(19) Europäisches Patentamt
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(11) **EP 2 846 045 A1**

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

(43) Date of publication:
11.03.2015 Bulletin 2015/11

(21) Application number: **12875846.3**

(22) Date of filing: **19.09.2012**

(51) Int Cl.:
F04D 25/08 *(2006.01)* ***F04D 29/40*** *(2006.01)*

(86) International application number:
PCT/KR2012/007496

(87) International publication number:
WO 2013/165056 (07.11.2013 Gazette 2013/45)

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

(30) Priority: **02.05.2012 KR 20120003629 U**

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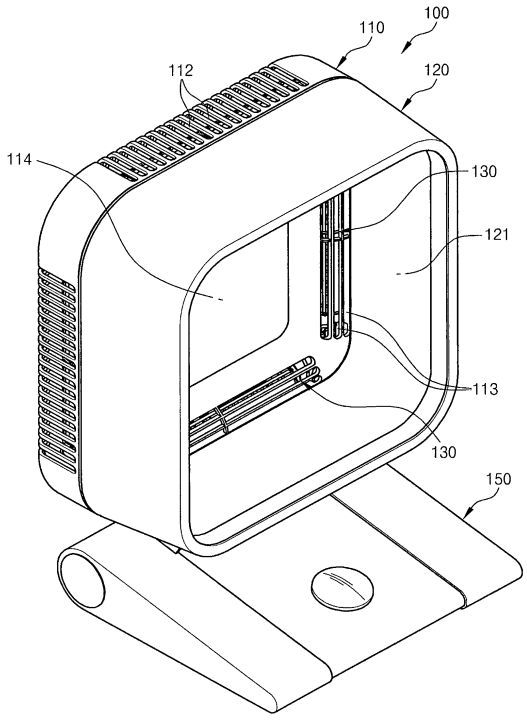
(54) **FAN**

(57) Disclosed herein is an electric fan. The electric fan includes a casing, a rotary unit and a cover. The casing has a frame shape such that a first opening is formed in a central portion of the casing. An inlet hole and an outlet hole are respectively formed in inner and outer peripheral surfaces of the frame. A space is defined in the casing. The rotary unit includes an impeller installed in the space, and a drive unit. The rotary unit is configured such that when the impeller is rotated by the drive unit, external air is drawn into the space through the inlet hole and then discharged out of the space through an outlet hole. The cover is installed on a front part of the casing in a direct contact manner. The cover defines a second opening communicating with the first opening so that air supplied from the outlet hole is discharged out of the second opening.

[FIG. 1]



EP 2 846 045 A1

Description

Technical Field

[0001] The present invention relates, in general, to electric fans and, more particularly, to an electric fan configured in such a way that impellers are disposed in respective peripheral parts of a casing configured in a form of a polygon having segments so that a discharge flow rate of air per unit air inflow rate can be enhanced, whereby the strength of wind can be increased.

Background Art

[0002] Generally, electric fans for home use include a set of blades or vanes provided on a shaft and rotated around the shaft, and a drive unit rotating the blades to produce flow of air. The flow and circulation of air produces a breeze that cools for users as heat is dissipated from their skin by convection currents and evaporation.

[0003] Such electric fans can be configured in various sizes and shapes. For example, there may be ceiling electric fans that are 1 m or more in diameter. Typically, such a ceiling electric fan is suspended from a ceiling so as to produce downward air flow to cool a room. For desk electric fans, the diameter thereof is mainly about 30 cm. Most desk electric fans are generally free standing and portable. Floor standing tower fans include a vertical casing that is typically about 1 m in height and are generally provided with at least one set of impellers to produce air flow within a range from 300 l/s (liter/sec) to 500 l/s Such floor standing tower fans may employ an oscillating mechanism so as to rotate the air discharge outlet and enable air flow to be supplied to a wide area of a room.

[0004] In the above-described typical electric fans or floor standing tower fans, a motor having a relatively high output is required because an air discharge rate is determined by the RPM of the impeller.

[0005] That is, the strength of air flow is determined by factors such as the size and RPM of an impeller of an electric fan. The output per unit input energy used by a motor is comparatively low. To overcome the above problems, a technique for increasing the strength of air flow per unit input is urgently needed.

Disclosure

Technical Problem

[0006] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an electric fan that can increase the flow rate of air discharged from the electric fan in such a way that air flow is produced by means of a difference of air pressure.

[0007] Another object of the present invention is to provide an electric fan configured such that air pressure in the electric fan can be markedly increased whereby the strength of air flow produced from the electric fan can be increased.

Technical Solution

[0008] In order to accomplish the above objects, the present invention provides an electric fan, including: a casing having a frame shape such that a first opening is formed in a central portion of the casing, with an inlet hole and an outlet hole respectively formed in inner and outer peripheral surfaces of the frame, and a space defined in the casing; a rotary unit comprising an impeller installed in the space, and a drive unit, the rotary unit being configured such that when the impeller is rotated by the drive unit, external air is drawn into the space through the inlet hole and then discharged out of the space through an outlet hole; and a cover installed on a front part of the casing in a direct contact manner, the cover defining a second opening communicating with the first opening so that air supplied from the outlet hole is discharged out of the second opening.

[0009] An inner surface of the second opening may be inclined such that the second opening is increased in cross-sectional area from a rear end thereof to a front end.

[0010] The impeller of the rotary unit installed in the space may include a shaft and a plurality of blades radially provided on an outer circumferential surface of the shaft, wherein the shaft is connected to the drive unit so that the shaft is electrically-driven.

[0011] The space may comprise two columns of spaces spaced apart from each other, and the impeller may comprise impellers respectively placed upright in the spaces.

[0012] The space may comprise two columns and two rows of spaces continuously connected at ends thereof to each other, and the impeller may comprise impellers vertically or horizontally installed in the respective spaces.

[0013] The impeller may be installed in the space by a bracket. The bracket may include: a connection part having a predetermined length; a fixed part bent from an upper end of the connection part, the fixed part having a connection

hole through which the shaft is coupled to the fixed part; a support part bent from a lower end of the connection part, the support part being coupled to a lower end of the drive unit; and connection brackets respectively connected to the fixed part and the support part, the connection brackets being integrally fastened to respective fixed brackets provided in the space.

Advantageous Effects

[0014] In an electric fan according to the present invention, a casing having a frame shape and a cover are coupled to each other, and a rotary unit is installed in a space formed in the casing. The electric fan is operated such that external air is drawn into the space through an inlet hole, the pressure in the space is thus increased, and then air is discharged out of an outlet hole at a high flow rate by increased pressure in the space, whereby external air around the cover passes through the cover, thus generating air currents and increasing the flow rate of air by virtue of a difference in air pressure before air is discharged out of the electric fan. Therefore, the strength of air flow produced from the electric fan can be further increased.

[0015] Furthermore, in the electric fan according to the present invention, a rotating means is installed in the casing. The air pressure of the space in the casing can be further increased by the rotating means. Thereby, the discharge flow rate and speed of air can be further enhanced.

[0016] In addition, brackets are used to install impellers in respective spaces defined in the segments of the loop-shaped casing, thus facilitating the installation of the impellers, whereby the efficiency of manufacturing the electric fan can be enhanced.

Description of Drawings

[0017]

FIG. 1 is a perspective view illustrating an electric fan according to the present invention.
FIG. 2 is an exploded perspective view illustrating the electric fan according to the present invention.
FIG. 3 is a sectional view illustrating the electric fan according to the present invention.
FIG. 4 is a perspective view illustrating an electric fan) according to another embodiment of the present invention.
FIG. 5 is a sectional view illustrating the electric fan according to another embodiment of the present invention.

<Description of the Reference Numerals in the Drawings>

[0018]

100:	electric fan	110:	casing
111:	space	112:	inlet hole
113:	outlet hole	114 :	first opening
115:	fixed bracket	120:	cover
121:	second opening	130:	rotary unit
131:	second opening	132:	impeller
132a:	shaft	132b:	blade
133:	drive unit	140:	bracket
141:	connection part	142:	fixed part
143:	connection hole	144:	support part
145:	connection bracket		

Best Mode

[0019] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the attached drawings.

[0020] Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same or similar components. If in the specification, detailed descriptions of well-known functions or configurations would unnecessarily obfuscate the gist of the present invention, the detailed descriptions will be omitted.

[0021] FIG. 1 is a perspective view illustrating an electric fan according to the present invention. FIG. 2 is an exploded

perspective view illustrating the electric fan according to the present invention. FIG. 3 is a sectional view illustrating the electric fan according to the present invention. FIG. 4 is a perspective view illustrating an electric fan according to another embodiment of the present invention. FIG. 5 is a sectional view illustrating the electric fan according to another embodiment of the present invention.

[0022] As shown in FIGS. 1 through 5, an electric fan 100 according to the present invention includes a casing 110, a cover 120 and a rotary unit 130.

[0023] The casing 110 has a polygonal frame shape. The casing 110 has one or more segments forming a polygon

[0024] In the present invention, the casing 110 will be illustrated as having a streamlined shape having two segments or a square shape having four segments. The shape of the casing 110 is not limited to a special shape.

[0025] In detail, as shown in FIG. 4, the casing 110 that has a streamlined shape is configured to have a two-column structure such that spaces 111 are spaced apart from each other. An impeller 132 is placed upright in each space 111.

[0026] As shown in FIG. 4, the square-shaped casing 110 is configured in such a way that spaces 111 that form two rows and two columns of segments are continuously connected to each other. An impeller 132 is horizontally or vertically installed in each of the spaces 111 formed at upper, lower, left and right positions.

[0027] Overall, the casing 110 having such a polygonal shape forms a loop shape such that a first opening 114 is formed in a central portion of the casing 110.

[0028] Here, the body of the polygonal casing 110 is called a frame.

[0029] The segments of the polygonal frame define therein the respective spaces 111. Inlet holes 112 are formed in an outer surface of a periphery of the casing 110, and outlet holes 113 are formed in an inner surface of the periphery of the casing 110. The inlet holes 112 and the outlet holes 113 communicate 110. The inlet holes 112 and the outlet holes 113 communicate with the spaces 111.

[0030] The rotary unit 130 includes the impellers 132 installed in the respective spaces 111 and is configured such that when the impellers 132 are rotated by drive units 133, external air is drawn into the spaces 111 through the inlet holes 112 and then discharged to the outside through the outlet holes 113.

[0031] Each impeller 132 includes a shaft 132a having a predetermined length, and a plurality of blades 132b radially provided around the outer circumferential surface of the shaft 132a

[0032] The drive units 133 are installed on the respective impellers 132. A rotating shaft 132a of a motor of each drive unit 133 is connected to the shaft 132a of the corresponding impeller 132 so that the impeller 132 can be directly rotated by force generated from the drive unit 133.

[0033] Furthermore, each impeller 132 is supported by a bracket 140 in the corresponding space 111.

[0034] The bracket 140 includes a connection part 141, a fixed part 142, a support part 144 and connection brackets 145.

[0035] The connection part 141 has a predetermined length corresponding to the length of the impeller 132.

[0036] Furthermore, the fixed part 142 is bent from an upper end of the connection part 141 and has a connection hole 143 through which the shaft 132a is coupled to the fixed part 142.

[0037] The support part 144 is bent from a lower end of the connection part 141 and coupled to a lower end of the drive unit 133.

[0038] The connection brackets 145 are respectively provided on the fixed part 142 and the support part 144 and are integrally coupled to corresponding fixed brackets 115 provided in the spaces 111.

[0039] As such, the brackets 140 are installed in the spaces 111 in such a way that the connection brackets 145 are coupled to the fixed brackets 115 provided in the spaces 111. Each impeller 132 provided with the drive unit 133 is installed between the connection part 141 and the fixed part 142 of the corresponding bracket 140.

[0040] In other words, the brackets 140 are used to install the impellers 132 in the respective spaces 111 defined in the segments of the loop-shaped casing 110, thus facilitating the installation of the impellers 132, whereby the efficiency of manufacturing the electric fan can be enhanced.

[0041] In the electric fan 100 having the above-mentioned construction, when the impellers 132 are rotated by the drive units 133, external air is drawn into the spaces 111 through the inlet holes 112 and then discharged to the outside through the outlet holes 113.

[0042] The cover 120 is installed on a front part of the casing 110 in a direct contact manner and has therein a second opening 121 communicating with the first opening 114 so that air supplied from the outlet holes 113 is discharged out of the second opening 121.

[0043] Preferably, an inner surface of the second opening 121 is inclined in such a way that the second opening 121 is increased in cross-sectional area from the rear end thereof to the front end.

[0044] Air discharged from the one or more outlet holes 113 moves towards the second opening 121 via the first opening 114; and the air flows partially combine with each other thus rapidly increasing the discharge flow rate.

[0045] That is, the pressure of air becomes lowered in the first opening 114 of the casing 110 in which the flow rate of air is comparatively high, while the pressure of air becomes relatively increased in the second opening 121. Consequently, because the force of air acts from a high pressure side to a low pressure side, air that passes through the casing 110 at a relatively high speed makes external air pass through the casing 110 along therewith, thus forming a constant

and strong air current.

[0046] As described above, in the electric fan 100 according to the present invention, the casing 110 having a frame shape and the cover 120 are coupled to each other, and the rotary unit 130 is installed in the internal spaces 111. The electric fan 100 is operated in such a way that external air is drawn into the spaces 111 through the inlet holes 112, the pressure in the spaces 111 is thus increased, and then air is discharged out of the outlet holes 113 at a high flow rate by increased pressure in the spaces 111, whereby external air around the cover 120 passes through the cover 120, thus generating air currents, and increasing the flow rate of air by virtue of a difference in air pressure before air is discharged out of the electric fan. Therefore, the wind strength of the electric fan can be further increased.

[0047] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. An electric fan, comprising:

a casing having a frame shape such that a first opening is formed in a central portion of the casing, with an inlet hole and an outlet hole respectively formed in inner and outer peripheral surfaces of the frame, and a space defined in the casing;
a rotary unit comprising an impeller installed in the space, and a drive unit, the rotary unit being configured such that when the impeller is rotated by the drive unit, external air is drawn into the space through the inlet hole and then discharged out of the space through an outlet hole; and
a cover installed on a front part of the casing in a direct contact manner, the cover defining a second opening communicating with the first opening so that air supplied from the outlet hole is discharged out of the second opening.

2. The electric fan of claim 1, wherein an inner surface of the second opening is inclined such that the second opening is increased in cross-sectional area from a rear end thereof to a front end.

3. The electric fan of claim 1, wherein the impeller of the rotary unit installed in the space comprises a shaft and a plurality of blades radially provided on an outer circumferential surface of the shaft, wherein the shaft is connected to the drive unit so that the shaft is electrically-driven.

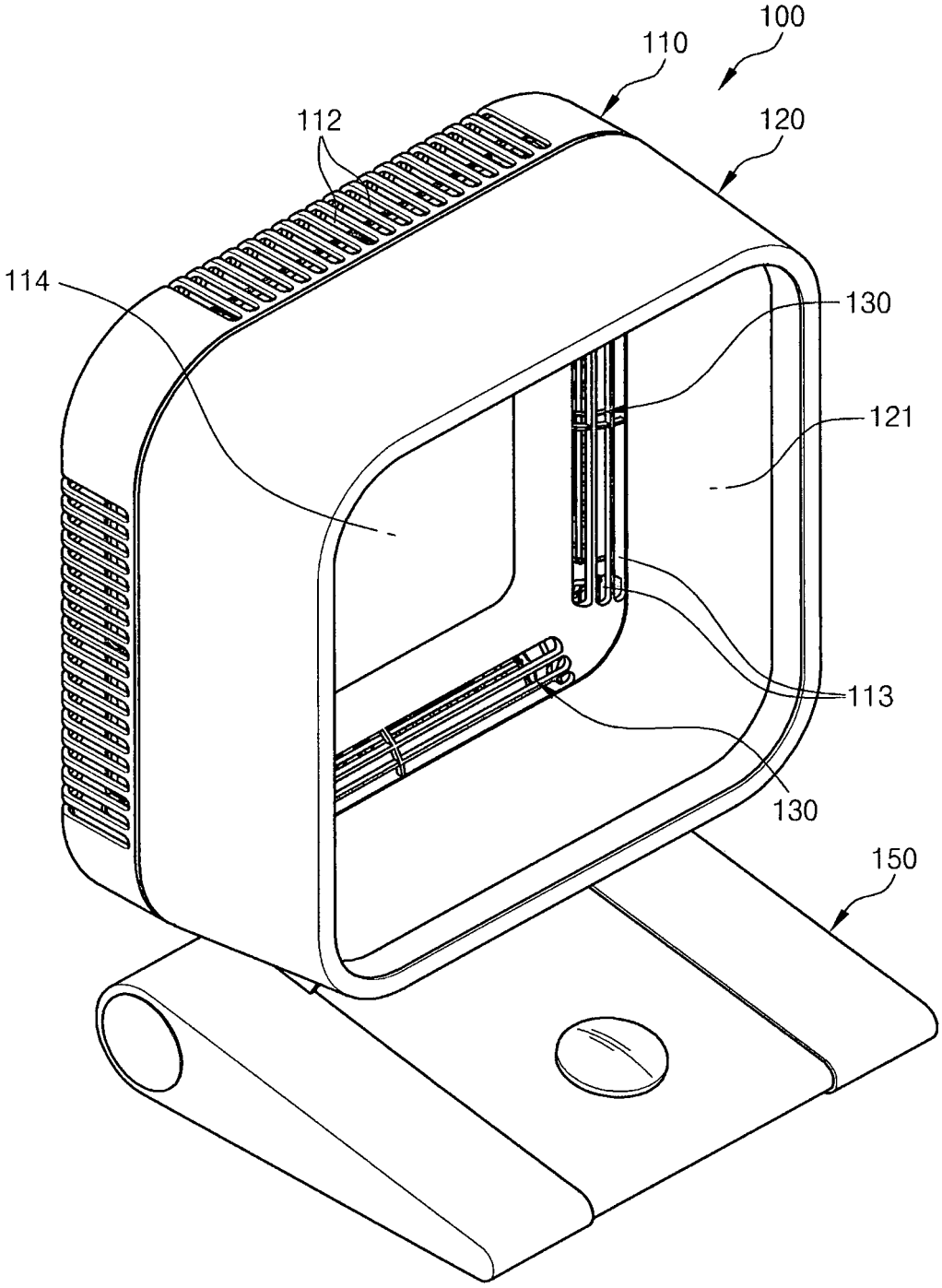
4. The electric fan of claim 1, wherein the space comprises two columns of spaces spaced apart from each other, and the impeller comprises impellers respectively placed upright in the spaces.

5. The electric fan of claim 1, wherein the space comprises two columns and two rows of spaces continuously connected at ends thereof to each other, and the impeller comprises impellers vertically or horizontally installed in the respective spaces.

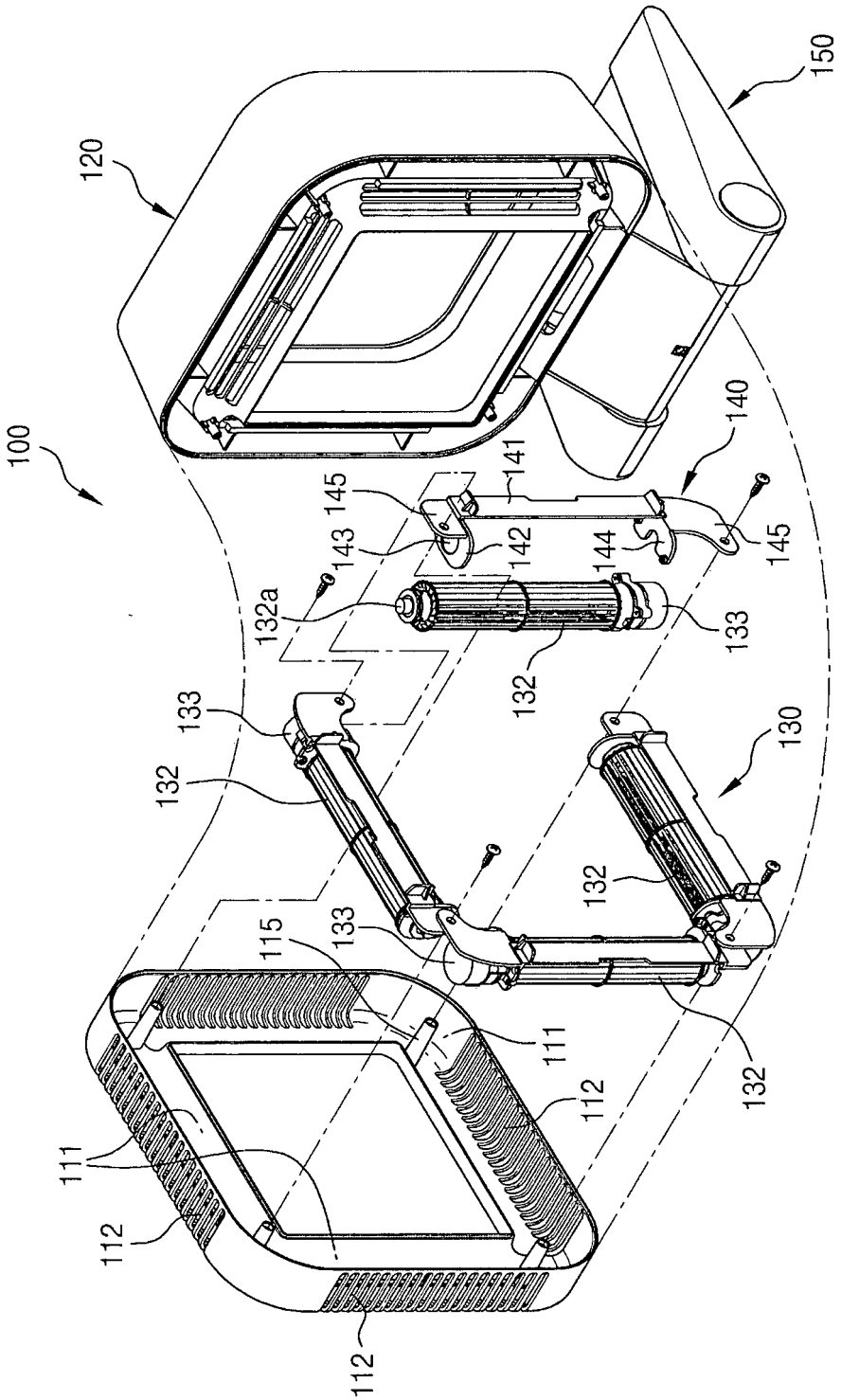
6. The electric fan of claim 3, wherein the impeller is installed in the space by a bracket,
the bracket comprising:

a connection part having a predetermined length;
a fixed part bent from an upper end of the connection part, the fixed part having a connection hole through which the shaft is coupled to the fixed part;
a support part bent from a lower end of the connection part, the support part being coupled to a lower end of the drive unit; and
connection brackets respectively connected to the fixed part and the support part, the connection brackets being integrally fastened to respective fixed brackets provided in the space.

[FIG. 1]



[FIG. 2]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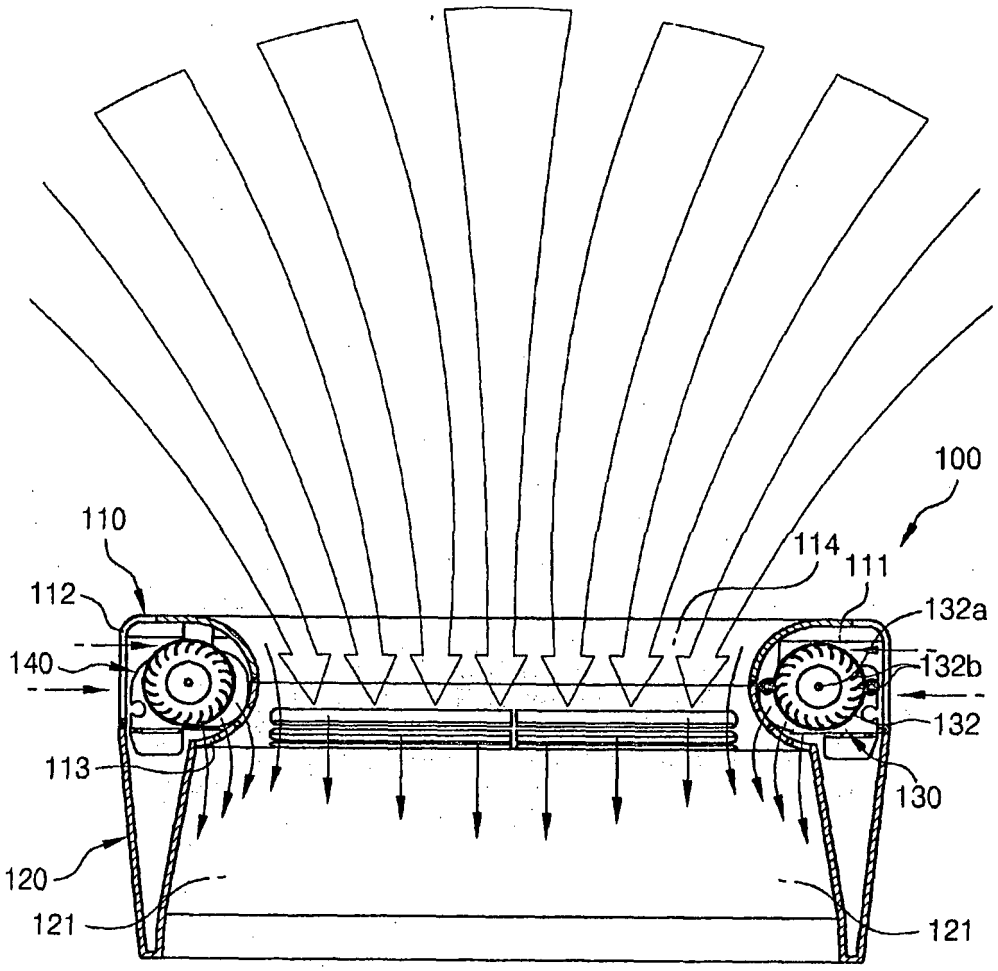
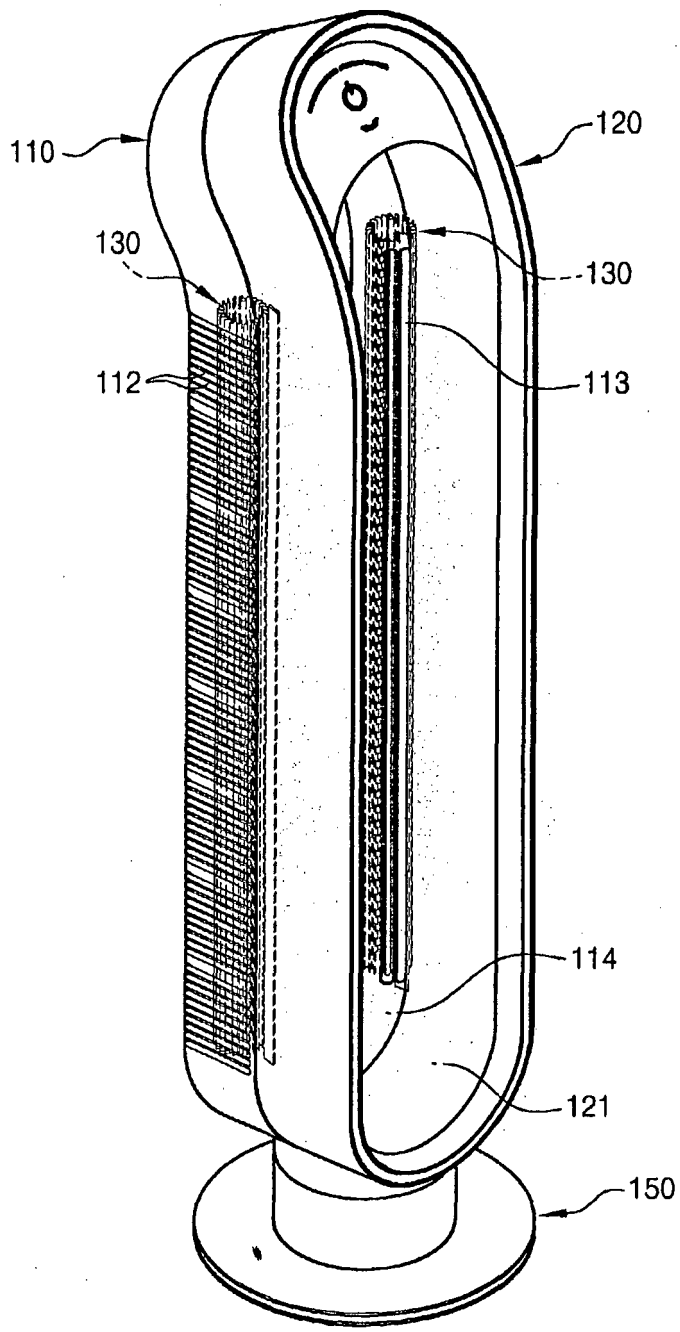
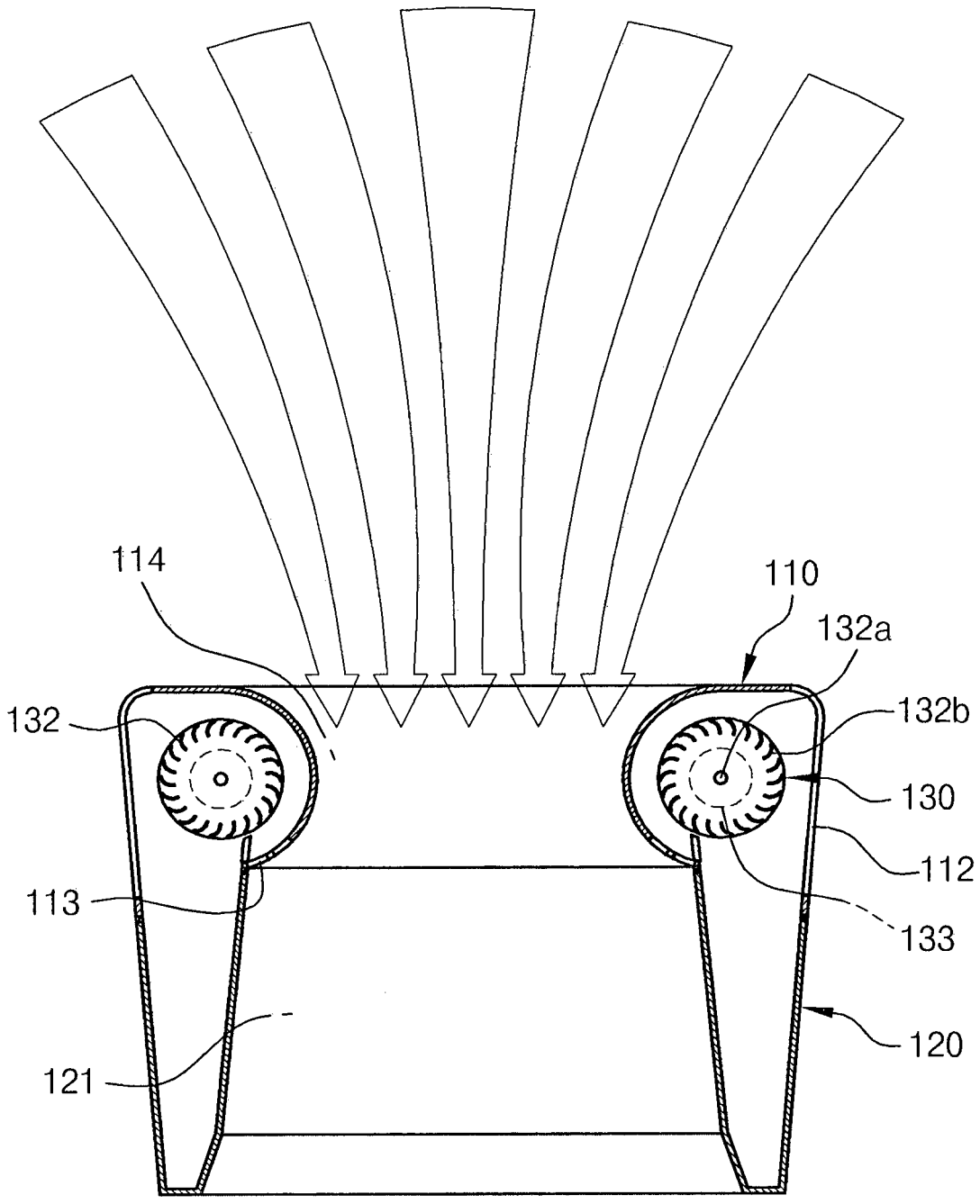
[Fig. 3]



[Fig. 4]



[FIG. 5]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2012/007496

A. CLASSIFICATION OF SUBJECT MATTER

F04D 25/08(2006.01)i, F04D 29/40(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F04D 25/08; F04D 33/00; F04D 29/44; F04D 17/04; F24F 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: fan, fan, ventilate, discharge hole

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
18 FEBRUARY 2013 (18.02.2013)	**19 FEBRUARY 2013 (19.02.2013)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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