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(54) **OBLIQUE FLOW BOOSTER FAN**

(57) An oblique flow booster fan includes an impeller having an impeller body and a plurality of blades, each blade spirally extended from top to bottom, two ends of each blade provided an upper edge and a lower edge respectively, and the upper edge having a width larger than the lower edge; an air guide assembly including an outer ring, an inner cylinder spaced apart in the outer ring, and air guide vanes evenly connected between the outer ring and the inner cylinder; a motor installed in the inner cylinder and having a rotating shaft connected to the impeller body; and a pressurization volute casing arranged outside the impeller and connected to the outer ring, one end of the pressurization volute casing provided with an air inlet, and another end of the outer ring provided with an air outlet. The fan is high wind pressure and low noise.

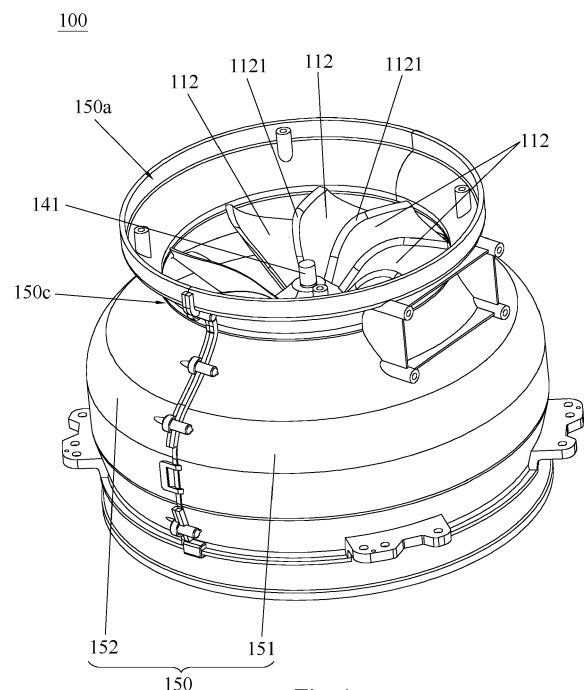


Fig.1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of fans, and more particularly to an oblique flow booster fan suitable for air purifiers.

BACKGROUND OF THE INVENTION

[0002] Air purifiers, also known as air cleaners, air cleaners, or air purifiers, refer to the ability to absorb, decompose or transform various air pollutants such as particulate matters in the air, including allergens, indoor PM2.5, etc, so as to improve air cleanliness. Furthermore, air purifiers can also solve the air pollution problem of volatile organic compounds in indoors, underground spaces, and cars caused by decoration or other reasons.

[0003] The power source of the air purifier is the fan, and the operation status of the fan directly affects the performance of the air purifier. The higher the purification effect required by the air purifier, the greater the drag coefficient of the filter screen, and the greater the wind pressure required for the wind turbine fan. It is difficult for traditional centrifugal wind wheels or axial flow wind wheels to meet this high wind pressure requirement, or much noise will be generated if the fan operates at a sufficient wind pressure, which is undesirable.

[0004] Therefore, it is necessary to provide a new type of fan with high wind pressure and low noise to solve the above-mentioned problems in the prior art.

SUMMARY OF THE INVENTION

[0005] One objective of the present invention is to provide an oblique flow booster fan with high wind pressure and low noise.

[0006] To achieve the mentioned above objective, the present invention provides an oblique flow booster fan including: an impeller, comprising an impeller body and a plurality of blades connected to the impeller body, each of the blades spirally extended from a top of the impeller body to a bottom of the impeller body, two ends of each of the blades being provided an upper edge and a lower edge respectively, and the upper edge having a width larger than the lower edge; an air guide assembly, comprising an outer ring, an inner cylinder spaced apart in the outer ring, and a plurality of air guide vanes evenly connected between the outer ring and the inner cylinder; a motor, installed in the inner cylinder and having a rotating shaft connected to the impeller body; and a pressurization volute casing, arranged outside the impeller and connected to the outer ring, one end of the pressurization volute casing being provided with an air inlet, and another end of the outer ring being provided with an air outlet.

[0007] Preferably, the impeller body is upward extended to form the upper edge that is spiral.

[0008] Preferably, the impeller has an odd number of the blades.

[0009] Preferably, the fan further includes a connecting base fixed at a top of the inner cylinder, the rotating shaft of the motor is protruded from the connecting base and connected to the impeller body.

[0010] Preferably, a holder is provided inside the inner cylinder for installing the motor.

[0011] Preferably, the inner cylinder is a frustum shape, and an outer diameter of a top of the inner cylinder is larger than that of a bottom of the inner cylinder, the inner cylinder is higher than the outer ring in an axial direction of the rotating shaft, and each of the air guide vanes are higher than the outer ring in the axial direction of the rotating shaft.

[0012] Preferably, each of the air guide vanes has a top side and a bottom side oppositely arranged, the top side is connected to the top of the inner cylinder and located above the outer ring, the bottom side is respectively connected to the inner cylinder and the outer ring, and the top side and the bottom side are bent toward each other in an axial direction of the rotating shaft to make each of the air guide vanes have an arc structure.

[0013] Preferably, the pressurization volute casing has a neck that is recessed inward, and an inner wall of the neck is spaced from the blades.

[0014] Preferably, the outer ring and the bottom edge of the pressurization volute casing are provided with protrusions and grooves matching with each other, and the protrusions are protruded along a radial direction of the outer ring.

[0015] Preferably, the pressurization volute casing includes a first casing and a second casing that are matched with each other, a first fixing part, a second fixing part, an engaging buckle, and a matching block are provided between the first and the second casings, the engaging buckle and the matching block are detachably engaged with each other, the first fixing part and the second fixing part are detachably connected together by a connector.

[0016] In comparison with the prior art, the blades of the impeller in the present invention are spirally extended from the top of the impeller body to the bottom, and the air guide assembly including an outer ring, an inner cylinder spaced apart in the outer ring, and a plurality of air guide vanes evenly connected therebetween are configured below the impeller. In such a specific configuration, the wind pressure is increased by using oblique flow pressurization principle, and the wind pressure is further increased due to the guidance of the air guide assembly. In addition, the two ends of each blade are respectively provided with an upper edge and a lower edge, and the width of the upper edge is greater than the width of the lower edge, thereby reducing the co-frequency resonance and the tail turbulence of the lower edge, thereby controlling the noise. Therefore, the oblique flow booster fan 100 of the present invention has the characteristics of high wind pressure and low noise, when it is applied

to an air purifier, the clean air volume (CADR value) of the air purifier is increased accordingly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings facilitate an understanding of the various embodiments of this invention. In such drawings:

Fig. 1 is a perspective view of an oblique flow booster fan according to an embodiment of the present invention;

Fig. 2 is another perspective view of the oblique flow booster fan of Fig. 1;

Fig. 3 is a partial perspective view of the oblique flow booster fan of Fig. 1, with the first casing is removed;

Fig. 4 is a sectional view of the oblique flow booster fan of Fig. 1;

Fig. 5 is a perspective view of a blade of oblique flow booster fan of Fig. 3;

Fig. 6 is a plan view of Fig. 5;

Fig. 7 is a front view of Fig. 5;

Fig. 8 is an exploded view of a air guide assembly, a motor and a connecting base in Fig. 3;

Fig. 9 is another perspective view of the air guide assembly in Fig. 8; and

Fig. 10 is exploded view of a pressurization volute casing of the oblique flow booster fan in Fig. 1.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0018] The present invention will be described in detail below with reference to the accompanying drawings and preferred embodiments. The oblique flow booster fan 100 provided by the present invention is mainly suitable for air purifiers, or other equipments, which is not limited here.

[0019] As illustrated in Figs. 1-4, the oblique flow booster fan 100 of the present invention includes in impeller 110, a air guide assembly 120, a connecting base 130, a motor 140 and a pressurization volute casing 150. The connecting base 130 is installed on the air guide assembly 120, the impeller 110 is installed on the connecting base 130, and the motor 140 is installed between the air guide assembly 120 and the connecting base 130. Specifically, a rotating shaft of the motor 140 is protruded from the connecting base 130 and connected to the impeller 110, for driving the rotation of the impeller 110. The pressurization volute casing 150 is covered outside the impeller 110 and connected with the air guide assembly 120, and the pressurization volute casing 150 has a first end near to the impeller 110 provided with an air inlet 150a, and a second end far away from the impeller 110 provided with an air outlet 150b.

[0020] Referring to Figs. 3-7, the impeller 110 includes an impeller body 111 and a plurality of blades 112 connected to the impeller body 111, each of the blades 112

is spirally extended from a top of the impeller body 111 to a bottom of the impeller body 111, and a flow channel 113 is formed between two adjacent blades 112. Further, a top end of each blade 112 is provided an upper edge 1121, and a bottom end of each blade 112 is provided a lower edge 1122.

[0021] Referring to Figs. 5-7, the distance from the connection starting point of the upper edge 1121 and the impeller body 111 to the end point away from the impeller body 111 is the width of the upper edge 1121. Correspondingly, the distance from the connection starting point of the lower edge 1122 and the impeller body 111 to the end point away from the impeller body 111 is the width of the lower edge 1122, and the width of the upper edge 1121 is greater than the width of the lower edge 1122, thereby reducing co-frequency resonance and reducing the tail turbulence of the lower edge 1122, thereby controlling and reducing noise.

[0022] Preferably, the impeller 111 has an odd number of the blades 112. As a preferred embodiment, nine blades 112 are configured. Combined with the principle of oblique flow pressurization, the wind pressure can be effectively increased. Of course, the number of the blades 112 can be changed according to actual demands.

[0023] Referring to Figs. 4, 8-9, the air guide assembly 120 includes an outer ring 121, an inner cylinder 122 spaced apart in the outer ring 121, and a plurality of air guide vanes 123. Specifically, the outer ring 121 is circular, the inner cylinder 122 is frustum-shaped, and the outer diameter of the top of the inner cylinder 122 is greater than the outer diameter of the bottom of the inner cylinder 122. That is, the outer diameter of the inner cylinder 122 gradually decreases from top to bottom, and such a configuration is conducive to guiding and pressurizing the air flow. Meanwhile, the inner cylinder 122 is higher than the outer ring 121 in the axial direction of the rotating shaft 141 of the motor 140, and the air guide vanes 123 are evenly connected between the outer ring 121 and the inner cylinder 122. That is, the air guide vanes 123 are evenly arranged along the radial direction of the outer ring 121, and respectively connected to the upper section of the inner cylinder 122 and the top of the outer ring 121. In other words, in the axial direction of the rotating shaft 141, most of the air guide vanes 123 are located above the outer ring 121 (see Fig. 8), and the passage formed between two adjacent air guide vanes 123 is conducive to pressurizing the airflow. As a result, the wind pressure of the oblique flow booster fan 100 is increased.

[0024] Referring to Figs. 8-9, each air guide vane 123 has a top side 1231 and a bottom side 1232 oppositely arranged, the top side 1231 is connected to the top of the inner cylinder 122 and located above the outer ring 121, the bottom side 1232 is connected to the tops of the inner cylinder 122 and the outer ring 121 respectively, and the top side 1231 and the bottom side 1232 are bent toward each other in an axial direction of the rotating shaft 141 to make each air guide vane 123 have an arc

structure. That is, the top side 1231 and the bottom side 1232 deviate from the vertical direction and bend toward each other.

[0025] Referring again to Figs. 3-4 and 8, the outer diameter of the top of the inner cylinder 122 corresponds to the outer diameter of the connecting base 130, and the inner cylinder 122 is provided with a holder 1221 for mounting on the motor 140 and a protruding post 1222 for connecting with the connecting base 130. The connecting base 130 is provided with a fixing hole 131 at a position corresponding to the protruding post 1222, and a through hole 132 is also opened in the middle of the connecting base 130. During installation, the motor 140 is installed in the holder 1221, and the rotating shaft 141 of the motor 140 is extended above the connecting base 130 through the through hole 132 on the connecting base 130 to connect to the impeller body 111, and then the connecting base 130 is clamped on the top of the inner cylinder 122, and the fixing hole 131 on the connecting base 130 is screwed to the protruding post 1222, thereby realizing the fixing between the connecting base 130 and the inner cylinder 122.

[0026] Referring to Figs. 1 to 4 and 10 again, the pressurization volute casing 150 is arranged outside the impeller 110 and connected with the outer ring 121, and the end of the pressurization volute casing 150 adjacent to the impeller 110 is provided an air inlet 150a, the other end of the pressurization volute casing 150 is provided with an air outlet 150b. In addition, the pressurization volute casing 150 has a neck 150c that is recessed inward and located at a position adjacent to the air inlet 150a, and there is a certain gap between the inner wall of the neck 150c and the blades 112.

[0027] More specifically, the pressurization volute casing 150 includes a first casing 151 and a second casing 152 that are matched with each other. The first casing 151 is provided with first fixing parts 1511 and engaging buckles 1512, and the second casing 152 is provided with second fixing parts 1521 that match with the first fixing parts 1511 and matching blocks 1522 that match with the engaging buckles 1512. After the first casing 151 is connected to the second casing 152, the engaging buckles 1512 and the matching blocks 1522 can be detachably engaged with each other, and the first fixing parts 1511 and the second fixing parts 1521 can be detachably connected together by a connector (such as a bolt).

[0028] As shown in Figs. 9-10 again, the edge of the outer ring 121 has a protrusion 1211 protruded in the radial direction (see Fig. 9), and the first casing 151 or the second casing 152 is correspondingly provided with a clamping block. In this embodiment, a clamping block 1513 is protruded from the bottom of the first casing 151, and the clamping block 1513 is provided with a groove (not shown) corresponding to the protrusion 1211. In such a configuration, the first casing 151 is engaged with the outer ring 121 by the engagement between the protrusion 1211 and the clamping block 1513. Of course,

the engagement parts also can be configured between the second casing 152 and the outer ring 121.

[0029] As shown in Figs. 1-10 again, when the oblique flow booster fan 100 of the present invention works, the motor 140 drives the impeller 110 to rotate, so that the airflow enters the pressurization volute casing 150 from the air inlet 150a, and flow in the flow channel 113 along the arrow in Fig. 4. In such a way, the wind pressure can be effectively increased due to the oblique flow pressurization principle and the guidance of the air guide assembly 120. At the same time, since the widths of the upper edges 1121 of the blades 112 are greater than the widths of the lower edge 1122 thereof, therefore the co-frequency resonance can be reduced, and the tail turbulence of the lower edge 1122 can be reduced as well, thereby controlling and reducing the noise.

[0030] In conclusion, the blades 112 of the impeller 110 in the present invention are spirally extended from the top of the impeller body to the bottom, and the air guide assembly 120 including an outer ring 121, an inner cylinder 122 spaced apart in the outer ring 121, and a plurality of air guide vanes 123 evenly connected therebetween are configured below the impeller 110. In such a specific configuration, the wind pressure is increased by using oblique flow pressurization principle, and the wind pressure is further increased due to the guidance of the air guide assembly 120. In addition, the two ends of each blade 112 are respectively provided with an upper edge 1121 and a lower edge 1122, and the width of the upper edge 1121 is greater than the width of the lower edge 1122, thereby reducing the co-frequency resonance and the tail turbulence of the lower edge 1122, thereby controlling the noise. Therefore, the oblique flow booster fan 100 of the present invention has the characteristics of high wind pressure and low noise, when it is applied to an air purifier, the clean air volume (CADR value) of the air purifier is increased accordingly.

[0031] It should be noted that, other structures of the air purifier involved in the present invention can be conventional designs well known to those of ordinary skill in the art, and thus no detailed description will be given here.

[0032] The foregoing description of the present invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching. Such modifications and variations that may be apparent to those skilled in the art are intended to be included within the scope of this invention as defined by the accompanying claims.

Claims

1. An oblique flow booster fan, comprising:

an impeller, comprising an impeller body and a plurality of blades connected to the impeller

- body, each of the blades spirally extended from a top of the impeller body to a bottom of the impeller body, two ends of each of the blades being provided an upper edge and a lower edge respectively, and the upper edge having a width larger than the lower edge;
 an air guide assembly, comprising an outer ring, an inner cylinder spaced apart in the outer ring, and a plurality of air guide vanes evenly connected between the outer ring and the inner cylinder;
 a motor, installed in the inner cylinder and having a rotating shaft connected to the impeller body; and
 a pressurization volute casing, arranged outside the impeller and connected to the outer ring, one end of the pressurization volute casing being provided with an air inlet, and another end of the outer ring being provided with an air outlet.
2. The oblique flow booster fan according to claim 1, wherein the impeller body is upward extended to form the upper edge that is spiral.
 3. The oblique flow booster fan according to claim 1, wherein the impeller has an odd number of the blades.
 4. The oblique flow booster fan according to claim 1, further comprising a connecting base fixed at a top of the inner cylinder, the rotating shaft of the motor is protruded from the connecting base and connected to the impeller body.
 5. The oblique flow booster fan according to claim 1, wherein a holder is provided inside the inner cylinder for installing the motor.
 6. The oblique flow booster fan according to claim 1, wherein the inner cylinder is a frustum shape, and an outer diameter of a top of the inner cylinder is larger than that of a bottom of the inner cylinder, the inner cylinder is higher than the outer ring in an axial direction of the rotating shaft, and each of the air guide vanes are higher than the outer ring in the axial direction of the rotating shaft.
 7. The oblique flow booster fan according to claim 1, wherein each of the air guide vanes has a top side and a bottom side oppositely arranged, the top side is connected to the top of the inner cylinder and located above the outer ring, the bottom side is respectively connected to the inner cylinder and the outer ring, and the top side and the bottom side are bent toward each other in an axial direction of the rotating shaft to make each of the air guide vanes have an arc structure.
 8. The oblique flow booster fan according to claim 1, wherein the pressurization volute casing has a neck that is recessed inward, and an inner wall of the neck is spaced from the blades.
 9. The oblique flow booster fan according to claim 1, wherein the outer ring and the bottom edge of the pressurization volute casing are provided with protrusions and grooves matching with each other, and the protrusions are protruded along a radial direction of the outer ring.
 10. The oblique flow booster fan according to claim 1, wherein the pressurization volute casing comprises a first casing and a second casing that are matched with each other, a first fixing part, a second fixing part, an engaging buckle, and a matching block are provided between the first and the second casings, the engaging buckle and the matching block are detachably engaged with each other, the first fixing part and the second fixing part are detachably connected together by a connector.

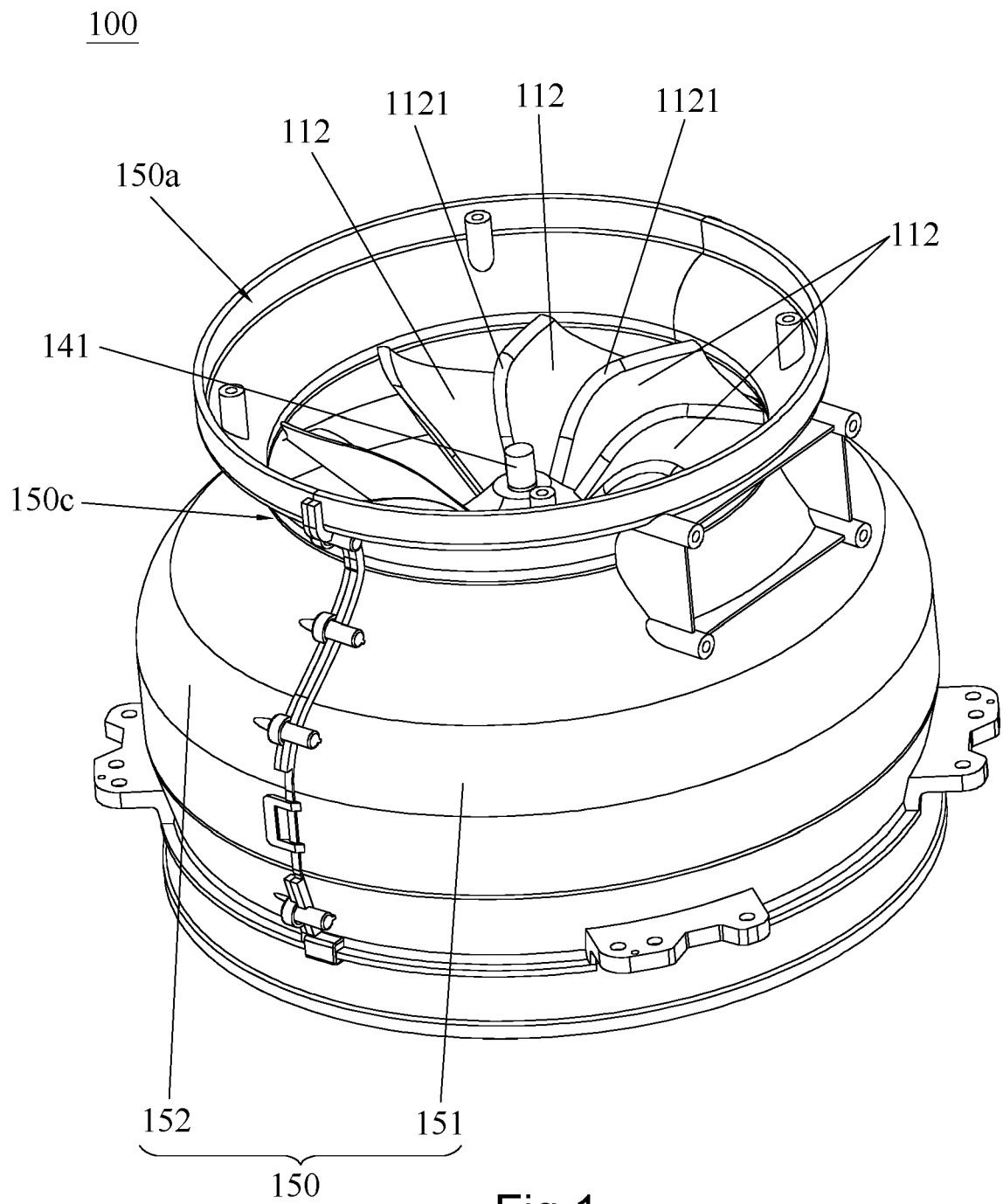


Fig.1

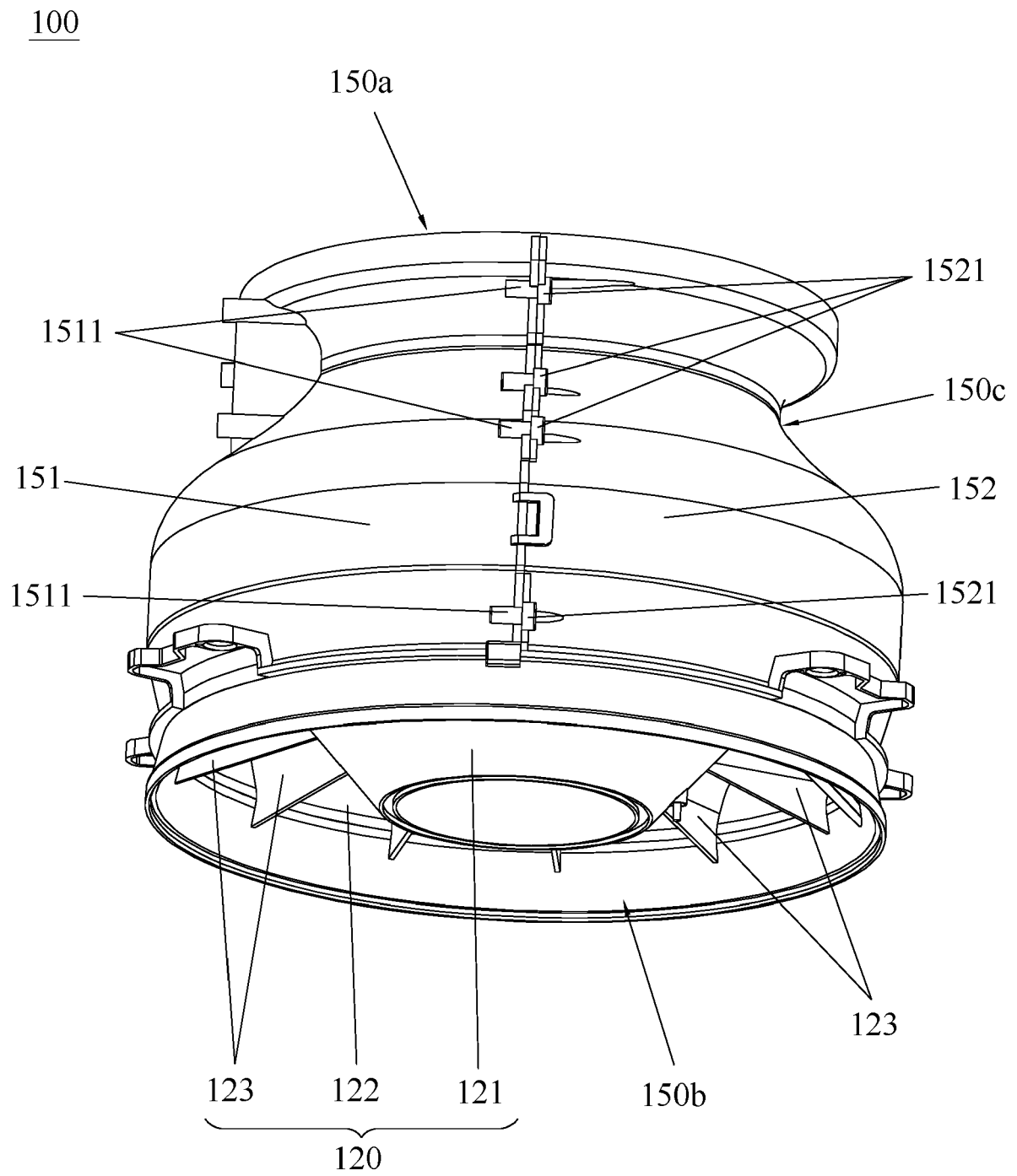


Fig.2

100

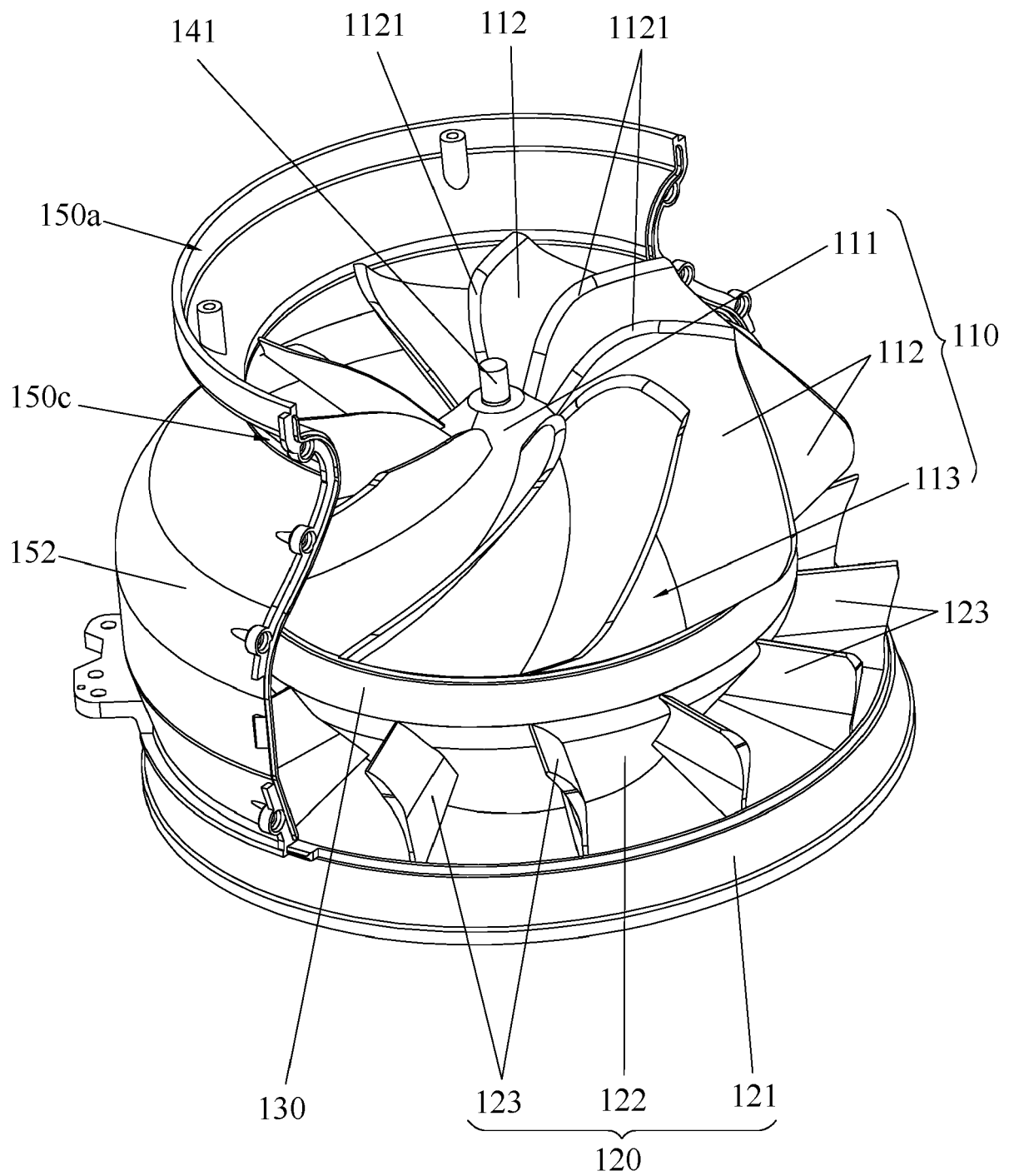


Fig.3

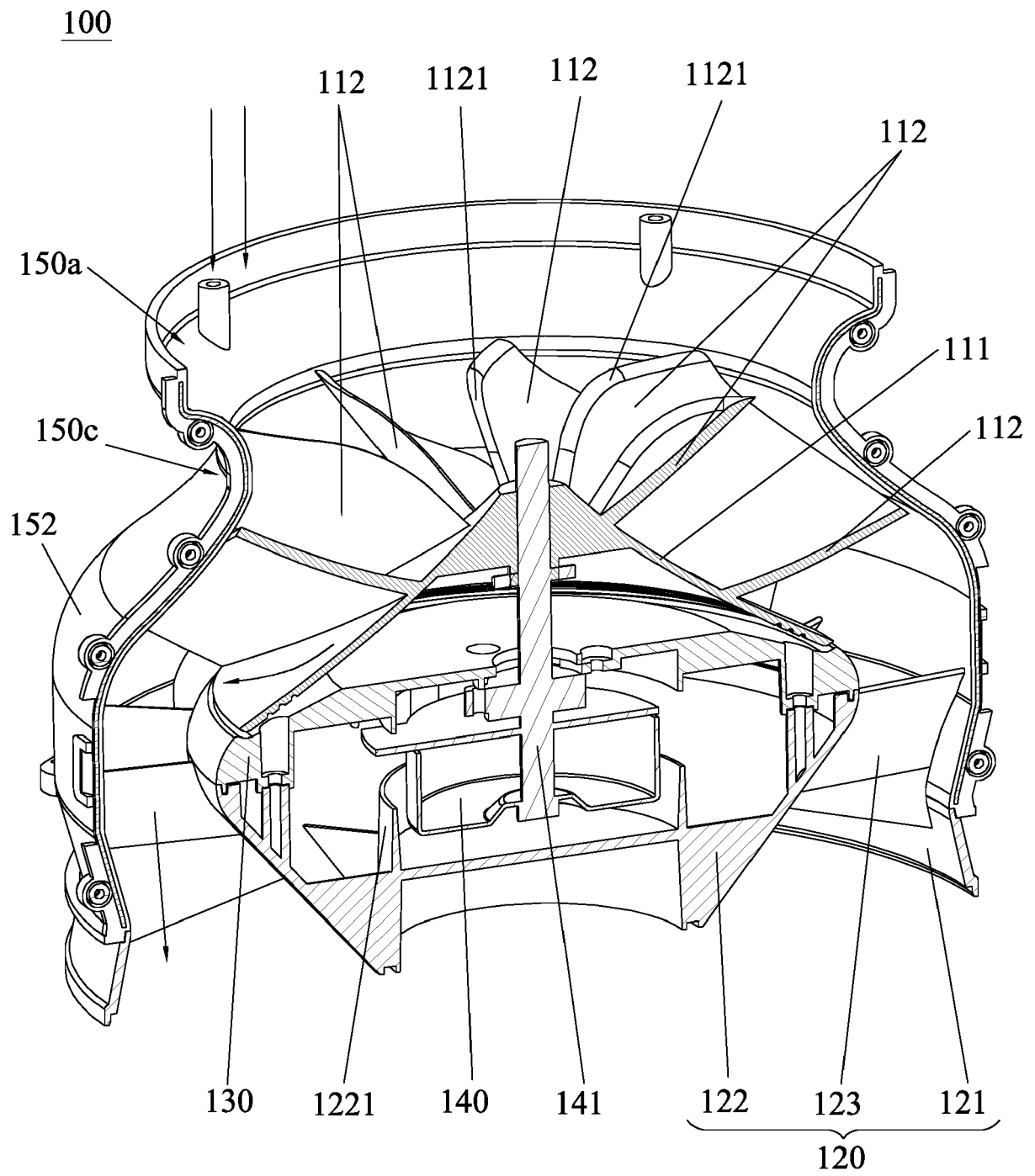


Fig.4

110

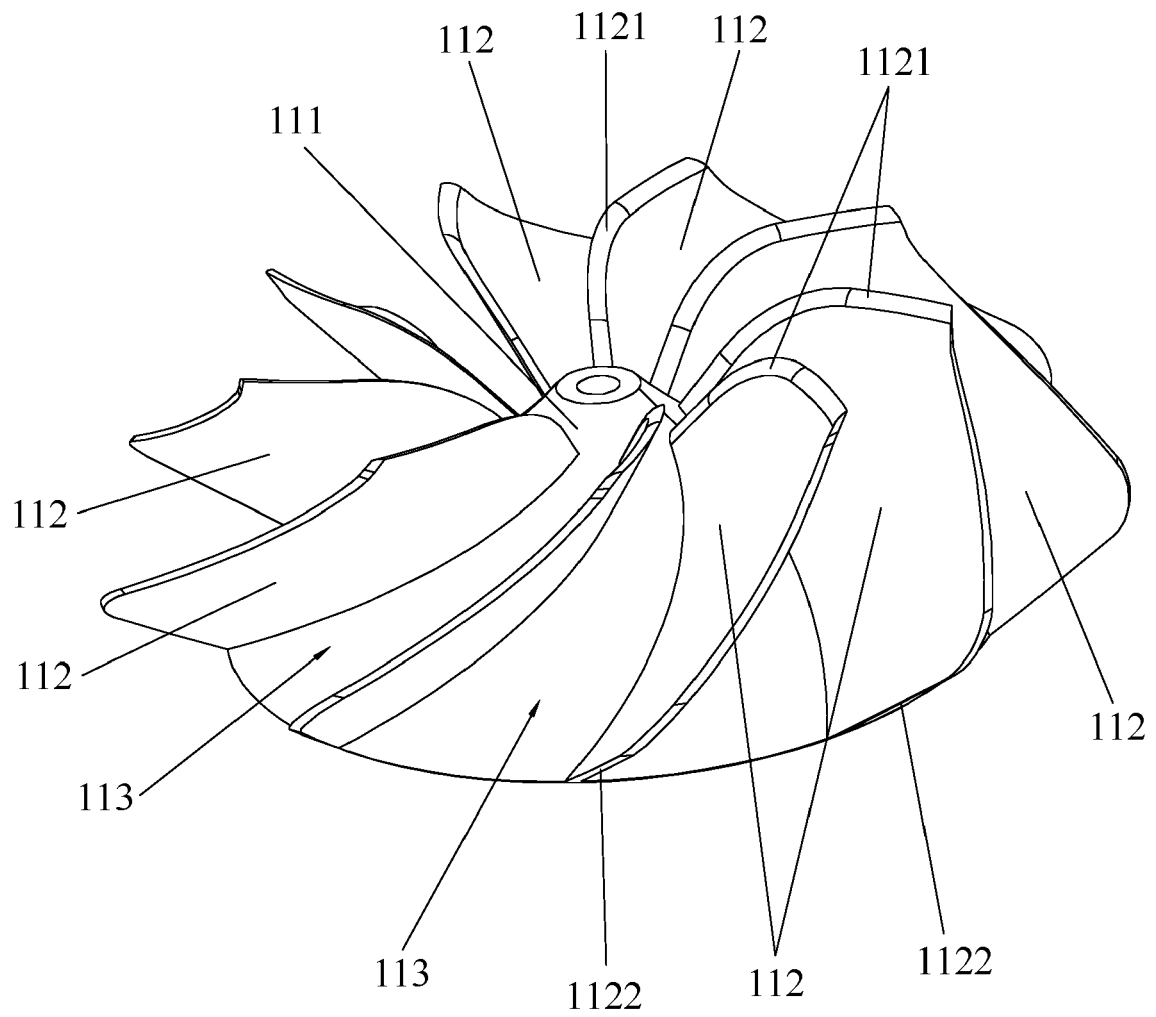


Fig.5

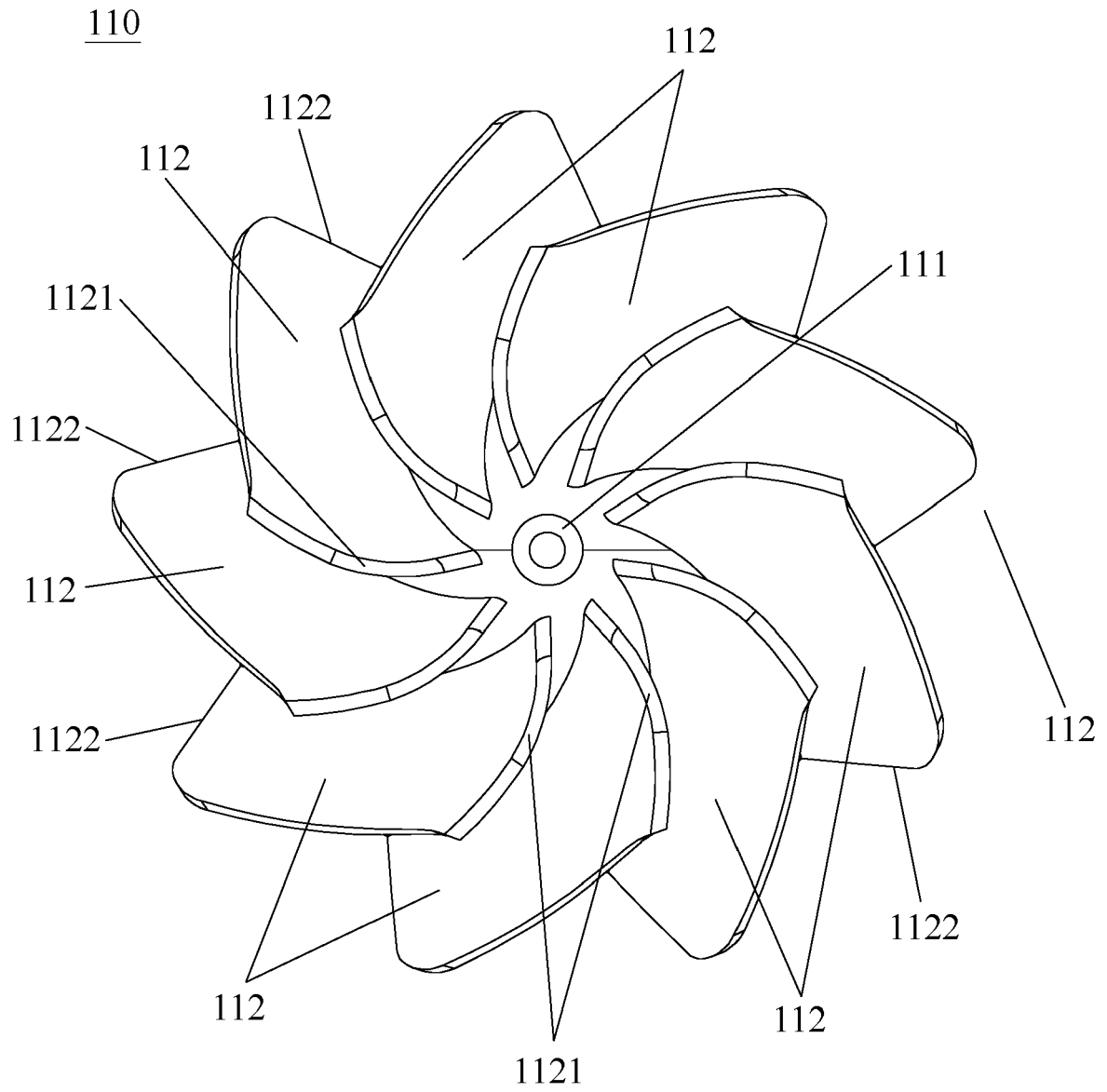


Fig.6

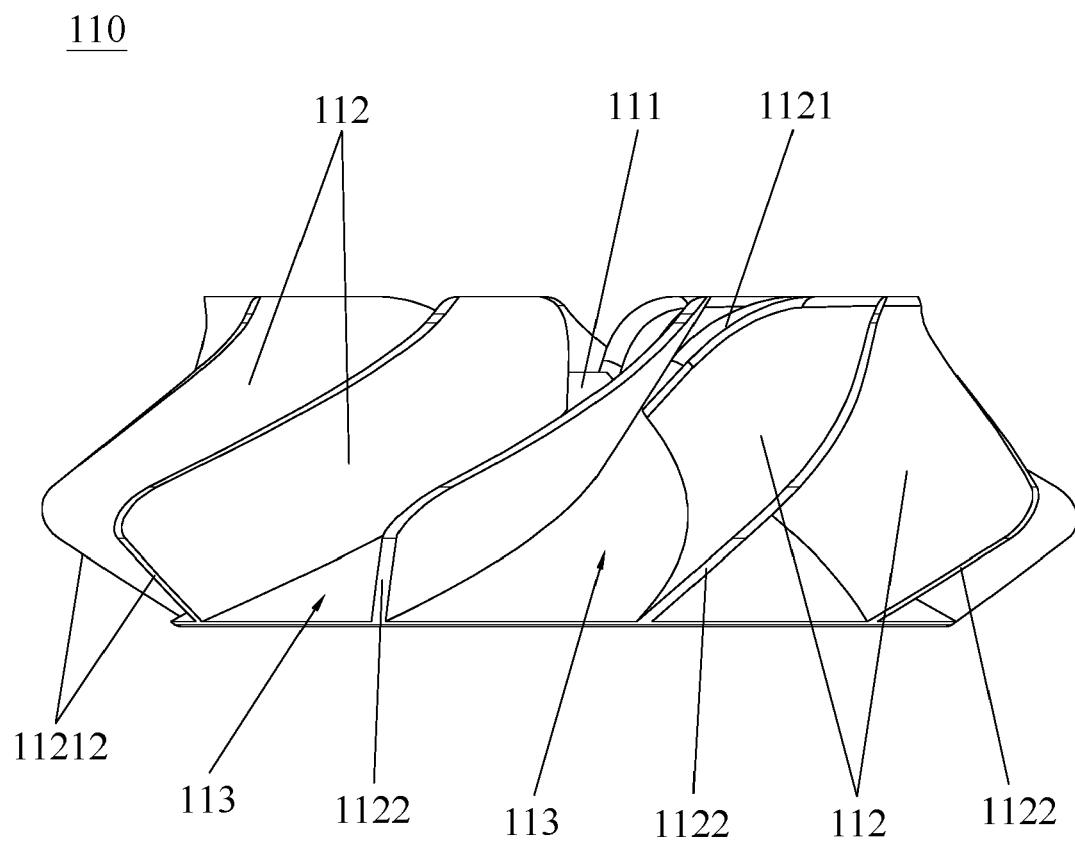


Fig.7

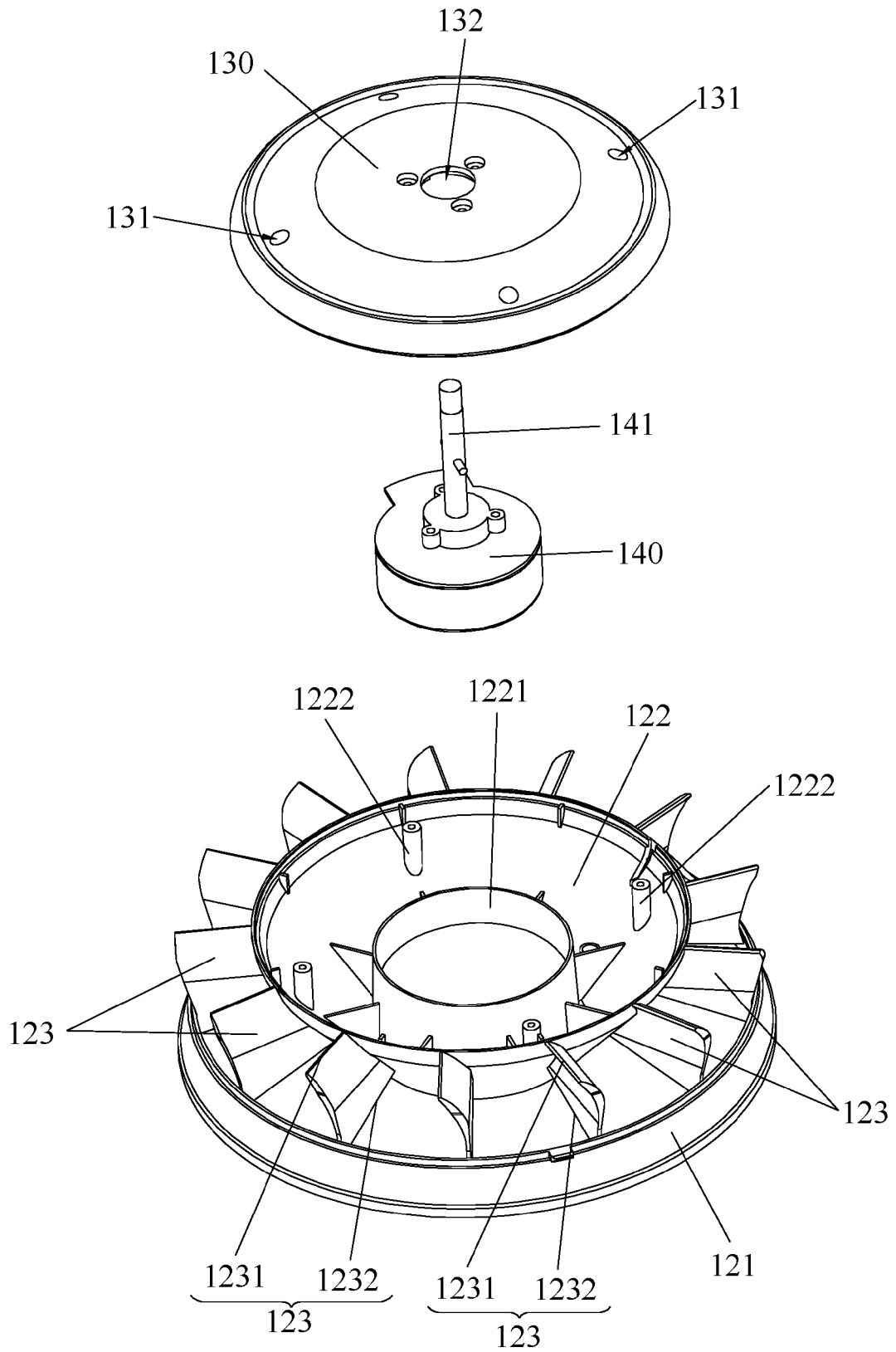


Fig.8

120

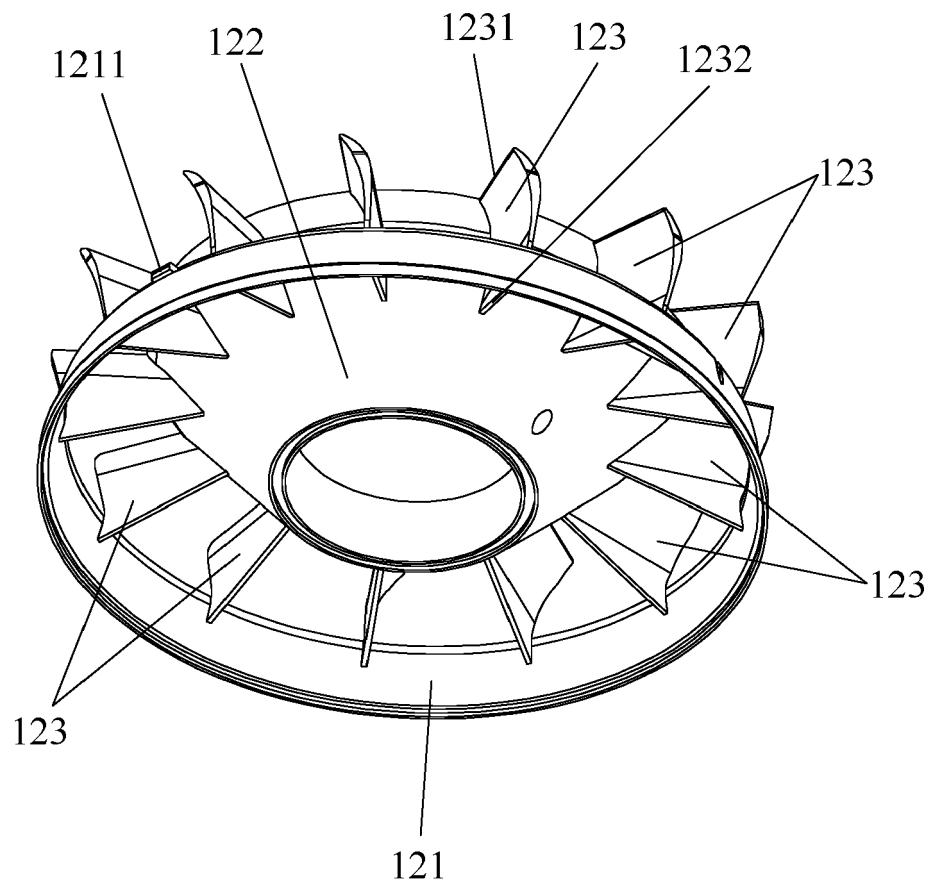


Fig.9

150

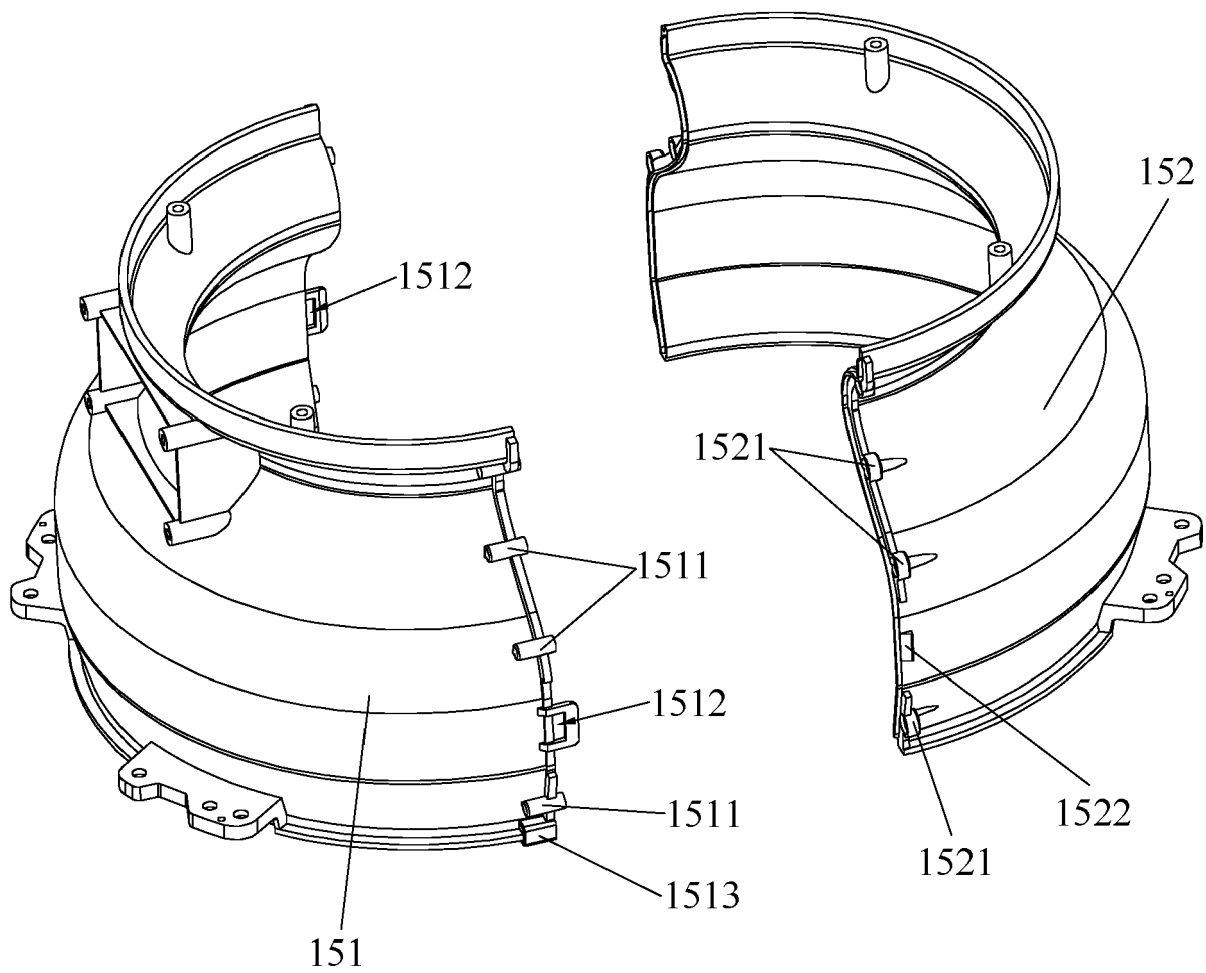


Fig.10



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Application Number
EP 21 16 1310

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 July 2021	Examiner Ingelbrecht, Peter
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