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(54) **SCROLL COMPRESSOR**

(57) A scroll compressor is provided, which includes an outer shell (1), an inner shell (2), a motor (3), and a scroll component (4). The outer shell (1) is provided with a gas inlet (11). The inner shell (2) is arranged in the outer shell (1). The motor (3) is arranged in the inner shell (2) and includes a stator (31) and a rotor (32) arranged in the stator (31). A compression chamber (41) for compressing refrigerant gas is formed in the scroll component (4), and is configured to compress the refrigerant gas under control of the motor (3). An air gap (23) is provided between the stator (31) and the rotor (32) and/or between the stator (31) and the inner shell (2). An upper chamber (21) is formed in the inner shell (2) between the motor (3) and the scroll component (4), and the upper chamber (21) is provided with an upper inlet hole (24). The refrigerant gas entering from the gas inlet (11) has a lower temperature than the motor (3), and is configured to enter the compression chamber (41) partially through the upper inlet hole (24) and partially through the air gap (23) to absorb heat of the motor (3). The scroll compressor has a simple air guiding structure, low manufacturing difficulty and low processing cost.

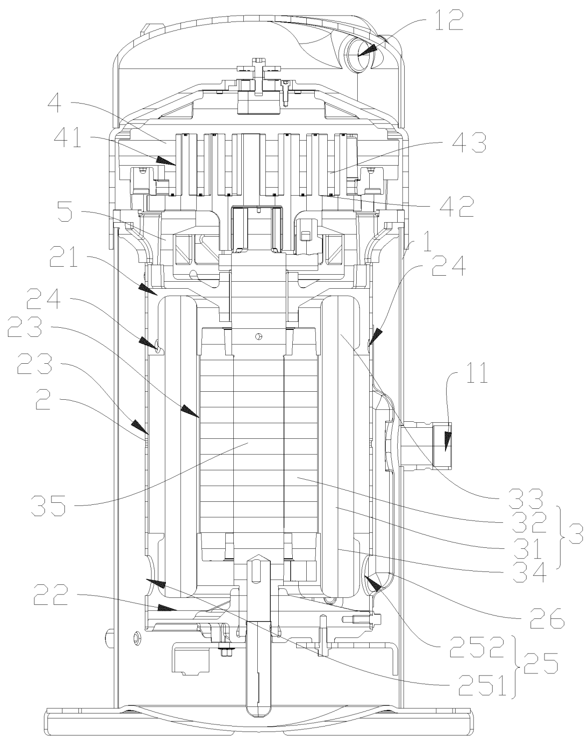

Figure 2

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Description

[0001] The present application claims priority to Chinese Patent Application No. 202311278617.5, titled "SCROLL COMPRESSOR", filed on September 28, 2023 with the National Intellectual Property Administration, PRC, which is incorporated herein by reference in its entirety.

FIELD

[0002] The present disclosure relates to the field of refrigeration devices, and in particular to a scroll compressor.

BACKGROUND

[0003] Scroll compressors are widely used in fields such as refrigeration, air conditioning and heat pumps due to their high efficiency, small size, light weight and smooth operation.

[0004] Specifically, a scroll compressor mainly includes a scroll assembly for compressing refrigerant and a motor for driving a compression mechanism. The motor may generate a large amount of heat during operation, and it is required to take away the heat from the motor by using the imported refrigerant, so as to reduce the temperature of the motor and prolong the service life of the motor.

[0005] However, as a lower wire wrap is located far away from a gas inlet of the motor, it is difficult to perform cooling. In an existing technology, the airflow is forced all into the lower wire wrap for cooling, then returns back to the upper wire wrap through the gap between the stator and rotor of the motor, and finally enters into the compression chamber. However, due to the gap between the stator and rotor and the stator of the motor and a cross-section area of the stator is very small, the refrigerant gas will have a large power loss after through such small cross-sectional area, which leads to an increase in the suction resistance of the scroll compressor, resulting in reduced energy efficiency of the scroll compressor.

[0006] In another existing technology, a part or all of the airflow is forced into the lower wire wrap of the motor, then flows to the upper wire wrap through a diversion pipeline bypassing the gap. Although this way can realize a good cooling effect of the motor, both the manufacturing difficulty and the cost are high.

SUMMARY

[0007] A scroll compressor is provided according to the present disclosure, to solve the problems in the conventional art.

[0008] According to a first aspect of the present disclosure, a scroll compressor is provided, which includes: an outer shell, an inner shell, a motor and a scroll assembly. The outer shell is provided with a gas inlet. The inner shell is arranged in the outer shell. The motor is arranged in the inner shell and includes a stator and a rotor arranged in the stator. The scroll assembly is provided with a compression chamber for compressing a refrigerant gas and configured to compress the refrigerant gas under control of the motor. An air gap is provided between the stator and the rotor and/or between the stator and the inner shell, an upper chamber is formed in the inner shell between the motor and the scroll assembly, and the upper chamber is provided with an upper inlet hole. Refrigerant gas entering from the gas inlet has a lower temperature than the motor, and is configured to enter the compression chamber partly from the upper inlet hole and partly from the air gap, to absorb heat of the motor.

[0009] In an embodiment of the present disclosure, a lower chamber is formed in the inner shell on a side of the motor away from the scroll assembly. The lower chamber is provided with a lower ventilation hole. The lower ventilation hole includes a lower inlet hole and a lower outlet hole, and the refrigerant gas entering from the gas inlet is configured to enter at least partially into the lower inlet hole; the lower outlet hole is connected to the upper inlet hole through a gap between the inner shell and outer shell.

[0010] In an embodiment of the present disclosure, the motor further includes an upper wire wrap and a lower wire wrap. The upper wire wrap is arranged in the upper chamber and the lower wire wrap is arranged in the lower chamber. Refrigerant gas in the upper chamber is configured to cool the upper wire wrap. The refrigerant gas in the upper chamber includes refrigerant gas entering the upper chamber from the gas inlet through the lower chamber and an air gap, refrigerant gas entering the upper chamber from the gas inlet through the upper inlet hole, and refrigerant gas entering the upper chamber from the gas inlet through the lower chamber, the lower ventilation hole and the upper inlet hole. The refrigerant gas in the lower chamber is configured to cool the lower wire wrap.

[0011] In an embodiment of the present disclosure, the scroll compressor further includes an air guiding portion. The air guiding portion is arranged on the inner shell or the outer shell and an end of the air guiding portion is in connection with the lower inlet hole, and an opening of the other end of the air guiding portion faces an export of the gas inlet.

[0012] In an embodiment of the present disclosure, the air guiding portion is arranged on the inner shell, an entry of the air guiding portion directly faces the opening of the outer shell, and a spacing between an outer contour of the air guiding portion and an inner surface of the outer shell ranges from 2 to 15 mm.

[0013] In an embodiment of the present disclosure, the refrigerant gas entering from the gas inlet is configured to all enter the lower inlet hole.

[0014] In an embodiment of the present disclosure, the scroll compressor further includes an air guiding portion.

The air guiding portion is configured to be connected at both ends to the gas inlet and the lower inlet hole, respectively.

[0015] In an embodiment of the present disclosure, a sum of areas of the upper inlet holes is set to be less than a sum of areas of the lower outlet holes.

[0016] In an embodiment of the present disclosure, the number of the upper inlet holes is greater than the number of the lower outlet holes, and an area of each of the upper inlet holes is less than the area of each of the lower outlet holes.

[0017] In an embodiment of the present disclosure, the upper inlet hole and the lower ventilation hole are configured to be uniformly distributed around the circumferential direction of the inner shell.

[0018] During operation of the scroll compressor of the present disclosure, refrigerant gas may enter the outer shell from the gas inlet, a part of the refrigerant gas may enter the upper chamber from the upper inlet hole, and another part of the refrigerant gas may enter the upper chamber from the air gap, then the refrigerant gas in the upper chamber may enter the compression chamber of the scroll assembly to be compressed and discharged from the scroll compressor.

[0019] Since the air gap is located between the stator and the rotor and/or between the stator and the inner shell, and the temperature of the refrigerant gas is lower than the temperature of the motor, the refrigerant gas can cool the motor when passing through the air gap, so that the heat of the motor can be efficiently discharged, thereby decreasing the temperature of the motor, thus prolonging the service life of the motor.

[0020] Since only a part of the refrigerant gas passes through the air gap, the rest part of the refrigerant gas enters the upper chamber from the upper inlet hole on the upper chamber, so that the amount of refrigerant gas that passes through the air gap is relatively small, which can achieve the effect of cooling the motor without causing a great power loss, and can realize the balance between cooling the motor and reducing the suction loss, thereby effectively increasing the energy efficiency of the compressor, thus improving the user experience.

[0021] Moreover, compared with the conventional art, the scroll compressor of the present disclosure has a simple air guide structure, less manufacturing difficulty, and lower processing costs.

[0022] Other features and advantages of the present disclosure will become clear through the following detailed description of the exemplary embodiments of the present disclosure with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The drawings, which are incorporated in and form a part of the specification, illustrate embodiments of the present disclosure and are used, together with their description, to explain the principles of the present disclosure.

Figure 1 is a schematic three-dimensional view of a scroll compressor according to embodiments of the present disclosure;

Figure 2 is a schematic cross-sectional view of a scroll compressor according to embodiments of the present disclosure;

Figure 3 is a schematic partial three-dimensional diagram of a scroll compressor according to embodiments of the present disclosure with a portion of the outer shell removed;

Figure 4 is a schematic partial three-dimensional diagram of a scroll compressor according to embodiments of the present disclosure with a portion of the outer shell and the inner shell removed; and

Figure 5 is a schematic diagram of the flow of a refrigerant gas in a scroll compressor according to embodiments of the present disclosure.

[0024] The one-to-one correspondence between names and the reference numbers of components in Figures 1 to 5 is described as follows:
1, Outer shell; 11, Gas inlet; 12, Gas outlet; 2, Inner shell; 21, Upper chamber; 22, Lower chamber; 23, Air gap; 24, Upper inlet hole; 25, Lower ventilation hole; 251, Lower inlet hole; 252, Lower outlet hole; 26, Air guiding portion; 3, Motor; 31, Stator; 32, Rotor; 33, Upper wire wrap; 34, Lower wire wrap; 35, Rotation shaft; 4, Scroll assembly; 41, Compression chamber; 42, Movable scroll member; 43, Stationary scroll member; 5, Main bearing housing.

DETAILED DESCRIPTION OF EMBODIMENTS

[0025] Various exemplary embodiments of the present disclosure will now be described in detail with reference to the drawings. It should be noted that the relative arrangements, numerical expressions and values of the components and steps set forth in these embodiments do not limit the scope of the present disclosure unless otherwise specifically stated.

[0026] The following description of at least one exemplary embodiment is in fact merely illustrative and in no way serves as any limitation on the present disclosure and its application or use.

[0027] Techniques, methods, and devices known to those skilled in the art may not be discussed in detail, but where appropriate, the techniques, methods, and devices should be considered as a portion of the specification.

[0028] In all examples shown and discussed herein, any specific values should be interpreted as merely exemplary and not as limitations. Thus, other examples of exemplary embodiments may have different values.

[0029] It should be noted that, similar symbols and letters denote similar items in the following drawings, and therefore, once an item is defined in one drawing, no further discussion is required in the subsequent drawings.

[0030] Herein, the terms "top", "bottom", "front", "back", "left", "right" and the like are used only to indicate relative positional relationship between related parts, rather than defining the absolute positions of such related parts.

[0031] Herein, the terms "first", "second" and the like are used only for distinguishing each other, rather than indicating the importance and order, or the premise of mutual existence.

[0032] Herein, the terms "equal", "same" and the like are not limitations in a strict mathematical and/or geometrical sense, but also encompass errors that are understandable to those skilled in the art and are permitted by manufacture or use, etc.

[0033] Unless otherwise indicated, the range of values herein includes not only the entire range within its two endpoints, but also a number of sub-ranges contained therein.

[0034] A scroll compressor is provided according to the present disclosure, the scroll compressor includes at least an outer shell, an inner shell, a motor, and a scroll assembly. The outer shell is provided with a gas inlet. The inner shell is arranged in the outer shell. The motor is arranged in the inner shell and includes a stator and a rotor arranged in the stator. A compression chamber is formed in the scroll assembly for compressing a refrigerant gas, and is configured to compress the refrigerant gas under control of the motor.

[0035] An air gap is provided between the stator and the rotor and/or between the stator and the inner shell, and an upper chamber is formed in the inner shell between the motor and the scroll assembly, the upper chamber is provided with an upper inlet hole. The temperature of the refrigerant gas from the gas inlet is lower than the temperature of the motor, and the refrigerant gas from the gas inlet is configured to partially enter the compression chamber through the upper inlet hole, and partially enter the compression chamber through the air gap, to absorb the heat from the motor.

[0036] During the operation of the scroll compressor of the present disclosure, the refrigerant gas may enter the outer shell from the gas inlet, and a part of the refrigerant gas may enter the upper chamber from the upper inlet hole, and another part of the refrigerant gas may enter the upper chamber from the air gap, and the refrigerant gas in the upper chamber may enter the compression chamber of the scroll assembly to be compressed and discharged from the scroll compressor.

[0037] Since the air gap is located between the stator and the rotor and/or between the stator and the inner shell, and the temperature of the refrigerant gas is lower than the temperature of the motor, the refrigerant gas can cool the motor when passing through the air gap, so that the heat of the motor can be efficiently discharged and the temperature of the motor can be lowered, which can in turn prolong the service life of the motor. In addition, because only a part of the refrigerant gas passes through the air gap, the rest part of the refrigerant gas enters the upper chamber from the upper inlet hole on the upper chamber, so that the amount of refrigerant gas that passes through the air gap is relatively small, which can achieve the effect of cooling the motor without causing a great power loss, and realize the balance between cooling the motor and reducing the suction loss, thereby effectively increasing the energy efficiency of the compressor, thus improving the user experience. Moreover, compared with the conventional art, the scroll compressor of the present disclosure has a simple air guide structure, less manufacturing difficulty, and lower processing costs.

[0038] For ease of understanding, the specific structure and operating principle of the scroll compressor of the present disclosure are described in detail below with reference to Figures 1 to 4, in conjunction with an embodiment.

[0039] As shown in Figures 1 and 2, a scroll compressor is provided according to the present disclosure, which includes at least an outer shell 1, an inner shell 2, a motor 3, and a scroll assembly 4.

[0040] The outer shell 1 is provided with a gas inlet 11, and it is appreciated that the outer shell 1 is further provided with a gas outlet 12 for compressed refrigerant gas to be discharged from the scroll compressor, as shown in Figures 1 and 2. The inner shell 2 is provided in the outer shell 1 and is configured for mounting various structures required for the scroll compressor.

[0041] The motor 3 is arranged in the inner shell 2 and includes a stator 31 and a rotor 32 arranged in the stator 31. It is appreciated that the motor 3 may further include an upper wire wrap 33 and a lower wire wrap 34, the upper wire wrap 33 and the lower wire wrap 34 are used for driving the rotor 32 to rotate relative to the stator 31 once an electric current is inputted.

[0042] The compression chamber 41 for compressing the refrigerant gas is formed in the scroll assembly 4 and is configured to compress the refrigerant gas under control of the motor 3. Specifically, the rotor 32 is provided with a rotation shaft 35, and the scroll assembly 4 may include a movable scroll member 42 and a stationary scroll member 43 arranged in the compression chamber 41, the movable scroll member 42 is connected to the rotation shaft 35 via an eccentric shaft, and the rotation shaft 35 can drive the movable scroll member 42 to perform a rotary translation relative to the stationary scroll member 43.

[0043] Both the movable scroll member 42 and the stationary scroll member 43 have helical profiles, and the movable scroll member 42 is mounted eccentrically with respect to the stationary scroll member 43 and contacts the stationary scroll member 43 in several straight lines in the axial direction, so that a series of crescent-shaped spaces, i.e., primitive volumes, are formed by the movable scroll member 42 and the stationary scroll member 43. In a case that the movable scroll member 42 takes a center of the stationary scroll member 43 as a rotation center, and performs the rotary translation without revolution with a certain rotation radius, the outer crescent-shaped spaces will continually move toward the center, thus the refrigerant gas is gradually pushed to the center region, with its volume constantly shrinking and the pressure continually increasing until reaching the center exhaust hole and being discharged from the exhaust hole on the outer shell 1.

[0044] The upper chamber 21 is formed in the inner shell 2 between the motor 3 and the scroll assembly 4, and an air gap 23 is provided between the stator 31 and the rotor 32 and/or between the stator 31 and the inner shell 2, and the air gap 23 is in communication with the upper chamber 21, so that the refrigerant gas can enter the upper chamber 21 from the air gap 23.

[0045] Specifically, since the rotor 32 rotates relative to the stator 31 during the operation of the motor 3, it is inevitably necessary to reserve a gap between the stator 31 and the rotor 32, which can be used as the air gap 23. In a case that the stator 31 is arranged on the inner side of the inner shell 2, the stator 31 may be tightly fitted with the inner side of the inner shell 2, and there may also be a gap there between. In a case that there is a gap running up and down between the stator 31 and the inner side of the inner shell 2, the gap may also serve as an air gap.

[0046] As shown in Figure 2, an upper inlet hole 24 is provided in the upper chamber 21. The temperature of the refrigerant gas entering from the gas inlet 11 is lower than the temperature of the motor 3, and the refrigerant gas entering from the gas inlet 11 is configured to enter the compression chamber 41 partly from the upper inlet hole 24 and partly from the air gap 23 to absorb the heat of the motor 3.

[0047] During the operation of the scroll compressor of the present disclosure, the refrigerant gas may enter into the outer shell 1 from the gas inlet 11, and a part of the refrigerant gas may enter into the upper chamber 21 from the upper inlet hole 24, and another part of the refrigerant gas may enter the upper chamber 21 from the air gap, and the refrigerant gas in the upper chamber 21 may enter into the compression chamber 41 of the scroll assembly 4 to be compressed and discharged from the scroll compressor.

[0048] Since the air gap 23 is located between the stator 31 and the rotor 32 and/or between the stator 31 and the inner shell 2, and the temperature of the refrigerant gas is lower than the temperature of the motor 3, the refrigerant gas can cool the motor 3 when passing through the air gap 23, so that the heat of the motor 3 can be effectively discharged and the temperature of the motor 3 can be decreased, which can in turn prolong the service life of the motor 3.

[0049] In addition, as only a part of the refrigerant gas passes through the air gap, the rest part of the refrigerant gas enters the upper chamber 21 from the upper inlet hole 24 on the upper chamber 21, so that the amount of refrigerant gas passing through the air gap is relatively small, which can achieve the effect of cooling the motor 3 without causing a great power loss, and realize the balance between cooling the motor and reducing the suction loss, thereby effectively improving the energy efficiency of the compressor, thus improving the user experience. Moreover, compared with the conventional art, the scroll compressor of the present disclosure has a simple air guiding structure, less manufacturing difficulty, and lower processing costs.

[0050] It is to be appreciated that, as shown in Figure 3, in an embodiment of the present disclosure, the scroll compressor of the present disclosure further includes a main bearing housing 5. The main bearing housing 5 is arranged between the motor 3 and the scroll assembly 4 and is configured to support the scroll assembly 4. The main bearing housing 5 is provided with an inlet passage, and the refrigerant gas is configured to enter the compression chamber 41 through the inlet passage. During operation of the scroll compressor of the present disclosure, the refrigerant gas entering the upper chamber 21 enters the compression chamber 41 of the scroll assembly 4 through the inlet passage on the main bearing housing 5.

[0051] Further, as shown in Figure 2, in an embodiment of the present disclosure, a lower chamber 22 is formed in the inner shell 2 on the side of the motor 3 away from the scroll assembly 4, and the lower chamber 22 is provided with the lower ventilation hole 25, the lower ventilation hole 25 includes a lower inlet hole 251 and a lower outlet hole 252, and the refrigerant gas entering from the gas inlet 11 is configured to at least partially enter the lower inlet hole 251. The lower outlet hole 252 is connected to the upper inlet hole 24 through a gap between the inner shell 2 and the outer shell 1.

[0052] During operation of the scroll compressor of the present disclosure, the refrigerant gas entering from the gas inlet 11 enters at least partially into the lower inlet hole 251 and thereby enters into the lower chamber 22, and then the refrigerant gas in the lower chamber 22 flows partially from the air gap 23 into the upper chamber 21, and partially flows out from the lower outlet hole 252 and then flows into the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1.

[0053] The "upper" and "lower" in the upper chamber 21 and the lower chamber 22 in the present disclosure refers only to the direction in the figure, and does not represent an actual installation direction of the scroll compressor, and this also applies to other structures, and will not be repeated herein.

[0054] In this way, with the scroll compressor of the present disclosure, a part of the refrigerant gas enters the lower chamber 22 and is diverged in the lower chamber 22, a part of which flows into the air gap 23, and another part of which flows out of the lower outlet hole 252 of the lower chamber 22, so that the amount of refrigerant gas flowing into the air gap can be guaranteed, so as to ensure that the motor 3 can be sufficiently cooled, and to avoid the occurrence of a situation in which the temperature of the motor 3 is too high or even burned out. Further, due to the small cross-sectional area of the air gap 23, when a large amount of refrigerant gas enters the lower chamber 22, the excess refrigerant gas may flow out of the lower outlet hole 252 and flow into the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1, thereby reducing the power loss of the refrigerant gas when flowing in the air gap 23, thus reducing the suction resistance of the scroll compressor.

[0055] As shown in Figure 2, it is to be appreciated that the upper wire wrap 33 is located in the upper chamber 21 and the lower wire wrap 34 is located in the lower chamber 22, and thus, in an embodiment of the present disclosure, the refrigerant gas in the upper chamber 21 is configured to cool the upper wire wrap 33, and the refrigerant gas in the upper chamber 21 includes refrigerant gas entering the upper chamber 21 from the gas inlet 11 via the lower chamber 22 and the air gap 23, refrigerant gas entering the upper chamber 21 from the gas inlet 11 via the upper inlet hole 24, and refrigerant gas entering the upper chamber 21 from the gas inlet 11 via the lower chamber 22, the lower ventilation hole 25, and the upper inlet hole 24. The refrigerant gas in the lower chamber 22 is configured to cool the lower wire wrap 34.

[0056] As shown in Figure 5, that is, the refrigerant gas in the upper chamber 21 includes two parts, one part is from the air gap 23 and the other part is from the upper inlet hole 24, and the refrigerant gas from the upper inlet hole 24 may be divided into two parts, one part of which enters the upper inlet hole 24 directly from the gas inlet 11, and the other part of which enters the lower chamber 22 from the gas inlet 11, and flows from the lower ventilation hole 25 to the gap between the inner shell 2 and the outer shell 1, and enters the lower chamber 22 from the upper inlet hole 24.

[0057] Since at least a part of the refrigerant gas can enter the lower chamber 22 to cool the lower wire wrap 34, and all of the refrigerant gas will enter the upper chamber 21 to cool the upper wire wrap 33 before flowing to the compression chamber 41, there will not be a situation in which a part of the refrigerant gas does not cool the motor 3. In this way, although only a part of the refrigerant gas entering from the gas inlet 11 is used for cooling the lower wire wrap 34, the temperature is lower and can effectively cool the lower wire wrap 34, and all of the refrigerant gas can effectively cool the upper wire wrap 33 after entering the upper chamber 21. In this way, with the scroll compressor of the present disclosure, an uneven degree of cooling between the upper wire wrap 33 and the lower wire wrap 34 can be avoided to a certain extent, preventing localized high temperature of a certain upper wire wrap, thus effectively prolonging the service life of the motor 3.

[0058] It is to be understood that in an embodiment of the present disclosure, the refrigerant gas entering from the gas inlet 11 is configured to partially enter the lower inlet hole 251, and partially flow directly from the lower outlet hole 252 and the upper inlet hole 24 to the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1. By controlling the amount of the refrigerant gas entering the lower inlet hole 251, the lower wire wrap 34 can be efficiently cooled, preventing the lower wire wrap 34 from overheating.

[0059] In another embodiment of the present disclosure, the refrigerant gas entering from the gas inlet 11 is configured to all enter the lower inlet hole 251. During the operation of the scroll compressor of the present disclosure, the refrigerant gas entering from the gas inlet 11 all enters the lower inlet hole 251, and thus enters the lower chamber 22, and then the refrigerant gas in the lower chamber 22 partly flows from the air gap 23 to the upper chamber 21, and partly flows from the lower outlet hole 23 to the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1.

[0060] In this way, with the scroll compressor of the present disclosure, all of the refrigerant gas enters the lower chamber 22 and is diverged in the lower chamber 22, a part of which flows into the air gap 23, and another part of which flows out of the lower outlet hole 252 of the lower chamber 22, so that the amount of refrigerant gas flowing into the air gap can be guaranteed, so as to ensure that the motor 3 can be sufficiently cooled, and to avoid the occurrence of a situation in which the temperature of the motor 3 is too high or even burned out. Further, due to the small cross-sectional area of the air gap 23, when a large amount of refrigerant gas enters the lower chamber 22, the excess refrigerant gas may flow out of the lower outlet hole 252 and flow into the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1, thereby reducing the power loss of the refrigerant gas when flowing in the air gap 23, thus reducing the suction resistance of the scroll compressor.

[0061] Since all of the refrigerant gas can enter the lower chamber 22 to cool the lower wire wrap 34, and all of the refrigerant gas will enter the upper chamber 21 to cool the upper wire wrap 33 before flowing to the compression chamber 41, there will not be a situation in which a part of the refrigerant gas does not cool the motor 3. In this way, with the scroll compressor of the present disclosure, an uneven degree of cooling between the upper wire wrap 33 and the lower wire wrap 34 can be avoided to a certain extent, preventing localized high temperature of a certain upper wire wrap, thus effectively prolonging the service life of the motor 3.

[0062] Specifically, in order to guide the refrigerant gas entering from the gas inlet 11 partially enter the lower inlet hole 251 of the scroll member, as shown in Figures 2 and 4, in an embodiment of the present disclosure, the scroll compressor of the present disclosure further includes an air guiding portion 26, the air guiding portion 26 is arranged on the inner shell 2 and is connected to the lower inlet hole 251 at one end, and the opening at the other end directly faces the export of the gas inlet 11. Since the opening of the air guiding portion 26 directly faces the outlet of the gas inlet 11, when the refrigerant gas flows into the outer shell 1 from the gas inlet 11, a part of the refrigerant gas will enter into the opening of the air guiding portion 26, and thus flow from the lower inlet hole 251 to the lower chamber 22 along the air guiding portion 26. In another embodiment of the present disclosure, one end of the air guiding portion 26 is connected to the lower inlet hole 251, and the opening at the other end is connected to the export of the gas inlet 11, which also enables that after the refrigerant gas flows into the outer shell 1 from the gas inlet 11, a part of the refrigerant gas enters the opening of the air guiding portion 26. In another embodiment of the present disclosure, the air guiding portion 26 may also be arranged on the outer shell 1, with one end connected to the gas inlet 11 and the opening at the other end connected to the lower inlet hole 251, in a similar principle, which will not be repeated herein.

[0063] As shown in Figure 2, in order to allow a large amount of refrigerant gas to enter the opening of the air guiding portion 26, in an embodiment of the present disclosure, the diameter of the opening of the air guiding portion 26 is larger than the diameter of the gas inlet 11. Since the diameter of the opening of the air guiding portion 26 is larger than the diameter of the export of the gas inlet 11, and the opening of the air guiding portion 26 directly faces the export of the inlet 11, so that during the operation of the scroll compressor of the present disclosure, a large portion of the refrigerant gas flowing out of the export of the gas inlet 11 will enter into the air guiding portion 26, so as to ensure that the refrigerant gases entering into the lower chamber 22 can efficiently cool the lower wire wrap 34, and to avoid an overheating of the lower wire wrap 34.

[0064] Further, as shown in Figure 2, in an embodiment of the present disclosure, the air guiding portion 26 is arranged on the inner shell 2, the entry of the air guiding portion 26 directly faces the opening of the outer shell 1, and the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 is from 2 to 15 mm. In a case that the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 is greater than or equal to 2 mm, the assembly accuracy between the air guiding portion 26 and the outer shell 1 can be effectively ensured, preventing contact between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1. In a case that the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 is less than or equal to 15 mm, it can be ensured that a large amount of refrigerant gas will not enter the upper inlet hole 24 through the gap between the air guiding portion 26 and the inner surface of the outer shell 1, so as to ensure the cooling effect of the motor 3.

[0065] Further, in an embodiment of the present disclosure, the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 is 5 mm, so as to effectively improve the cooling effect of the motor 3 and ensure the assembly accuracy between the air guiding portion 26 and the outer shell 1.

[0066] In the above embodiment, the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 is 5 mm, and in other embodiments, the spacing between the outer contour of the air guiding portion 26 and the inner surface of the outer shell 1 may also be set as needed, which is not limited herein.

[0067] In order to guide all of the refrigerant gas entering from the gas inlet 11 enter the lower inlet hole 251 of the scroll member, in another embodiment of the present disclosure, the scroll compressor of the present disclosure further includes an air guiding portion 26, and the air guiding portion 26 is configured so that the two ends are connected to the gas inlet 11, and the lower inlet hole 251, respectively. In this way, during the operation of the scroll compressor of the present disclosure, the refrigerant gas entering from the gas inlet 11 can all enter the lower inlet hole 251 along the air guiding portion 26, and thus enter into the lower chamber 22, and then the refrigerant gas in the lower chamber 22 flows partly from the air gap 23 into the upper chamber 21, and partly flows from the lower outlet hole 252 into the upper chamber 21 through the gap between the inner shell 2 and the outer shell 1.

[0068] As shown in Figure 4, in an embodiment of the present disclosure, a sum of the areas of the upper inlet holes 24 is set to be less than a sum of the areas of the lower outlet holes 252. By setting the sum of the areas of the upper inlet holes 24 smaller than the sum of the areas of the lower outlet holes 252, the amount of refrigerant gas flowing to the air gap 23 can meet the requirement so that the motor 3 can be effectively cooled and the temperature of the motor 3 can be effectively reduced.

[0069] It is to be understood that the ratio between the area of the upper inlet hole 24 and the area of the lower outlet hole 252 can be set so that the amount of refrigerant gas flowing to the air gap 23 is neither too much nor too little, so that the motor 3 can be effectively cooled without excessive power loss of the refrigerant gas.

[0070] As shown in Figure 4, in an embodiment of the present disclosure, the number of the upper inlet hole 24 is larger than the number of the lower outlet hole 252, and the area of each upper inlet hole 24 is smaller than the area of the lower outlet hole 252. By setting the number of the upper inlet holes 24 larger than the number of the lower outlet holes 252, and the area of each upper inlet hole 24 smaller than the area of the lower outlet hole 252, the refrigerant gas flowing out of the lower outlet hole 252 can enter into the upper chamber 21 from multiple upper inlet holes 24, so as to make the refrigerant gas more uniformly distributed when flowing in the gap between the inner shell 2 and the outer shell 1.

[0071] Specifically, in the scroll compressor of the present disclosure, the cooling effect of the motor 3 and the suction loss of the scroll compressor can be balanced by adjusting the area and number of the upper inlet hole 24, the structure is simple and the processing cost is relatively low.

[0072] Further, as shown in Figure 4, in an embodiment of the present disclosure, the upper inlet hole 24 and the lower ventilation hole 25 are configured to be uniformly distributed along the circumferential direction of the inner shell 2. Since the upper inlet hole 24 and lower ventilation hole 25 are uniformly distributed along the circumferential direction of the inner shell 2, the distances from lower outlet holes 252 to respective upper inlet holes 24 are relatively similar to each other, and the refrigerant gas can be distributed evenly in the circumferential direction of the inner shell 2, without excessive amount of gas on one side.

[0073] Various embodiments of the present disclosure have been described above, and the foregoing description is exemplary and not exhaustive, and is not limited to the disclosed embodiments. Many modifications and changes made without departing from the scope and spirit of the disclosed embodiments will be apparent to those skilled in the art. The terms used herein is chosen to best explain the principles of the embodiments, practical applications, or improvements to techniques in the marketplace, or to enable others of ordinary skill in the art to understand the embodiments disclosed herein. The scope of the present disclosure is limited by the claims.

Claims

1. A scroll compressor, comprising:

an outer shell (1), provided with a gas inlet (11);
an inner shell (2), arranged in the outer shell (1);
a motor (3), arranged in the inner shell (2) and comprising a stator (31) and a rotor (32) arranged in the stator (31); and
a scroll assembly (4), provided with a compression chamber (41) for compressing a refrigerant gas and configured to compress the refrigerant gas under control of the motor (3), wherein
an air gap (23) is provided between the stator (31) and the rotor (32) and/or between the stator (31) and the inner shell (2), an upper chamber (21) is formed in the inner shell (2) between the motor (3) and the scroll assembly (4), and the upper chamber (21) is provided with an upper inlet hole (24);
refrigerant gas entering from the gas inlet (11) has a lower temperature than the motor (3), and the refrigerant gas entering from the gas inlet (11) is configured to enter the compression chamber (41) partly from the upper inlet hole (24) and partly from the air gap (23), to absorb heat of the motor (3).

2. The scroll compressor according to claim 1, wherein a lower chamber (22) is formed in the inner shell (2) on a side of the motor (3) away from the scroll assembly (4), the lower chamber (22) is provided with a lower ventilation hole (25), the lower ventilation hole (25) comprises a lower inlet hole (251) and a lower outlet hole (252), and the refrigerant gas entering from the gas inlet (11) is configured to enter at least partially into the lower inlet hole (251); the lower outlet hole (252) is connected to the upper inlet hole (24) through a gap between the inner shell (2) and outer shell (1).

3. The scroll compressor according to claim 2, wherein the motor (3) further comprises an upper wire wrap (33) and a lower wire wrap (34), the upper wire wrap (33) is arranged in the upper chamber (21) and the lower wire wrap (34) is arranged in the lower chamber (22), refrigerant gas in the upper chamber (21) is configured to cool the upper wire wrap (33), the refrigerant gas in the upper chamber (21) comprises refrigerant gas entering the upper chamber (21) from the gas inlet (11) through the lower chamber (22) and an air gap (23), refrigerant gas entering the upper chamber (21) from the gas inlet (11) through the upper inlet hole (24), and refrigerant gas entering the upper chamber (21) from the gas inlet (11) through the lower chamber (22), the lower ventilation hole (25) and the upper inlet hole (24), and
the refrigerant gas in the lower chamber (22) is configured to cool the lower wire wrap (34).

4. The scroll compressor according to claim 2, further comprising an air guiding portion (26), wherein the air guiding portion (26) is arranged on the inner shell (2) or the outer shell (1) and an end of the air guiding portion (26) is in connection with the lower inlet hole (251), and an opening of the other end of the air guiding portion (26) faces an export of the gas inlet (11).

5. The scroll compressor according to claim 4, wherein the air guiding portion (26) is arranged on the inner shell (2), an entry of the air guiding portion (26) directly faces the opening of the outer shell (1), and a spacing between an outer contour of the air guiding portion (26) and an inner surface of the outer shell (1) ranges from 2 mm to 15 mm.

6. The scroll compressor according to claim 2, wherein the refrigerant gas entering from the gas inlet (11) is configured to all enter the lower inlet hole (251).

7. The scroll compressor according to claim 6, further comprising an air guiding portion (26), wherein the air guiding portion (26) is configured to be connected at both ends to the gas inlet (11) and the lower inlet hole (251) respectively.

8. The scroll compressor according to claim 2, wherein a sum of areas of upper inlet holes (24) is set to be less than a sum of areas of lower outlet holes (252).

9. The scroll compressor according to claim 8, wherein the number of the upper inlet holes (24) is greater than the number of the lower outlet holes (252) and an area of each of the upper inlet holes (24) is smaller than an area of each of the lower outlet holes (252).

10. The scroll compressor according to claim 2, wherein the upper inlet hole (24) and the lower ventilation hole (25) are configured to be uniformly distributed around the circumferential direction of the inner shell (2).

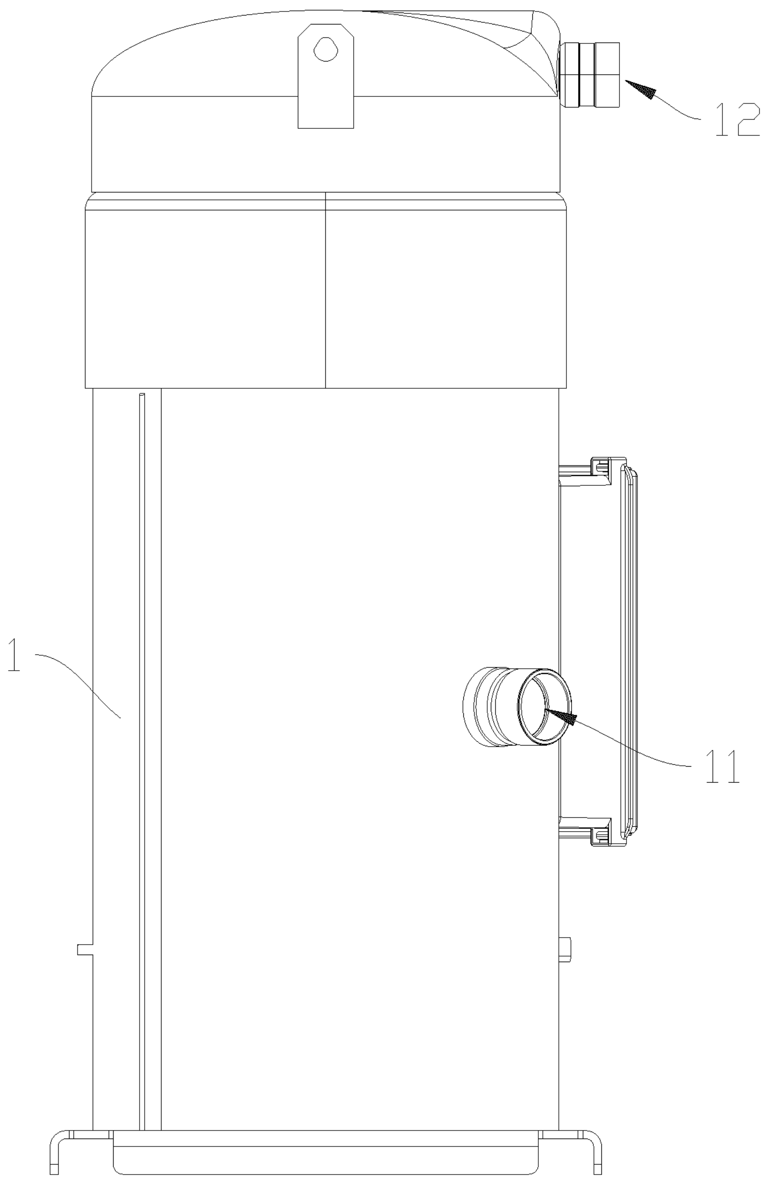

Figure 1

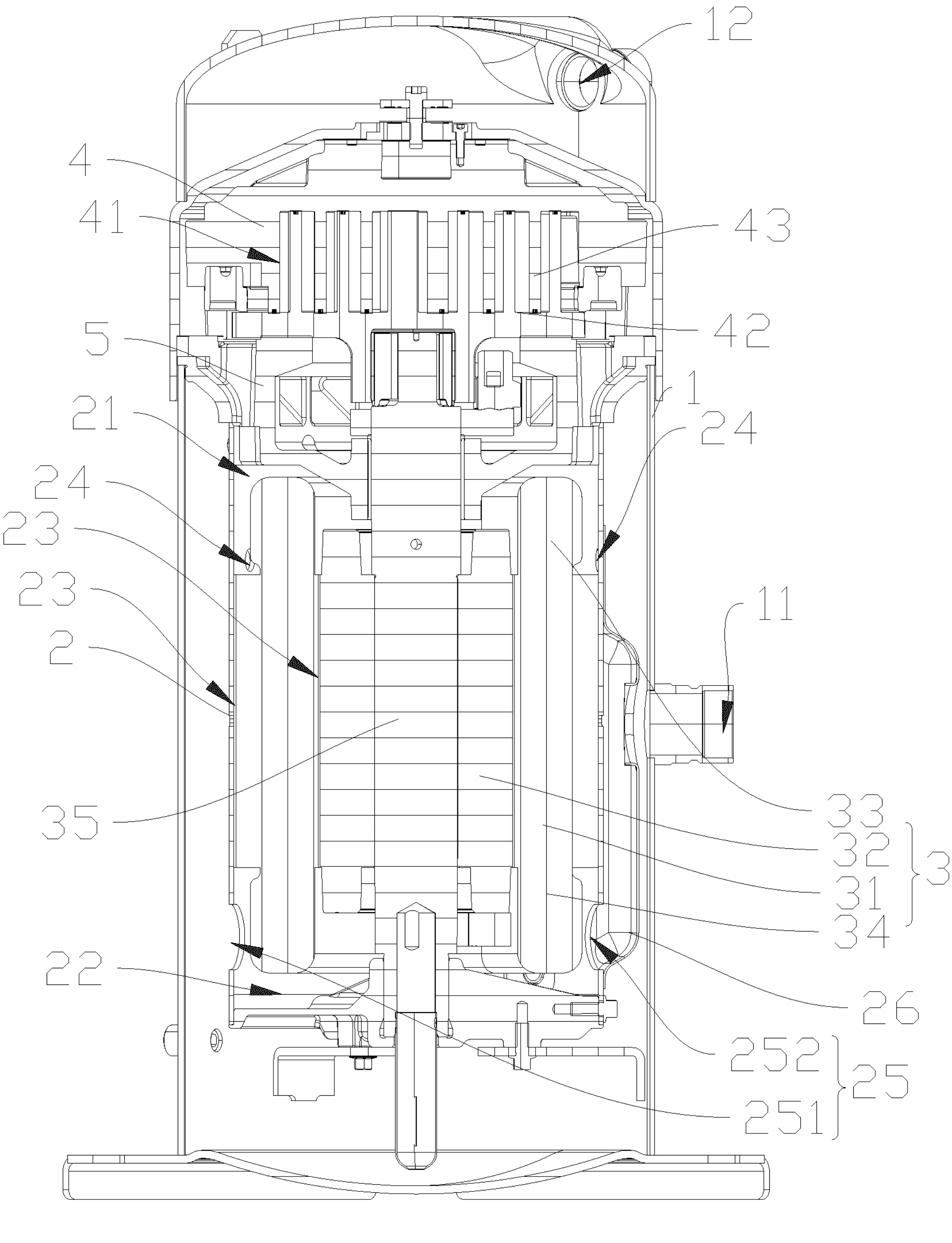

Figure 2

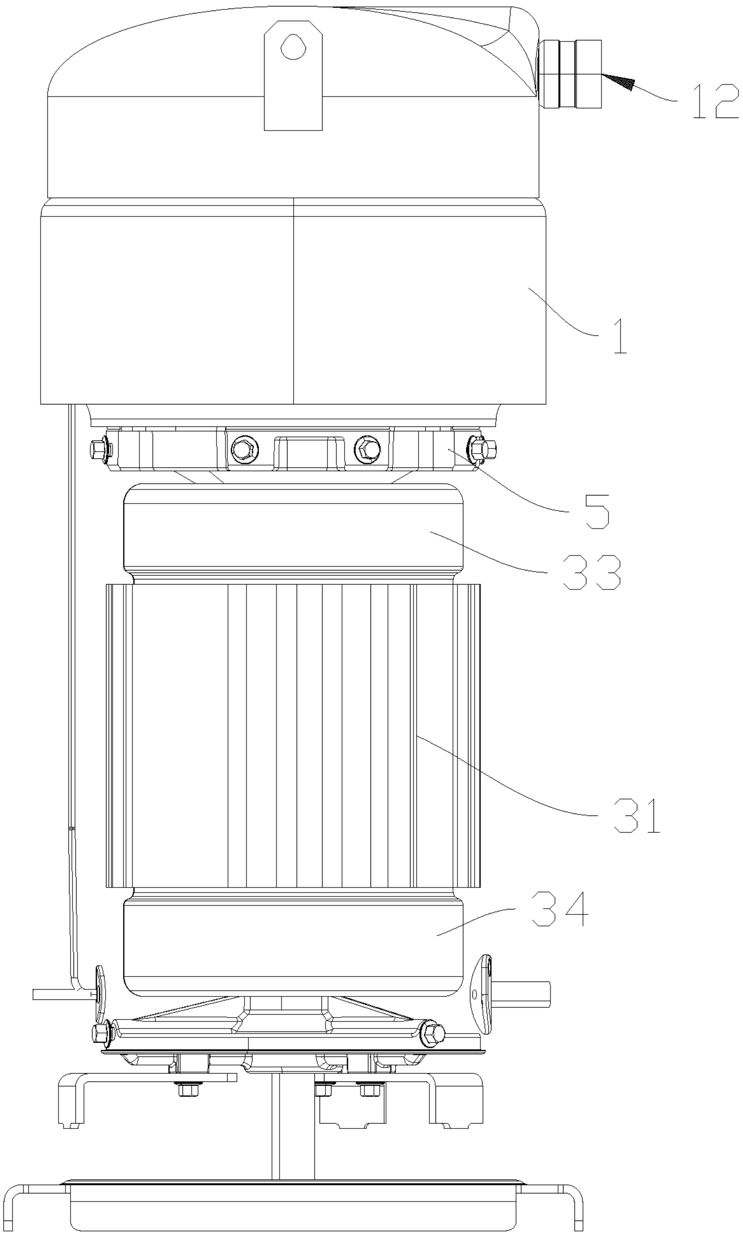

Figure 3

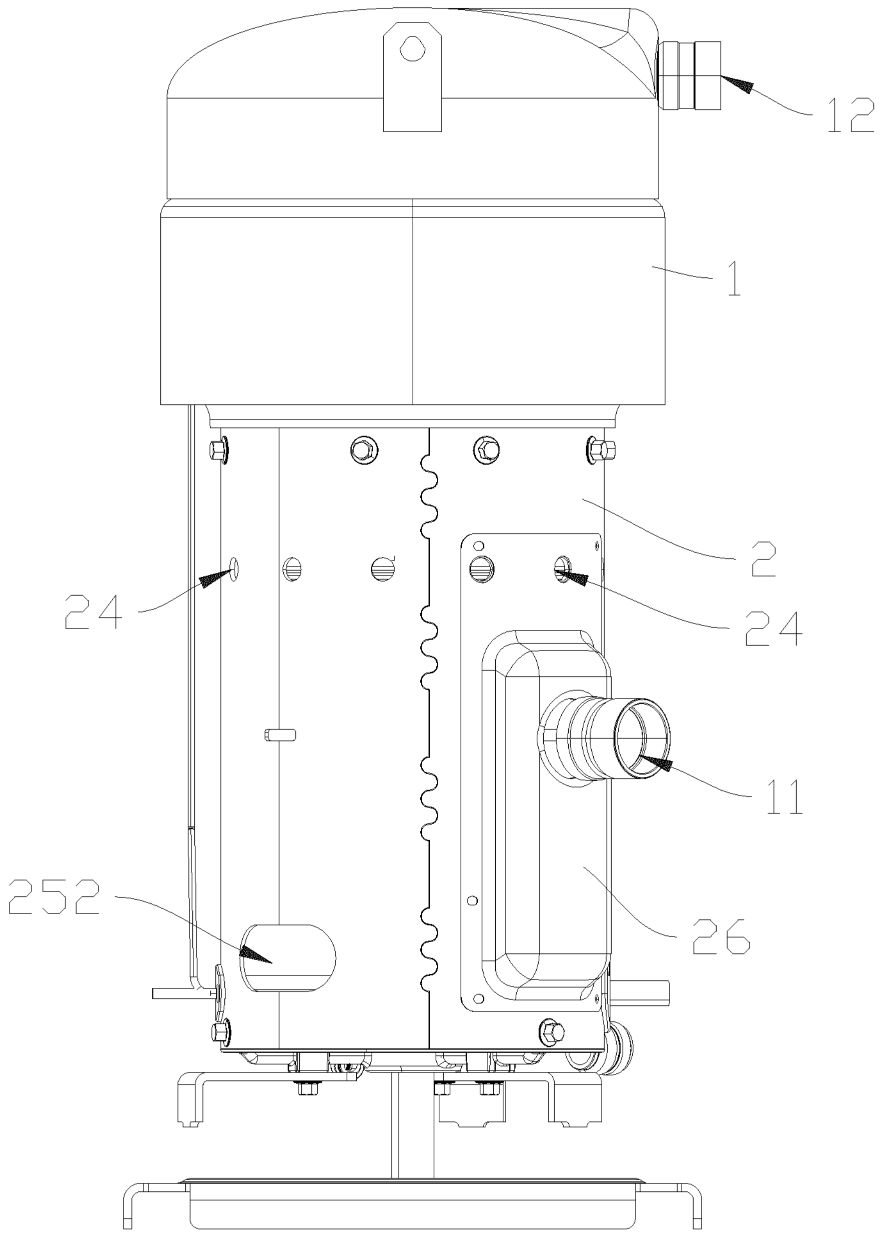

Figure 4

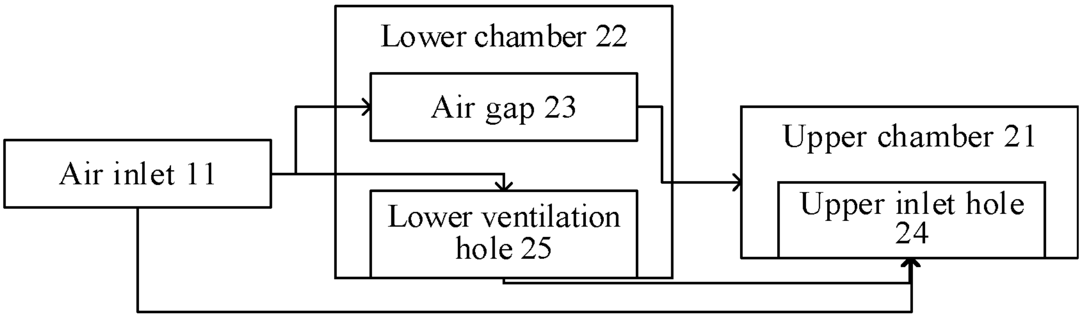

Figure 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/085338

A. CLASSIFICATION OF SUBJECT MATTER

F04C18/02(2006.01)i；F04C29/04(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)

IPC: F04C

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)

CNTXT, VEN, CNKI: 涡旋, 涡卷, 螺旋, 压缩机, 电机, 马达, 冷却, scroll, spiral, comperssor, motor, cool

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 1181128 A (AMERICAN STANDARD INC.) 06 May 1998 (1998-05-06) entire document	1-10

☐ 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
"D" document cited by the applicant in the international application
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"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	Date of mailing of the international search report
21 May 2024	**10 June 2024**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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