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# (54) BLOWER

(57) [CHINESE]

A blower includes an upper housing and a lower housing. An air flow space and an air outlet passage are formed inside and communicate with each other. A fan is mounted in the upper housing and the lower housing. A motor is mounted outside the lower housing. A driving shaft of the motor passes through the lower housing and is connected to the fan. The upper housing has an air inlet opening that corresponds to the air inlet hole on the top of the fan. The upper housing has a first annular rib with an arc-shaped surface at an edge of the air inlet opening. The upper housing has a second annular rib protruding on an inner bottom surface of the upper housing and adjacent to the air inlet opening. When an external fluid flows in the air inlet opening, the fluid can smoothly pass through the arc-shaped surface of the first annular rib. The fluid is then transported by the fan to the air flow space. A part of the fluid is blocked by the second annular rib, and thus forms a vertical downward airflow curtain, which significantly reduces noise generation and enhances the noise reduction effect.

[DESCRIPTION OF THE REFERENCE NUMBERS IN THE REPRESENTATIVE DRAWING]

10: upper housing
100: air flow space
11: air inlet opening
111: first annular rib
112: second annular rib
113: annular recess
12: upper annular flow passage
13: upper air outlet passage
20: lower housing
21: base
22: lower annular flow passage
23: lower air outlet passage
30: fan
31: blade
32: upper plate
320: air inlet hole
34: lower plate
40: motor
41: driving shaft

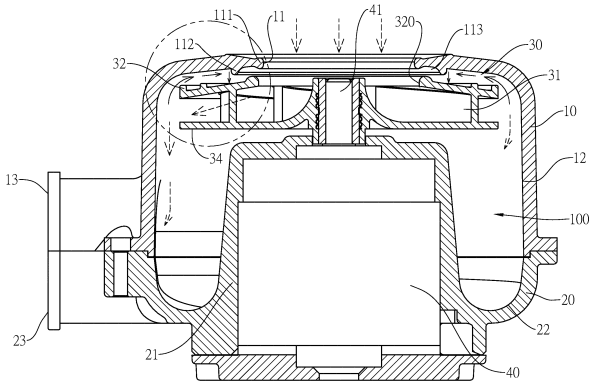


FIG.3

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## Description

[FIELD OF THE UTILITY MODEL]

**[0001]** The present utility model relates to an air delivery device, especially a blower with the noise reduction effect.

[DESCRIPTION OF THE PRIOR ARTS]

**[0002]** Blower is a device that uses the pressure difference to make the fluid flow for air delivery, as shown in Fig. 6. A conventional blower generally comprises a casing 50, which is composed of an upper part 51 and a lower part 52. The casing 50 forms an inner space 53 inside. The casing 50 has a cylindrical shape, and a center of the upper part 51 forms an air inlet opening 54 that communicates with the inner space 53. An air outlet tube 55 extends along the peripheral side of the casing 50 and communicates with the inner space 53 at the end of the air outlet tube 55. A motor 56 is mounted on the lower part 52 of the casing 50, and the driving shaft 561 of the motor 56 can output power and protrude into the inner space 53 of the casing. A fan 57 is installed inside the casing 50, and a rotation center of the fan 57 is fixedly connected to the driving shaft 561 and corresponds to the position of the air inlet opening 54 of the upper part 51 in location. When the fan 57 rotates, an external fluid enters the inner part through the air inlet opening 54, passes through a central upper part of the fan 57, and is pressurized and pushed out by the fan 57, and then flows through the peripheral surface of the fan 57 and output through the air outlet tube 55.

**[0003]** Since the upper part 51 of the blower casing is formed by a plate with approximately the same thickness or by other current metalworking techniques, the upper and lower surfaces of the upper part 51 adjacent to the air inlet opening 54 are flat. Because the air inlet opening 54 is formed through the upper part 51, when the external fluid enters rapidly through the air inlet opening 54, most of the fluid enters the inner part through the central upper part of the fan 57 and is pressurized and pushed out. However, a portion of the fluid passes through the gap between the upper part 51 of the casing and a top surface of the fan 57, which will cause annoying noise problems and disadvantages.

[CONTENT OF THE PRESENT UTILITY MODEL]

**[0004]** In view of the problems and shortcomings of the aforementioned prior art, the inventor has redesigned and improved the first annular rib and the second annular rib respectively protruding from the edge of the air inlet opening and the inner bottom surface of the upper housing, so that the fluid flows through the air inlet opening can be smoother to reduce noise and provide better noise reduction effect.

**[0005]** In order to achieve the above-mentioned purpose, the technical means used in the present utility model is to provide a blower, which includes an upper housing, a lower housing, a fan, and a motor. The upper housing is connected with the lower housing and thus composes a casing. The casing is a hollow cylinder, inside forms an air flow space and an air outlet passage connected with the air flow space. The upper housing has an air inlet opening formed through a center thereof. The upper housing has a first annular rib on an edge of the air inlet opening. The fan is located between the upper housing and the lower housing. An air inlet hole is formed at an upper portion of the fan and multiple flow paths are formed in the fan. The air inlet hole corresponds to the air inlet opening of the upper housing in location. Each one of the flow paths has one end connected to the air inlet hole and another end connected to the air flow space of the casing. The motor is mounted out of the lower housing and includes a driving shaft. The driving shaft has an end mounted through the lower housing and protrudes into the air flow space to be fixed with the fan.

**[0006]** The blower further has a second annular rib protruding from an inner bottom surface of the upper housing and adjacent to the air inlet opening. The second annular rib has an outer peripheral surface and an inner peripheral surface. The inner peripheral surface is adjacent to the first annular rib and a diameter of the first annular rib is smaller than that of the second annular rib. The first annular rib and the second annular rib are arranged in concentric circles. A portion of the upper housing located between the first annular rib and the second annular rib forms an annular recess on an inner and bottom surface thereof and concaved upward. An edge of the air inlet opening corresponds to the annular recess.

**[0007]** In the aforesaid blower, a cross-sectional shape of the first annular rib and a cross-sectional shape of the second annular rib are arc-shaped.

**[0008]** In the aforesaid blower, an angle (A) between the inner bottom surface of the upper housing and the outer peripheral surface of the second annular rib is preferably 70 to 90 degrees.

**[0009]** In the aforesaid blower, the fan has an upper plate and a lower plate. Multiple blades are located between the upper plate and the lower plate. The flow paths are formed between two of the blades. An inner annular rib is formed on an edge of the air inlet hole and located above the upper plate. An outer annular rib is formed on an outer peripheral surface. A middle annular rib is formed between the inner annular rib and the outer annular rib. The inner annular rib, the middle annular rib, and the outer annular rib are arranged in concentric circles.

**[0010]** The upper housing and the lower housing of this utility model are combined as a casing and a fan is mounted inside. A rotating center of the fan is connected with the driving shaft of the motor set at a bottom of the lower housing. A first annular rib and a second annular rib respectively protrude from an edge of the air inlet opening and an inner bottom surface of the upper housing. The

cross-sectional shapes of the first annular rib and the second annular rib are both arc-shaped. With the arc-shaped the first annular rib and the second annular rib, when an external fluid is driven by the fan, passes the air inlet opening, and enters the upper housing and the lower housing, the fluid can pass smoothly and enter the air inlet hole of the fan. Thus, the sound of wind cutting is reduced, and most of the airflow can be pressurized and then output from the air outlet duct. Besides, a small part of the escaped air enters a gap between a top of the fan and an inner surface of the upper housing, and then is blocked by the second annular rib and changes the direction of flow downward, which forms an air curtain. With the air curtain, the blower can prevent the escaped airflow from continually escaping to the air inlet opening which generates wind noise. Therefore, the blower enhances the quietness effect.

[BRIEF DESCRIPTION OF THE DRAWINGS]

**[0011]**

Fig. 1 is a perspective view in accordance with the present utility model.

Fig. 2 is an exploded perspective view of the present utility model.

Fig. 3 is a cross-sectional view of the present utility model.

Fig. 4 is a partial enlarged view of the present utility model.

Fig. 5 is a cross-sectional perspective view of the present utility model.

Fig. 6 is a perspective view of a conventional blower.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS]

**[0012]** As shown in Figs. 1 and 2, the blower of the present utility model comprises an upper housing 10, a lower housing 20, a fan 30, and a motor 40.

**[0013]** The upper housing 10 and the lower housing 20 mutually abut and form a casing, which is a hollow cylinder that forms an air flow space 100 inside. The fan 30 is disposed between the upper housing 10 and the lower housing 20. The motor 40 is located out of the lower housing 20. The motor 40 comprises a driving shaft 41 that penetrates the lower housing 20 and protrudes into the air flow space 100, and thus the driving shaft 41 is fixedly coupled with the rotating center of the fan 30.

**[0014]** As shown in Figs. 2 to 5, the upper housing 10 has an air inlet opening 11 formed therethrough. The upper housing 10 has a first annular rib 111 formed on an edge of the air inlet opening 11. The first annular rib 111 has an arc-shaped profile. The upper housing 10 has a second annular rib 112 protruding from an inner bottom surface of the upper housing 10 and adjacent to the air inlet opening 11. The second annular rib 112 has an arc-shaped profile at a protruding end. The second annular rib 112 includes an outer peripheral surface 1121 and an inner peripheral surface. The inner peripheral surface is adjacent to the first annular rib 111. An angle A is formed between the inner bottom surface of the upper housing 10 and the outer peripheral surface 1121 of the second annular rib 112 with a preferable implementation angle of 70 to 90 degrees. As shown in the specific embodiment of FIG. 3, the cross-sectional shapes of the first annular rib 111 and the second annular rib 112 are both arc-shaped. The first annular rib 111 is located higher than the second annular rib 112 to form a progressively increasing height configuration. The diameter of the first annular rib 111 is smaller than that of the second annular rib 112, and the first annular rib 111 and the second annular rib 112 are arranged in concentric circles. An annular recess 113 is formed on the inner bottom surface of the upper housing 10 between the first annular rib 111 and the second annular rib 112. The upper housing 10 has a lower annular flow passage 12 and an upper air outlet passage 13. The lower annular flow passage 12 is formed in the upper housing 10. The upper air outlet passage 13 protrudes out of the upper housing 10. The lower annular flow passage 12 and the upper air outlet passage 13 communicate with each other in space.

**[0015]** As shown in one of the specific embodiments in the figure, the thickness of the upper housing 10 adjacent to the air inlet opening 11 gradually decreases towards the air inlet opening 11 and then forms the first annular rib 111.

**[0016]** The lower housing 20 has a base 21. The base 21 is concave on a bottom of the lower housing 20 and protrudes upwardly at a center of the lower housing 20. The base 21 has a through hole formed through a center thereof. The lower housing 20 forms a lower annular flow passage 22 inside and a lower air outlet passage 23 protruding at the periphery. The lower annular flow passage 22 and the lower air outlet passage 23 communicate with each other. After the upper housing 10 and the lower housing 20 are stacked and combined with each other, the lower air outlet passage 23 and the upper air outlet passage 13 together form an air outlet passage that communicates with the air flow space 100 inside the casing.

**[0017]** The motor 40 is installed and assembled within the base 21 of the lower housing 20. The driving shaft 41 of the motor 40 passes through the through hole of the base 21. The fan 30 is a component of the current technique. The fan 30 comprises an upper plate 32, a lower plate 34, and multiple blades 31 formed between the upper plate 32 and the lower plate 34. The blades 31 are spaced apart and arranged radially, with flow paths for fluid (e.g., air) to pass through spaces formed between the blades 31. The lower plate 34, which is a lower portion of the fan 30, forms a hole 33 at a center thereof. The hole 33 is fitted and fixed to the driving shaft 41. The upper plate 32, which is an upper portion of the fan 30, forms an air inlet hole 320 at a center thereof. The air inlet hole 320 communicates with an interior of the fan 30 and corresponds to the air inlet opening 11 of the

upper housing 10 in position. An inner annular rib 321 is formed on an edge of the air inlet hole 320 on the upper plate 32 of the fan 30. An outer annular rib 323 is formed on the outer peripheral edge of the upper plate 32. A middle annular rib 322 is formed between the inner annular rib 321 and the outer annular rib 323. The inner annular rib 321, the middle annular rib 322, and the outer annular rib 323 are arranged concentrically.

**[0018]** When the fan30 rotates, a fluid L (as shown in Fig. 3 and Fig. 4, represented by dashed arrow) enters the interior of the fan 30 through the air inlet opening 11 and the air inlet hole 320, passes through the flow paths between the blades 31, enters the air flow space 100 between the upper housing 10 and the lower housing 20, and can be outputted through the air outlet passage.

**[0019]** As shown in Fig. 3, in a preferred embodiment of the utility model, the edge of the air inlet hole 32 corresponds to the annular recess 113 between the first annular rib 111 and the second annular rib 112 in location.

**[0020]** When the blower of the present utility model is in use, the rotating fan 30 draws external fluid L into the casing through the air inlet opening 11, and then enters the interior of the fan 30 through the air inlet hole 320. Due to the arc-shaped design of the first annular rib 111 and the smaller diameter of the air inlet opening 11 compared to that of the air inlet hole 320, the fluid L can smoothly pass along a surface of the air inlet opening 11 and then enter the air inlet hole 320. The fluid L flows through spaces between the plurality of blades 31, and then is discharged through the space between the lower annular flow passage 12 and the lower annular flow passage 13, and the space between the upper air outlet passage 13 and the lower air outlet passage 23. Because there is a gap between an inner surface of the upper housing 10 and the upper plate 32 of the fan 30, parts of fluid will scatter upwards to form a branch fluid L1 (represented by solid arrow in Fig. 3 and Fig. 4). Due to the obstruction of the outer peripheral surface 1121 of the second annular rib 112, the airflow of the branch fluid L1 may change direction and turn into a flow that is perpendicular to the direction of the branching fluid L1. The flow of fluid L1 will continue to flow downward and form an air curtain. The air curtain can prevent the airflow from continually escaping to the air inlet opening 11 and the air inlet hole 320 which generate wind noise. Therefore, the blower enhances the quietness effect.

[DESCRIPTION OF THE MAIN REFERENCE NUMBERS]

**[0021]**

10: upper housing
100: air flow space
11: air inlet opening
111: first annular rib
112: second annular rib
1121: outer peripheral surface
113: annular recess
12: upper annular flow passage
13: upper air outlet passage
20: lower housing
21: base
22: lower annular flow passage
23: lower air outlet passage
30: fan
31: blade
32: upper plate
320: air inlet hole
321: inner annular rib
322: middle annular rib
323: outer annular rib
33: hole
34: lower plate
40: motor
41: driving shaft
50: casing
51: upper part
52: lower part
53: inner space
54: air inlet opening
55: air outlet tube
56: motor
561: driving shaft
57: fan
A: angle
L: fluid
L1: branch fluid

## Claims

**1.** A blower comprising:

an upper housing having:

an air inlet opening in a center of the upper housing; and
a first rib around a periphery of the air inlet opening;

a lower housing connected to the upper housing and forming a casing, the casing being hollow and cylindrical and forming:

an airflow space inside the casing; and
an outlet passage connected to the airflow space;

a fan located between the upper housing and lower housing and forming:

an air inlet hole corresponding to the air inlet opening of the upper housing in location; and
multiple channels, one end of each one of

the channels connected to the airflow space and another end of the channel connected to the airflow space of the casing; and

a motor mounted out of the lower housing and having:
a driving shaft, one end of the driving shaft mounted through the lower housing, extending into the airflow space, and fixed on the fan.

**2.** The blower as claimed in claim 1 further including:

a second annular rib protruding from an inner bottom surface of the upper housing and adjacent to the air inlet opening, the second annular rib including:
an outer peripheral surface and an inner peripheral surface adjacent to the first annular rib, a diameter of the first annular rib being smaller than that of the second annular rib, and the first annular rib and the second annular rib arranged in concentric circles;
wherein a portion of the upper housing located between the first annular rib and the second annular rib forms:
an annular recess on an inner and bottom surface thereof and concaved upward, an edge of the air inlet opening corresponding to the annular recess.

**3.** The blower as claimed in claim 1, wherein a cross-sectional shape of the first annular rib and a cross-sectional shape of the second annular rib are arc-shaped.

**4.** The blower as claimed in claim 2, wherein an angle (A) between the inner bottom surface of the upper housing and the outer peripheral surface of the second annular rib is 70 to 90 degrees.

**5.** The blower as claimed in claim 3, wherein an angle (A) between the inner bottom surface of the upper housing and the outer peripheral surface of the second annular rib is 70 to 90 degrees.

**6.** The blower as claimed in any of claims 1-5, wherein the fan comprises:

an upper plate, a lower plate, and multiple blades located between the upper plate and the lower plate; the flow paths formed between two of the blades;
an inner annular rib formed on an edge of the air inlet hole and located above the upper plate;
an outer annular rib formed on an outer peripheral surface; and
a middle annular rib formed between the inner annular rib and the outer annular rib;
wherein the inner annular rib, the middle annular rib, and the outer annular rib arranged in concentric circles.

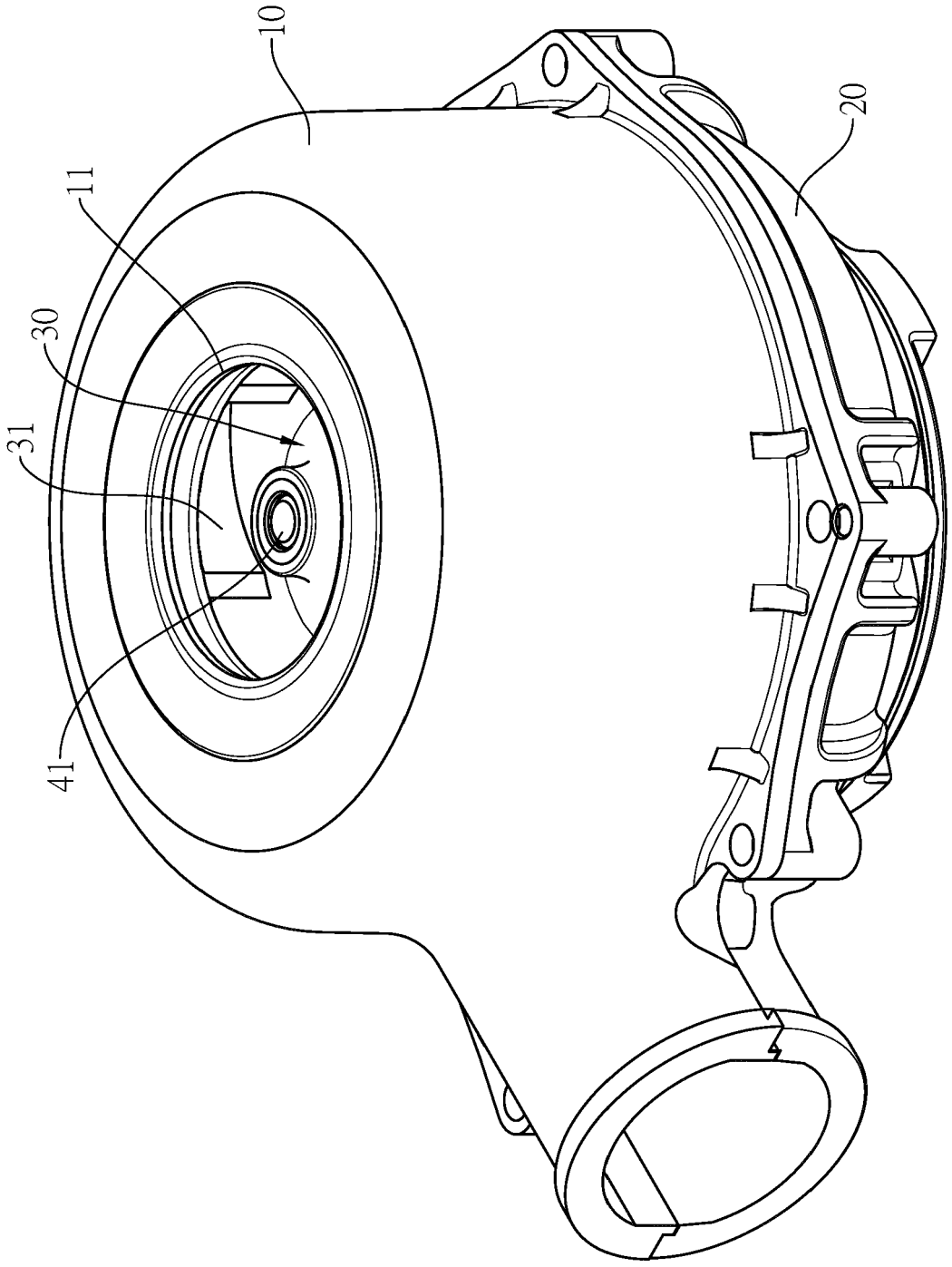


FIG.1

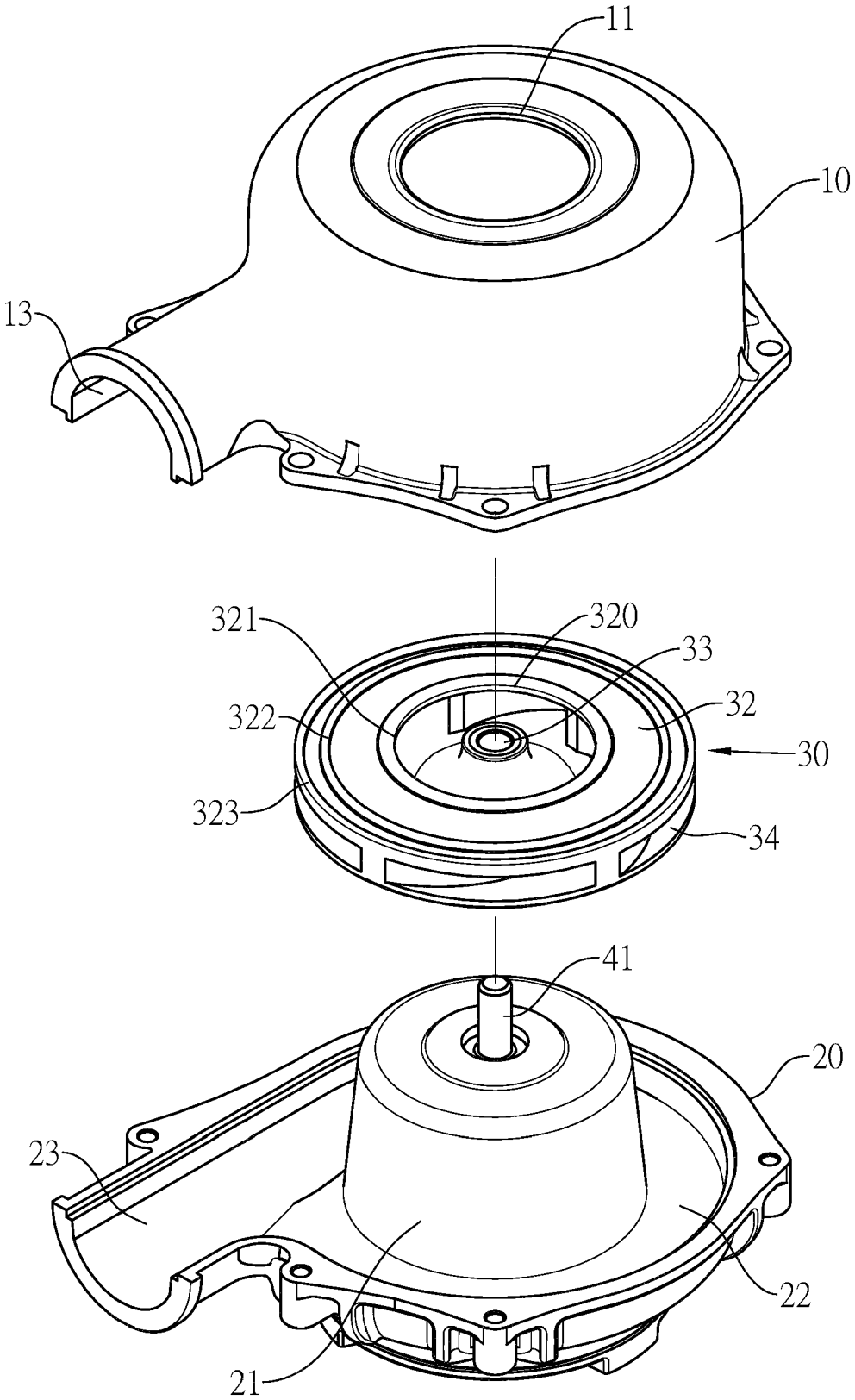


FIG.2

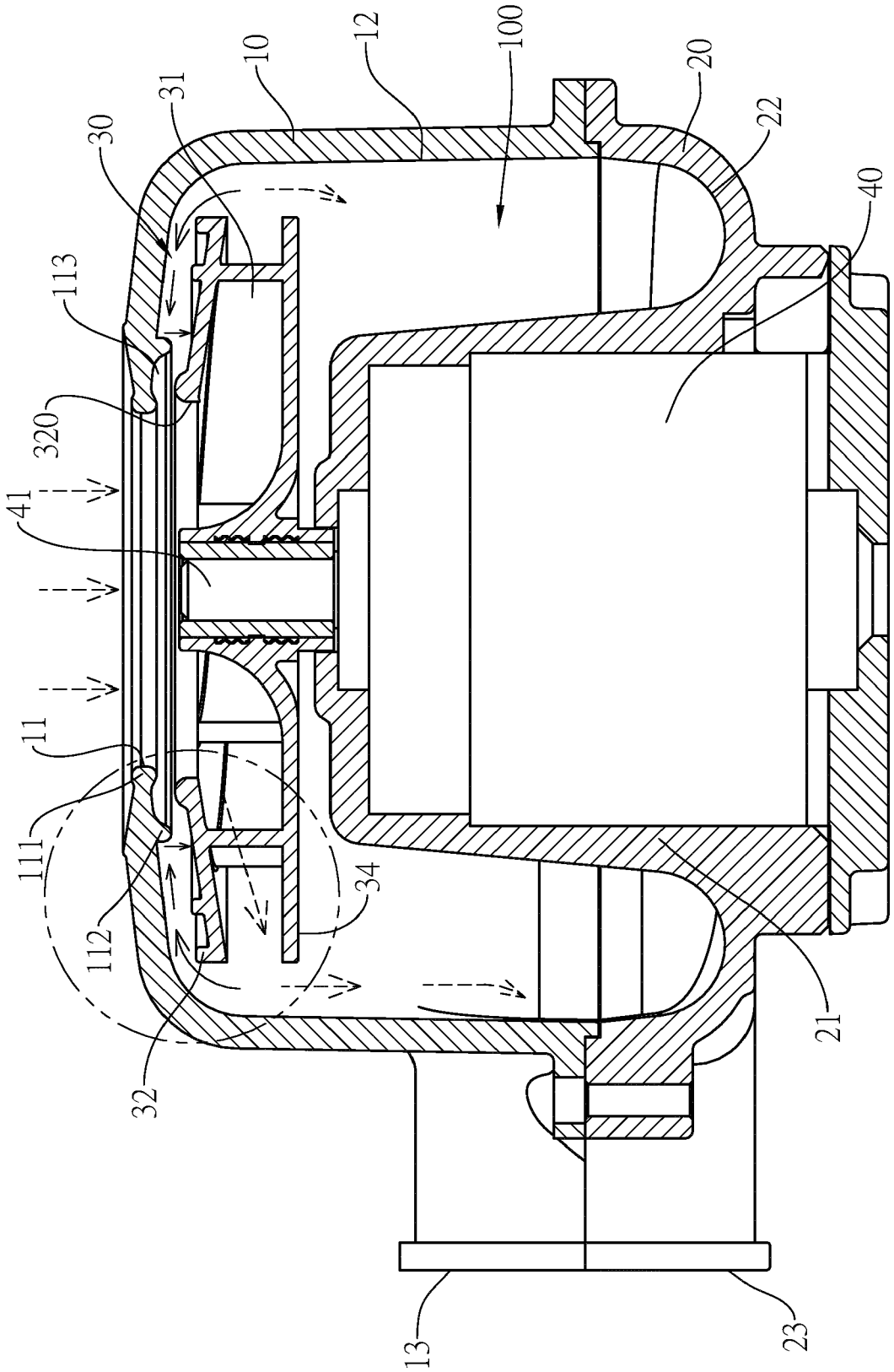


FIG.3

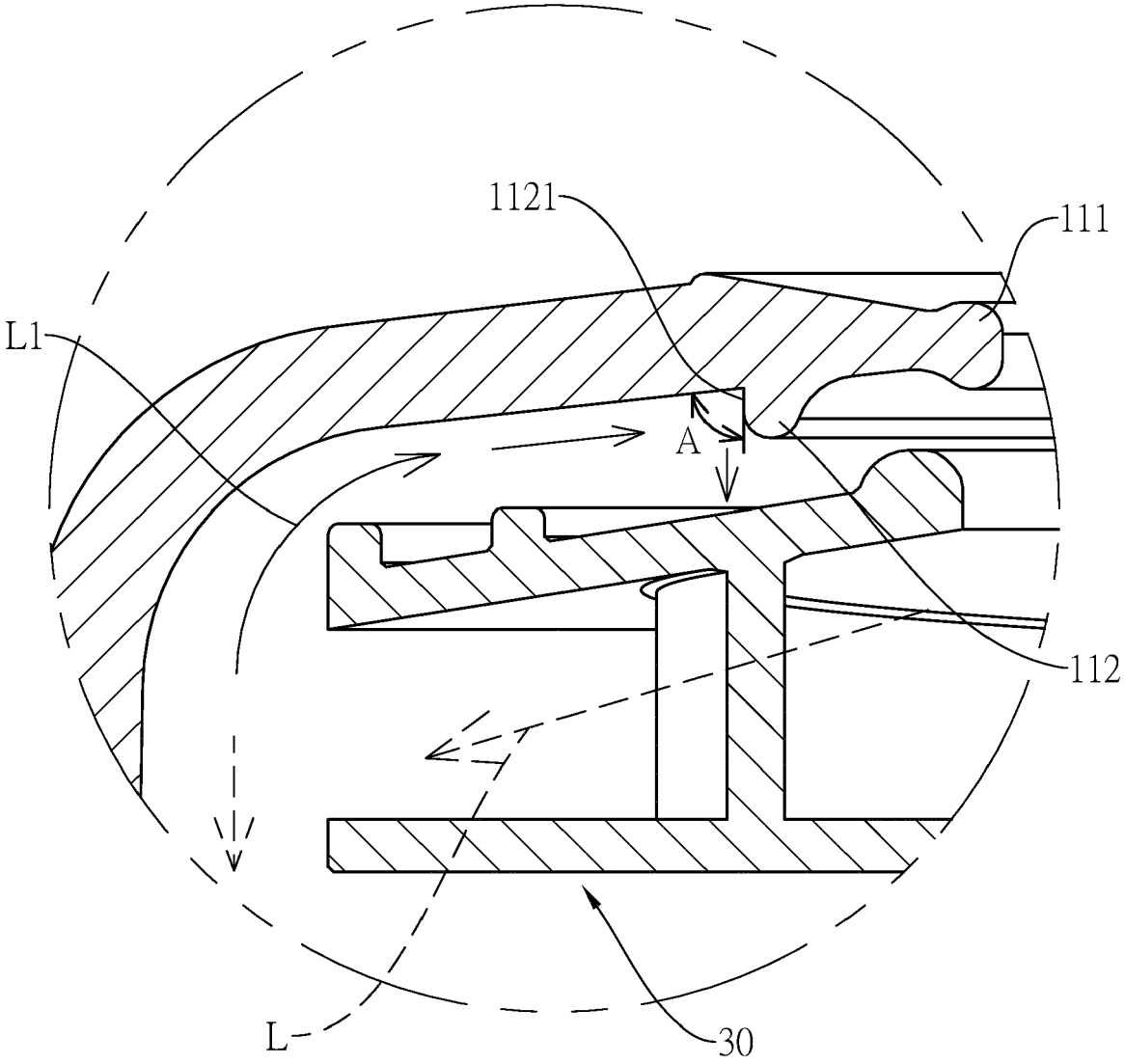


FIG.4

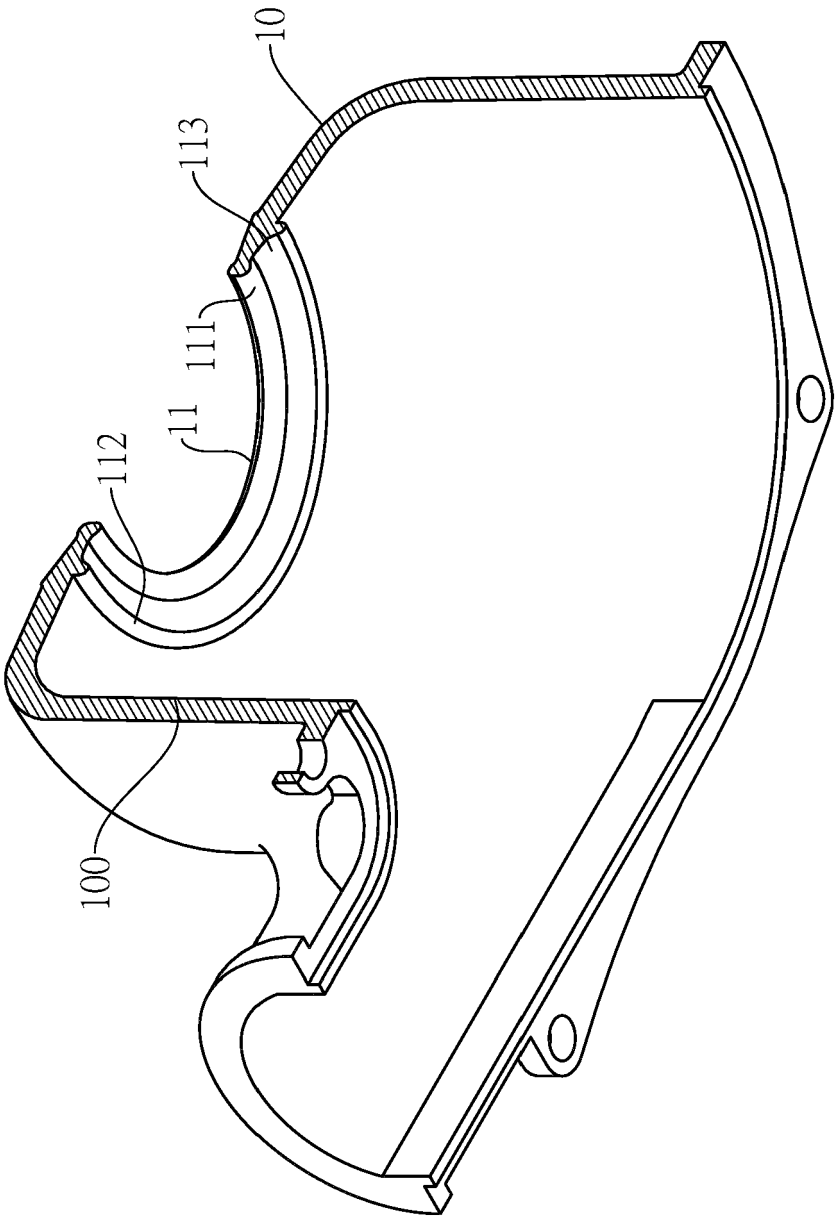


FIG.5

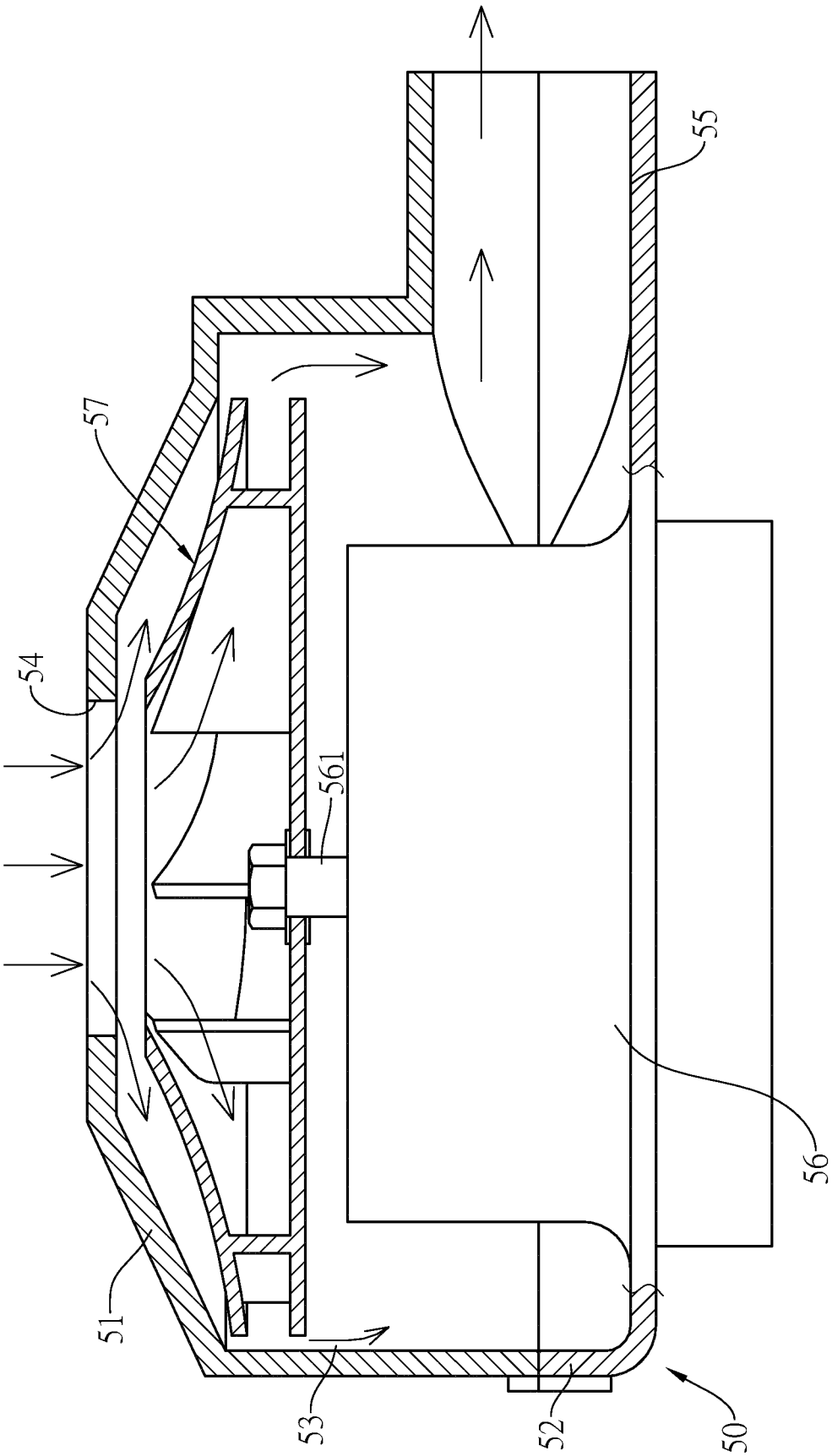


FIG.6

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# EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 21 July 2023 | Kolby, Lars |

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