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(54) **AIR CONDITIONER**

(57) An air conditioner includes an air-conditioner air inlet (70), an air-conditioner air outlet (80), and an air duct structure disposed between the air-conditioner air inlet (70) and the air-conditioner air outlet (80). The air duct structure includes a cross-flow blade (20) and a volute-and-tongue assembly (10), wherein the cross-flow blade (20) is disposed inside the volute-and-tongue assembly (10). The volute-and-tongue assembly (10) includes an air flow inlet (11) and an air flow outlet (12). In an extending direction of the cross-flow blade (20), a height of the air flow inlet (11) is a ; a height of the air flow outlet (12) is b ; a height of the air-conditioner air inlet (70) is h ; and a height of the air-conditioner air outlet (80) is k , wherein $k < b < a < h$.

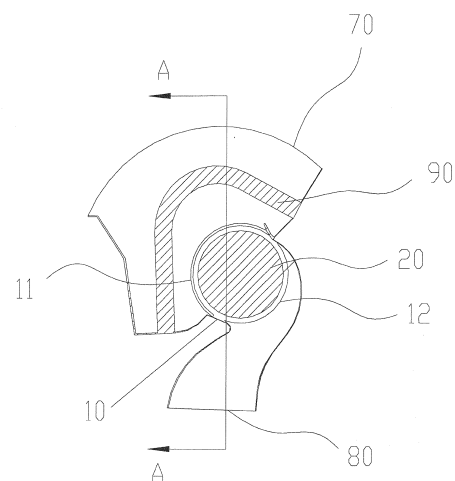


FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of air conditioner, and in particular to an air conditioner.

BACKGROUND

[0002] At present, the cross-flow air duct is widely used in air conditioners. Two ends of the cross-flow air duct system are relatively low-pressure zones. During the working process of the cross-flow blade, it is easy to form return vortexes at positions of two end surfaces, which causes a phenomenon of non-uniform air blow and causes noise easily. In addition, when the air conditioner is used to heat and supply heat air, external air is engulfed at two end surfaces due to the phenomenon of return vortexes, causing the temperatures at two end surfaces to be significantly lower than the temperatures at other positions of the air flow outlet, and there is a problem of non-uniform air blow at the air flow outlet.

SUMMARY

[0003] The main objective of the present disclosure is to provide an air conditioner, to solve the problem of non-uniform air blow of an air duct structure of an air conditioner in the prior art.

[0004] In order to achieve the above objective, the present disclosure provides an air conditioner comprising an air-conditioner air inlet, an air-conditioner air outlet, and an air duct structure disposed between the air-conditioner air inlet and the air-conditioner air outlet; the air duct structure comprises: a cross-flow blade, and a volute-and-tongue assembly, wherein the cross-flow blade is arranged inside the volute-and-tongue assembly; the volute-and-tongue assembly comprises an air flow inlet and an air flow outlet; along an extending direction of the cross-flow blade, a height of the air flow inlet is a ; a height of the air flow outlet is b ; a height of the air-conditioner air inlet is h ; and a height of the air-conditioner air outlet is k , wherein $k < b < a < h$.

[0005] Furthermore, $6\text{ mm} \leq a - b \leq 15\text{ mm}$.

[0006] Furthermore, the air duct structure further comprises: an upper end cap provided at a first end of the volute-and-tongue assembly, and a first retaining ring provided on the upper end cap, wherein, at least a portion of a first end of the cross-flow blade is disposed inside the first retaining ring.

[0007] Furthermore, the cross-flow blade fits the first retaining ring with a clearance.

[0008] Furthermore, the clearance between the cross-flow blade and the first retaining ring is c , wherein $5\text{ mm} \leq c \leq 10\text{ mm}$.

[0009] Furthermore, the first retaining ring includes: a first retaining ring section for air intake, and a first retaining ring section for air blow; wherein the first retaining

ring section for air intake is provided at a side of the upper end cap, and the side of the upper end cap is adjacent to the air flow inlet; the first retaining ring section for air blow is disposed at another side of the upper end cap, and the other side of the upper end cap is adjacent to the air flow outlet; a distance from an outer end surface of the first retaining ring section for air intake to an end surface of the first end of the cross-flow blade is e , and a distance from an outer end surface of the first retaining ring section for air blow to the end surface of the first end of the cross-flow blade is d , wherein $e < d$. Furthermore, $3\text{ mm} \leq d - e \leq 8\text{ mm}$.

[0010] Furthermore, the air duct structure further comprises: a lower end cap provided at a second end of the volute-and-tongue assembly, and a second retaining ring provided on the lower end cap; wherein at least a portion of a second end of the cross-flow blade is disposed inside the second retaining ring; the first retaining ring and the second retaining ring are arranged opposite to each other; and the air flow inlet and the air flow outlet are disposed between the first retaining ring and the second retaining ring.

[0011] Furthermore, the cross-flow blade fits the second retaining ring with a clearance.

[0012] Furthermore, the clearance between the cross-flow blade and the second retaining ring is s , wherein $5\text{ mm} \leq s \leq 10\text{ mm}$.

[0013] Furthermore, the second retaining ring comprises: a second retaining ring section for air intake, and a second retaining ring section for air blow; wherein, the second retaining ring section for air intake is provided at a side of the lower end cap, and the side of the lower end cap is adjacent to the air flow inlet; the second retaining ring section for air blow is disposed at another side of the lower end cap, and the other side of the lower end cap is adjacent to the air flow outlet; a distance from an outer end surface of the second retaining ring section for air intake to an end surface of a second end of the cross-flow blade is f , and a distance from an outer end surface of the second retaining ring section for air blow to the end surface of the second end of the cross-flow blade is g , wherein $f < g$.

[0014] Furthermore, $3\text{ mm} \leq g - f \leq 8\text{ mm}$.

[0015] Furthermore, $6\text{ mm} \leq h - a \leq 15\text{ mm}$, and/or, $6\text{ mm} \leq b - k \leq 15\text{ mm}$.

[0016] In the air conditioner of the present disclosure, along the extending direction of the cross-flow blade, the height of the air flow inlet is a ; the height of the air flow outlet is b ; the height of the air-conditioner air inlet is h ; and the height of the air-conditioner air outlet is k . By setting $k < b < a < h$, the return vortexes formed at the positions of two end surfaces of the cross-flow air duct of the air duct structure can be reduced, thereby avoiding the phenomenon of non-uniform air blow. The air conditioner includes the air-conditioner air inlet, the air-conditioner air outlet, and the air duct structure disposed between the air-conditioner air inlet and the air-conditioner air outlet; the air duct structure includes the volute-and-tongue

assembly and the cross-flow blade; the cross-flow blade is arranged inside the volute-and-tongue assembly. The volute-and-tongue assembly includes the air flow inlet and the air flow outlet. The air conditioner of the present disclosure can reduce the return vortexes formed at the positions of two end surfaces of the cross-flow air duct of the air duct structure, thereby avoiding the phenomenon of non-uniform air blow, and solving the problem of non-uniform air blow of an air duct structure of the air conditioner in the prior art.

BRIEF DESCRIPTION OF DRAWINGS

[0017] The accompanying drawings attached to the specification form a part of the disclosure and are intended to provide a further understanding of the present disclosure. The illustrative embodiments of the disclosure and the description thereof are used for explanations of the present disclosure, and do not constitute improper limitations of the present disclosure. In the accompanying drawings:

FIG. 1 is a schematic structural diagram of an air duct structure of an air conditioner according to an embodiment of the present disclosure;

FIG. 2 is a schematic diagram illustrating a cross-sectional structure in an A-A direction of the air conditioner in FIG. 1.

FIG. 3 is a schematic diagram illustrating a partially enlarged structure at a location B of the air conditioner in FIG. 2;

FIG. 4 is a schematic diagram illustrating a partially enlarged structure at a location C of the air conditioner in FIG. 2;

[0018] The above drawings include the following reference signs:

10, volute-and-tongue assembly; 11, air flow inlet; 12, air flow outlet; 20, cross-flow blade; 30, upper end cap; 40, lower end cap; 50, first retaining ring; 51, first retaining ring section for air intake; 52, first retaining ring section for air blow; 60, second retaining ring; 61, second retaining ring section for air intake; 62, second retaining ring section for air blow; 70, air-conditioner air inlet; 80, air-conditioner air outlet; 90, heat exchanger.

DETAILED DESCRIPTION OF DISCLOSED EMBODIMENTS

[0019] It should be noted that the embodiments in the present disclosure and the features in the embodiments can be combined with each other if no conflicts occur. The disclosure will be described in detail below with reference to the accompanying drawings in combination with the embodiments.

[0020] It should be noted that the following detailed description is illustrative and is intended to provide a further description of the disclosure. Unless otherwise indi-

cated, all technical and scientific terms used herein have the same meanings as commonly understood by the ordinary skilled in the art of the present disclosure.

[0021] It should be noted that terms used herein are only for the purpose of describing specific embodiments and not intended to limit the exemplary embodiments of the present disclosure. The singular of a term used herein is intended to include the plural of the term unless the context otherwise specifies. In addition, it should also be appreciated that when terms "include" and/or "comprise" are used in the description, they indicate the presence of features, steps, operations, devices, components and/or their combination.

[0022] The present disclosure provides an air conditioner. Refer to FIG. 1 and FIG. 2, the air conditioner includes an air-conditioner air inlet 70, an air-conditioner air outlet 80, and an air duct structure arranged between the air-conditioner air inlet 70 and the air-conditioner air outlet 80. The air duct structure includes a cross-flow blade 20 and a volute-and-tongue assembly 10. The cross-flow blade 20 is arranged inside the volute-and-tongue assembly 10. The volute-and-tongue assembly 10 includes an air flow inlet 11 and an air flow outlet 12. Along the extending direction of the cross-flow blade 20, a height of the air flow inlet 11 is a ; a height of the air flow outlet 12 is b ; a height of the air-conditioner air inlet 70 is h ; and a height of the air-conditioner air outlet 80 is k , where $k < b < a < h$.

[0023] In the air conditioner of the present disclosure, along the extending direction of the cross-flow blade 20, the height of the air flow inlet 11 is a ; the height of the air flow outlet 12 is b ; the height of the air-conditioner air inlet 70 is h ; and the height of the air-conditioner air outlet 80 is k . By setting $k < b < a < h$, the return vortexes formed at the positions of two end surfaces of the cross-flow air duct of the air duct structure can be reduced, thereby avoiding the phenomenon of non-uniform air blow. The air conditioner includes the air-conditioner air inlet 70, the air-conditioner air outlet 80, and the air duct structure disposed between the air-conditioner air inlet 70 and the air-conditioner air outlet 80; the air duct structure includes the volute-and-tongue assembly 10 and the cross-flow blade 20; the cross-flow blade 20 is arranged inside the volute-and-tongue assembly 10. The volute-and-tongue assembly 10 includes the air flow inlet 11 and the air flow outlet 12. The air conditioner of the present disclosure can reduce the return vortexes formed at the positions of two end surfaces of the cross-flow air duct of the air duct structure, thereby avoiding the phenomenon of non-uniform air blow, and solving the problem of non-uniform air blow of an air duct structure of the air conditioner in the prior art.

[0024] In the present embodiment, the volute-and-tongue assembly 10 has a cross-flow air duct. The cross-flow air duct has an air flow inlet 11 and an air flow outlet 12.

[0025] Preferably, $6\text{ mm} \leq a-b \leq 15\text{ mm}$.

[0026] In the present embodiment, as for the air duct

structure, if the air flow resistance at the air flow inlet becomes larger, the flow-through load resistance of the air duct structure becomes larger; and if the air flow resistance at the air flow outlet becomes larger, the flow-through load resistance of the air duct structure becomes smaller. Therefore, that the height of the air flow outlet 12 is less than the height of the air flow inlet 11 helps to ensure the continuity and smoothness of the air flow of the air intake and the air blow. When $6\text{mm} \leq a-b \leq 15\text{mm}$, better smoothness of the air flow at the air flow inlet and at the air flow outlet can be ensured, and a larger sheltered height of the cross-flow blade 20 can be avoided, thereby ensuring an effective working height of the cross-flow blade 20.

[0027] In order to further avoid the problem of non-uniform air blow of the air duct structure, as shown in FIG. 2, the air duct structure further includes an upper end cap 30 provided at a first end of the volute-and-tongue assembly 10, and a first retaining ring 50 provided on the upper end cap 30. At least a portion of the first end of the cross-flow blade 20 is disposed inside the first retaining ring 50.

[0028] In the present embodiment, the air duct structure further includes the upper end cap 30 and the first retaining ring 50. The upper end cap 30 is disposed at the first end of the volute-and-tongue assembly 10, and the first retaining ring 50 is provided on the upper end cap 30. At least a portion of the first end of the cross-flow blade 20 is disposed inside the first retaining ring 50. To ensure a normal operation of the cross-flow blade 20, the cross-flow blade 20 fits the first retaining ring 50 with a clearance.

[0029] Preferably, the clearance between the cross-flow blade 20 and the first retaining ring 50 is c , wherein $5\text{ mm} \leq c \leq 10\text{ mm}$.

[0030] In the present embodiment, the flow volume and the flow rate at two ends of the cross-flow blade 20 are lower; the pressure gradient is larger; and controlling the clearance to be smaller to reduce drastic changes of the pressure gradient and improve the surge phenomenon caused by the pressure change. However, if the clearance is too small, the requirements for the dynamic balance of the blade and the accuracy of the air duct structure are high, and actually, it is difficult to meet the requirements, thus causing the problem that the fan collides with the inner wall of the air duct structure to generate friction when the fan is running. Therefore, in this embodiment, when $5\text{ mm} \leq c \leq 10\text{ mm}$, the drastic changes of the pressure gradient at two ends of the cross-flow blade 20 can be effectively reduced.

[0031] As for the specific structure of the first retaining ring 50, as shown in FIG. 3, the first retaining ring 50 includes a first retaining ring section 51 for air inlet and a first retaining ring section 52 for air blow. The first retaining ring section 51 for air inlet is provided at a side of the upper end cap 30, and the side of the upper end cap 30 is adjacent to the air flow inlet 11. The first retaining ring section 52 for air blow is disposed at another side of

the upper end cap 30, and the other side of the upper end cap 30 is adjacent to the air flow outlet 12. The distance from the outer end surface of the first retaining ring section 51 for air inlet to the end surface of the first end of the cross-flow blade 20 is e , and the distance from the outer end surface of the first retaining ring section 52 for air blow to the end surface of the first end of the cross-flow blade 20 is d , where $e < d$.

[0032] In the present embodiment, the first retaining ring 50 includes the first retaining ring section 51 for air inlet and the first retaining ring section 52 for air blow; the first retaining ring section 51 for air inlet is provided at the side of the upper end cap 30, and the side of the upper end cap 30 is adjacent to the air flow inlet 11, and the first retaining ring section 52 for air blow is provided at the other side of the upper end cap 30, and the other side of the upper end cap 30 is adjacent to the air flow outlet 12.

[0033] In order to ensure that the height of the air flow inlet 11 is greater than the height of the air flow outlet 12, preferably, the distance from the outer end surface of the first retaining ring section 51 for air inlet to the end surface of the first end of the cross-flow blade 20 is e , and the distance from the outer end surface of the first retaining ring section 52 for air blow to the end surface of the first end of the cross-flow blade 20 is d , where $e < d$.

[0034] Preferably, $3\text{ mm} \leq d-e \leq 8\text{ mm}$.

[0035] In this embodiment, by setting $3\text{ mm} \leq d-e \leq 8\text{ mm}$, a smooth air flow of the air intake and the air blow can be ensured without causing a large blocking height to the cross-flow blade 20, thereby ensuring an effective operation height of the cross-flow blade 20.

[0036] Accordingly, the air duct structure further includes a lower end cap 40 provided at the second end of the volute-and-tongue assembly 10, and a second retaining ring 60 provided on the lower end cap 40. At least a portion of the second end of the cross-flow blade 20 is disposed inside the second retaining ring 60. The first retaining ring 50 and the second retaining ring 60 are arranged opposite to each other, and the air flow inlet 11 and the air flow outlet 12 are disposed between the first retaining ring 50 and the second retaining ring 60.

[0037] Preferably, the cross-flow blade 20 fits the second retaining ring 60 with a clearance.

[0038] Preferably, the clearance between the cross-flow blade 20 and the second retaining ring 60 is s , wherein $5\text{ mm} \leq s \leq 10\text{ mm}$.

[0039] As for the specific structure of the second retaining ring 60, as shown in FIG. 2 and FIG. 4, the second retaining ring 60 includes a second retaining ring section 61 for air intake, and a second retaining ring section 62 for air blow. The second retaining ring section 61 for air intake is provided at a side of the lower end cap 40, and the side of the lower end cap 40 is adjacent to the air flow inlet 11. The second retaining ring section 62 for air blow is disposed at another side of the lower end cap 40, and the other side of the lower end cap 40 is adjacent to the air flow outlet 12. The distance from the outer end surface

of the second retaining ring section 61 for air intake to the end surface of the second end of the cross-flow blade 20 is f , and the distance from the outer end surface of the second retaining ring section 62 for air blow to the end surface of the second end of the cross-flow blade 20 is g , where $f < g$.

[0040] In the present embodiment, the air flow inlet 11 is disposed between the first retaining ring section 51 for air inlet and the second retaining ring section 61 for air intake, and the air flow outlet 12 is disposed between the first retaining ring section 52 for air blow and the second retaining ring section 62 for air blow.

[0041] Preferably, $3\text{ mm} \leq g-f \leq 8\text{ mm}$.

[0042] Preferably, the air conditioner includes the air-conditioner air inlet 70 and the air-conditioner air outlet 80; the air duct structure is disposed between the air-conditioner air inlet 70 and the air-conditioner air outlet 80; along the extending direction of the cross-flow blade 20, the height of the air-conditioner air inlet 70 is greater than the height of the air flow inlet 11; and/or the height of the air flow outlet 12 is greater than the height of the air-conditioner air outlet 80. Preferably, along the extending direction of the cross-flow blade 20, the height of the air-conditioner air inlet 70 is h , and the height of the air-conditioner air outlet 80 is k , wherein $6\text{ mm} \leq h-a \leq 15\text{ mm}$, and/or, $6\text{ mm} \leq b-k \leq 15\text{ mm}$.

[0043] In this embodiment, the overall air duct satisfies a variation trend of the height of the air duct gradually decreasing along the flow direction. The air-conditioner air inlet 70, the air flow inlet 11, the air flow outlet 12 and the air-conditioner air outlet 80 are designed to be tapered.

[0044] The air conditioner further includes a heat exchanger 90. The heat exchanger 90 is disposed between the air-conditioner air inlet 70 and the air flow inlet 11 of the cross-flow air duct.

[0045] From the above description, it can be seen that the above-described embodiments of the present disclosure achieve the following technical effects:

In the air conditioner of the present disclosure, along the extending direction of the cross-flow blade 20, the height of the air flow inlet 11 is a ; the height of the air flow outlet 12 is b ; the height of the air-conditioner air inlet 70 is h ; and the height of the air-conditioner air outlet 80 is k . By setting $k < b < a < h$, the return vortexes formed at the positions of two end surfaces of the cross-flow air duct of the air duct structure can be reduced, thereby avoiding the phenomenon of non-uniform air blow. The air conditioner includes the air-conditioner air inlet 70, the air-conditioner air outlet 80, and the air duct structure disposed between the air-conditioner air inlet 70 and the air-conditioner air outlet 80; the air duct structure includes the volute-and-tongue assembly 10 and the cross-flow blade 20; the cross-flow blade 20 is arranged inside the volute-and-tongue assembly 10. The volute-and-tongue assembly 10 includes the air flow inlet 11 and the air flow outlet 12. The air conditioner of the present disclosure can reduce the return vortexes formed at the positions of two end

surfaces of the cross-flow air duct of the air duct structure, thereby avoiding the phenomenon of non-uniform air blow, and solving the problem of non-uniform air blow of the air duct structure of the air conditioner in the prior art.

[0046] Two ends of the cross-flow air duct system are relatively low-pressure zones. During the working process of the cross-flow blade, it is easy to form return vortexes at positions of two end surfaces, which causes the phenomenon of non-uniform air blow and causes noise easily. In addition, when the air conditioner is applied to heating and air distribution, external air is engulfed at two end surfaces due to the phenomenon of return vortexes, thus causing the temperatures at two end surfaces to be significantly lower than the temperatures at other positions of the air flow outlet, and there is a problem of non-uniform air blow at the air flow outlet.

[0047] In the air conditioner of the present disclosure, the overall air duct satisfies the variation trend of the height of the air duct structure gradually decreasing along the flow direction. The air-conditioner air inlet 70, the air flow inlet 11, the air flow outlet 12 and the air-conditioner air outlet 80 are designed to be tapered, which solves the problems of the non-uniform air blow and the non-uniform temperature of the air blow at the end surface of the air flow outlet of the cross-flow air duct.

[0048] It should be noted that the terms "first", "second", and the like in the description, claims and drawings of the present disclosure are used to distinguish similar objects, and are not necessarily used to describe a specific order or order. It should be appreciated that such terms can be interchangeable if appropriate, so that the embodiments of the disclosure described herein can be implemented, for example, in an order other than those illustrated or described herein. In addition, the terms "comprise", "have" and any deformations thereof, are intended to cover a non-exclusive inclusion, for example, a process, a method, a system, a product, or a device that includes a series of steps or units is not necessarily limited to explicitly list those steps or units, but can include other steps or units that are not explicitly listed or inherent to such a process, a method, a product or a device.

[0049] For convenience of description, spatially relative terms such as "above", "over", "on a surface of", "upper", etc., may be used herein to describe the spatial position relationships between one device or feature and other devices or features as shown in the drawings. It should be appreciated that the spatially relative term is intended to include different directions during using or operating the device other than the directions described in the drawings. For example, if the device in the drawings is inverted, the device is described as the device "above other devices or structures" or "on other devices or structures" will be positioned "below other devices or structures" or "under other devices or structures". Thus, the exemplary term "above" can include both "above" and "under". The device can also be positioned in other different ways (rotating 90 degrees or at other orientations), and the corresponding description of the space used

herein is interpreted accordingly.

[0050] The above descriptions are merely the preferred embodiments of the present disclosure, and are not intended to limit the present disclosure. For those skilled in the art, various modifications and changes can be made for the present disclosure. Any modifications, equivalent substitutions, improvements, etc., made within the spirits and the principles of the present disclosure are included within the protection of the present disclosure.

Claims

1. An air conditioner, comprising an air-conditioner air inlet (70), an air-conditioner air outlet (80), and an air duct structure disposed between the air-conditioner air inlet (70) and the air-conditioner air outlet (80), **characterized in that**, the air duct structure comprises:
 - a cross-flow blade (20), and
 - a volute-and-tongue assembly (10), wherein the cross-flow blade (20) is arranged inside the volute-and-tongue assembly (10);
 - the volute-and-tongue assembly (10) comprises an air flow inlet (11) and an air flow outlet (12); along an extending direction of the cross-flow blade (20), a height of the air flow inlet (11) is a ; a height of the air flow outlet (12) is b ; a height of the air-conditioner air inlet (70) is h ; and a height of the air-conditioner air outlet (80) is k , wherein $k < b < a < h$.
2. The air conditioner according to claim 1, **characterized in that**, $6\text{ mm} \leq a-b \leq 15\text{ mm}$.
3. The air conditioner according to claim 1, **characterized in that**, the air duct structure further comprises:
 - an upper end cap (30) provided at a first end of the volute-and-tongue assembly (10), and
 - a first retaining ring (50) provided on the upper end cap (30), wherein, at least a portion of a first end of the cross-flow blade (20) is disposed inside the first retaining ring (50).
4. The air conditioner of claim 3, **characterized in that**, the cross-flow blade (20) fits the first retaining ring (50) with a clearance.
5. The air conditioner according to claim 4, **characterized in that**, the clearance between the cross-flow blade (20) and the first retaining ring (50) is c , wherein $5\text{ mm} \leq c \leq 10\text{ mm}$.
6. The air conditioner according to claim 3, **characterized in that**, the first retaining ring (50) comprises:
 - a first retaining ring section (51) for air intake, and a first retaining ring section (52) for air blow; wherein the first retaining ring section (51) for air intake is provided at a side of the upper end cap (30), and the side of the upper end cap (30) is adjacent to the air flow inlet (11); the first retaining ring section (52) for air blow is disposed at another side of the upper end cap (30), and the other side of the upper end cap (30) is adjacent to the air flow outlet (12);
 - a distance from an outer end surface of the first retaining ring section (51) for air intake to an end surface of the first end of the cross-flow blade (20) is e , and a distance from an outer end surface of the first retaining ring section (52) for air blow to the end surface of the first end of the cross-flow blade (20) is d , wherein $e < d$.
7. The air conditioner according to claim 6, **characterized in that**, $3\text{ mm} \leq d-e \leq 8\text{ mm}$.
8. The air conditioner according to claim 3, **characterized in that**, the air duct structure further comprises:
 - a lower end cap (40) provided at a second end of the volute-and-tongue assembly (10), and
 - a second retaining ring (60) provided on the lower end cap (40); wherein at least a portion of a second end of the cross-flow blade (20) is disposed inside the second retaining ring (60);
 - the first retaining ring (50) and the second retaining ring (60) are arranged opposite to each other;
 - and the air flow inlet (11) and the air flow outlet (12) are disposed between the first retaining ring (50) and the second retaining ring (60).
9. The air conditioner of claim 8, **characterized in that**, the cross-flow blade (20) fits the second retaining ring (60) with a clearance.
10. The air conditioner according to claim 9, **characterized in that**, the clearance between the cross-flow blade (20) and the second retaining ring (60) is s , wherein $5\text{ mm} \leq s \leq 10\text{ mm}$.
11. The air conditioner according to claim 8, **characterized in that**, the second retaining ring (60) comprises:
 - a second retaining ring section (61) for air intake, and a second retaining ring section (62) for air blow;
 - wherein, the second retaining ring section (61) for air intake is provided at a side of the lower end cap (40), and the side of the lower end cap (40) is adjacent to the air flow inlet (11); the second retaining ring section (62) for air blow is dis-

posed at another side of the lower end cap (40),
and the other side of the lower end cap (40) is
adjacent to the air flow outlet (12);
a distance from an outer end surface of the sec- 5
ond retaining ring section (61) for air intake to
an end surface of a second end of the cross-
flow blade (20) is f , and a distance from an outer
end surface of the second retaining ring section
(62) for air blow to the end surface of the second 10
end of the cross-flow blade (20) is g , wherein f
< g .

12. The air conditioner according to claim 11, **charac-**
terized in that, $3\text{ mm} \leq g-f \leq 8\text{ mm}$.

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13. The air conditioner according to claim 1, **character-**
ized in that, $6\text{ mm} \leq h-a \leq 15\text{ mm}$,
and/or, $6\text{ mm} \leq b-k \leq 15\text{ mm}$.

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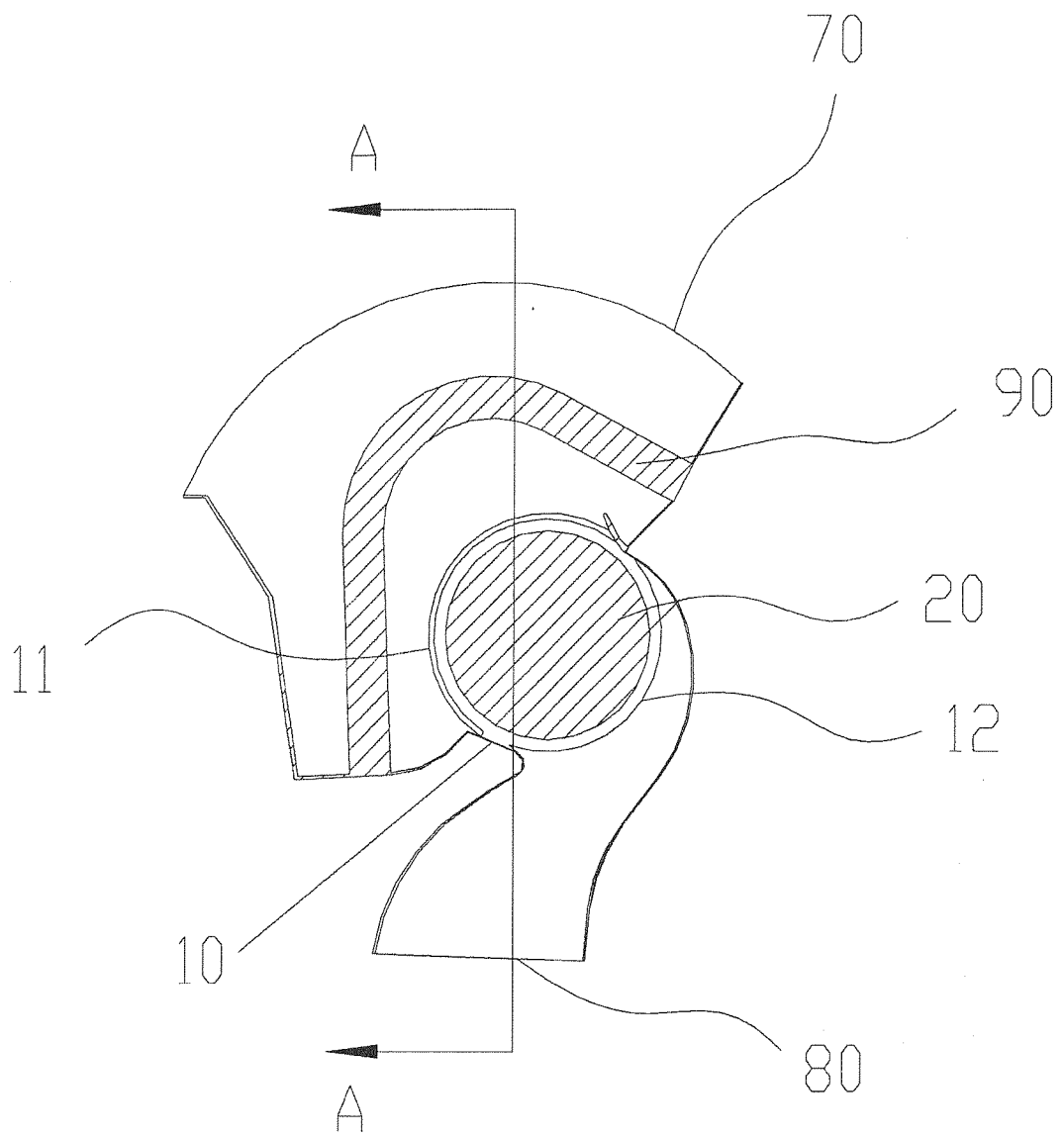


FIG. 1

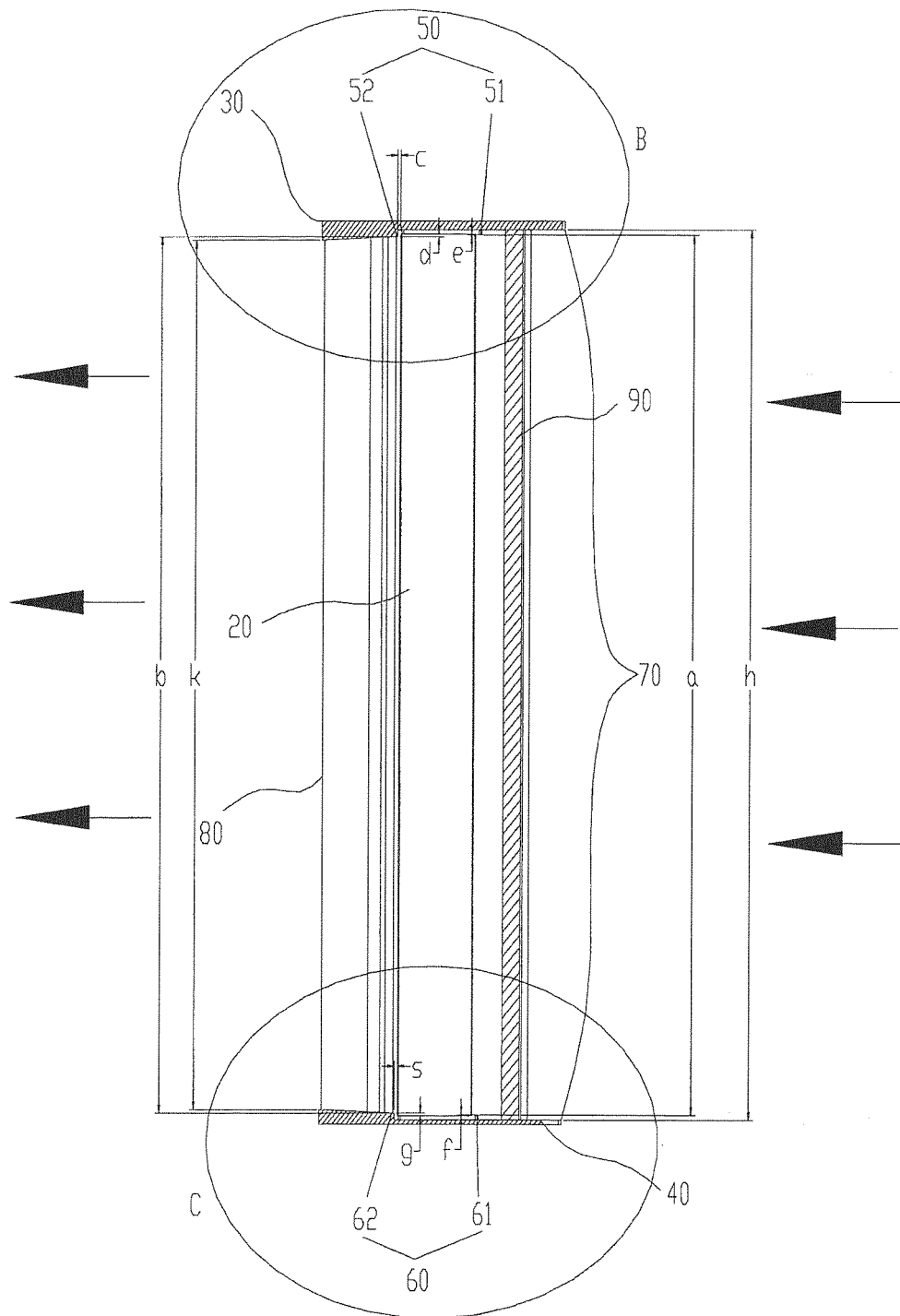


FIG. 2

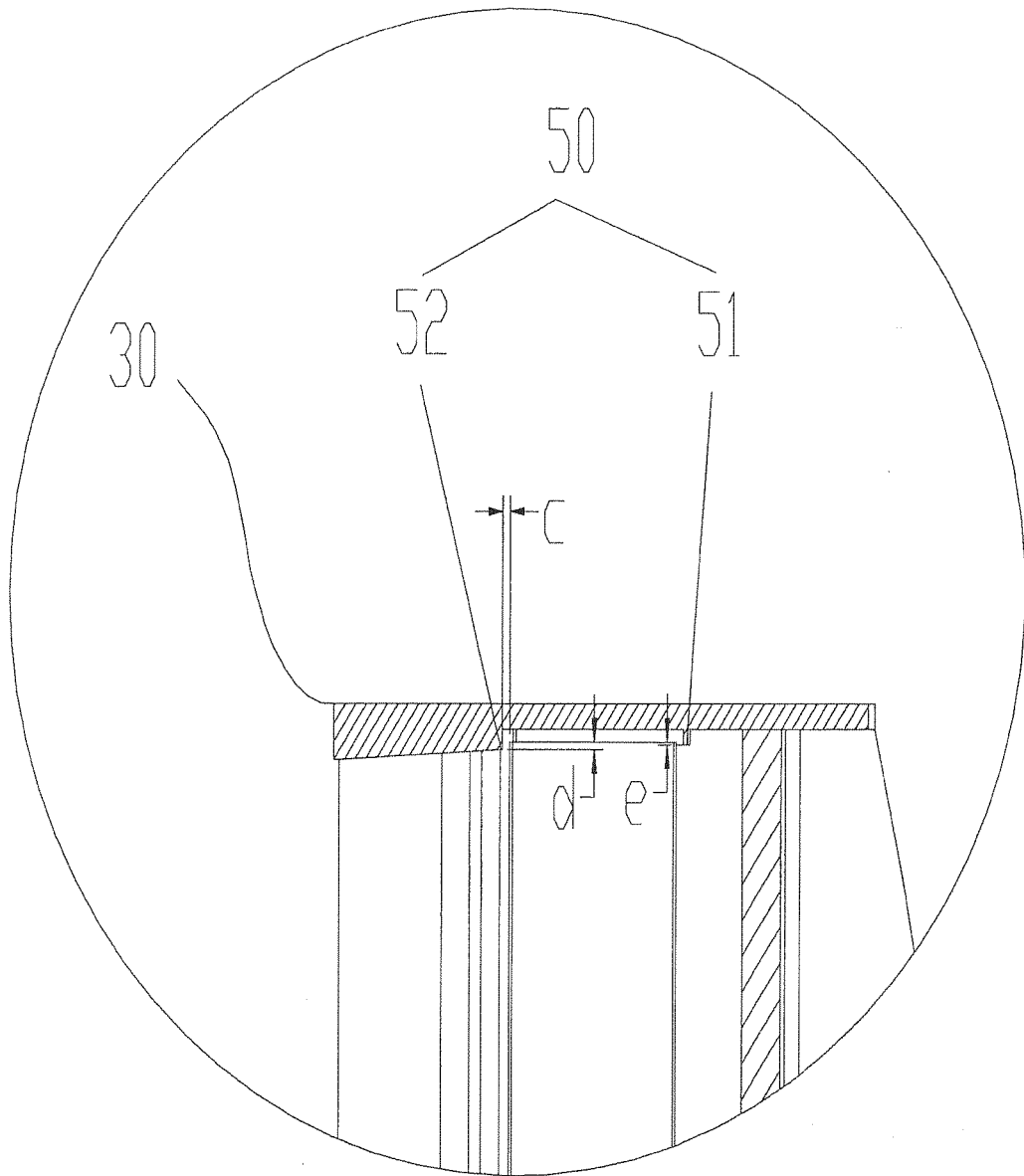


FIG. 3

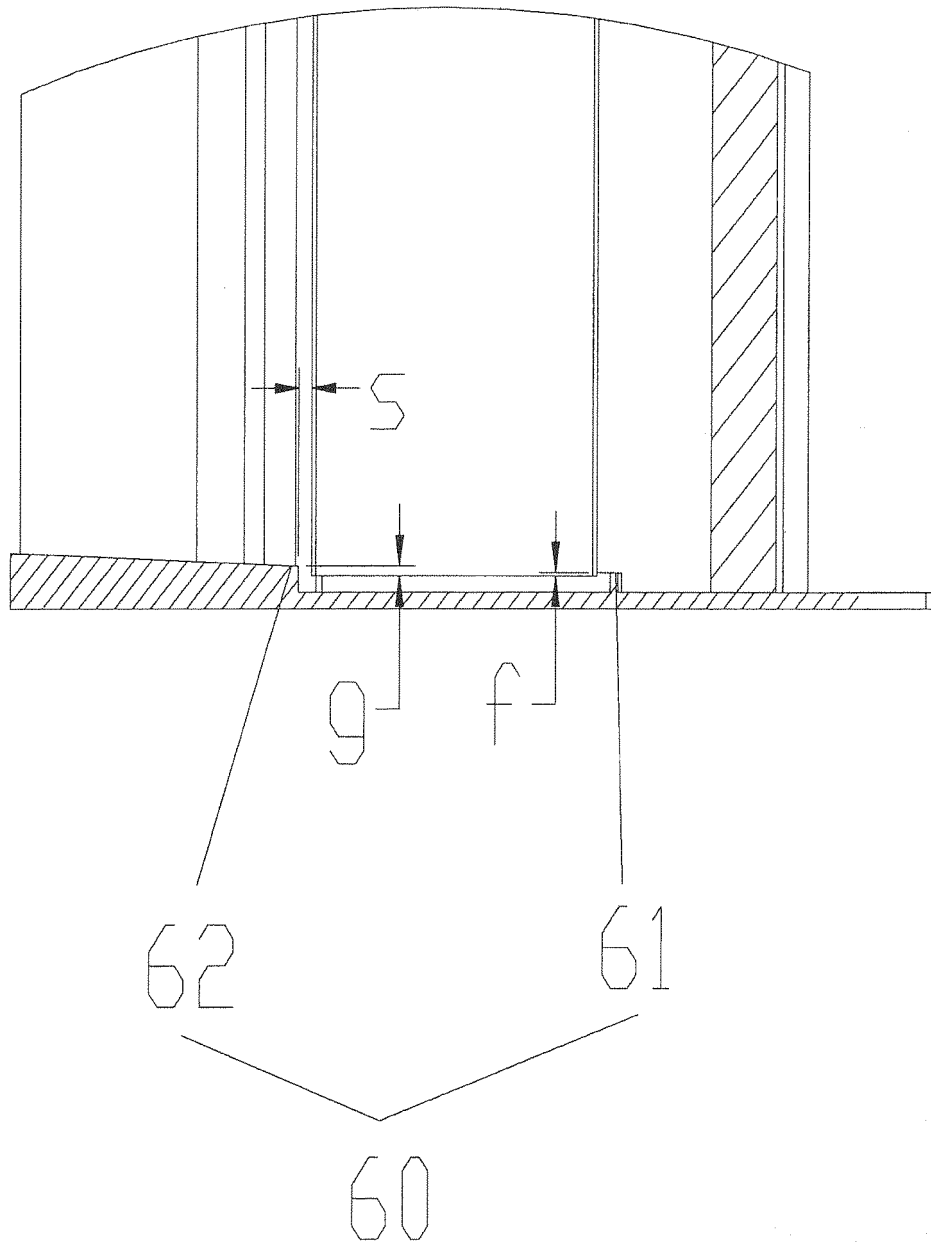


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/118958

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/00(2019.01)i; F24F 13/02(2006.01)i; F24F 13/08(2006.01)i; F24F 13/24(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNABS, CNKI, DWPI, VEN: 空调, 进风口, 出风口, 贯流风叶, 蜗壳, 蜗舌, 高度, 间隙, 噪声, air conditioner, inlet, outlet, cross flow fan, volute, snail tongue, height, gap, noise

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 206094308 U (TCL AIR CONDITIONER (ZHONGSHAN) CO., LTD. ET AL.) 12 April 2017 (2017-04-12) description, paragraphs [0029]-[0043], and figures 1 and 2	1-13
PX	CN 108266794 A (GREE ELECTRIC APPLIANCES INC. OF ZHUHAI) 10 July 2018 (2018-07-10) claims 1-13	1-13
A	CN 202361596 U (GUANGDONG MIDEA ELECTRIC APPLIANCES CO., LTD.) 01 August 2012 (2012-08-01) entire document	1-13
A	CN 104696281 A (GREE ELECTRIC APPLIANCES INC. OF ZHUHAI) 10 June 2015 (2015-06-10) entire document	1-13

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 February 2019

Date of mailing of the international search report

13 March 2019

Name and mailing address of the ISA/CN

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Facsimile No. (86-10)62019451

Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2018/118958

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Patent document cited in search report			Publication date (day/month/year)		Patent family member(s)			Publication date (day/month/year)	
CN	206094308	U	12 April 2017		None				
CN	108266794	A	10 July 2018		None				
CN	202361596	U	01 August 2012		None				
CN	104696281	A	10 June 2015		WO	2015081696	A1	11 June 2015	

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