



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.11.2013 Bulletin 2013/46

(51) Int Cl.:
F04D 29/32 (2006.01)

(21) Application number: **12167662.1**

(22) Date of filing: **11.05.2012**

(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

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(54) **Heat dissipating fan and fan wheel**

(57) A fan wheel comprises an axial line (AX), a radial line perpendicular to the axial line, at least one first vane (411, 412, 413) and at least one second vane (421, 422, 423), and the first vane(s) and the second vane(s) are extended from the axial line (AX), and included angles between chord lines (C1, C2) of the first (411, 412, 413) and second (421, 422, 423) vanes and the axial line (AX) of the fan wheel are unequal angles. A heat dissipating fan comprises a fan hub (100), a plurality of first vanes (411, 412, 413) and a plurality of second vanes (421, 422, 423), and the first vanes (411, 412, 413) and the second vanes (421, 422, 423) are extended outwardly from the fan hub (100), and excluded angles between their chord lines (C1, C2) and the axial line (AX) of the fan hub (100) are unequal angles.

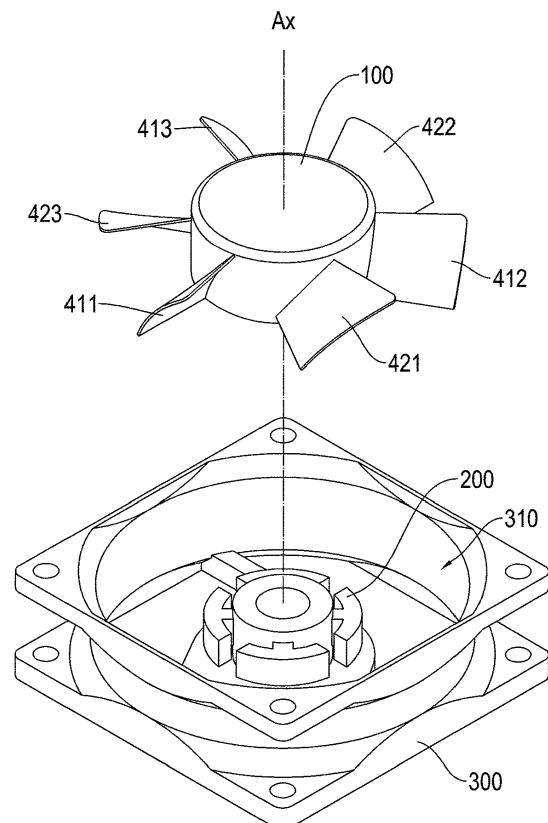


FIG.2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a heat dissipating fan, in particular to the heat dissipating fan having vanes arranged with different included angles.

BACKGROUND OF THE INVENTION

[0002] In general, computer chips generate heat during their operation. For example, electronic products such as mobile phones with a slower computing speed still can dissipate the generated heat to the air by natural convection, but the heat generated by present existing computer chips with a high computing speed no longer can be dissipated to the air by the natural convection completely, so that fans are usually installed in a computer casing to perform a compulsory convection.

[0003] The selection of fans is evaluated according to system structure and heat dissipation requirements of a computer. In other words, the heat dissipating fans are usually selected by taking the flow impedance of the system into consideration. However, airflow and wind pressure of the heat dissipating fan cannot be taken into consideration concurrently, and the correlation between the airflow and the wind pressure of the fan relates to the angle of inclination of vanes with respect to the axial line of an axle. The greater the angle of inclination of the vanes with respect to the axial line of the axle, the greater is the wind pressure of the fan and the smaller is the airflow. On the other hand, the smaller the angle of inclination of the vanes with respect to the axial line of the axle, the greater is the airflow and the smaller is the wind pressure.

[0004] Therefore, a fan with a greater airflow can be selected in an environment with a smaller flow impedance, and a fan with a greater wind pressure can be selected in an environment with a greater flow impedance (such as a cotton filter or a filter that is additionally installed onto an air inlet or an air outlet of a casing) to overcome the problem of the flow impedance. Since different casing structures require different fans, inappropriate fans may be installed by mistake easily and result in poor heat dissipation, and manufacturers need to manufacture fans with different specifications to cope with different requirements, thus incurring a higher cost.

[0005] In view of the foregoing problem of the prior art, the inventor of the present invention conducts extensive researches and experiments, and finally provided a feasible design to overcome the problem.

SUMMARY OF THE INVENTION

[0006] Therefore, it is a primary objective of the present invention to provide a fan wheel of a heat dissipating fan having vanes installed at different angles of inclination to fit the installing environment of various different flow

impedances.

[0007] To achieve the aforementioned objective, the present invention provides a fan wheel, comprising an axial line, a radial line perpendicular to the axial line, a first vane and a second vane, wherein the first vane is extended along the radial line, and a first included angle is defined between a chord line of the first vane and the axial line, and the second vane is extended along the radial line, and a second included angle is defined between a chord line of the second vane and the axial line, and the second included angle and the first included angle are unequal angles.

[0008] Preferably, the fan wheel further comprises a third vane extended along the radial line, and a third included angle is defined between a chord line of the third vane and the axial line, wherein the third included angle, the second included angle, and the first included angle are unequal angles.

[0009] Preferably, the first vanes of the fan wheel are installed uniformly in a circumferential direction of the axial line.

[0010] Preferably, the second vanes of the fan wheel are installed uniformly in a circumferential direction of the axial line.

[0011] To achieve the aforementioned objective, the present invention provides another fan wheel, comprising a fan hub, a first vane and a second vane. The fan hub has an axial line and a radial line perpendicular to the axial line. The first vane is extended in a radial direction and outwardly from the periphery of the fan hub, and a first included angle is defined between a chord line of the first vane and the axial line of the fan hub. The second vane is extended in a radial direction and outwardly from the periphery of the fan hub, and a second included angle is defined between a chord line of the second vane and the axial line of the fan hub, and the second included angle and the first included angle are unequal angles.

[0012] Preferably, the first vane and the second vane of the fan wheel are integrally formed at fan hub.

[0013] Preferably, the fan wheel further comprises a third vane extended along the radial line and outwardly from the periphery of the fan hub, and a third included angle is defined between a chord line of the third vane and the axial line of the fan hub, wherein the third included angle, the second included angle, and the first included angle are unequal angles.

[0014] Another objective of the present invention is to provide a heat dissipating fan having vanes installed at different angles of inclination to fit installing environments of various different flow impedances.

[0015] To achieve the aforementioned objective, the present invention provides a heat dissipating fan comprising a fan hub, a plurality of first vanes and a plurality of second vanes. The fan hub is a cylindrical body having an axial line and a radial line perpendicular to the axial line. The first vanes are extended along the radial line and outwardly from the periphery of the fan hub, and a first included angle is defined between a chord line of

each first vane and the axial line of the fan hub. The second vanes are extended along the radial line and outwardly from the periphery of the fan hub, and a second included angle is defined between a chord line of each second vane and the axial line of the fan hub, and each second included angle and each first included angle are unequal angles.

[0016] Preferably, the first vanes of the heat dissipating fan are installed uniformly along the axial line.

[0017] Preferably, the second vanes of the heat dissipating fan are installed uniformly along the axial line.

[0018] Preferably, the first vane and the second vane of the heat dissipating fan are integrally formed at the fan hub.

[0019] Preferably, the heat dissipating fan further comprises a plurality of third vanes extended along the radial one and outwardly from the periphery of the fan hub, and a third included angle is defined between a chord line of each third vane and the axial line, and each second included angle, each first included angle and each second included angle are unequal angles.

[0020] Preferably, the heat dissipating fan further comprises a frame, and the fan hub is installed on an internal side of the frame.

[0021] Since the vanes of the heat dissipating fan of the present invention are installed at different angles of inclination, therefore the vanes with a fixed proportion can maximize their working efficiency at different flow impedances, and the heat dissipating fan of the present invention can fit various different flow impedances.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is a perspective view of a heat dissipating fan in accordance with a first preferred embodiment of the present invention;

[0023] FIG. 2 is an exploded view of a heat dissipating fan in accordance with the first preferred embodiment of the present invention;

[0024] FIG. 3 is a schematic view of vanes installed in a fan wheel in accordance with the first preferred embodiment of the present invention;

[0025] FIG. 4 is a side view of a first vane of a fan wheel in accordance with the first preferred embodiment of the present invention;

[0026] FIG. 5 is a side view of a second vane of a fan wheel in accordance with the first preferred embodiment of the present invention;

[0027] FIG. 6 is a schematic view of vanes installed in a fan wheel in accordance with a second preferred embodiment of the present invention;

[0028] FIG. 7 is a side view of a third vane of a fan wheel in accordance with the second preferred embodiment of the present invention;

[0029] FIG. 8 is a schematic view of vanes installed in a fan wheel in accordance with a third preferred embodiment of the present invention; and

[0030] FIG. 9 is a schematic view of vanes installed in

a fan wheel in accordance with a fourth preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] With reference to FIGS. 1 and 2 for a perspective view and an exploded view of a heat dissipating fan in accordance with the first preferred embodiment of the present invention respectively, the heat dissipating fan comprises a fan wheel, a drive motor 200, and a frame 300. The fan wheel comprises a fan hub 100, a plurality of first vanes 411, 412, 413 (or first blades) and a plurality of second vanes 421, 422, 423 (or second blades).

[0032] Preferably, the fan hub 100 is made of plastic and in a circular cylindrical shape. The frame 300 is made of plastic and in a square shape having a penetrating circular containing space 310. The drive motor 200 is mounted onto the frame 300 and disposed at the center of the circular containing space 310, and the fan hub 100 is sheathed on the drive motor 200, and the drive motor 200 is used for driving the fan hub 100 to rotate along an axial line AX.

[0033] With reference to FIGS. 2 and 3, the fan wheel of this preferred embodiment comprises three first vanes 411, 412, 413 integrally formed at the fan hub 100, and each first vane 411, 412, 413 is extended outwardly from the fan hub 100 in a radial direction of the axial line AX. The three first vanes 411, 412, 413 are installed uniformly along the circumferential direction of the axial line AX, and a same first included angle A1 is defined between each first vane 411, 412, 413 and the axial line AX, wherein the first included angle A1 is preferably an acute angle.

[0034] In this preferred embodiment, the heat dissipating fan of the present invention preferably comprises three second vanes 421, 422, 423 integrally formed at the fan hub 100, and each second vane 421, 422, 423 is extended in a radial direction of the axial line AX and outwardly from the fan hub 100. The three second vanes 421, 422, 423 are installed uniformly in a circumferential direction of the axial line AX, and a same second included angle A2 is defined between each second vane 421, 422, 423 and the axial line AX, wherein the second included angle A2 is preferably an acute angle.

[0035] In this preferred embodiment, the first vanes 411, 412, 413 and the second vanes 421, 422, 423 have the same appearance, and the three first vanes 411, 412, 413 are installed with the same first included angle A1, and the three second vanes 421, 422, 423 are installed with the same second included angle A2. The fan hub 100 can be rotated to drive the first vanes 411, 412, 413 and the second vanes 421, 422, 423 to rotate accordingly.

[0036] With reference to FIG. 4, a same first included angle A is defined between a chord line C1 of each first vane 411, 412, 413 and the axial line AX. With reference to FIG. 5, a same second included angle A2 is defined between a chord line C2 of each second vane 421, 422, 423 and the axial line AX. Preferably, the first included

angle A1 of the first vane is smaller than the second included angle A2 of the second vane. When the fan hub 100 drives the first vanes 411, 412, 413 and the second vanes 421, 422, 423 to rotate, the three first vanes 411, 412, 413 provide a greater airflow in an environment with a smaller flow impedance and the three second vanes 421, 422, 423 provides a higher wind pressure in an environment with a higher flow impedance.

[0037] With reference to FIG. 6 for a heat dissipating fan in accordance with the second preferred embodiment of the present invention, the heat dissipating fan comprises a fan wheel, a drive motor 200 and a frame 300. The fan wheel comprises a fan hub 100, a plurality of first vanes 511, 512, 513, a plurality of second vanes 521, 522, 523 and a plurality of third vanes (or blades) 531, 532, 533. Wherein, the fan hub 100, the drive motor 200 and the frame 300 have the same structure and relation as those of the first preferred embodiment, and thus will not be repeated.

[0038] In this preferred embodiment, the heat dissipating fan of the present invention preferably comprises three first vanes 511, 512, 513 uniformly installed in a circumferential direction of the axial line AX, three second vanes 521, 522, 523 uniformly installed in a circumferential direction of the axial line AX, and three third vanes 531, 532, 533 uniformly installed in a circumferential direction of the axial line, wherein the first vanes 511, 512, 513, the second vanes 521, 522, 523 and the third vanes 531, 532, 533 preferably have the same appearance and are integrally formed at the fan hub 100 and extended outwardly from the fan hub 100 and in a radial direction of the axial line AX. A same first included angle A1 is defined between a chord line C1 (which is a line defined on a cross-section and connecting front and rear edges of a vane) of each first vane 511 512, 513 and the axial line AX as shown in FIG. 4, and a same second included angle A2 is defined between a chord line C2 of each second vane 521 522, 523 and the axial line AX as shown in FIG. 5. With reference to FIG. 7, a same third included angle A3 is defined between a chord line C3 of each third vane 531 532, 533 and the axial line AX. The first included angle A1, the second included angle A2 and the second included angle A3 are unequal. In this preferred embodiment, preferably the first included angle A1 is smaller than the third included angle A3 and the third included angle is smaller than the second included angle ($A1 < A3 < A2$).

[0039] With reference to FIG. 8 for a heat dissipating fan in accordance with the third preferred embodiment of the present invention, the heat dissipating fan comprises a fan wheel, a drive motor 200, and a frame 300. The fan wheel comprises a fan hub 100, three first vanes 611, 612, 613, six second vanes 621, 622, 623, 624, 625, 626 and three third vanes 631, 632, 633. Wherein, the fan hub 100, the drive motor 200 and the frame 300 have the same structure and relation as those of the first preferred embodiment, and thus will not be repeated.

[0040] A same first included angle A1 is defined be-

tween a chord line C1 of each first vane 611 612, 613 and the axial line AX (as shown in FIG. 4); and a same second included angle A2 is defined between a chord line C2 of each second vane 621 622, 623, 624, 625, 626 and the axial line AX (as shown in FIG. 5); and a same is defined between a chord line C3 of each third vane 631 632, 633 and the axial line AX (as shown in FIG. 7).

[0041] In this preferred embodiment, the first vanes 611, 612, 613, the second vanes 631, 632, 633, 634, 635, 636 and the third vanes 621, 622, 623 have the same appearance, and are preferably integrally formed at the fan hub 100 and extended outwardly from the fan hub 100 and in a radial direction of the axial line AX, and the first included angle A1, the second included angle A2 and the third included angle A3 are unequal. Preferably, the first included angle A1 is smaller than the third included angle A3 which is smaller than the second included angle A2 ($A1 < A3 < A2$).

[0042] With reference to FIG. 9 for a schematic view of vanes installed in a fan wheel in accordance with the fourth preferred embodiment of the present invention, the heat dissipating fan comprises a fan wheel, a drive motor 200 and a frame 300. The fan wheel comprises three first vanes 711, 712, 713, three second vanes 721, 722, 723 and a connecting element 701.

[0043] A same first included angle A1 is defined between a chord line C1 of each first vane 711 712, 713 and the axial line AX as shown in FIG. 4; and a same second included angle A2 is defined between a chord line C2 of each second vane 721 722, 723 and the axial line AX as shown in FIG. 5.

[0044] In this preferred embodiment, the first vanes 711, 712, 713 and the second vanes 721, 722, 723 have the same appearance, and are extended outwardly from the axial line AX and in a radial direction of the axial line AX, and external ends of the first vanes 711, 712, 713 and the second vanes 721, 722, 723 are connected by a connecting element 701, and the first included angle A1 and the second included angle A2 are unequal. Preferably the first included angle A1 is smaller than the second included angle A2.

[0045] In summary there is disclosed a fan wheel comprising an axial line AX, a radial line perpendicular to the axial line, at least one first vane; e.g. 411, 412, 413 (or 511, 512, 513; or 611, 612, 613); and at least one second vane, e.g. 421, 422, 423 (or 521, 522, 523; or 621, 622, 623, 624, 625, 626) and the first vane(s) and the second vane(s) are extended from the axial line AX, and included angles between chord lines C1, C2 of the first and second vanes and the axial line AX of the fan wheel are unequal angles. A heat dissipating fan comprising a fan hub 100, a plurality of first vanes 411, 412, 413 (or 511, 512, 513; or 611, 612, 613) and a plurality of second vanes 421, 422, 423 (or 521, 522, 523; or 621, 622, 623, 624, 625, 626) and the first vanes and the second vanes are extended outwardly from the fan hub 100, and excluded angles between their chord lines C1, C2 and the axial line AX of the fan hub 100 are unequal angles.

[0046] When the heat dissipating fan and the fan wheel of the present invention are rotated, each vane of the fan wheel provides a different airflow and a different wind pressure, so that the best working efficiency of the vanes can be assured, no matter what is the flow impedance of the installing environment, so as to compensate the working efficiency of the remaining vanes. Therefore, the heat dissipating fan of the present invention can fit casings of different flow impedances.

Claims

1. A fan wheel, comprising:

an axial line (AX);
 a radial line perpendicular to the axial line (AX);
 a first vane (411, 412, 413; 511, 512, 513; 611, 612, 613; 711, 712, 713), extended along the radial line;
 a second vane (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626; 721, 722, 723), extended along the radial line;
 a first included angle (A1), defined between a chord line (C1) of the first vane (411, 412, 413; 511, 512, 513; 611, 612, 613; 711, 712, 713) and the axial line (AX); and
 a second included angle (A2), defined between a chord line (C2) of the second vane (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626; 721, 722, 723) and the axial line (AX), and the second included angle (A2) and the first included angle (A1) being unequal angles.

2. The fan wheel of claim 1, further comprising a third vane (531, 532, 533; 631, 632, 633) extended along the radial line, and a third included angle (A3) defined between a chord line (C3) of the third vane (531, 532, 533; 631, 632, 633) and the axial line (AX), and the third included angle (A3), and the second included angle (A2) and the first included angle (A1) being unequal angles.

3. The fan wheel of claim 1 or 2, wherein there are a plurality of first vanes (411, 412, 413; 511, 512, 513; 611, 612, 613; 711, 712, 713) arranged uniformly in a circumferential direction of the axial line (AX).

4. The fan wheel of one of the preceding claims, wherein there are a plurality of second vanes (421, 422, 423, 521, 522, 523, 621, 622, 623, 624, 625, 626, 721, 722, 723) arranged uniformly in a circumferential direction of the axial line (AX).

5. A fan wheel, comprising:

a fan hub (100), having an axial line (AX) and a radial line perpendicular to the axial line (AX);

a first vane (411, 412, 413; 511, 512, 513; 611, 612, 613), extended outwardly along the radial line from the periphery of the fan hub (100), and a first included angle (A1) being defined between a chord line (C1) of the first vane (411, 412, 413; 511, 512, 513; 611, 612, 613) and the axial line (AX) of the fan hub (100); and
 a second vane (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626), extended outwardly along the radial line from the periphery of the fan hub (100), and a second included angle (A2) being defined between a chord line (C2) of the second vane (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626) and the axial line (AX) of the fan hub (100), and the second included angle (A2) and the first included angle (A1) being unequal angles.

6. The fan wheel of claim 5, wherein there are a plurality of first vanes (411, 412, 413, 511, 512, 513, 611, 612, 613) and a plurality of second vanes (421, 422, 423, 521, 522, 523, 621, 622, 623, 624, 625, 626) integrally formed at the fan hub (100).

7. The fan wheel of claim 5 or 6, further comprising a third vane (531, 532, 533, 631, 632 or 633) extended along the radial line and outwardly from the periphery of the fan hub (100), and a third included angle (A3) being defined between a chord line (C3) of the third vane (531, 532, 533, 631, 632 or 633) and the axial line (AX) of the fan hub (100), and the third included angle (A3), the second included angle (A2) and the first included angle (A1) being unequal angles.

8. A heat dissipating fan, comprising:

a fan hub (100), being a cylindrical body, and having an axial line (AX) and a radial line perpendicular to the axial line (AX);
 a plurality of first vanes (411, 412, 413; 511, 512, 513; 611, 612, 613), extended along the radial line and outwardly from the periphery of the fan hub (100), and a first included angle (A1) being defined between a chord line (C1) of each of the first vanes (411, 412, 413; 511, 512, 513; 611, 612, 613) and the axial line (AX) of the fan hub (100); and
 a plurality of second vanes (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626), extended along the radial line and outwardly from the periphery of the fan hub (100), and a second included angle (A2) being defined between a chord line (C2) of each of the second vanes (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626) and the axial line (AX) of the fan hub (100), and each of the second included angles (A2) and each of the first included angle (A1) being unequal angles.

9. The heat dissipating fan of claim 8, wherein the first vanes (411, 412, 413; 511, 512, 513; 611, 612, 613) are installed uniformly in a circumferential direction of the axial line (AX). 5
10. The heat dissipating fan of claim 8 or 9, wherein the second vanes (421, 422, 423; 521, 522, 523; 621, 622, 623, 624, 625, 626) are installed uniformly in a circumferential direction of the axial line (AX). 10
11. The heat dissipating fan of one of claims 8-10, wherein the first vanes (411, 412, 413, 511, 512, 513, 611, 612, 613) and the second vanes (421, 422, 423, 521, 522, 523, 621, 622, 623, 624, 625, 626) are integrally formed at the fan hub (100). 15
12. The heat dissipating fan of one of claims 8-11, further comprising a plurality of third vanes (531, 532, 533; 631, 632, 633) extended along the radial line and outwardly from the periphery of the fan hub (100), and a third included angle (A3) being defined between a chord line (C3) of each of the third vanes (531, 532, 533, 631, 632, 633) and the axial line (AX) of the fan hub (100), and each of the second included angles (A2), each of the first included angles (A1) and each of the second included angles (A2) being unequal angles. 20 25
13. The heat dissipating fan of one of claims 8-12, further comprising a frame (300), and the fan hub (100) being installed on an internal side of the frame (300). 30

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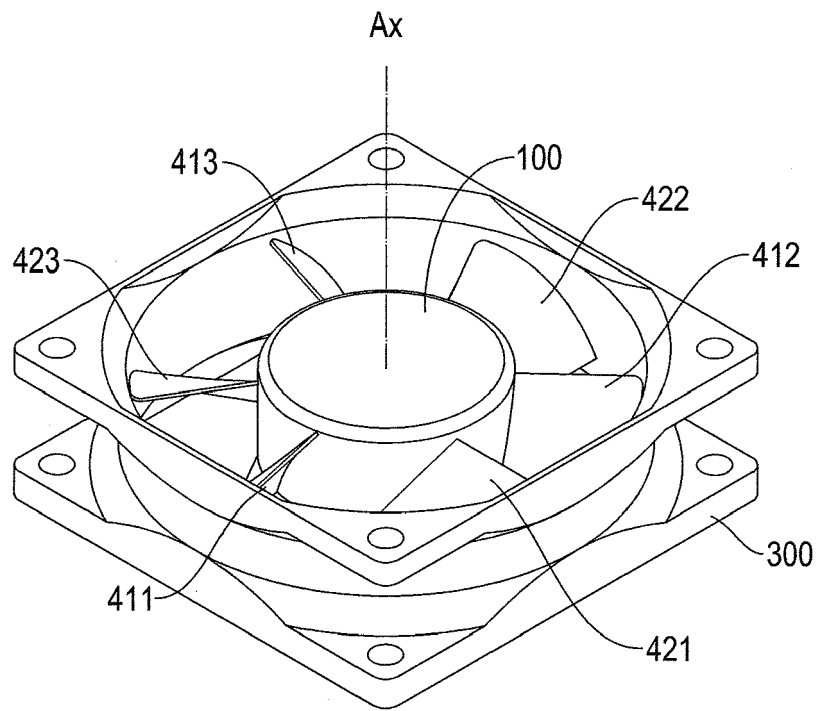


FIG.1

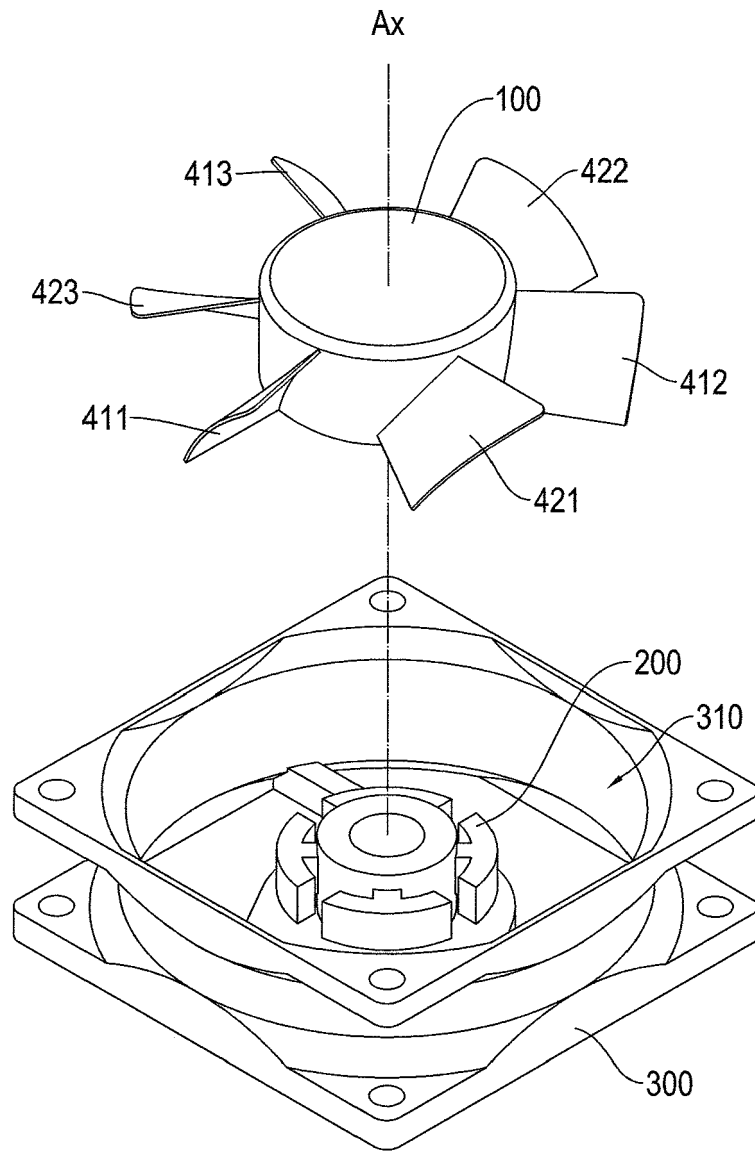


FIG.2

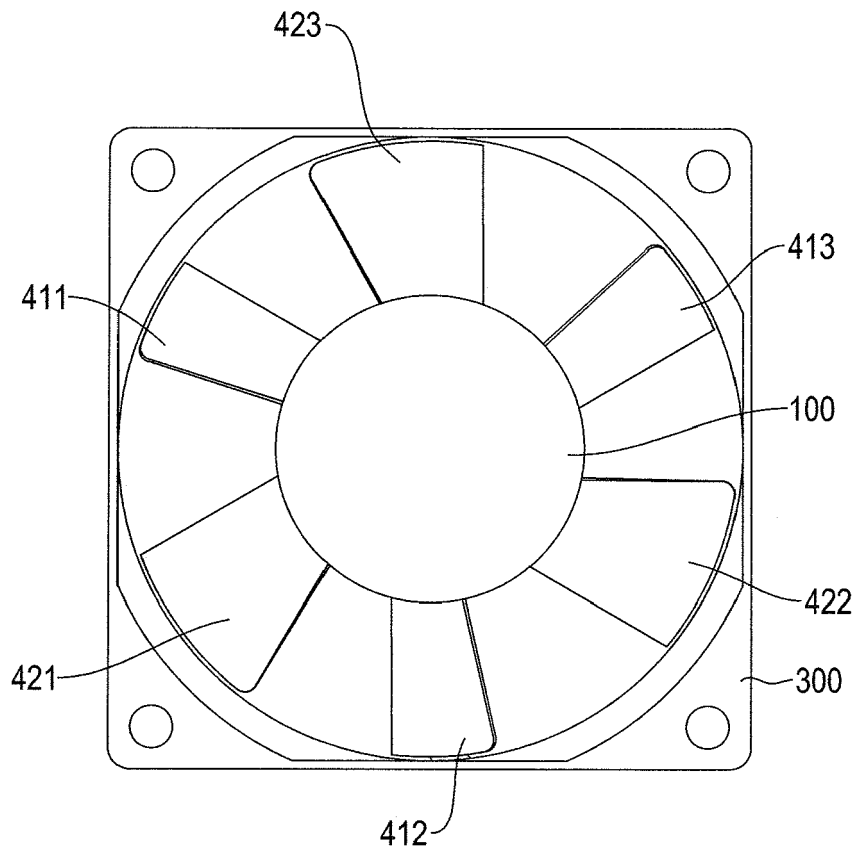


FIG.3

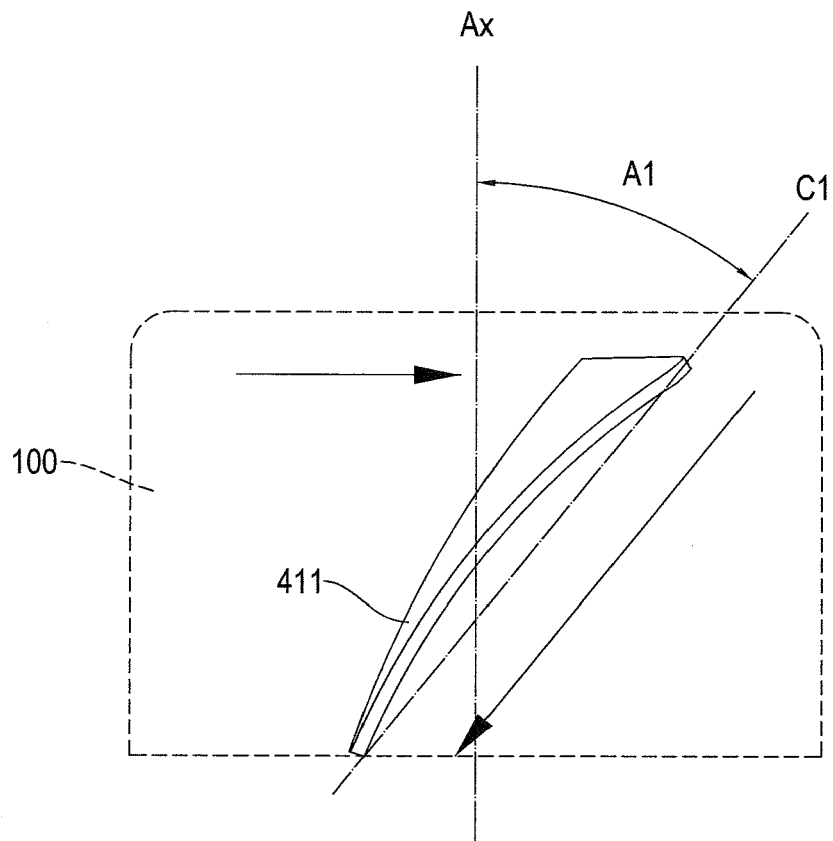


FIG.4

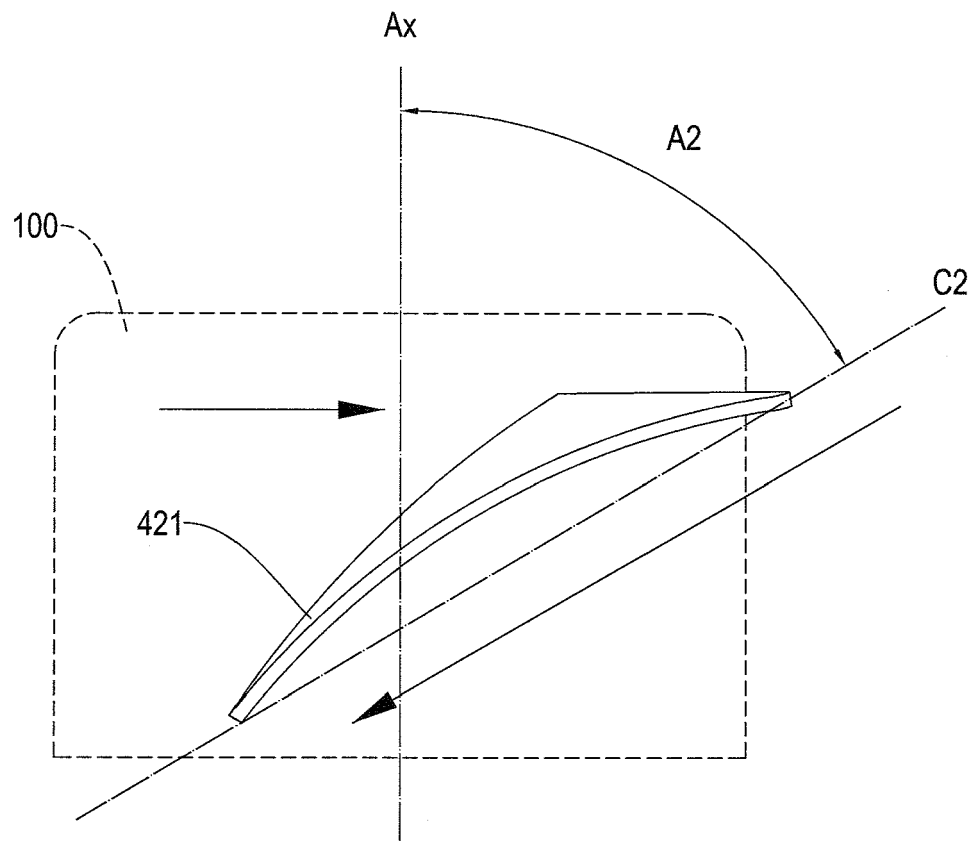


FIG.5

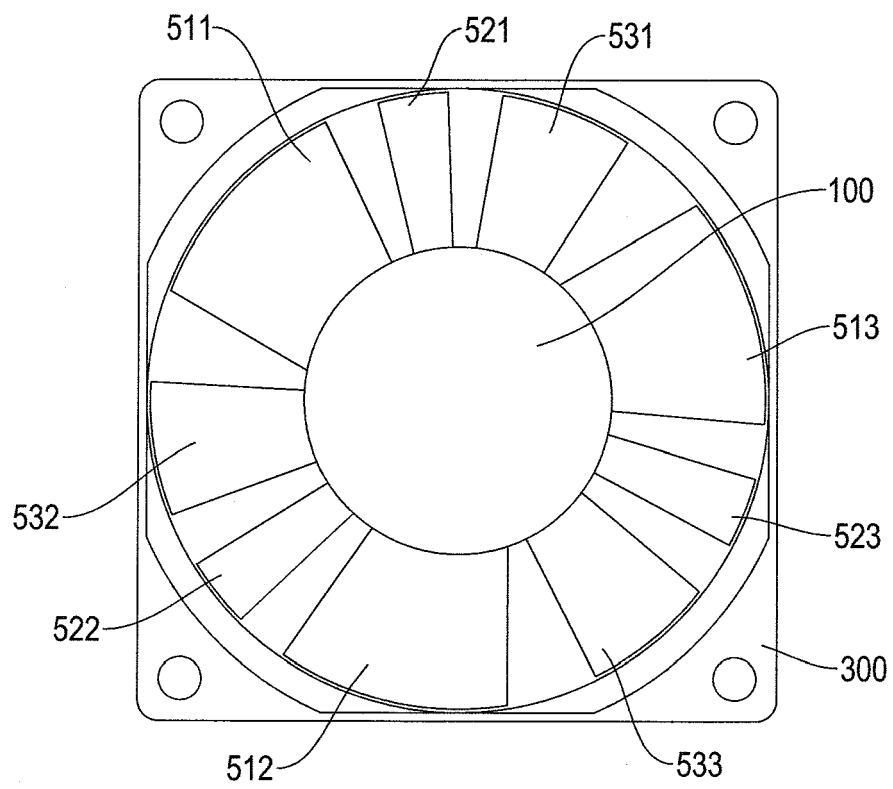


FIG.6

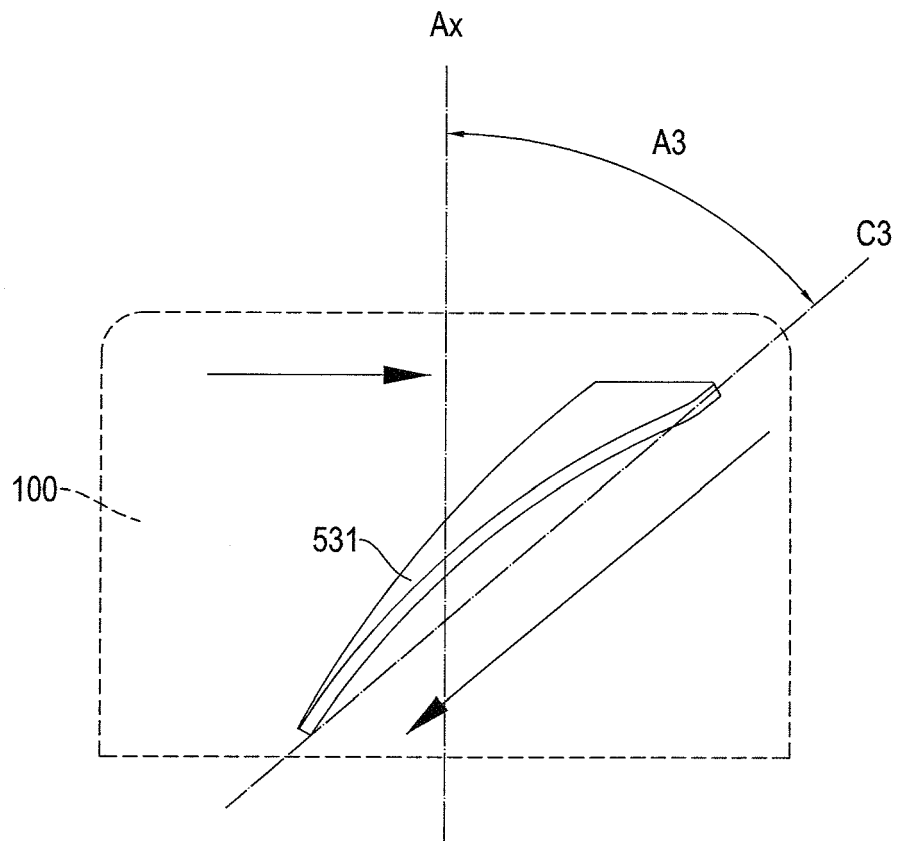


FIG.7

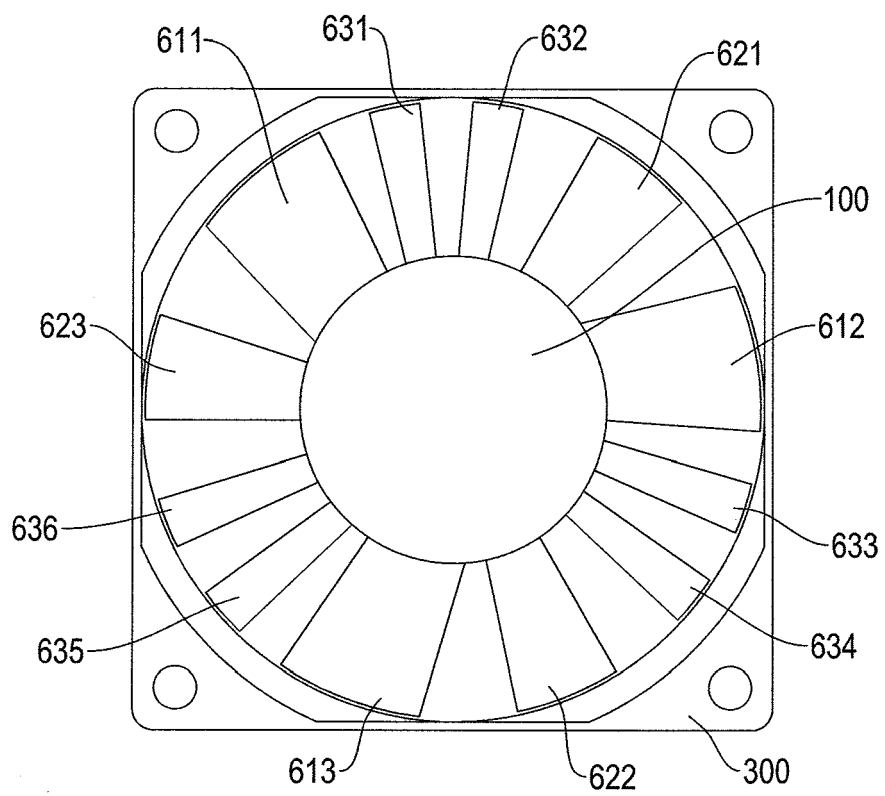


FIG.8

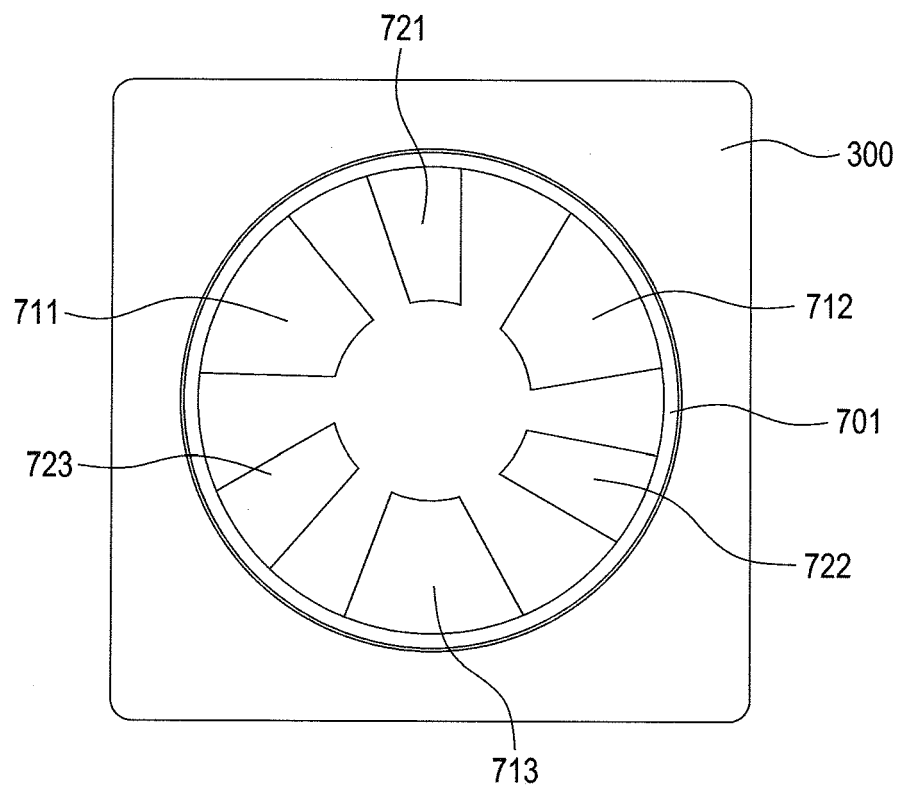


FIG. 9



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7662

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 2002/182053 A1 (A. MIYAZAWA) 5 December 2002 (2002-12-05) * paragraphs [0028], [0129]; figures 12,13 *	1-13	INV. F04D29/32
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 October 2012	Examiner de Martino, Marcello
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			

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EPO FORM 1503 03.82 (P04C01)

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

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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
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05-10-2012

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