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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to a series fan, and more particularly to a series fan in which two dynamic blades are connected to form a driving blade in the form of a continuous blade so as to enhance the wind pressure of the series fan.

2. Description of the Related Art

[0002] Along with the advance of sciences and technologies, the reliance of peoples on various electronic devices has been more and more increased. However, in operation, the internal components of the electronic devices (such as computers and notebooks) will generate high heat. The heat must be conducted out of the electronic devices in time. Otherwise, the internal components will be over-heated. Therefore, in most of the electronic devices, a cooling fan is often employed to actively dissipate the heat so as to keep the electronic products working within a certain operation temperature range. However, sometimes one single cooling fan can hardly provide sufficient wind force. Therefore, two or more fans are often serially assembled to form a series fan so as to provide sufficient wind force.

[0003] US2015/226222 A1 describes a conventional series fan, a front fan and a rear fan are serially connected. The main components of the series fan include pre-dynamic blades, pre-static blades, post-static blades and post-dynamic blades, which are sequentially arranged from the wind incoming opening to the wind outgoing opening. The pre-static blades of the front fan and the post-static blades of the rear fan serve as best support components for the series fan. However, the pre-static blades of the front fan and the post-static blades of the rear fan are positioned in the middle of the series fan. Therefore, the structural supportability of the series fan in the position of the pre-dynamic blades of the front fan and the post-dynamic blades of the rear fan is relatively weak. That is, the structural supportability of the series fan at the wind incoming opening and the wind outgoing opening is weaker.

[0004] When the conventional series fan is fixed in the electronic device, the electronic device is assembled with the wind incoming opening or wind outgoing opening of the series fan. However, the pre-dynamic blades and the post-dynamic blades at the wind incoming opening and the wind outgoing opening are not supported by any support structure. In this case, the vibration value of the entire series fan is often increased to affect the stability of the system of the entire series fan.

[0005] Moreover, the pre-dynamic blades and the post-dynamic blades at the wind incoming opening and the wind outgoing opening are in an open state. In con-

sideration of security, a protection web is often additionally mounted in the positions of the wind incoming opening and the wind outgoing opening of the series fan to achieve protection effect. This causes increase of cost of material and working time of the entire series fan.

[0006] Furthermore, when the conventional series fan is disposed in the electronic device, the corresponding installation height of the series fan is fixed and limited. Therefore, the total thickness of the series fan is limited. That is, the design of the dynamic and static blades of the series fan is limited by the arrangement of the middle motors and the pre-dynamic blades and the post-dynamic blades of the front and rear fans so that the total height and size of the series fan are designed in a fixed proportion. Relatively, the pre-dynamic blades and the post-dynamic blades have fixed sizes and proportions. In addition, the pre-dynamic blades and the post-dynamic blades are limited by the fixed sizes and arrangement of the intermediate components, (that is, the pre-static blades and the post-static blades) so that the pre-dynamic blades and the post-dynamic blades can only independently rotate as two separate components and cannot be made in the form of one single continuous blade. As a result, when the pre-dynamic blades and the post-dynamic blades with fixed sizes respectively pressurize the airflow flowing into the series fan, before the airflow is pressurized, the airflow is thrown out by the respective blades, (that is, the pre-dynamic blades and the post-dynamic blades). Therefore, the pressurizing time of the pre-dynamic blades and the post-dynamic blades for the airflow flowing into the series fan is too short so that the wind pressure of the entire series fan cannot be effectively enhanced.

[0007] US 2004/219022 A1 describes an assembled type impeller of a cooling fan comprising a main impeller having a hub and a plurality of main blades on an outer side of the hub and a "n" shaped extension portion next to one end of the hub thereof and a secondary impeller having a plurality of secondary blades on an outer side of a hub, the secondary impeller being joined to the main impeller being closely fitted onto the extension portion with the secondary blades being connected to respective ones of the main blades to form larger blades. Thus, both seats are mounted on the same side of the frame.

[0008] JP5610008 B2 describes a projector with an axial flow fan with blades. The frame body 63 of the impeller 6, 61 is located in the middle between an inlet frame body 51 and an outlet frame body 52 respectively.

[0009] EP 3 708 842 A1 describes a fan and air conditioner indoor unit with a first and a second wind wheel.

SUMMARY OF THE INVENTION

[0010] It is therefore a primary object of the present invention to provide a series fan, which has enhanced wind pressure effect.

[0011] To achieve the above and other objects, the series fan of the present invention includes a first fan and

a second fan. The first fan includes a first frame body, a first dynamic blade impeller and a first shaft seat. Two sides of the first frame body are respectively formed with a wind incoming side and a connection side. The first shaft seat is disposed at a center of the wind incoming side. A first static blade is disposed between the first shaft seat and inner circumference of the first frame body. The first dynamic blade impeller is pivotally disposed on the first shaft seat and has multiple first dynamic blades. Each first dynamic blade has at least one connection section. The second fan includes a second frame body, a second dynamic blade impeller and a second shaft seat. Two sides of the second frame body are respectively formed with a wind outgoing side and a mating side mated with the connection side in communication therewith. The second shaft seat is disposed at a center of the wind outgoing side. A second static blade is disposed between the second shaft seat and inner circumference of the second frame body. The second dynamic blade impeller is pivotally disposed on the second shaft seat and has multiple second dynamic blades. Each second dynamic blade has at least one connected section. The connected section of the second dynamic blade is connected with the connection section of the first dynamic blade to form integrally a driving blade. The first fan is upside-down placed on the second fan and serially reverse-connected with the second fan. By means of the above design of the series fan of the present invention, the wind pressure of the entire series fan is effectively enhanced.

[0012] In the above series fan, the connection side has a first opening. The first dynamic blade impeller has a first hub and a first shaft. One end of the first shaft is fixedly disposed at a center of the first hub. The other end of the first shaft is pivotally disposed in the first shaft seat. The multiple first dynamic blades are radially disposed along an outer circumference of the first hub. Each first dynamic blade has a blade front edge and a blade tail edge. The connection section is disposed on the blade front edge. The blade front edge is protruded from, recessed into or flush with the first opening. The blade tail edge is positioned in the wind incoming side.

[0013] In the above series fan, the mating side has a second opening in communication with the first opening. The second dynamic blade impeller has a second hub and a second shaft. One end of the second shaft is fixedly disposed at a center of the second hub. The other end of the second shaft is pivotally disposed in the second shaft seat. The multiple second dynamic blades are radially disposed along an outer circumference of the second hub. Each second dynamic blade has a blade front edge and a blade tail edge. The connected section is disposed on the blade front edge of the second dynamic blade. The blade front edge of the second dynamic blade is protruded from the second opening into the first opening, flush with the second opening or recessed into the second opening. The blade tail edge of the second dynamic blade is positioned in the wind outgoing side.

[0014] In the above series fan, each first dynamic blade has a first upper surface and a first lower surface and each second dynamic blade has a second upper surface and a second lower surface. The first upper surface is connected with the second upper surface to form a continuous upper surface. The first lower surface is connected with the second lower surface to form a continuous lower surface.

[0015] In the above series fan, the connection section and the connected section are raised structure and recessed structure in adaptation to the raised structure or any other connection structures in adaptation to each other, such as recessed structure and raised structure in adaptation to the recessed structure, screw structures, insertion structures, adhesion structures or welding structures.

[0016] In the above series fan, the connection side of the first frame body is mated with the mating side of the second frame body by means of engagement, locking, insertion, adhesion, slide rail or latching.

[0017] In the above series fan, the connection side has a first opening. A first flow way is defined between the wind incoming side and the first opening. The first flow way is in communication with the wind incoming side and the first opening.

[0018] In the above series fan, the mating side has a second opening in communication with the first opening. A second flow way is defined between the wind outgoing side and the second opening. The second flow way is in communication with the wind outgoing side and the second opening. The first and second flow ways are in communication with each other to together form an airflow guide passage. The driving blade is positioned in the airflow guide passage.

[0019] In the above series fan, the first dynamic blade impeller and the second dynamic blade impeller are formed integrally by means of injection molding.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein:

Fig. 1 is a perspective exploded view of a preferred embodiment of the present invention;

Fig. 2A is a perspective assembled view of the preferred embodiment of the present invention;

Fig. 2B is a sectional view of the preferred embodiment of the present invention, showing that the airflow is continuously pressurized by the driving blades; and

Fig. 3 is a perspective view of the preferred embod-

iment of the present invention, showing the connection form of the connection section and the connected section, in which the connection section and the connected section are raised structure and recessed structure in adaptation to the raised structure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Please refer to Figs. 1, 2A and 2B. The series fan 1 of the present invention includes a first fan 11 and a second fan 21. The first fan 11 includes a first frame body 111, a first dynamic blade impeller 13 and a first shaft seat 15. Two sides of the first frame body 111 are respectively formed with a wind incoming side 1111 and a connection side 1113. The connection side 1113 has a first opening 1114. The first opening 1114 and the wind incoming side 1111 define therebetween a first flow way 12 in communication with the wind incoming side 1111 and the first opening 1114. The wind incoming side 1111 serves to guide external airflow 4 to flow into the first flow way 12 of the first frame body 111. The airflow is then guided out by the first opening 1114 to flow into the second fan 21. The first shaft seat 15 is disposed at the center of the wind incoming side 1111. A first static blade 16 is disposed between the first shaft seat 15 and inner circumference of the first frame body 111. The first static blade 16 is positioned at the wind incoming side 1111. In this embodiment, the first static blade 16 is a rib. Two ends of the first static blade 16 are, but not limited to, respectively connected with outer circumference of the first shaft seat 15 and the inner circumference of the first frame body 111 for illustration purposes. In practice, the first static blade 16 can be a blade. The first dynamic blade impeller 13 is pivotally disposed on the first shaft seat 15 and positioned in the first flow way 12. The first dynamic blade impeller 13 has multiple first dynamic blades 131, a first hub 132, a stator 17 and a first shaft 133. One end of the first shaft 133 is fixedly disposed at the center of the first hub 132. The other end of the first shaft 133 is pivotally disposed in the first shaft seat 15. The multiple first dynamic blades 131 are radially disposed along an outer circumference of the first hub 132. The stator 17 of the first dynamic blade impeller 13 is fitted around a bearing cup of the first shaft seat 15. A magnetic member 18 (such as a magnet) is disposed on inner circumference of the first hub 132. The stator 17 and the magnetic member 18 are magnetized with each other by induction.

[0022] Each first dynamic blade 131 has a blade front edge 1313, a blade tail edge 1314, a first upper surface 1315, a first lower surface 1316 and at least one connection section 1311. The blade front edge 1313 and the blade tail edge 1314 of the first dynamic blade 131 are respectively positioned in the first opening 1114 of the connection side 1113 and the wind incoming side 1111. The blade front edge 1313 can be selectively protruded from, recessed into or flush with the first opening 1114.

The connection section 1311 is disposed on the blade front edge 1313 of the first dynamic blade 131.

[0023] The second fan 21 includes a second frame body 211, a second dynamic blade impeller 23 and a second shaft seat 25. Two sides of the second frame body 211 are respectively formed with a wind outgoing side 2111 and a mating side 2113. The mating side 2113 is mated with the connection side 1113 in communication therewith. The connection side 1113 of the first frame body 111 is mated with the mating side 2113 of the second frame body 211 by means of engagement, locking, insertion, adhesion, slide rail or latching, whereby the first fan 11 is upside-down placed on the second fan and serially reverse-connected with the second fan 21 to form the series fan 1.

[0024] The mating side 2113 has a second opening 2114. The second opening 2114 serves to further guide the airflow flowing from the first opening 1114, whereby the airflow can continuously flow. The second opening 2114 and the wind outgoing side 2111 define therebetween a second flow way 22 in communication with the wind outgoing side 2111 and the first and second openings 1114, 2114. The first and second flow ways 12, 22 communicate with each other to together form an airflow guide passage.

[0025] The wind outgoing side 2111 serves to discharge the airflow 4, which is boosted (pressurized) in the airflow guide passage so as to forcedly dissipate the heat generated by a heat generation component (such as a central processing unit or graphics processing unit).

[0026] The second shaft seat 25 is disposed at the center of the wind outgoing side 2111. A second static blade 26 is disposed between the second shaft seat 25 and inner circumference of the second frame body 211. In this embodiment, the second static blade 26 is a rib positioned at the wind outgoing side 2111. Two ends of the second static blade 26 are, but not limited to, respectively connected with outer circumference of the second shaft seat 25 and the inner circumference of the second frame body 211. In practice, the first and second static blades 16, 26 can be adjusted into same structure (such as both are ribs) or different structures (such as one is a rib, while the other is a static blade) according to the design requirement of the boosting or entire supportability of the series fan 1. The first and second static blades 16, 26 are respectively disposed in the wind incoming side 1111 and the wind outgoing side 2111 of the series fan 1 so that the supporting strength of the entire structure of the series fan 1 is effectively enhanced. Also, the vibration of the entire series fan 1 can be avoided. Moreover, the first and second static blades 16, 26 serve to shield and protect the first and second dynamic blade impellers 13, 23 so as to effectively improve the shortcoming of the conventional series fan that a protection web must be additionally arranged to cause increase of cost of material and working time.

[0027] The second dynamic blade impeller 23 is pivotally disposed on the second shaft seat 25 and positioned

in the second flow way 22. The second dynamic blade impeller 23 has multiple second dynamic blades 231, a second hub 232, a stator 27 and a second shaft (not shown). One end of the second shaft is fixedly disposed at the center of the second hub 232. The other end of the second shaft is pivotally disposed in the second shaft seat 25. The stator 17 is fitted around a bearing cup of the second shaft seat 25. A magnetic member (such as a magnet, not shown) is disposed on inner circumference of the second hub 232. The stator 17 and the magnetic member are magnetized with each other by induction. The first hub 132 and the second hub 232 are upside-down arranged.

[0028] The multiple second dynamic blades 231 are radially disposed along an outer circumference of the second hub 232. Each second dynamic blade 231 has a blade front edge 2313, a blade tail edge 2314, a second upper surface 2315, at least one connected section 2311 and a second lower surface 2316. The blade front edge 2313 and the blade tail edge 2314 are respectively positioned in the second opening 2114 of the mating side 2113 and the wind outgoing side 2111. The blade front edge 2313 of the second dynamic blade 231 can be selectively protruded from the second opening 2114 into the first opening 1114 or flush with (or recessed into) the second opening 2114. The connected section 2311 is disposed on the blade front edge 2313 of the second dynamic blade 231. In this embodiment, the connection section 1311 of the first dynamic blade 131 and the connected section 2311 of the second dynamic blade 231 are raised structure and recessed structure in adaptation to the raised structure for illustration purposes. That is, the connection section 1311 of the first dynamic blade 131 is a boss body, while the connected section 2311 of the second dynamic blade 231 is a dent, which is connected with the boss body. Accordingly, the connection sections 1311 of the multiple first dynamic blades 131 and the connected sections 2311 of the multiple second dynamic blades 231 are connected to form integrally multiple driving blades 31 in a continuous blade form. In addition, the first upper surface 1315 is connected with the second upper surface 2315 without any gap in the junction between the first upper surface 1315 and the second upper surface 2315 so as to form a continuous upper surface. The first lower surface 1316 is connected with the second lower surface 2316 without any gap in the junction between the first lower surface 1316 and the second lower surface 2316 so as to form a continuous lower surface.

[0029] Please refer to Figs. 1 and 2B. When the series fan 1 operates, the first and second dynamic blade impellers 13, 23 will synchronously rotate. The multiple driving blades 31 in the continuous blade form in the airflow guide passage will guide the external airflow 4 to axially pass through the wind incoming side 1111 into the first flow way 12 of the airflow guide passage. After the airflow 4 is guided in by the blade tail edges 1314 of the first dynamic blades 131 of the multiple driving blades 31, the

multiple first dynamic blades 131 will pressurize the airflow 4 to flow along the first upper surfaces 1315 in a direction to the blade front edges 1313. At this time, the pressurized airflow 4 flows to the blade front edges 1313 of the first dynamic blades 131 to further continuously flow to the second upper surface 2315, whereby the second dynamic blades 231 in the second flow way 22 further pressurizes the airflow 4. The further pressurized airflow 4 flows along the second upper surfaces 2315 in a direction to the blade tail edges 1314. Then the airflow 4 is downward thrown out (flow out) at a certain speed to pass through the second static blade 26 to outer side of the wind outgoing side 2111.

[0030] In another embodiment, the connection section 1311 and the connected section 2311 are selected from a group consisting of raised structure and recessed structure in adaptation to the raised structure (as shown in Fig. 3), screw structures, insertion structures, adhesion structures and welding structures (connected by means of welding).

[0031] In a modified embodiment, the first hub 132 of the first dynamic blade impeller 13 and the multiple first dynamic blades 131 thereon and the second hub 232 of the second dynamic blade impeller 23 and the multiple second dynamic blades 231 thereon are formed integrally by means of injection molding.

[0032] According to the above design, the multiple first and second dynamic blades 131, 231 of the series fan 1 of the present invention are connected to form integrally multiple driving blades 31 in a continuous blade form. In this case, the airflow 4 can be continuously pressurized by the first and second dynamic blades 131, 231 of the multiple driving blades 31 in the airflow guide passage so as to effectively greatly enhance the wind pressure of the entire series fan 1.

[0033] The present invention has been described with the above embodiments thereof and it is understood that many changes and modifications in such as the form or layout pattern or practicing step of the above embodiments can be carried out without departing from the scope of the invention that is intended to be limited only by the appended claims.

45 Claims

1. A series fan (1) comprising:

a first fan (11) including a first frame body (111), a first dynamic blade impeller (13) and a first shaft seat (15), two sides of the first frame body (111) being respectively formed with a wind incoming side (1111) and a connection side (1113), the first shaft seat (15) being disposed at a center of the wind incoming side (1111), a first static blade (16) being disposed between the first shaft seat (15) and inner circumference of the first frame body (111), the first dynamic

blade impeller (13) being pivotally disposed on the first shaft seat (15), the first dynamic blade impeller (13) having multiple first dynamic blades (131),

a second fan (21) including a second frame body (211), a second dynamic blade impeller (23) and a second shaft seat (25), two sides of the second frame body being (211) respectively formed with a wind outgoing side (2111) and a mating side (2113), the mating side (2113) being mated with the connection side (1113) in communication therewith, the second shaft seat (25) being disposed at a center of the wind outgoing side (2111), a second static blade (26) being disposed between the second shaft seat (25) and inner circumference of the second frame body, the second dynamic blade impeller (23) being pivotally disposed on the second shaft seat (25), the second dynamic blade impeller (23) having multiple second dynamic blades (231),

characterized in that

each first dynamic blade (131) having at least one connection section (1311); and each second dynamic blade (231) having at least one connected section (2311), the connected section (2311) of the second dynamic blade (231) being connected with the connection section (1311) of the first dynamic blade (131) to form integrally a driving blade (31), the first fan (11) being upside-down placed on the second fan (21) and thus serially reverse-connected with the second fan (21).

2. The series fan (1) as claimed in claim 1, wherein the connection side has a first opening (1114), the first dynamic blade impeller having a first hub (132) and a first shaft (133), one end of the first shaft being fixedly disposed at a center of the first hub (132), the other end of the first shaft being pivotally disposed in the first shaft seat, the multiple first dynamic blades being radially disposed along an outer circumference of the first hub, each first dynamic blade having a blade front edge (1313) and a blade tail edge (1314), the connection section being disposed on the blade front edge (1313), the blade front edge (1313) being protruded from, recessed into or flush with the first opening (1114), the blade tail edge (1314) being positioned in the wind incoming side (1111).
3. The series fan (1) as claimed in claim 2, wherein the mating side has a second opening (2114) in communication with the first opening (1114), the second dynamic blade impeller having a second hub and a second shaft, one end of the second shaft being fixedly disposed at a center of the second hub (232), the other end of the second shaft being pivotally disposed in the second shaft seat, the multiple second

dynamic blades being radially disposed along an outer circumference of the second hub (232), each second dynamic blade having a blade front edge (2313) and a blade tail edge (2314), the connected section being disposed on the blade front edge (2313) of the second dynamic blade, the blade front edge (2313) of the second dynamic blade being protruded from the second opening (2114) into the first opening (1114), flush with the second opening (2114) or recessed into the second opening (2114), the blade tail edge (2314) of the second dynamic blade being positioned in the wind outgoing side.

4. The series fan (1) as claimed in claim 1, wherein each first dynamic blade has a first upper surface (1315) and a first lower surface (1316) and each second dynamic blade has a second upper surface (2315) and a second lower surface (2316), the first upper surface (1315) being connected with the second upper surface (2315) to form a continuous upper surface, the first lower surface (1316) being connected with the second lower surface (2316) to form a continuous lower surface.
5. The series fan (1) as claimed in claim 1, wherein the connection section and the connected section are selected from a group consisting of raised structure and recessed structure in adaptation to the raised structure, recessed structure and raised structure in adaptation to the recessed structure, screw structures, insertion structures and adhesion structures.
6. The series fan (1) as claimed in claim 1, wherein the connection section and the connected section are connected with each other by means of welding.
7. The series fan (1) as claimed in claim 1, wherein the connection side of the first frame body is mated with the mating side of the second frame body by means of engagement, locking, insertion, adhesion, slide rail or latching.
8. The series fan (1) as claimed in claim 1, wherein the connection side has a first opening, a first flow way being defined between the wind incoming (1111) side and the first opening, the first flow way being in communication with the wind incoming side (1111) and the first opening.
9. The series fan (1) as claimed in claim 8, wherein the mating side has a second opening (2114) in communication with the first opening, a second flow way being defined between the wind outgoing side and the second opening (2114), the second flow way being in communication with the wind outgoing side and the second opening (2114), the first and second flow ways being in communication with each other to together form an airflow guide passage, the driving

blade (31) being positioned in the airflow guide passage.

10. The series fan (1) as claimed in claim 1, wherein the first dynamic blade impeller and the second dynamic blade impeller are formed integrally by means of injection molding.

Patentansprüche

1. Reihenlüfter (1) umfassend:

einen ersten Lüfter (11), der einen ersten Rahmenkörper (111), ein erstes dynamisches Flügelrad (13) und einen ersten Wellensitz (15) umfasst, wobei zwei Seiten des ersten Rahmenkörpers (111) jeweils mit einer Windeintrittsseite ausgebildet sind (1111) und einer Verbindungsseite (1113), wobei der erste Wellensitz (15) in der Mitte der Windeintrittsseite (1111) angeordnet ist und ein erster statischer Flügel (16) zwischen dem ersten Wellensitz (15) und dem Innenumfang des ersten Rahmenkörpers (111) angeordnet ist, wobei das erste dynamische Flügelrad (13) drehbar auf dem ersten Wellensitz (15) angeordnet ist, wobei das erste dynamische Flügelrad (13) mehrere erste dynamische Flügel (131) aufweist, einen zweiten Lüfter (21), der einen zweiten Rahmenkörper (211), ein zweites dynamisches Flügelrad (23) und einen zweiten Wellensitz (25) umfasst, wobei zwei Seiten des zweiten Rahmenkörpers (211) jeweils mit einer Windaustrittsseite (2111) und einer Verbindungsseite (2113) ausgebildet sind, wobei die Verbindungsseite (2113) mit der Verbindungsseite (1113) in Verbindung steht und der zweite Wellensitz (25) in der Mitte der Windaustrittsseite (2111) angeordnet ist, wobei ein zweiter statischer Flügel (26) zwischen dem zweiten Wellensitz (25) und dem Innenumfang des zweiten Rahmenkörpers angeordnet ist, das zweite dynamische Flügelrad (23) drehbar auf dem zweiten Wellensitz (25) angeordnet ist, das zweite dynamische Flügelrad (23) mit mehreren zweiten dynamischen Flügeln (231) ausgebildet ist, **dadurch gekennzeichnet, dass** jeder erste dynamische Flügel (131) mindestens einen Verbindungsabschnitt (1311) aufweist, und jeder zweite dynamische Flügel (231) mindestens einen verbundenen Abschnitt (2311) aufweist, wobei der verbundene Abschnitt (2311) des zweiten dynamischen Flügels (231) mit dem Verbindungsabschnitt (1311) des ersten dynamischen Flügels (131) verbunden ist, um einen Antriebsflügel (31) einstückig auszubilden, wobei der erste Lüfter (11) kopfüber auf

dem zweiten Lüfter (21) platziert und somit seriell umgekehrt mit dem zweiten Lüfter (21) verbunden ist.

- 5 2. Reihenlüfter (1) nach Anspruch 1, wobei die Verbindungsseite eine erste Öffnung (1114) aufweist, das erste dynamische Flügelrad eine erste Nabe (132) und eine erste Welle (133) aufweist, ein Ende der ersten Welle fest in der Mitte der ersten Nabe (132) angeordnet ist, das andere Ende der ersten Welle ist im ersten Wellensitz drehbar angeordnet, die mehreren ersten dynamischen Flügel sind jeweils radial entlang eines Außenumfangs der ersten Nabe angeordnet, wobei jeder erste dynamische Flügel mit einer Flügelvorderkante (1313) und einer Flügelhinterkante (1314) ausgebildet ist, wobei der Verbindungsabschnitt an der Flügelvorderkante (1313) angeordnet ist, die Flügelvorderkante (1313) vorsteht, darin versenkt ist oder bündig mit der ersten Öffnung (1114) ausgebildet ist, wobei die Flügelhinterkante (1314) an der Windeintrittsseite (1111) positioniert ist.
- 10
- 15
- 20
- 25 3. Reihenlüfter (1) nach Anspruch 2, wobei die Verbindungsseite eine zweite Öffnung (2114) aufweist, die mit der ersten Öffnung (1114) in Verbindung steht, wobei das zweite dynamische Flügelrad eine zweite Nabe und eine zweite Welle aufweist wobei das Ende der zweiten Welle fest in der Mitte der zweiten Nabe (232) angeordnet ist, das andere Ende der zweiten Welle drehbar im zweiten Wellensitz angeordnet ist und die mehreren zweiten dynamischen Flügel radial entlang eines Außenumfangs der zweiten Nabe (232) angeordnet sind, wobei jeder zweite dynamische Flügel eine Flügelvorderkante (2313) und eine Flügelhinterkante (2314) aufweist, wobei der verbundene Abschnitt an der Flügelvorderkante (2313) des zweiten dynamischen Flügels angeordnet ist, wobei die Flügelvorderkante (2313) von dem zweiten dynamischen Flügel aus der zweiten Öffnung (2114) in die erste Öffnung (1114) hineinragt, bündig mit der zweiten Öffnung (2114) abschließt oder in die zweite Öffnung (2114) versenkt ist, wobei die Flügelhinterkante (2314) von der zweiten dynamische Flügel an der Windaustrittsseite positioniert ist.
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- 50 4. Reihenlüfter (1) nach Anspruch 1, wobei jeder erste dynamische Flügel eine erste obere Oberfläche (1315) und eine erste untere Oberfläche (1316) aufweist und jeder zweite dynamische Flügel eine zweite obere Oberfläche (2315) und eine zweite untere Fläche (2316) aufweist, wobei die erste obere Fläche (1315) mit der zweiten oberen Fläche (2315) verbunden ist, um eine durchgehende obere Fläche zu bilden, und die erste untere Fläche (1316) mit der zweiten unteren Fläche (2316) verbunden ist, um eine durchgehende untere Oberfläche zu bilden.
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5. Reihenlüfter (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Verbindungsabschnitt und der verbundene Abschnitt aus einer Gruppe umfassend aus erhabener Struktur und vertiefter Struktur in Anpassung an die erhabene Struktur, die vertiefte Struktur und erhabene Struktur in Anpassung an die vertiefte Struktur, Schraubstrukturen, Einlegestrukturen und Klebestrukturen ausgewählt sind. 5
6. Reihenlüfter (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Verbindungsabschnitt und verbundener Abschnitt werden durch Schweißen miteinander verbunden sind. 10
7. Reihenlüfter (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verbindungsseite von dem ersten Rahmenkörper mit der Gegenseite des zweiten Rahmenkörpers durch Einrasten, Verriegeln, Einsetzen, Kleben, eine Gleitschiene oder Einrasten verbunden ist. 15 20
8. Der Reihenlüfter (1) nach Anspruch 1, wobei die Verbindungsseite eine erste Öffnung aufweist, wobei zwischen der Windeintrittsseite (1111) und der ersten Öffnung ein erster Strömungsweg definiert ist, wobei der erste Strömungsweg mit der Windeintrittsseite (1111) und die erste Öffnung in Verbindung steht. 25
9. Reihenlüfter (1) nach Anspruch 8, wobei die Verbindungsseite eine zweite Öffnung (2114) aufweist, die mit der ersten Öffnung in Verbindung steht, wobei zwischen der Windaustrittsseite und der zweiten Öffnung (2114) ein zweiter Strömungsweg definiert ist, wobei der zweite Strömungsweg mit der Windaustrittsseite und der zweiten Öffnung (2114) in Verbindung steht, der erste und der zweite Strömungsweg miteinander in Verbindung stehen, um zusammen einen Luftströmungsführungskanal zu bilden, wobei der Antriebsflügel (31) in dem Luftstromführungskanal positioniert ist. 30 35 40
10. Reihenlüfter (1) nach Anspruch 1, wobei das erste dynamische Schaufelrad und das zweite dynamische Schaufelrad einstückig mittels Spritzguss hergestellt sind. 45

Revendications

1. Un ventilateur en série (1) comprenant :

un premier ventilateur (11) comprenant un premier corps de cadre (111), une première roue à pales dynamique (13) et un premier siège d'arbre (15), deux côtés du premier corps de cadre (111) étant respectivement formés d'un côté d'entrée du vent (1111) et d'un côté de con-

nexion (1113), le premier siège d'arbre (15) étant disposé au centre du côté d'entrée du vent (1111), une première pale statique (16) est disposée entre le premier siège d'arbre (15) et la circonférence intérieure du premier corps de cadre (111), la première roue à pales dynamiques (13) est disposée de manière pivotante sur le premier siège d'arbre (15), la première roue à pales dynamiques (13) ayant plusieurs premières pales dynamiques (131), un deuxième ventilateur (21) comprenant un deuxième corps de cadre (211), une deuxième roue à pales dynamiques (23) et un deuxième siège d'arbre (25), deux côtés du deuxième corps de cadre étant (211) respectivement formés d'un côté de sortie du vent (2111) et d'un côté d'accouplement (2113), le côté d'accouplement (2113) étant accouplé avec le côté de connexion (1113) en communication avec lui, le deuxième siège d'arbre (25) étant disposé au centre du côté de sortie du vent (2111), une deuxième pale statique (26) étant disposée entre le deuxième siège d'arbre (25) et la circonférence intérieure du deuxième corps de cadre, la deuxième roue à pales dynamique (23) étant disposée de manière pivotante sur le deuxième siège d'arbre (25), la deuxième roue à pales dynamique (23) ayant plusieurs deuxièmes pales dynamiques (231), **caractérisée en ce que** chaque première pale dynamique (131) ayant au moins une section de connexion (1311); et chaque deuxième pale dynamique (231) ayant au moins une section connectée (2311), la section connectée (2311) de la deuxième pale dynamique (231) étant connectée à la section de connexion (1311) de la première pale dynamique (131) pour former intégralement une pale motrice (31), le premier ventilateur (11) étant placé à l'envers sur le deuxième ventilateur (21) et donc connecté en série inversée avec le deuxième ventilateur (21).

2. Le ventilateur en série (1) selon la revendication 1, dans lequel le côté de connexion a une première ouverture (1114), la première roue à pales dynamiques ayant un premier moyeu (132) et un premier arbre (133), une extrémité du premier arbre étant disposée de manière fixe au centre du premier moyeu (132), l'autre extrémité du premier arbre étant disposée de manière pivotante dans le premier siège de l'arbre, les multiples premières pales dynamiques sont disposées radialement le long d'une circonférence extérieure du premier moyeu, chaque première pale dynamique ayant un bord avant de pale (1313) et un bord arrière de pale (1314), la section de connexion étant disposée sur le bord avant de pale (1313), le bord avant de pale (1313) étant en saillie de la première ouverture, encastrée dans cel-

- le-ci ou au ras de celle-ci (1114), le bord arrière de pale (1314) étant positionné dans le côté d'entrée du vent (1111).
3. Le ventilateur en série (1) selon la revendication 2, dans lequel le côté d'accouplement a une deuxième ouverture (2114) en communication avec la première ouverture (1114), la deuxième roue à pales dynamiques ayant un deuxième moyeu et un deuxième arbre, une extrémité du deuxième arbre étant disposée de manière fixe au centre du deuxième moyeu (232), l'autre extrémité du deuxième arbre étant disposée de manière pivotante dans le deuxième siège d'arbre, les multiples pales dynamiques étant disposées radialement le long d'une circonférence extérieure du deuxième moyeu(232), chaque deuxième pale dynamique a un bord avant de pale (2313) et un bord arrière de pale (2314), la section connectée étant disposée sur le bord avant de pale (2313) de la deuxième pale dynamique, le bord avant de pale (2313) de la deuxième pale dynamique faisant saillie de la deuxième ouverture (2114) dans la première ouverture (1114), affleurant la deuxième ouverture (2114) ou encastré dans la deuxième ouverture (2114), le bord arrière de pale (2314) de la deuxième pale dynamique étant positionné du côté de sortie du vent.
 4. Le ventilateur en série (1) selon la revendication 1, dans lequel chaque première pale dynamique a une première surface supérieure (1315) et une première surface inférieure (1316) et chaque deuxième pale dynamique a une deuxième surface supérieure (2315) et une deuxième surface inférieure (2316), la première surface supérieure (1315) étant connectée à la deuxième surface supérieure (2315) pour former une surface supérieure continue, la première surface inférieure (1316) étant connectée à la deuxième surface inférieure (2316) pour former une surface inférieure continue.
 5. Le ventilateur en série (1) selon la revendication 1, où la section de connexion et la section connectée sont choisies dans un groupe constitué d'une structure surélevée et d'une structure en creux en adaptation à la structure surélevée, d'une structure en creux et d'une structure surélevée en adaptation à la structure en creux, de structures à vis, de structures d'insertion et de structures d'adhérence.
 6. Le ventilateur en série (1) selon la revendication 1, où la section de connexion et la section connectée sont connectées l'une à l'autre par soudage.
 7. Le ventilateur en série (1) selon la revendication 1, où le côté de connexion du premier corps de cadre est accouplé avec le côté d'accouplement du deuxième corps de cadre par engagement, verrouillage, insertion, adhésion, glissière ou enclenchement.
 8. Le ventilateur en série (1) selon la revendication 1, dans lequel le côté de connexion a une première ouverture, une première voie d'écoulement étant définie entre le côté d'entrée du vent (1111) et la première ouverture, la première voie d'écoulement étant en communication avec le côté d'entrée du vent (1111) et la première ouverture.
 9. Le ventilateur en série (1) selon la revendication 8, dans lequel le côté d'accouplement présente une deuxième ouverture (2114) en communication avec la première ouverture, une deuxième voie d'écoulement étant définie entre le côté de sortie du vent et la deuxième ouverture (2114), la deuxième voie d'écoulement étant en communication avec le côté de sortie du vent et la deuxième ouverture (2114), la première et la deuxième voies d'écoulement étant en communication l'une avec l'autre pour former ensemble un passage de guidage du flux d'air, la pale d'entraînement (31) étant positionnée dans le passage de guidage du flux d'air.
 10. Le ventilateur en série (1) selon la revendication 1, dans lequel la première roue à aubes dynamique et la deuxième roue à aubes dynamique sont formées intégralement au moyen d'un moulage par injection.

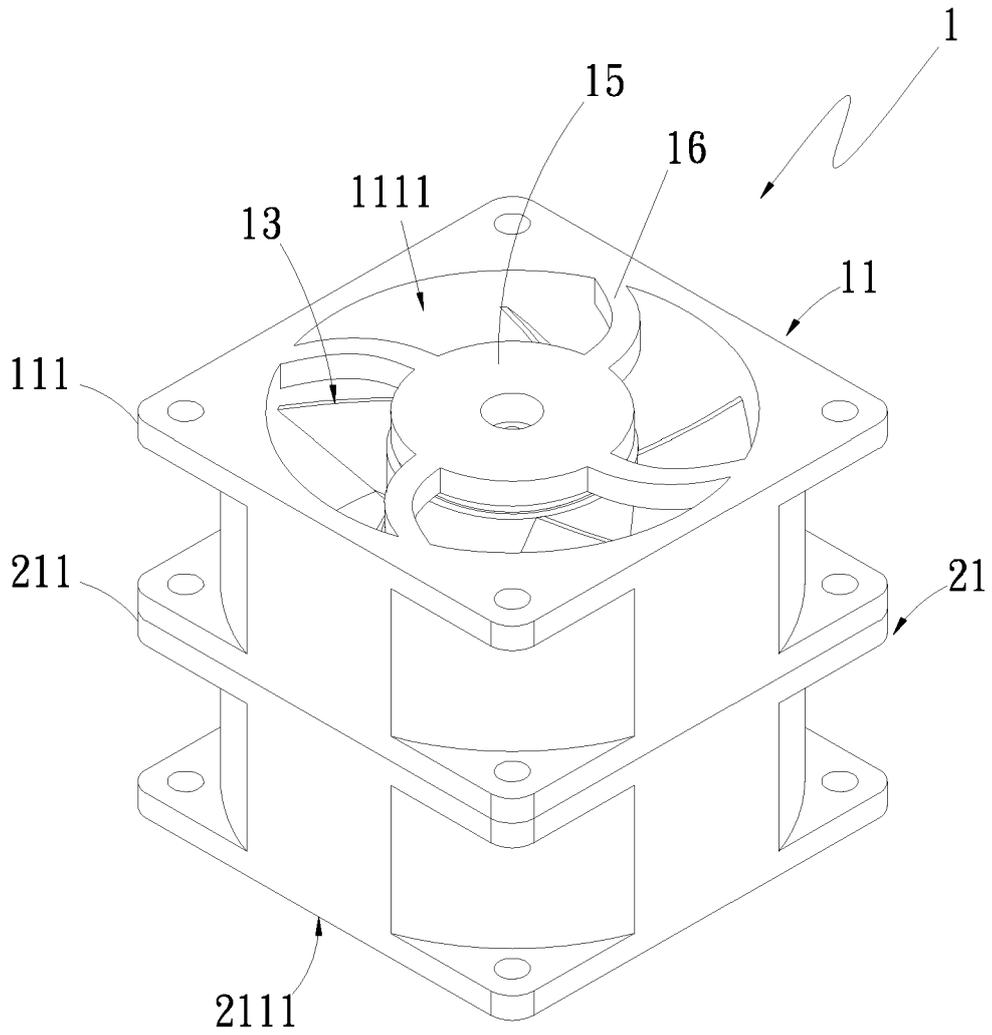


Fig. 2A

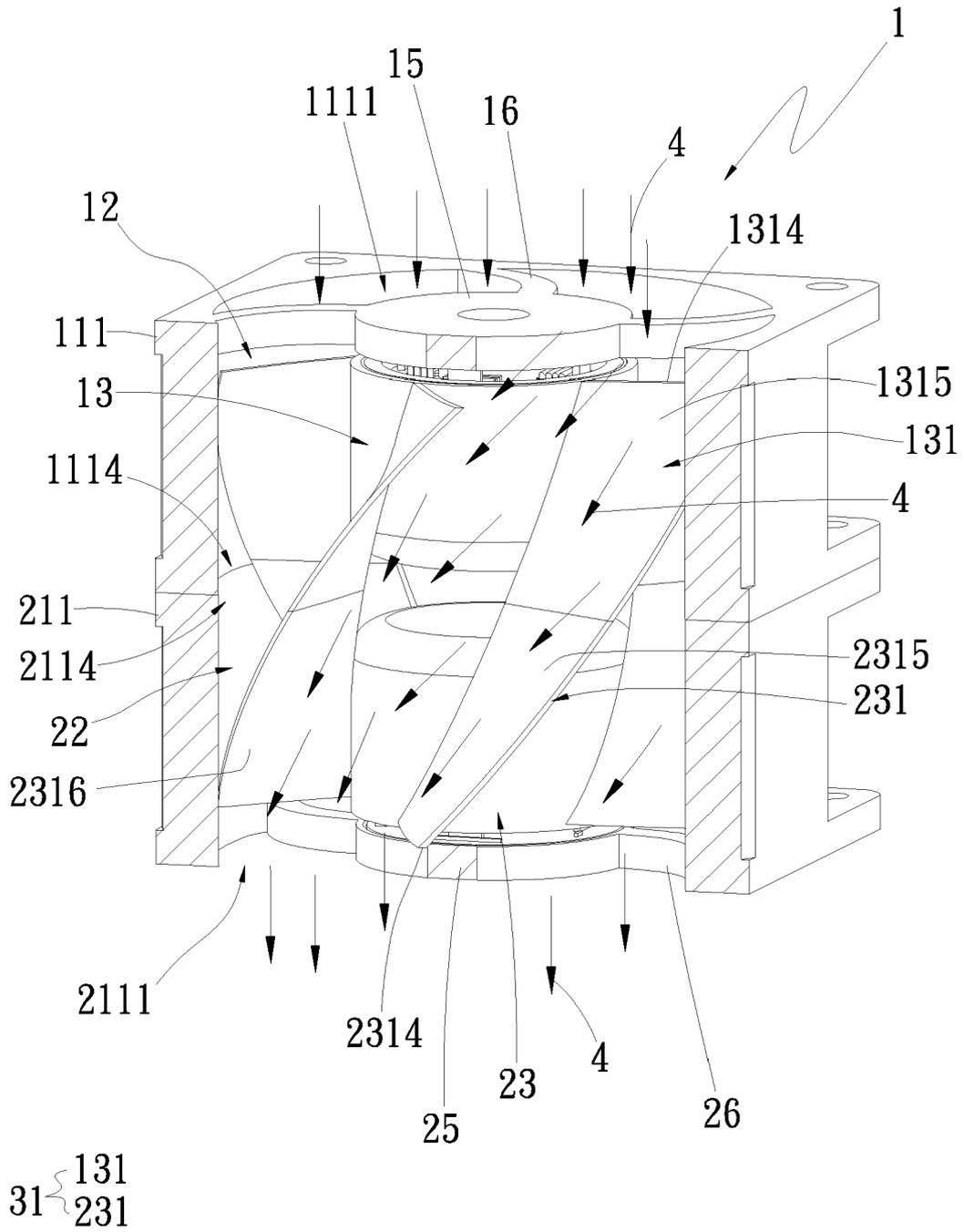


Fig. 2B

REFERENCES CITED IN THE DESCRIPTION

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