the first stepped portion 162. Thus, when the power line 30 is clamped between the first and second pressing surfaces 161 and 171, the power line 30 has a bend at the first and second stepped portions 162 and 172 to provide an anti-pulling effect. Thus, disengagement of the end of the power line 30 from the connection port 22 resulting from pulling the power line 30 can be avoided. The power line 30 can be fixed in the wire-guiding slot 16 such as by glue or fasteners without using the positioning member 17.

[0021] The impeller 40 includes a hub 41. A shaft 411 and a permanent magnet 412 are mounted to the hub 41. The shaft 411 is coupled to the shaft seat 13, so that the impeller 40 is rotatable in the compartment 12 of the housing 10 about an axis. The permanent magnet 412 is aligned with the coil unit 21.

[0022] In use, the coil unit 21 interacts with the permanent magnet 412 to drive the impeller 40 to rotate. Air currents are driven by the impeller 40 into the compart-

ment 12 via the air inlet 14 and then exit the housing 10 via the air outlet 15 to proceed with heat dissipation. Thus, the heat-dissipating fan 1 according to the preferred teachings of the present invention can be mounted in differing electronic devices or equipment and provide desired heat-dissipating effect.

[0023] Since the connection port 22 faces the wire-guiding slot 16 of the housing 10 and since the connection port 22 is located on the reference line L, the connection port 22 is close to the wire-guiding slot 16. Namely, the distance between the connection port 22 and the wire-guiding slot 16 can be shortened. After the end of the power line 30 is connected to the connection port 22, the other end of the power line 30 can extend beyond the housing 10 directly through the wire-guiding slot 16 without the need of winding the power line 30 inside the housing 10. Thus, the power line 30 can be straight extended through the wire-guiding slot 16, enhancing assembling convenience and reliably preventing the power line 30 from being entangled into the impeller 40 during operation of the heat-dissipating fan 1 according to the preferred teachings of the present invention.

[0024] FIGS. 7-9 show a heat-dissipating fan 2 of a second embodiment according to the preferred teachings of the present invention. The heat-dissipating fan 2 includes a housing 10, a base 20a, a power line 30, and an impeller 40. The housing 10, the power line 30, and the impeller 40 of the second embodiment are substantially the same as those of the first embodiment and, thus, not described in detail to avoid redundancy.

[0025] The base 20a includes a coil unit 21 and a connection port 22 electrically connected to the coil unit 21. The connection port 22 is located outside of a rotational area of the permanent magnet 412. Specifically, the connection port 22 is intermediate an outer periphery of the permanent magnet 412 and an inner peripheral face of the peripheral wall 11 of the housing 10.

[0026] Since the connection port 22 faces the wire-guiding slot 16 of the housing 10 and since the connection port 22 is located on the reference line L, the assembling convenience of the power line 30 is enhanced. Furthermore, the power line 30 is prevented from being entangled into the impeller 40 during operation of the heat-dissipating fan 2. Furthermore, a spacing D (FIG. 9) between the permanent magnet 412 of the impeller 40 and the base 20a can be shortened, for the connection port 22 and the power line 30 are not located in the spacing D. Thus, the overall axial height of the heat-dissipating fan 2 along the axis can be reduced, allowing light, compact design of the heat-dissipating fan 2.

[0027] FIGS. 10 and 11 show a heat-dissipating fan 3 of a third embodiment according to the preferred teachings of the present invention. The heat-dissipating fan 3 includes a housing 10, a base 20b, a power line 30, and an impeller 40. The housing 10, the power line 30, and the impeller 40 of the third embodiment are substantially the same as those of the first embodiment and, thus, not described in detail to avoid redundancy.

[0028] The base 20b includes a coil unit 21 and a connection port 22 electrically connected to the coil unit 21. Specifically, an extension 23 extends radially outward from an outer periphery of the base 20b towards the wire-guiding slot 16. The connection port 22 is formed on a face of the extension 23. The extension 23 and the connection port 22 are located on the reference line L.

[0029] Since the connection port 22 faces the wire-guiding slot 16 of the housing 10 and since the connection port 22 is located on the reference line L, the assembling convenience of the power line 30 is enhanced. Furthermore, the power line 30 is prevented from being entangled into the impeller 40 during operation of the heat-dissipating fan 3. Furthermore, by providing the extension 23 of the base 20b, the connection port 22 is located outside of the rotational area of the permanent magnet 412 of the impeller 40. Further, the connection port 22 is closer to the wire-guiding slot 16, so that straight insertion of the other end of the power line 30 through the wire-guiding slot 16 is easier, further enhancing the assembling convenience of the power line 30.

[0030] FIGS. 12 and 13 show a heat-dissipating fan 4 of a fourth embodiment according to the preferred teachings of the present invention. The heat-dissipating fan 4 includes a housing 10, a base 20c, a power line 30, and an impeller 40. The housing 10, the power line 30, and the impeller 40 of the fourth embodiment are substantially the same as those of the first embodiment and, thus, not described in detail to avoid redundancy.

[0031] The base 20c includes a coil unit 21 and a connection port 22 electrically connected to the coil unit 21. Specifically, the base 20c includes a layout board 24 and a drive circuit board 25 electrically connected to the layout board 24. The connection port 22 is formed on a face of the drive circuit board 25. The connection port 22 is located on the reference line L. Furthermore, the connection port 22 is adjacent to and faces the wire-guiding slot 16. The drive circuit board 25 can include a drive circuit consisting of a plurality of electric elements. The drive circuit board 25 can activate the coil unit 21 to drive the impeller 40 to rotate.

[0032] Since the connection port 22 faces the wire-guiding slot 16 of the housing 10 and since the connection port 22 is located on the reference line L, the assembling convenience of the power line 30 is enhanced. Furthermore, the connection port 22 is adjacent to the wire-guiding slot 16 due to provision of the drive circuit board 25, further enhancing the assembling convenience of the power line 30. Furthermore, the electric elements on the drive circuit board 25 are located outside of the rotational area of the permanent magnet 412 of the impeller 40, so that the power line 30 is far away from the rotational area of the impeller 40. Further, the connection port 22 is closer to the wire-guiding slot 16, so that straight insertion of the other end of the power line 30 through the wire-guiding slot 16 is easier, further enhancing the assembling convenience of the power line 30. The overall axial height of the heat-dissipating fan 4 along the axis can be re-

duced while preventing the power line 30 from being entangled into the impeller 40 during operation of the heat-dissipating fan 4.

[0033] In the preferred forms shown in FIGS. 5-14, a lid 18 having an air-guiding opening is mounted to the housing 10 for smoothly guiding air currents into the compartment 12 of the housing 10.

[0034] Thus since the invention disclosed herein may be embodied in other specific forms without departing from the spirit or general characteristics thereof, some of which forms have been indicated, the embodiments described herein are to be considered in all respects illustrative and not restrictive. The scope of the invention is to be indicated by the appended claims, rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

Claims

1. A heat-dissipating fan (1, 2) comprising, in combination:

a housing (10) including a peripheral wall (11) defining a compartment (12), with a shaft seat (13) provided in the compartment (12), with the peripheral wall (11) including a wire-guiding slot (16) in communication with the compartment (12);

a base (20, 20a) coupled to the housing (10), with the base (20, 20a) including a coil unit (21) and a connection port (22) electrically connected to the coil unit (21), with the connection port (22) facing the wire-guiding slot (16) of the housing (10);

a power line (30) including a first end connected to the connection port (22) and a second end extending through the wire-guiding slot (16); and

an impeller (40) including a hub (41), a shaft (411) mounted to the hub (41), and a permanent magnet (412) mounted to the hub (41), with the shaft (411) coupled to the shaft seat (13), with the permanent magnet (412) facing the coil unit (21),

with the connection port (22) located on a reference line (L) passing through the shaft seat (13) and the wire-guiding slot (16).

2. The heat-dissipating fan (1, 2) as claimed in claim 1, with the connection port (22) of the base (20, 20a) located outside of a rotational area of the permanent magnet (412), and with the connection port (22) intermediate an outer periphery of the permanent magnet (412) and an inner peripheral face of the peripheral wall (11) of the housing (10).

3. The heat-dissipating fan (1, 2) as claimed in claim 1, further comprising, in combination: a positioning member (17) engaged in the wire-guiding slot (16), with the wire-guiding slot (16) including a first pressing surface (161), with the positioning member (17) including a second pressing surface (171), and with the power line (30) clamped between the first and second pressing surfaces (161, 171).

4. The heat-dissipating fan (1, 2) as claimed in claim 3, with the first pressing surface (161) of the wire-guiding slot (16) including a first stepped portion (162), with the second pressing surface (171) of the positioning member (17) including a second stepped portion (172) facing and engaged with the first stepped portion (162).

5. The heat-dissipating fan (1, 2) as claimed in claim 4, with the wire-guiding slot (16) located in a corner of the peripheral wall (11) of the housing (10).

6. The heat-dissipating fan (1, 2) as claimed in claim 1, with the wire-guiding slot (16) located in a corner of the peripheral wall (11) of the housing (10).

7. The heat-dissipating fan (1, 2) as claimed in claim 1, with the housing (10) including a bottom wall (111) formed inside the peripheral wall (11) and defining the compartment (12), with a plurality of catches (112) being formed on the bottom wall (111) and located in the compartment (12), with the base (20, 20a) mounted in the compartment (12) and abutting the bottom wall (111), and with the plurality of catches (112) engaged with an outer periphery of the base (20, 20a).

8. The heat-dissipating fan (1, 2) as claimed in claim 1, with the coil unit (21) formed on a face of the base (20, 20a) by layout.

9. A heat-dissipating fan (3) comprising, in combination:

a housing (10) including a peripheral wall (11) defining a compartment (12), with a shaft seat (13) provided in the compartment (12), with the peripheral wall (11) including a wire-guiding slot (16) in communication with the compartment (12);

a base (20b) coupled to the housing (10), with the base (20b) including a coil unit (21) and a connection port (22) electrically connected to the coil unit (21), with the base (20b) including an outer periphery, with the base (20b) further including an extension (23) extending radially outward from the outer periphery of the base (20b) towards the wire-guiding slot (16), with the connection port (22) formed on a face of the extension (23);

a power line (30) including a first end connected to the connection port (22) and a second end extending through the wire-guiding slot (16); and an impeller (40) including a hub (41), a shaft (411) mounted to the hub (41), and a permanent magnet (412) mounted to the hub (41), with the shaft (411) coupled to the shaft seat (13), with the permanent magnet (412) facing the coil unit (21),
with the extension (23) and the connection port (22) located on a reference line (L) passing through the shaft seat (13) and the wire-guiding slot (16).

10. The heat-dissipating fan (3) as claimed in claim 9, with the connection port (22) of the base (20b) located outside of a rotational area of the permanent magnet (412), and with the connection port (22) intermediate an outer periphery of the permanent magnet (412) and an inner peripheral face of the peripheral wall (11) of the housing (10).

11. The heat-dissipating fan (3) as claimed in claim 9, further comprising, in combination: a positioning member (17) engaged in the wire-guiding slot (16), with the wire-guiding slot (16) including a first pressing surface (161), with the positioning member (17) including a second pressing surface (171), and with the power line (30) clamped between the first and second pressing surfaces (161, 171).

12. The heat-dissipating fan (3) as claimed in claim 11, with the first pressing surface (161) of the wire-guiding slot (16) including a first stepped portion (162), with the second pressing surface (171) of the positioning member (17) including a second stepped portion (172) facing and engaged with the first stepped portion (162).

13. The heat-dissipating fan (3) as claimed in claim 12, with the wire-guiding slot (16) located in a corner of the peripheral wall (11) of the housing (10).

14. The heat-dissipating fan (3) as claimed in claim 9, with the wire-guiding slot (16) located in a corner of the peripheral wall (11) of the housing (10).

15. The heat-dissipating fan (3) as claimed in claim 9, with the housing (10) including a bottom wall (111) formed inside the peripheral wall (11) and defining the compartment (12), with a plurality of catches (112) formed on the bottom wall (111) and located in the compartment (12), with the base (20b) mounted in the compartment (12) and abutting the bottom wall (111), and with the plurality of catches (112) engaged with an outer periphery of the base (20b).

16. A heat-dissipating fan (4) comprising, in combination:

a housing (10) including a peripheral wall (11) defining a compartment (12), with a shaft seat (13) provided in the compartment (12), with the peripheral wall (11) including a wire-guiding slot (16) in communication with the compartment (12);
a base (20c) coupled to the housing (10), with the base (20c) including a layout board (24) and a drive circuit board (25) electrically connected to the layout board (24), with the layout board (24) including a coil unit (21), with the drive circuit board (25) including a connection port (22) electrically connected to the coil unit (21), with the connection port (22) facing and adjacent to the wire-guiding slot (16) of the housing (10);
a power line (30) including a first end connected to the connection port (22) and a second end extending through the wire-guiding slot (16); and
an impeller (40) including a hub (41), a shaft (411) mounted to the hub (41), and a permanent magnet (412) mounted to the hub (41), with the shaft (411) coupled to the shaft seat (13), with the permanent magnet (412) facing the coil unit (21),
with the connection port (22) located on a reference line (L) passing through the shaft seat (13) and the wire-guiding slot (16).

17. The heat-dissipating fan (4) as claimed in claim 16, further comprising, in combination: a positioning member (17) engaged in the wire-guiding slot (16), with the wire-guiding slot (16) including a first pressing surface (161), with the positioning member (17) including a second pressing surface (171), and with the power line (30) clamped between the first and second pressing surfaces (161, 171).

18. The heat-dissipating fan (4) as claimed in claim 17, with the first pressing surface (161) of the wire-guiding slot (16) including a first stepped portion (162), with the second pressing surface (171) of the positioning member (17) including a second stepped portion (172) facing and engaged with the first stepped portion (162).

19. The heat-dissipating fan (4) as claimed in claim 16, with the wire-guiding slot (16) located in a corner of the peripheral wall (11) of the housing (10).

20. The heat-dissipating fan (4) as claimed in claim 16, with the housing (10) including a bottom wall (111) formed inside the peripheral wall (11) and defining the compartment (12), with a plurality of catches (112) being formed on the bottom wall (111) and located in the compartment (12), with the base (20c) mounted in the compartment (12) and abutting the

bottom wall (111), and with the plurality of catches (112) engaged with an outer periphery of the base (20c).

Amended claims in accordance with Rule 137(2) EPC.

1. A heat-dissipating fan (1, 2) comprising:

a housing (10), a base (20, 20a, 20b, 20c), a power line (30) and an impeller (40),
the housing (10) includes a peripheral wall (11) defining a compartment (12), with a shaft seat (13) provided in the compartment (12), with the peripheral wall (11) including a wire-guiding slot (16) in communication with the compartment (12);
the base (20, 20a, 20b, 20c) is coupled to the housing (10) and includes a coil unit (21);
the power line (30) includes a second end extending through the wire-guiding slot (16); and
the impeller (40) includes a hub (41), a shaft (411) mounted to the hub (41), and a permanent magnet (412) mounted to the hub (41), with the shaft (411) coupled to the shaft seat (13), with the permanent magnet (412) facing the coil unit (21),

wherein the heat-dissipating fan (1, 2) is **characterized in that** the base (20, 20a, 20b, 20c) further includes a connection port (22) electrically connected to the coil unit (21), with the connection port (22) facing the wire-guiding slot (16) of the housing (10), with the power line (30) including a first end connected to the connection port (22), with the connection port (22) located on a reference line (L) passing through the shaft seat (13) and the wire-guiding slot (16).

2. The heat-dissipating fan (1, 2) as claimed in claim 1,
characterized in that
the connection port (22) of the base (20, 20a) is located outside of a rotational area of the permanent magnet (412), with the connection port (22) intermediate an outer periphery of the permanent magnet (412) and an inner peripheral face of the peripheral wall (11) of the housing (10).

3. The heat-dissipating fan (1, 2) as claimed in claim 1,
characterized in that
a positioning member (17) is engaged in the wire-guiding slot (16), with the wire-guiding slot (16) including a first pressing surface (161), with the positioning member (17) including a second pressing surface (171), and with the power line (30) clamped between the first and second pressing surfaces (161, 171).

4. The heat-dissipating fan (1, 2) as claimed in claim 3,
characterized in that
the first pressing surface (161) of the wire-guiding slot (16) includes a first stepped portion (162), with the second pressing surface (171) of the positioning member (17) including a second stepped portion (172) facing and engaged with the first stepped portion (162).

5. The heat-dissipating fan (1, 2) as claimed in claim 4,
characterized in that
the wire-guiding slot (16) is located in a corner of the peripheral wall (11) of the housing (10).

6. The heat-dissipating fan (1, 2) as claimed in claim 1,
characterized in that
the wire-guiding slot (16) is located in a corner of the peripheral wall (11) of the housing (10).

7. The heat-dissipating fan (1, 2) as claimed in claim 1,
characterized in that
the housing (10) includes a bottom wall (111) formed inside the peripheral wall (11) and defining the compartment (12), with a plurality of catches (112) being formed on the bottom wall (111) and located in the compartment (12), with the base (20, 20a) mounted in the compartment (12) and abutting the bottom wall (111), and with the plurality of catches (112) engaged with an outer periphery of the base (20, 20a).

8. The heat-dissipating fan (1, 2) as claimed in claim 1,
characterized in that
the coil unit (21) is formed on a face of the base (20, 20a) by layout.

9. The heat-dissipating fan (1, 2) as claimed in claim 1
characterized in that
the base (20b) further includes an outer periphery, with the base (20b) further including an extension (23) extending radially outward from the outer periphery of the base (20b) towards the wire-guiding slot (16), with the connection port (22) formed on a face of the extension (23).

10. The heat-dissipating fan (1, 2) as claimed in claim 1
characterized in that
the base (20c) further includes a layout board (24) and a drive circuit board (25) electrically connected

to the layout board (24), with the layout board (24) including a coil unit (21), with the drive circuit board (25) including a connection port (22) electrically connected to the coil unit (21), with the connection port (22) facing and adjacent to the wire-guiding slot (16) of the housing (10).

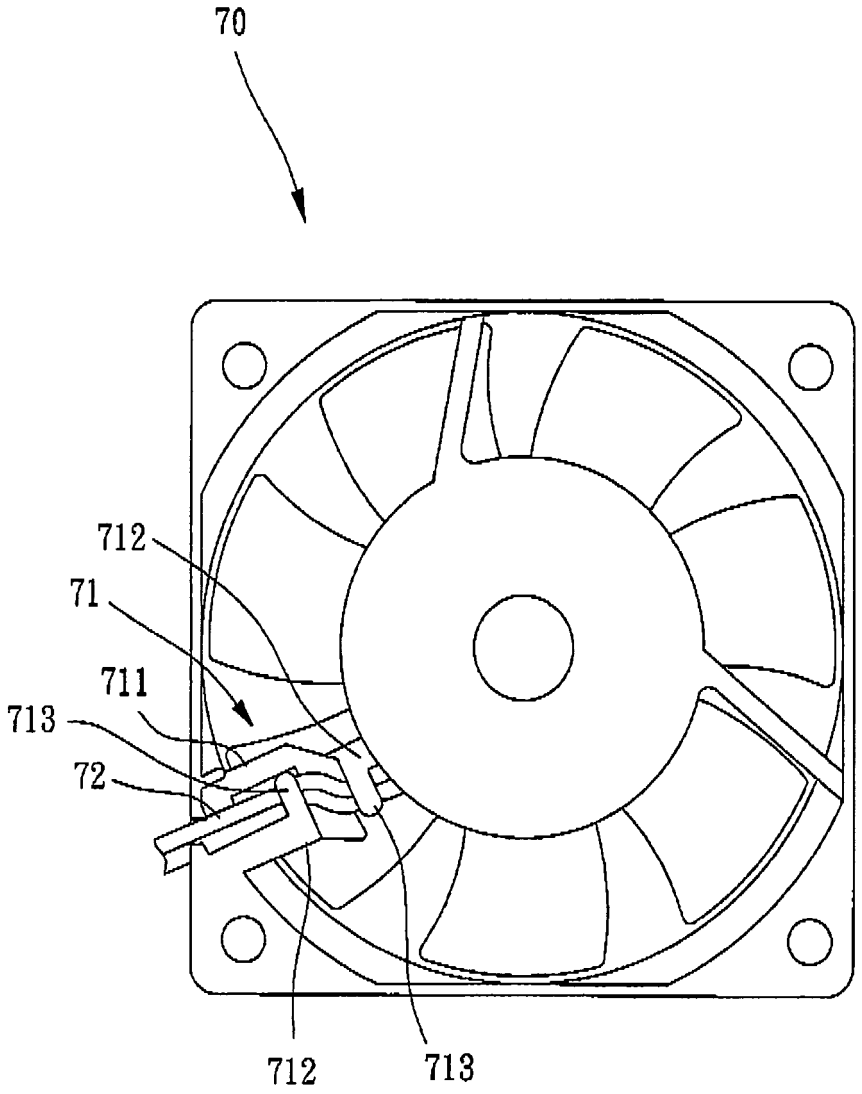

FIG. 1
PRIOR ART

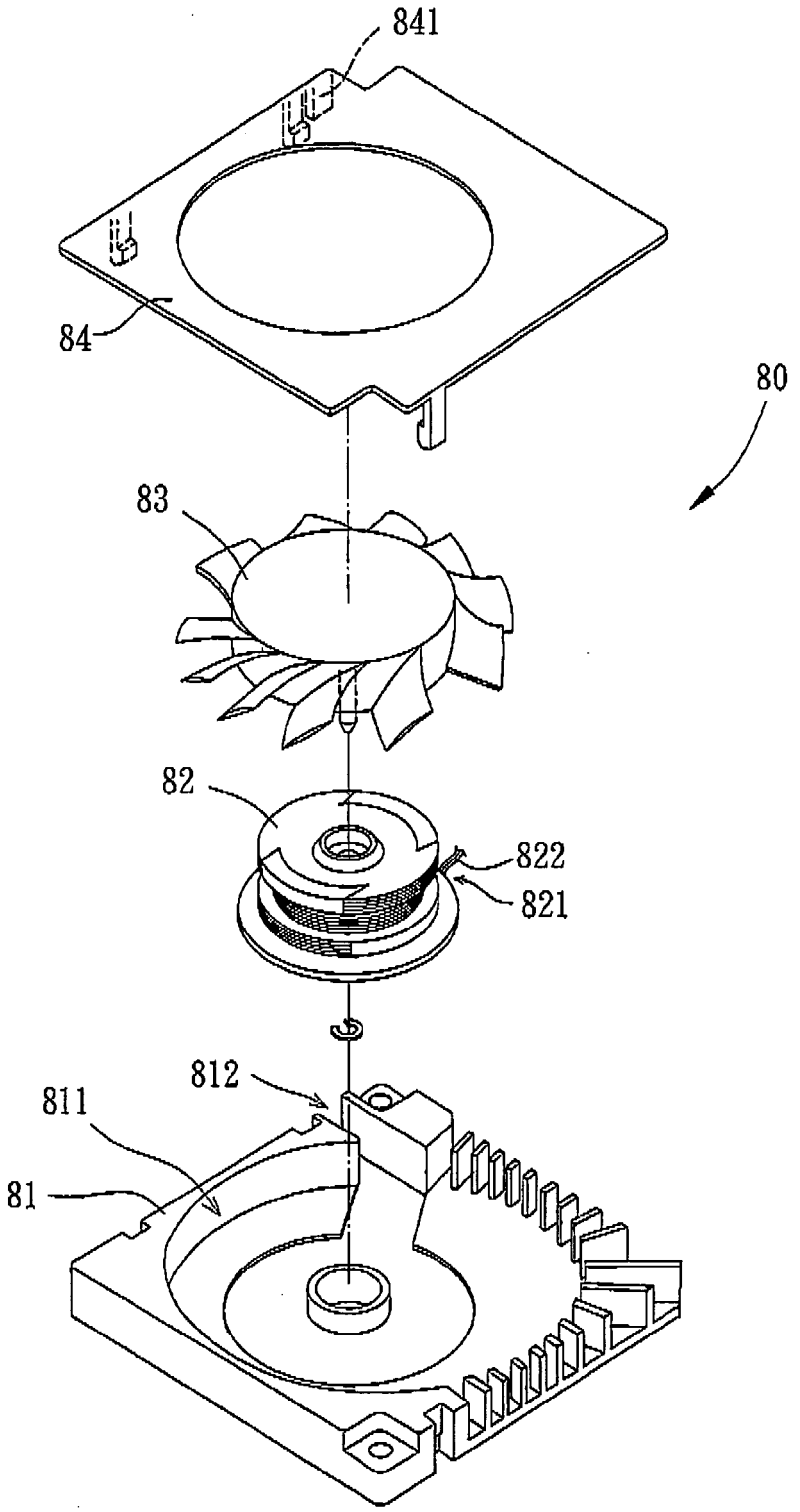

FIG. 2
PRIOR ART

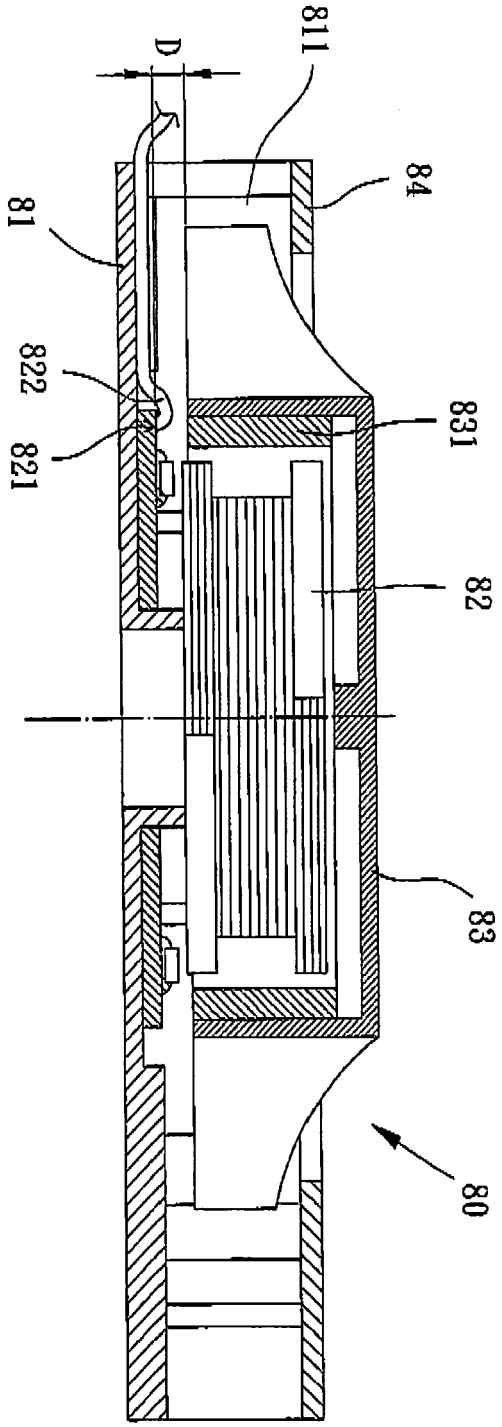

FIG. 3
PRIOR ART

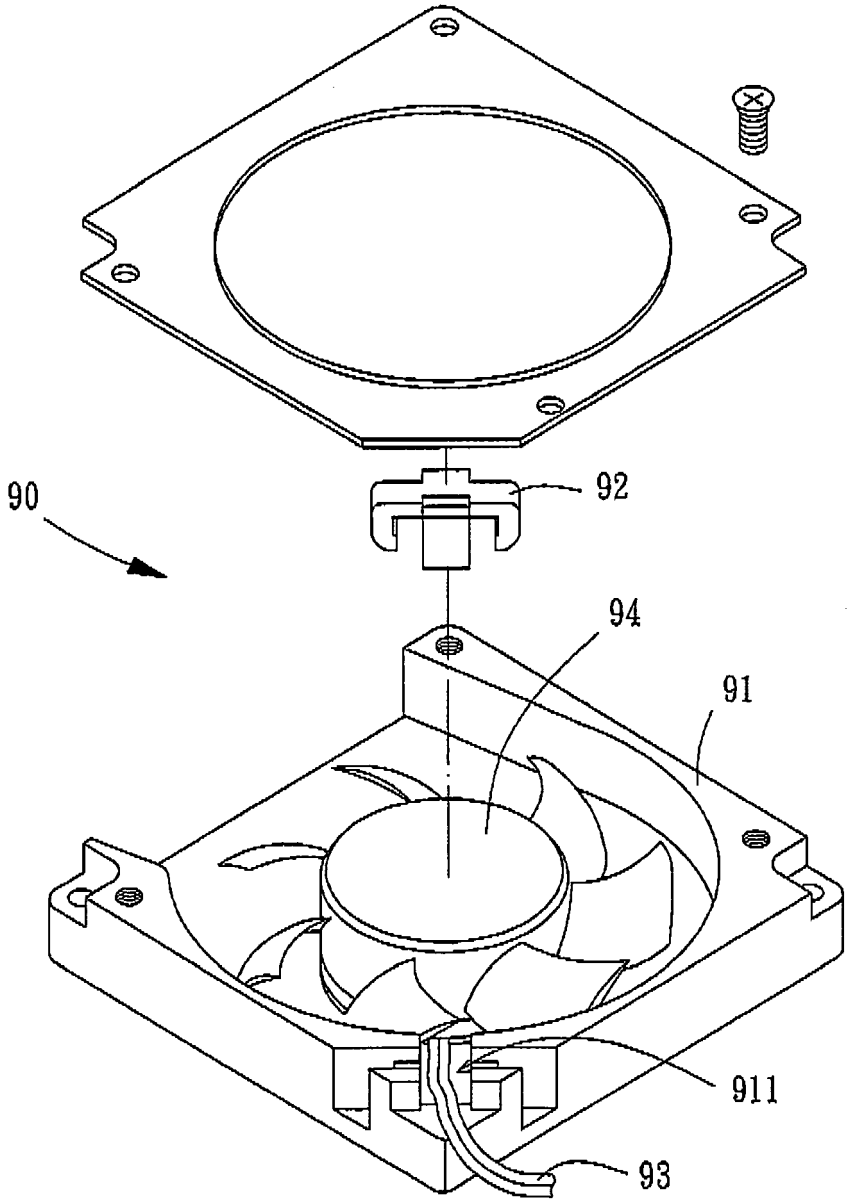

FIG. 4
PRIOR ART

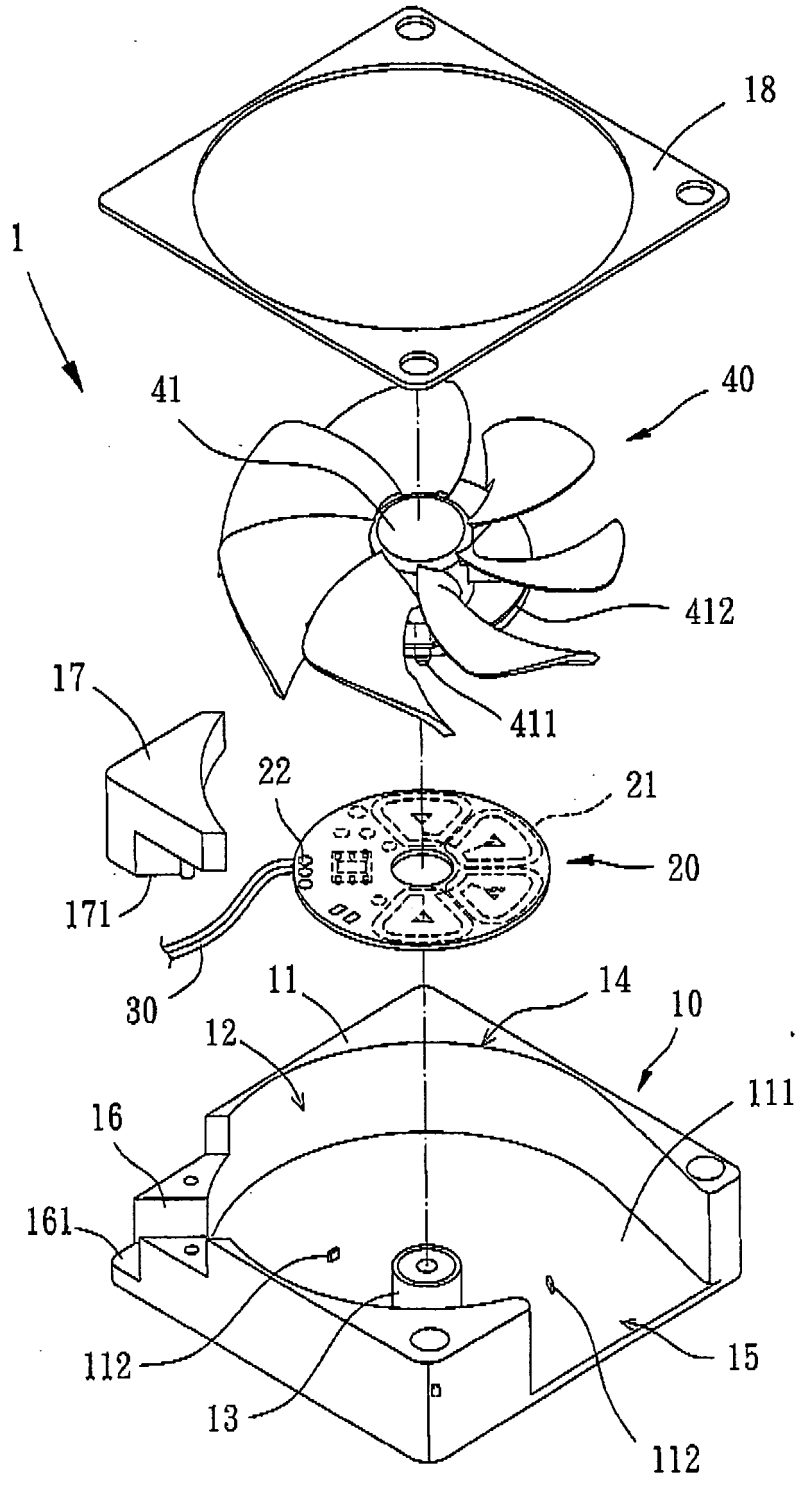
18
1
41
40
412
411
17
22
21
20
171
30
11
14
10
12
111
16
161
112
13
15
112

FIG. 5

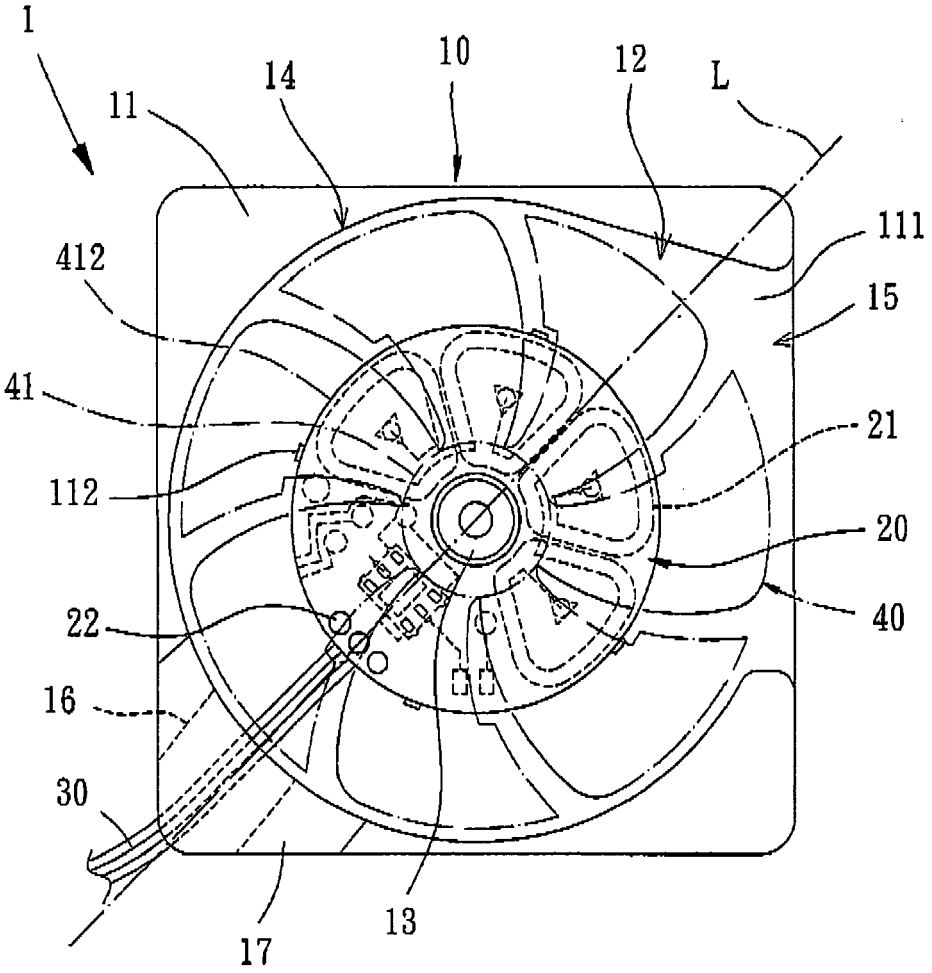

FIG. 6

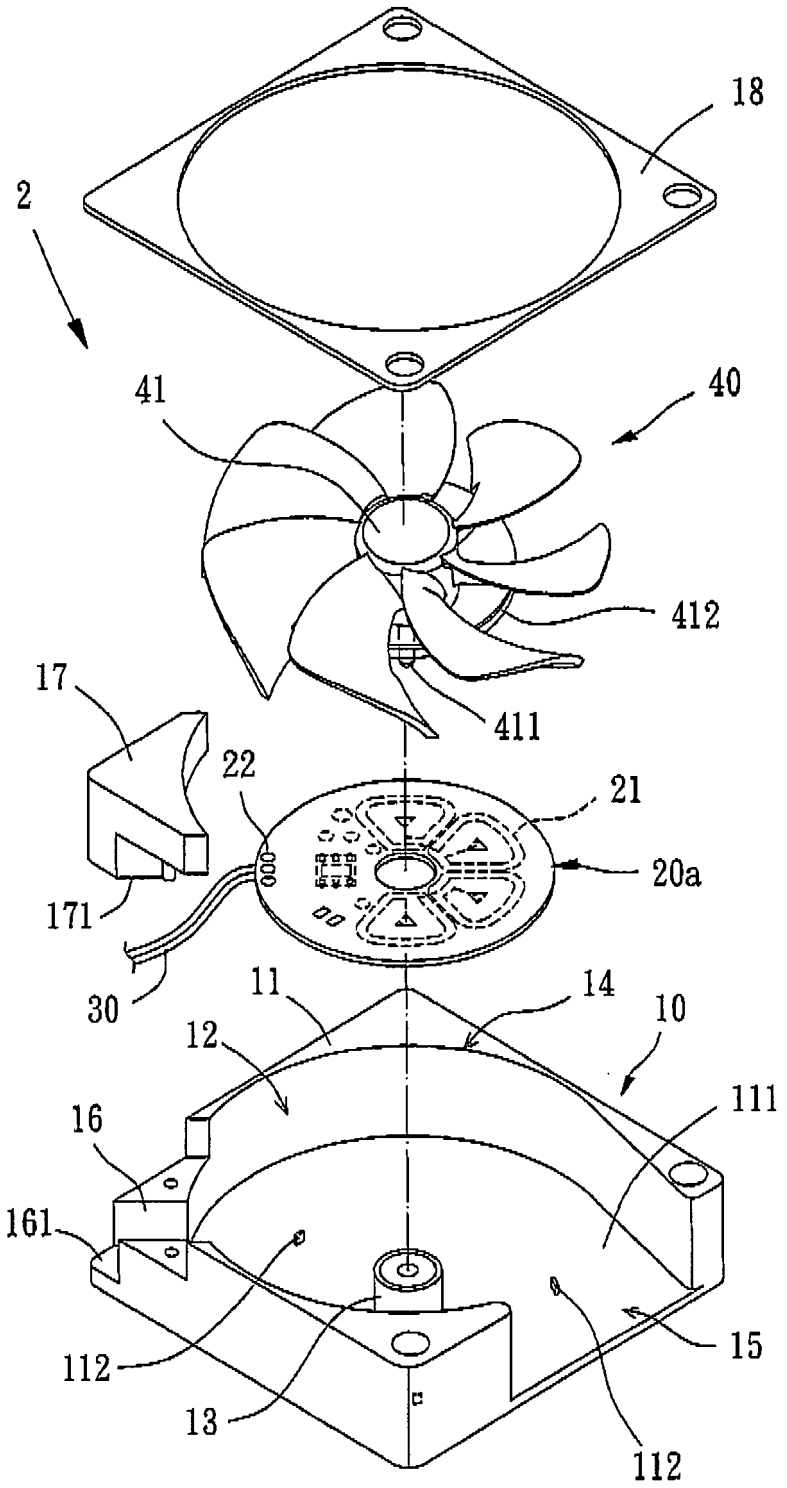
18
2
41
40
412
411
17
22
21
20a
171
30
11
14
10
12
111
16
161
112
13
15
112

FIG. 7

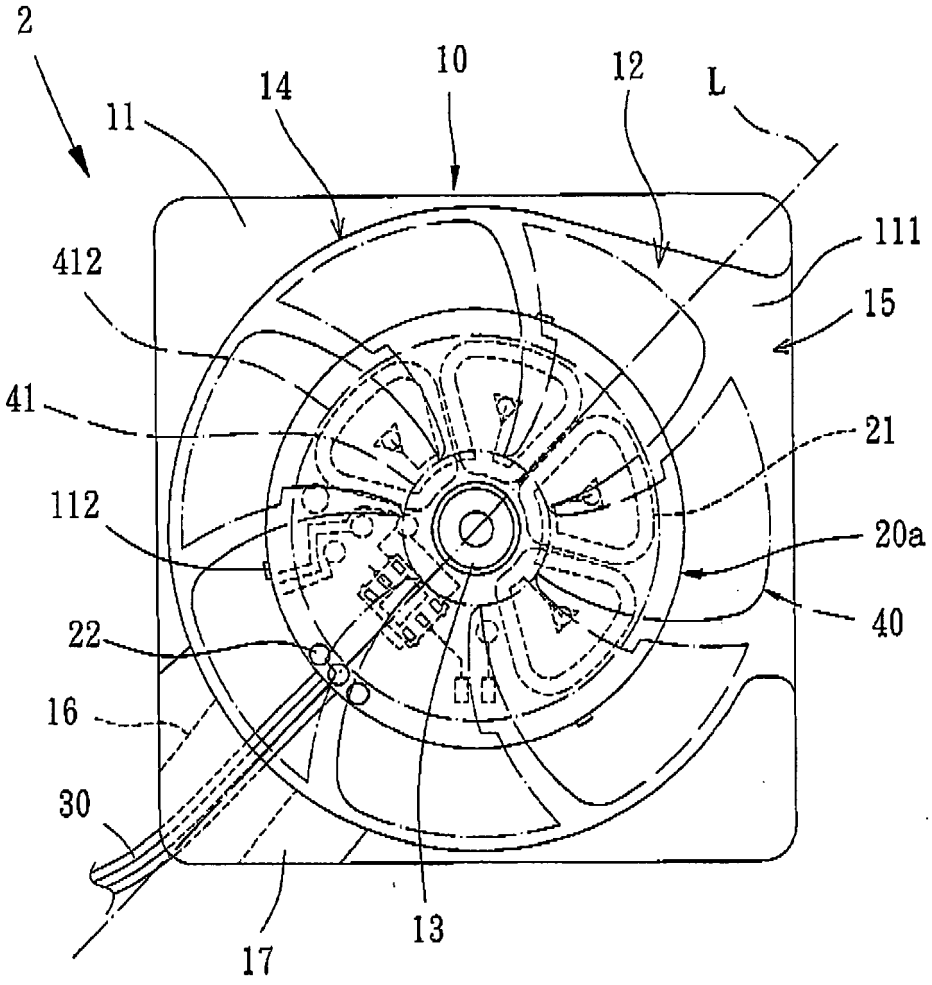

FIG. 8

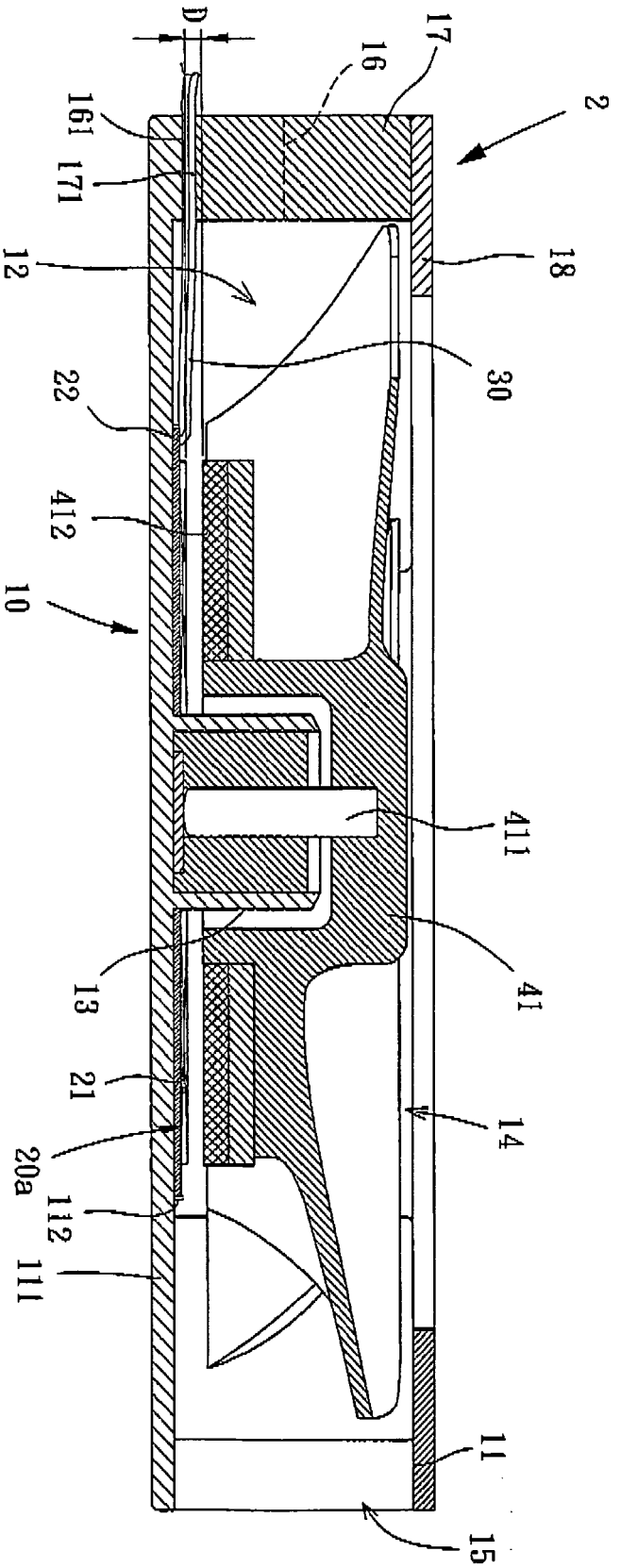

FIG. 9

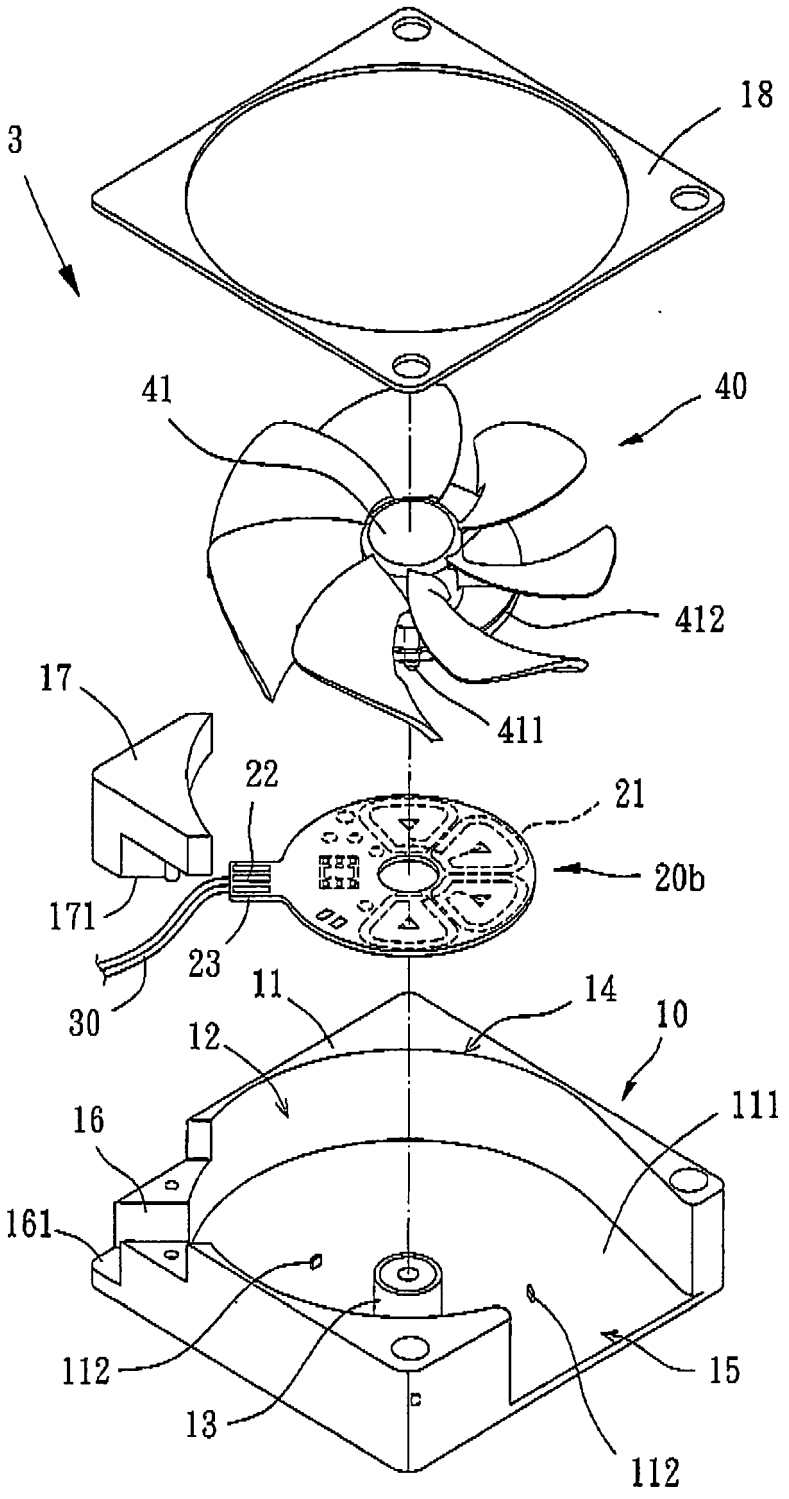
3
18
41
40
412
411
17
22
21
20b
171
23
30
11
14
10
12
111
16
161
112
15
13
112

FIG. 10

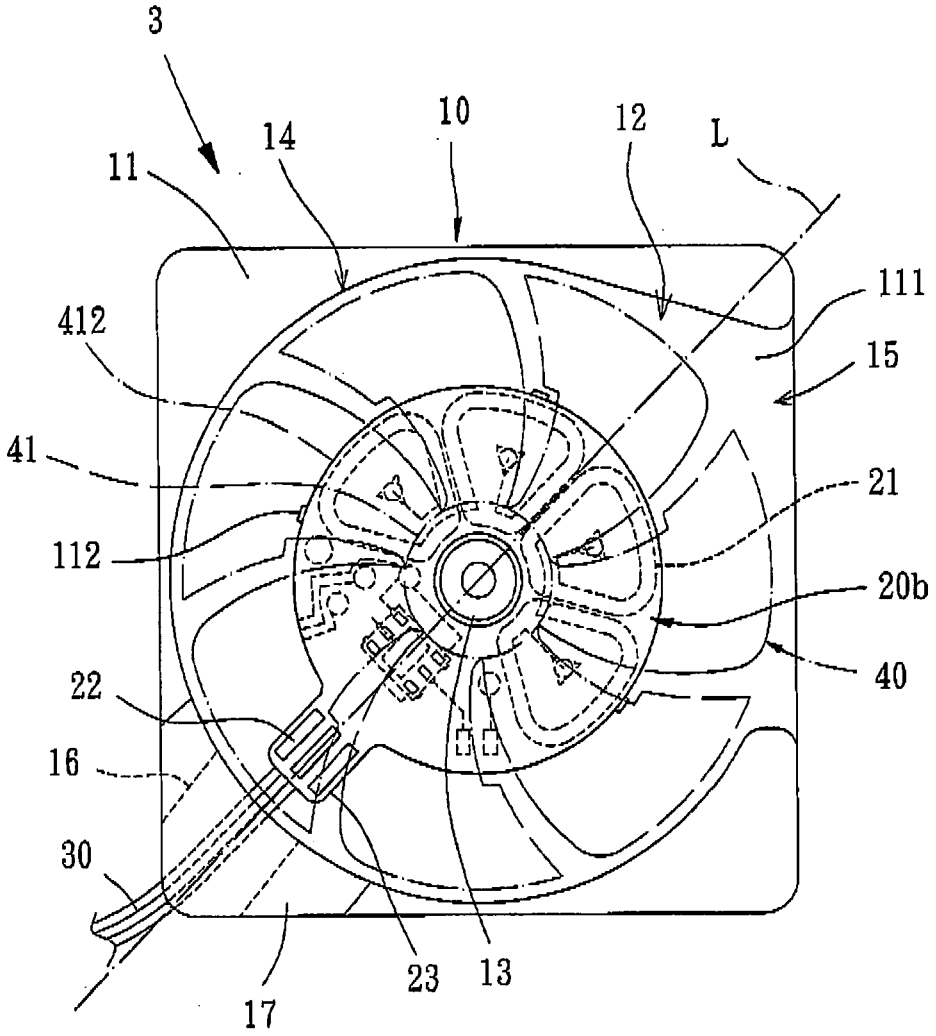

FIG. 11

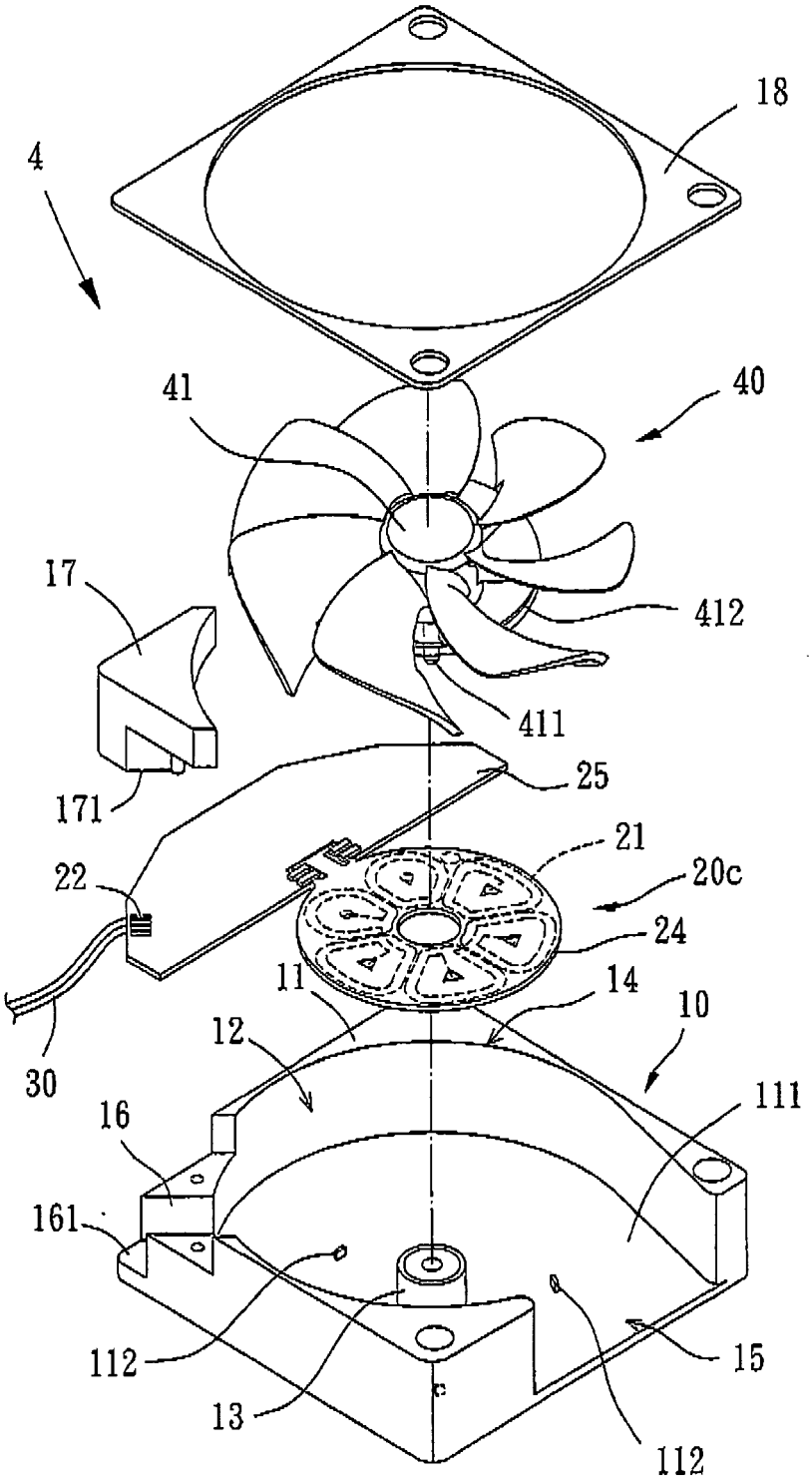
4
18
41
40
17
412
411
171
25
21
22
20c
24
11
14
10
12
30
16
111
161
112
15
13
112

FIG. 12

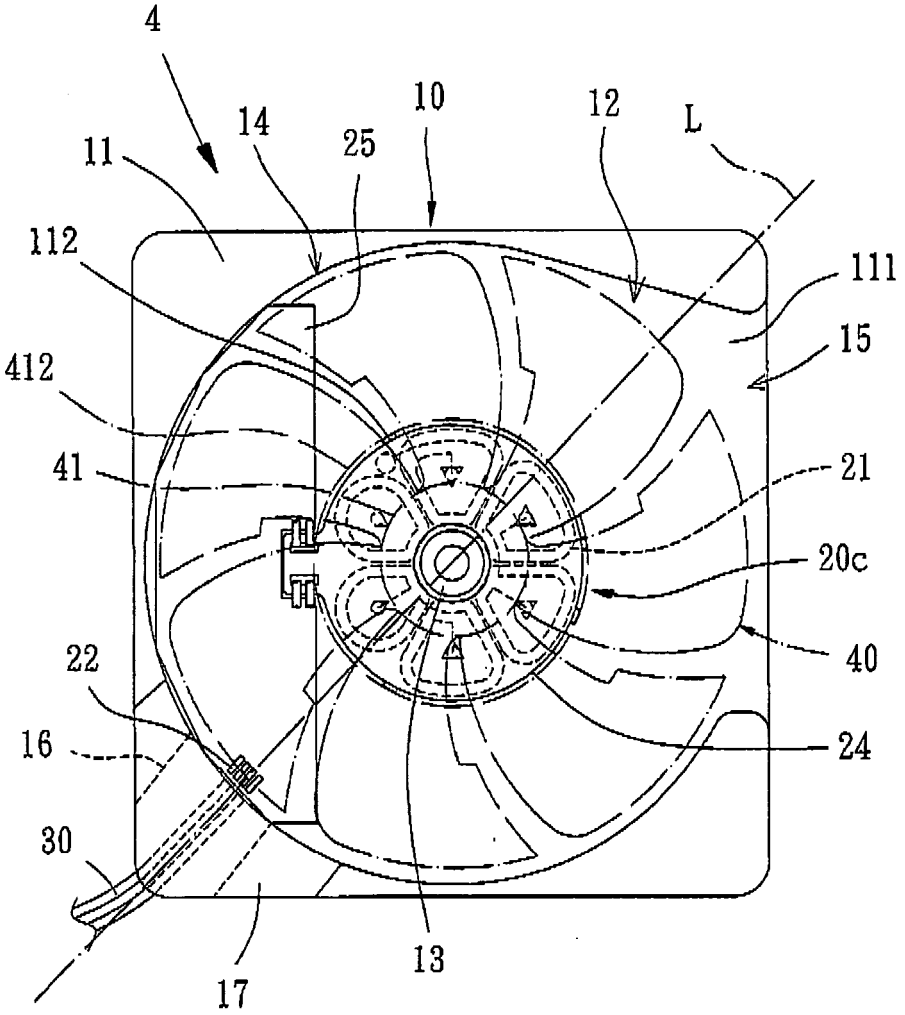

FIG. 13

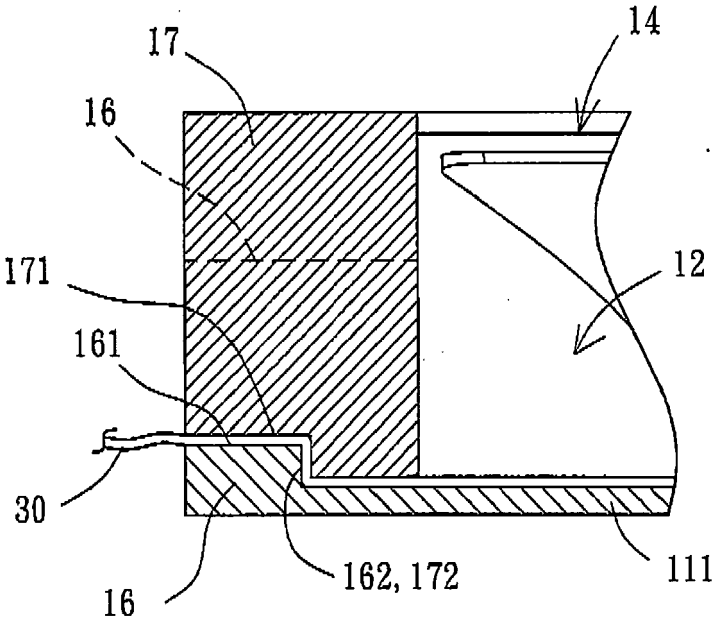

FIG. 14

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 09 01 0289

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	US 2003/063974 A1 (HSIEH HSIN-MAO [TW]) 3 April 2003 (2003-04-03)	1,3,4,7, 9,11,12, 15-18,20	INV. F04D25/06
Y	* paragraph [0019] - paragraph [0024] * * figures 1-3 *	2,8,10	

X	US 6 375 418 B1 (WATANABE MICHINORI [JP] ET AL) 23 April 2002 (2002-04-23)	1,5-7,9, 13-16, 19,20	
Y	* column 3, line 52 - column 4, line 44 * * figures 1,2 *	2,8,10	

X	US 2008/152489 A1 (ALEX HORNG [TW] ET AL) 26 June 2008 (2008-06-26)	1,5-7,9, 13-16, 19,20	
Y	* paragraph [0004] * * figure 1 *	2,8,10	

X	DE 296 15 089 U1 (LEE RICHARD [TW]) 17 October 1996 (1996-10-17)	1,7,9, 15,16,20	
Y	* page 4 - page 6 * * figures 1-3 *	2,8,10	TECHNICAL FIELDS SEARCHED (IPC)
	-----		F04D H05K H01L H02K
Y	DE 198 59 079 A1 (SUNONWEALTH ELECTR MACH IND CO [TW]) 29 June 2000 (2000-06-29) * figure 14 *	2,10	

Y	US 6 351 044 B1 (MIYAHARA MASAHARU [JP]) 26 February 2002 (2002-02-26) * column 4, line 65 - column 5, line 24 * * figures 2A-4 *	8	

Y	JP 58 095969 A (CANON KK; CANON PRECISION INC) 7 June 1983 (1983-06-07) * abstract * * figures 1,2 *	8	

	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 February 2010	Homan, Peter

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 09 01 0289

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 4 658 162 A (KOYAMA RYOUHEI [JP] ET AL) 14 April 1987 (1987-04-14) * column 1, line 6 - line 18 * * column 4, line 16 - line 65 * * column 9, line 11 - line 15 * * figures 1A-1C,3A-3C,10 * -----	8	
A	US 2002/024264 A1 (MATSUMOTO KAORU [JP]) 28 February 2002 (2002-02-28) * figure 1 * -----	1-7,9-20	
			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 February 2010	Homan, Peter

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 09 01 0289

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 09 01 0289

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7,9-20

mounting wiring within a heat-dissipating fan
---

2. claim: 8

forming a stator coil of a heat-dissipating fan

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 01 0289

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-02-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003063974 A1	03-04-2003	NONE	
US 6375418 B1	23-04-2002	JP 2001156230 A	08-06-2001
		TW 469616 B	21-12-2001
US 2008152489 A1	26-06-2008	NONE	
DE 29615089 U1	17-10-1996	US 5676523 A	14-10-1997
DE 19859079 A1	29-06-2000	US 6179561 B1	30-01-2001
US 6351044 B1	26-02-2002	JP 4045628 B2	13-02-2008
		JP 11214878 A	06-08-1999
JP 58095969 A	07-06-1983	NONE	
US 4658162 A	14-04-1987	DE 3526166 A1	30-01-1986
US 2002024264 A1	28-02-2002	JP 2002005093 A	09-01-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82