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(54) **ROTOR ASSEMBLY, CIRCULATING PUMP, AND AIR CONDITIONER**

(57) A rotor assembly, a circulating pump, and an air conditioner. The rotor assembly (100) comprises a rotor, a shielding cover (150), and a sealing member (160); the rotor comprises a rotating shaft (110) and a magnetic ring (120); the magnetic ring (120) is fixed to the outer wall of the rotating shaft (110); the shielding cover (150) covers the outer side of the rotor and is used for separating the rotor from a stator (180); the shielding cover (150) is provided with a relief hole (151) corresponding to the end of the rotating shaft (110); and the sealing member (160) is detachably mounted at the relief hole (151).

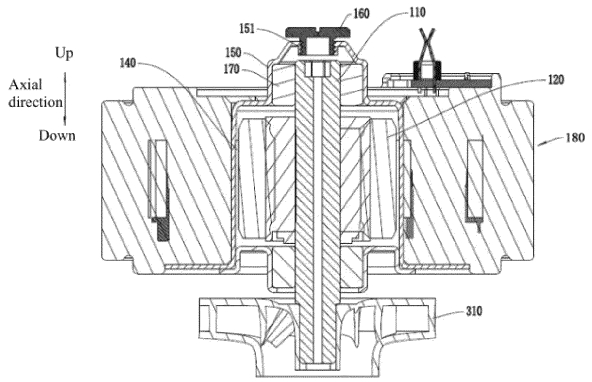

Fig. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is filed on the basis of Chinese patent application No. 202211407723.4 filed November 10, 2022, entitled "ROTOR ASSEMBLY, CIRCULATING PUMP, AND AIR CONDITIONER" and Chinese patent application No. 202211407724.9 filed November 10, 2022, entitled "CIRCULATING PUMP AND AIR CONDITIONER", and claims priority to the Chinese patent applications, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of circulating pumps, and in particular to a rotor assembly, a circulating pump, and an air conditioner.

BACKGROUND

[0003] In related technologies, a heating, ventilation, and air conditioning (HVAC) system is generally equipped with a circulating pump which can circulate water in the air conditioning system over and over again, to overcome the resistance loss of the loop and meet a heating requirement of a customer. During operation of conventional circulating pumps, once the rotor gets stuck, many components have to be disassembled in order to maintain the rotor, which is very inconvenient.

SUMMARY

[0004] The present disclosure aims to at least solve one of the technical problems in the related art. To this end, the present disclosure provides a rotor assembly which is easy to maintain.

[0005] The present disclosure further provides a circulating pump comprising the rotor assembly, and an air conditioner comprising the rotor assembly.

[0006] In accordance with a first aspect of the present disclosure, an embodiment provides a rotor assembly, comprising:

a rotor comprising a rotating shaft and a magnetic ring fixed to an outer wall of the rotating shaft;
a shielding cover arranged over an outer side of the rotor for separating the rotor from a stator, and comprising a relief hole corresponding to an end of the rotating shaft; and
a sealing member detachably mounted at the relief hole.

[0007] In some embodiments of the present disclosure, the sealing member is a sealing bolt threadedly connected to an inner wall of the relief hole.

[0008] In some embodiments of the present disclosure, the rotating shaft comprises an engaging portion through which the rotating shaft is easily driven to rotate, and the engaging portion is located at an end of the rotating shaft facing towards the relief hole.

[0009] In some embodiments of the present disclosure, the engaging portion is a polygonal socket or a polygonal protrusion.

[0010] In some embodiments of the present disclosure, the rotor further comprises a plastic over-molding member over-molded onto the outer wall of the rotating shaft, and the magnetic ring is fixed to the outer wall of the rotating shaft through the plastic over-molding member.

[0011] In some embodiments of the present disclosure, the rotating shaft comprises a first through hole axially penetrating the rotating shaft, and the plastic over-molding member comprises a second through hole axially penetrating the plastic over-molding member (130).

[0012] In some embodiments of the present disclosure, the rotating shaft comprises a connecting portion to enhance strength of connection with the plastic over-molding member, and the connecting portion is a recess, a rib, or a flat.

[0013] In some embodiments of the present disclosure, the rotor further comprises a sleeve member which is sleeved over and fixed to an outer peripheral wall of the magnetic ring.

[0014] In some embodiments of the present disclosure, the rotating shaft comprises a flat segment, which is configured to mount an impeller, arranged at an end of the rotating shaft away from the sealing member.

[0015] In some embodiments of the present disclosure, an outer wall of the flat segment comprises a limiting groove for limiting an axial movement of the impeller.

[0016] In accordance with a second aspect of the present disclosure, an embodiment provides a circulating pump, comprising:

a motor comprising a rotor, a stator, a shielding cover, and a sealing member, where the stator is wound around an outer periphery of the rotor, the shielding cover is arranged over an end of the rotor in an axial direction of the rotor for separating the rotor from the stator, and comprises a relief hole corresponding to a rotating shaft of the rotor, and the sealing member is detachably mounted at the relief hole;
an electronic control assembly connected to an end of the motor provided with the sealing member in an axial direction of the motor, where the electronic control assembly comprises a relief channel corresponding to the sealing member; and
a pump head connected to the other end of the motor in the axial direction, where the pump head comprises a pump cavity, and an impeller connected to the rotating shaft is mounted in the pump cavity.

[0017] In some embodiments of the present disclosure, the sealing member is a sealing bolt threadedly connected to an inner wall of the relief hole.

[0018] In some embodiments of the present disclosure, the rotating shaft comprises an engaging portion through which the rotating shaft is driven to rotate, and the engaging portion is located at an end of the rotating shaft facing towards the relief hole.

[0019] In some embodiments of the present disclosure, the engaging portion is a polygonal socket or a polygonal protrusion.

[0020] In some embodiments of the present disclosure, the rotating shaft comprises a first channel axially penetrating the rotating shaft, the first channel is in communication with the pump cavity.

[0021] In some embodiments of the present disclosure, an outer wall of the pump head is connected to an inlet pipe and an outlet pipe which are both in communication with the pump cavity, an axis of an inlet of the inlet pipe and an axis of an outlet of the outlet pipe are collinear.

[0022] In some embodiments of the present disclosure, the axis of the inlet of the outlet pipe is tangent to the outer wall of the pump head.

[0023] In some embodiments of the present disclosure, the electronic control assembly comprises an electronic control box, an outer wall of the electronic control box comprises a boss with a mounting hole for a fastener to pass through, and an end of the stator comprises a first connecting hole matching the mounting hole.

[0024] In some embodiments of the present disclosure, the electronic control box comprises a positioning column on a bottom wall of the electronic control box, and the stator comprises a positioning groove matching the positioning column on an outer wall of the stator.

[0025] In some embodiments of the present disclosure, the circulating pump further comprises a first sealing ring sandwiched between the electronic control box and the shielding cover, and a second sealing ring is sandwiched between the electronic control box and the stator.

[0026] In accordance with an embodiment of a third aspect of the present disclosure, an air conditioner comprises the rotor assembly according to the embodiment of the first aspect of the present disclosure, or the circulating pump according to the embodiment of the second aspect of the present disclosure.

[0027] Other aspects and advantages of the present disclosure will be set forth in the subsequent specification, and partly become apparent from the following specification or may be understood by implementing of the present disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0028]

FIG. 1 is a schematic structural sectional view of a rotor assembly and a stator according to some embodiments of the present disclosure;

FIG. 2 is a schematic structural sectional view of a rotor according to some embodiments of the present disclosure, where a sleeve member is not shown;

FIG. 3 is a schematic perspective structural diagram of a rotating shaft according to some embodiments of the present disclosure;

FIG. 4 is a schematic sectional view of a circulating pump according to some embodiments of the present disclosure;

FIG. 5 is a schematic sectional view of an impeller according to some embodiments of the present disclosure; and

FIG. 6 is a schematic perspective structural diagram of a circulating pump according to some embodiments of the present disclosure.

[0029] List of reference numerals:

rotor assembly 100; rotating shaft 110; engaging portion 111; first through hole 112; flat segment 113; limiting groove 114; recess 115; magnetic ring 120; plastic over-molding member 130; sleeve member 140; shielding cover 150; relief hole 151; sealing member 160; bearing 170;

stator 180; positioning groove 181;

electronic control assembly 200; relief channel 210; positioning column 220; boss 230; fastener 240; wiring terminal 250; first sealing ring 260; second sealing ring 270;

pump head 300; impeller 310; flat hole 311; limiting rib 312; pump cavity 320; inlet (of the inlet pipe) 330; outlet (of the outlet pipe) 340;

motor 500.

DETAILED DESCRIPTION

[0030] Embodiments of the present disclosure will be described in detail below with reference to the accompanying drawings in which the same or like reference characters refer to the same or like elements or elements having the same or like functions throughout. The embodiments described below by reference to the accompanying drawings are illustrative and are intended for illustration only and are not to be construed as limiting the present disclosure.

[0031] In the description of the present disclosure, it should be understood that for the description of orientations, the orientation or positional relationships indicated by the terms such as "on", "below", "front", "rear", "left", and "right" are based on orientation or positional relation-

ships shown in the accompanying drawings, and are used only for ease and brevity of illustration and description, rather than indicating or implying that the mentioned apparatus or element must have a particular orientation or must be constructed and operated in a particular orientation. Therefore, such terms should not be construed as limiting of the present disclosure.

[0032] In the description of the present disclosure, the term "at least one" means one or more, the term "plurality of" (or multiple) means at least two, the term such as "greater than", "less than", "exceed" or variants thereof prior to a number or series of numbers is understood to not comprise the number adjacent to the term. If used herein, the terms such as "first", "second" and the like are merely used for distinguishing technical features, and are not intended to indicate or imply relative importance, or implicitly point out the number of the indicated technical features, or implicitly point out the order of the indicated technical features.

[0033] In the description of the present disclosure, unless otherwise explicitly defined, the terms such as "arrange", "configure", "install/mount", "connect", "assemble", "engage", and their variants should be understood in a broad sense, and those having ordinary skill in the art can reasonably determine the specific meanings of the above terms in the present disclosure based on the specific contents of the technical scheme.

[0034] In related technologies, an HVAC system is generally equipped with a circulating pump which can circulate water in the air conditioning system over and over again, to overcome the resistance loss of the loop and meet a heating requirement of a customer. During operation of conventional circulating pumps, once the rotor gets stuck, many components have to be disassembled in order to maintain the rotor, which is very inconvenient.

[0035] To solve at least one of the above-mentioned technical problems, the present disclosure provides a rotor assembly which is more convenient to maintain.

[0036] Referring to FIG. 1 to FIG. 2, in accordance with a first aspect of the present disclosure, an embodiment provides a rotor assembly 100. The rotor assembly 100 is configured to drive an impeller 310 in a pump cavity 320 to rotate, so as to transport liquid into a circulation pipeline. The rotor assembly 100 comprises a rotor, a shielding cover 150, and a sealing member 160. The rotor comprises a rotating shaft 110 and a magnetic ring 120. The magnetic ring 120 is fixed to an outer wall of the rotating shaft 110. The rotating shaft 110 is connected to the impeller 310 to drive the impeller 310 to rotate. The shielding cover 150 arranged on an outer side of the rotor is configured to separate the rotor from a stator 180. The shielding cover 150 is filled with water or other liquid to be transported in which the rotor is immersed. Two bearings 170 distributed axially are arranged in the shielding cover 150. The two bearings 170 are respectively sleeved at two ends of the rotating shaft 110, such that the rotor can rotate in the shielding cover 150. The shielding cover 150 has a relief hole 151 corresponding to an end portion of the rotating shaft 110, and the sealing member 160 is detachably mounted at the relief hole 151.

[0037] In the rotor assembly 100, the relief hole 151 is provided in the shielding cover 150 at a position corresponding to the rotating shaft 110, and the sealing member 160 is detachably mounted at the relief hole 151. When the rotor gets stuck or other problems occur, the sealing member 160 may be removed from the relief hole 151, and then a tool is inserted into the relief hole 151 to rotate the rotating shaft 110, so as to quickly solve the rotor stuck or other problems. In addition, gas left in the pump cavity 320 can be discharged. The maintenance of the rotor assembly 100 does not require removing too many components, so that the maintenance is easy to implement and the maintenance efficiency of the rotor assembly 100 is improved.

[0038] Referring to FIG. 1 and FIG. 4, it can be understood that in some embodiments of the present disclosure, the sealing member 160 is a sealing bolt which can be threadedly connected to an inner wall of the relief hole 151 in order to achieve quick mounting and removal of the sealing member 160 while providing desirable sealing performance. A straight groove or a cross groove may be provided on a head of the sealing bolt, such that the sealing bolt can be conveniently screwed using a tool, thereby achieving the mounting or removal of the sealing bolt. When the sealing bolt is threadedly connected and locked to the inner wall of the relief hole 151, the sealing bolt can well seal the relief hole 151 to prevent the liquid in the shielding cover 150 from flowing out through the relief hole 151. Of course, a rubber pad may also be arranged at a lower end of the head of the sealing bolt, such that when the sealing bolt is threadedly connected and locked to the inner wall of the relief hole 151, the rubber pad deforms under pressure to tightly fit against a lower end surface of the head of the sealing bolt and an upper end surface of the shielding cover 150, thereby achieving a satisfactory sealing effect.

[0039] Referring to FIG. 2 and FIG. 3, it should be noted that in order to make it easy to use the tool to drive the rotating shaft 110 to rotate, in some embodiments of the present disclosure, the rotating shaft 110 has an engaging portion 111 through which the rotating shaft 110 can be easily driven to rotate. The engaging portion 111 is located at an end of the rotating shaft 110 facing towards the relief hole 151. When the rotor gets stuck, the sealing member 160 may be removed from the relief hole 151 first, then the tool is inserted into the relief hole 151 to engage with the engaging portion 111 of the rotating shaft 110 to drive the rotating shaft 110 to rotate, thereby solving the problem of rotor stuck. Because the rotating shaft 110 has the engaging portion 111, the engaging portion 111 can be quickly engaged with the tool to drive the rotating shaft 110 to rotate, so that the maintenance efficiency is improved.

[0040] Referring to FIG. 3, it can be understood that in some embodiments of the present disclosure, the enga-

ging portion 111 may be in the form of a polygonal socket. For example, the engaging portion 111 may be an internal hexagonal socket. In this case, a wrench may be inserted into the internal hexagonal socket, and then rotated to drive the rotating shaft 110 to rotate. Of course, the engaging portion 111 may also be in the form of a polygonal protrusion. For example, the engaging portion 111 may be a hexagonal head. In this case, a wrench may be sleeved over the head, and then rotated to cause the head to rotate, so as to drive the rotating shaft 110 to rotate. Of course, the engaging portion 111 may also be in the form of a triangular prism or a rectangular column, such that the engaging portion 111 can bear a large torque. As such, the rotating shaft 110 can be easily driven to rotate by engaging the engaging portion 111 with a corresponding tool, thereby improving the convenience of rotor maintenance.

[0041] Referring to FIG. 2, it should be noted that in some embodiments of the present disclosure, the rotor further comprises a plastic over-molding member 130 wrapping the outer wall of the rotating shaft 110 to reduce assembly steps and improve the assembly efficiency of the rotor assembly 100, and the plastic over-molding member 130 is made of a plastic material. The plastic over-molding member 130 is connected between the magnetic ring 120 and the rotating shaft 110 to fix the magnetic ring 120 to the rotating shaft 110. During manufacturing of the rotor, an injection molding process is performed, such that the magnetic ring 120 and the rotating shaft 110 are fixed using a mold, and then molten plastic is injection-molded between the magnetic ring 120 and the rotating shaft 110. Therefore, the magnetic ring 120 and the rotating shaft 110 are integrally injection-molded. This reduces subsequent assembly steps to improve the assembly efficiency of the rotor assembly 100, makes the structure of the rotor more compact to reduce an overall volume of the rotor assembly 100, and improves the structural stability of the rotor to prevent the magnetic ring 120 from loosening up during operation.

[0042] In related technologies, a stator assembly of a conventional circulating pump is assembled in a housing. A shielding cover is arranged in a middle part of the stator assembly. A rotor is mounted in an inner cavity of the shielding cover. A drainage groove is provided between the housing and the shielding cover to prevent condensed water or water vapor from infiltrating or even accumulating on the conductive part of the stator. Therefore, in some embodiments of the present disclosure, the stator 180 is a plastic-coated stator, such that the waterproof performance of the stator 180 is better, and the risk of infiltration of a conductive part of the stator 180 by water is reduced. There is no need to provide a drainage structure, such that the manufacturing cost is reduced, and the number of components can be further reduced, thereby improving the assembly efficiency.

[0043] It should be noted that during operation of the rotor, the rotating shaft 110 drives the impeller 310 in the pump cavity 320 to rotate. There is liquid in the shielding cover 150, and the rotor is immersed in the liquid. In order to reduce the settlement of impurities in the liquid in the shielding cover 150, referring to FIG. 2, in some embodiments of the present disclosure, the rotating shaft 110 has a first through hole 112. The plastic over-molding member 130 has a second through hole. When the rotating shaft 110 rotates, the liquid can flow between the pump cavity 320 and an internal space of the shielding cover 150 through the first through hole 112 and the second through hole, such that the settlement of impurities in the liquid can be effectively reduced to prevent the formation of scale which affects normal operation of the rotor, and reduce the risk of the rotor getting stuck, thereby improving the stability of operation of the rotor. Of course, there may be a plurality of second through holes which are provided at intervals along a circumferential direction of the plastic over-molding member 130 to make the flow of the liquid between the pump cavity 320 and the internal space of the shielding cover 150 smoother, thereby further reducing the settlement of impurities in the liquid in the shielding cover 150 and maintaining the smooth rotation of the rotor.

[0044] It can be understood that when the rotor operates, its rotational speed is high, so the moment of inertia is large. Because the magnetic ring 120 is fixed to the outer wall of the rotating shaft 110, the magnetic ring 120 is likely to loosen up relative to the rotating shaft 110 when the rotating speed of the rotor is high. Therefore, in some embodiments of the present disclosure, the rotating shaft 110 further has a connecting portion to enhance the strength of connection with the plastic over-molding member 130. The connecting portion may be a recess, a rib, a tab, or other structures. When the magnetic ring 120 and the rotating shaft 110 are integrally formed with the plastic over-molding member 130, the connecting portion can greatly improve the strength of connection between the plastic over-molding member 130 and the rotating shaft 110. Referring to FIG. 3, in some embodiments of the present disclosure, a recess 115 is provided on the outer wall of the rotating shaft 110. When the magnetic ring 120 and the rotating shaft 110 are integrally formed by the plastic over-molding member 130, part of the plastic constituting the plastic over-molding member 130 is embedded in the recess 115. As such, an engagement force between the plastic over-molding member 130 and the rotating shaft 110 is greatly improved, and the magnetic ring 120 can be more stably mounted on the rotating shaft 110 to prevent the magnetic ring 120 from moving relative to the rotating shaft 110, thereby improving the structural stability of the rotor.

[0045] Of course, a plurality of recesses 115 may be distributed at intervals along a circumferential direction of the outer wall of the rotating shaft 110, so that the engagement force between the plastic over-molding member 130 and the rotating shaft 110 can be further improved, thereby further reducing the shaking of the magnetic ring 120. In an embodiment, when the rotor rotates, the magnetic ring 120 has a tendency to rotate in the

circumferential direction relative to the rotating shaft 110. Therefore, the recess 115 may be configured to extend in the axial direction of the rotating shaft 110, such that when the plastic over-molding member 130 is embedded in the recess 115, the recess 115 extending in the axial direction can provide a greater engagement force to the engagement member.

[0046] It can be understood that the magnetic ring 120 is subjected to a large centrifugal force during operation, and after the magnetic ring 120 operates for an excessively long period of time, the magnetic ring 120 may crack or fall off, and consequently the rotor cannot operate normally. Therefore, referring to FIG. 1, in some embodiments of the present disclosure, the rotor further comprises a sleeve member 140 which are sleeved over and fixed to an outer peripheral wall of the magnetic ring 120. The sleeve member 140 can limit the magnetic ring 120 in the circumferential direction to optimize a distribution of stress on the magnetic ring 120 and reduce the phenomenon such as cracking or falling off of the magnetic ring 120. Even if the magnetic ring 120 cracks, the magnetic ring 120 will not fall off directly due to the limiting effect of the sleeve member 140, thereby facilitating after-sales related maintenance. In an embodiment, the sleeve member 140 may be a steel sleeve, which has desirable ductility and can be better wrapped around the outer periphery of the magnetic ring 120, thereby limiting and fixing the magnetic ring 120. Of course, the magnetic ring 120 may also be made of other suitable materials.

[0047] Referring to FIG. 3 and FIG. 5, it can be understood that in some embodiments of the present disclosure, a flat segment 113 is provided at an end of the rotating shaft 110 away from the sealing member 160, and a flat hole 311 matching the flat segment 113 is provided in the impeller 310 in order to realize a quick mounting connection between the rotating shaft 110 and the impeller 310. During mounting, the impeller 310 is fixed, and then the flat segment 113 is aligned with and inserted into the flat hole 311. i.e., the flat segment 113 can be engaged in the flat hole 311, thus the impeller 310 is mounted on the rotating shaft 110 quickly and conveniently. Of course, during mounting, it is also feasible to fix the rotating shaft 110, then align the flat hole 311 with the flat segment 113, and then sleeve the impeller 310 over the rotating shaft 110, such that the rotating shaft 110 is engaged in the flat hole 311, thus realizing the mounting and connection between the impeller 310 and the rotating shaft 110. In an embodiment, a thickness of the flat segment 113 is less than a thickness of a main body of the rotating shaft 110, and a cross section of the flat segment 113 is substantially rectangular, such that the flat segment 113 can be engaged in the flat hole 311 to drive the impeller 310 to rotate.

[0048] Referring to FIG. 3 and FIG. 5, it should be noted that in some embodiments of the present disclosure, a limiting groove 114 is further provided on an outer wall of the flat segment 113, and a limiting rib 312 matching the limiting groove 114 is provided on an inner wall of the flat hole 311 of the impeller 310 to further improve the stability of the impeller 310 mounted on the rotating shaft 110. When the flat segment 113 is inserted into the flat hole 311, the limiting rib 312 is engaged in the limiting groove 114 to further improve the stability of the impeller 310 mounted on the rotating shaft 110. In an embodiment, the limiting groove 114 extends in a circumferential direction of the flat segment 113, such that the movement of the impeller 310 along the axial direction of the rotating shaft 110 can be well limited. Of course, a plurality of limiting grooves 114 may be provided, and correspondingly, a plurality of limiting ribs 312 may be provided. The stability of the impeller 310 mounted on the rotating shaft 110 can be further improved by respectively engaging the plurality of limiting ribs 312 in the corresponding limiting grooves 114.

[0049] Referring to FIGS. 4 and 6, in accordance with a second aspect of the present disclosure, an embodiment provides a circulating pump, which comprises a motor 500, an electronic control assembly 200, and a pump head 300. The electronic control assembly 200 and the pump head 300 are respectively connected to two ends of the motor 500 in an axial direction of the motor 500, such that a radial space occupied by the electronic control assembly 200 can be reduced, and a smaller volume of the circulating pump can be achieved. In an embodiment, the motor 500 comprises a rotor, a stator 180, a shielding cover 150, and a sealing member 160. The stator 180 is wound around an outer periphery of the rotor. The shielding cover 150 is arranged at one end of the rotor in the axial direction and separate the rotor from the stator 180. The shielding cover 150 is filled with water or other liquid to be transported in which the rotor is immersed. Two bearings 170 distributed axially are arranged in the shielding cover 150. The rotor has a rotating shaft 110. The two bearings 170 are respectively sleeved at two ends of the rotating shaft 110, such that the rotor can rotate in the shielding cover 150. The shielding cover 150 has a relief hole 151 corresponding to an end portion of the rotating shaft 110, and the sealing member 160 is detachably mounted at the relief hole 151. The electronic control assembly 200 is connected to an end of the motor 500 having the sealing member 160 in the axial direction. The electronic control assembly 200 has an relief channel 210 which runs through the electronic control assembly 200 in the axial direction and corresponds to the sealing member 160. The pump head 300 has a pump cavity 320 in which an impeller 310 is mounted, and the impeller 310 is connected to the rotating shaft 110. During operation of the circulating pump, the rotating shaft 110 is configured to drive the impeller 310 to rotate, thereby transporting the liquid into a circulation pipeline to realize functions such as heating.

[0050] When the rotor gets stuck or other problems occur, the tool may be passed through the relief channel 210 to detach the sealing member 160 from the relief hole 151, and then inserted into the relief hole 151 to rotate the rotating shaft 110, so as to quickly solve the rotor stuck or

other problems. In addition, gas left in the pump cavity 320 can be discharged. Because the maintenance of the rotor in the circulation pump does not require removing components such as the electronic control assembly 200 and the pump head 300, the related maintenance operation can be performed without disassembling the overall structure of the circulation pump, thereby making the maintenance operation very convenient and greatly improving the maintenance efficiency of the circulation pump.

[0051] It should be noted that in the prior art, although the electronic control assembly of some circulating pumps is relatively compact, such circulating pumps comprise one axial mounting space and two radial mounting spaces, and therefore have a very large volume. During installation, the installation angle of the electronic control assembly has to be change according to the actual site, resulting in inconvenience in production and installation. In the circulating pump of the present disclosure, the electronic control assembly 200 and the pump head 300 are respectively connected to the two ends of the motor 500 in the axial direction, it is no longer necessary to change the angle of the electronic control assembly 200 to solve the radial angle during installation, and the convenience of installation is improved.

[0052] As shown in FIG. 4 and FIG. 5, an outer wall of the pump head 300 is connected to an inlet pipe and an outlet pipe. Both the inlet pipe and the outlet pipe are in communication with the pump cavity 320. When the impeller 310 rotates, the impeller 310 drives outside liquid to enter the inlet pipe through an inlet 330 of the inlet pipe, and then enters the pump cavity 320 through an outlet of the inlet pipe. During discharging of the liquid, the liquid enters the outlet pipe through an inlet of the outlet pipe, and is then discharged through an outlet 340 of the outlet pipe. In order to make the pump head 300 more stable under stress, referring to FIG. 4, an axis of the inlet 330 of the inlet pipe and an axis of the outlet 340 of the outlet pipe are collinear, such that an impact force of the liquid on the pump head 300 at the inlet 330 of the inlet pipe and a recoil force of the liquid on the pump head 300 at the outlet 340 of the outlet pipe are substantially collinear, and have opposite directions. Therefore, the impact force and the recoil force can be eliminated by each other, thereby improving the stability of the pump head 300 under stress. In an embodiment, the axis of the inlet 330 of the inlet pipe is also perpendicular to an axis of the rotating shaft 110, such that the stability of the pump head 300 under stress can be further improved.

[0053] It can be understood that in order to improve the hydraulic efficiency of the circulating pump, in some embodiments of the present disclosure, the axis of the inlet of the outlet pipe is tangent to the outer wall of the pump head 300, such that the liquid can be discharged from the pump cavity 320 more smoothly, and the resistance to the discharging of water is reduced, thereby improving the hydraulic efficiency of the circulating pump.

[0054] It can be understood that in some embodiments of the present disclosure, referring to FIG. 6, the electronic control assembly 200 comprises an electronic control box to quickly connect the electronic control assembly 200 and the pump head 300 to the two ends of the motor 500 in the axial direction. An outer wall of the electronic control box has a boss 230 with a mounting hole for a fastener 240 to pass through. The stator 180 has a first connecting hole corresponding to the mounting hole. The first connecting hole runs through the stator 180 along the axial direction, and the pump head 300 has a second connecting hole corresponding to the first connecting hole. During installation, the electronic control assembly 200 and the pump head 300 are respectively placed at the two ends of the motor 500 in the axial direction, and then the fastener 240 such as a bolt is sequentially inserted into the mounting hole, the first connecting hole, and the second connecting hole, so as to quickly connect the electronic control assembly 200 and the pump head 300 to the two ends of the motor 500 in the axial direction. Of course, a plurality of mounting holes may be distributed at intervals in an outer peripheral wall of the electronic control box to improve the stability of connection. A fastener 240 is mounted in each of the mounting holes. Correspondingly, a plurality of first connecting holes and a plurality of second connecting holes are also provided, and each of the mounting holes corresponds to one first connecting hole and one second connecting hole.

[0055] It can be understood that in some embodiments of the present disclosure, referring to FIG. 6, a positioning column 220 is provided on a bottom wall of the electronic control box, and a positioning groove 181 matching the positioning column 220 is provided on an outer wall of the stator 180 to improve the convenience of installation. During assembly of the electronic control assembly 200 and the motor 500, the positioning column 220 can be inserted into the positioning groove 181, thereby realizing the functions of assembly guidance and misalignment prevention, and improving the convenience of installation. Of course, two or more positioning columns 220 may be circumferentially distributed at intervals on the bottom wall of the electronic control box.

[0056] It can be understood that the electronic control assembly 200 has a wiring terminal 250 connected to the stator 180. In some embodiments of the present disclosure, referring to FIG. 4, the circulating pump further comprises a first sealing ring 260 and a second sealing ring 270 to prevent liquid or other impurities from entering the electronic control box to affect the electrical connection. The first sealing ring 260 is sandwiched between the electronic control box and the shielding cover 150. The second sealing ring 270 is sandwiched between the electronic control box and the stator 180. The first sealing ring 260 is located on an inner side of the wiring terminal 250. The second sealing ring 270 is located on an outer side of the wiring terminal 250. Both the first sealing ring 260 and the second sealing ring 270 are made of an elastic material, for example, rubber or silicone, etc. When the electronic control assembly 200 is connected

to an end of the motor 500 by the fastener 240, the first sealing ring 260 deforms under pressure to tightly fit against an end surface between the electronic control box and the shielding cover 150 to realize a sealed connection. Therefore, the first sealing ring 260 can prevent impurities such as liquid or dust from entering the electronic control box from the inner side during use or maintenance of the circulating pump. At the same time, the second sealing ring 270 deforms under pressure to tightly fit against an end surface between the electronic control box and the stator 180. Therefore, the second sealing ring 270 can prevent impurities such as liquid or dust from entering the electronic control box from the outer side, thereby improving the waterproof and dust-proof performance of the electronic control assembly 200.

[0057] In accordance with a third aspect of the present disclosure, an embodiment provides an air conditioner, which comprises the rotor assembly according to embodiments of the first aspect of the present disclosure or the circulating pump according to embodiments of the second aspect of the present disclosure. The air conditioner may be an HVAC system or other air conditioners that can realize an HVAC function. The circulating pump can circulate water or other liquids in pipelines of the air conditioning system over and over again, to overcome the resistance loss of the loop and meet the heating requirements of the customer.

[0058] Due to the circulating pump described above in the air conditioner, the rotor assembly 100 of the circulating pump has the relief hole 151 in the shielding cover 150 at a position corresponding to the rotating shaft 110, and the sealing member 160 is detachably mounted at the relief hole 151. When the rotor gets stuck or other problems occur, the sealing member 160 may be detached from the relief hole 151, and then a tool may be inserted into the relief hole 151 to rotate the rotating shaft 110, so as to quickly solve the rotor stuck or other problems. In addition, gas left in the pump cavity 320 can be discharged. The maintenance of the rotor assembly 100 does not require removing too many components and is easy to implement, so that the maintenance efficiency of the rotor assembly 100 is improved.

The embodiments of the present disclosure have been described in detail above with reference to the accompanying drawings, but the present disclosure is not limited to the above embodiments, and various changes may be made within the knowledge of those having ordinary skills in the art without departing from the protection scope of the present disclosure.

Claims

1. A rotor assembly, comprising:

a rotor, comprising a rotating shaft and a magnetic ring fixed to an outer wall of the rotating shaft;

a shielding cover arranged over an outer side of the rotor for separating the rotor from a stator, wherein the shielding cover (150) comprises a relief hole corresponding to an end of the rotating shaft; and

a sealing member detachably mounted at the relief hole.

2. The rotor assembly of claim 1, wherein the sealing member is a sealing bolt threadedly connected to an inner wall of the relief hole.

3. The rotor assembly of claim 1 or 2, wherein the rotating shaft comprises an engaging portion through which the rotating shaft is driven to rotate, and the engaging portion is located at an end of the rotating shaft facing towards the relief hole.

4. The rotor assembly of claim 3, wherein the engaging portion is a polygonal socket or a polygonal protrusion.

5. The rotor assembly of any one of claims 1 to 4, wherein the rotor further comprises a plastic over-molding member over-molded onto the outer wall of the rotating shaft, and the magnetic ring is fixed to the outer wall of the rotating shaft through the plastic over-molding member.

6. The rotor assembly of claim 5, wherein the rotating shaft comprises a first through hole axially penetrating the rotating shaft , and the plastic over-molding member comprises a second through hole axially penetrating the plastic over-molding member.

7. The rotor assembly of claim 5 or 6, wherein the rotating shaft comprises a connecting portion to enhance strength of connection with the plastic over-molding member, and the connecting portion is a recess, a rib, or a flat.

8. The rotor assembly of any one of claims 1 to 7, wherein the rotor further comprises a sleeve member which is sleeved over and fixed to an outer peripheral wall of the magnetic ring.

9. The rotor assembly of any one of claims 1 to 8, wherein the rotating shaft comprises a flat segment, which is configured to mount an impeller, arranged at an end of the rotating shaft away from the sealing member.

10. The rotor assembly of claim 9, wherein an outer wall of the flat segment comprises a limiting groove for limiting an axial movement of the impeller.

11. A circulating pump, comprising:

a motor comprising a rotor, a stator, a shielding cover, and a sealing member, wherein the stator is wound around an outer periphery of the rotor, the shielding cover is arranged over an end of the rotor in an axial direction of the rotor for separating the rotor from the stator, wherein the shielding cover (150) comprises a relief hole corresponding to a rotating shaft of the rotor, and the sealing member is detachably mounted at the relief hole;

an electronic control assembly connected to an end of the motor provided with the sealing member in an axial direction of the motor, wherein the electronic control assembly comprises a relief channel corresponding to the sealing member; and

a pump head connected to an other end of the motor in the axial direction, wherein the pump head comprises a pump cavity, and an impeller connected to the rotating shaft is mounted in the pump cavity.

12. The circulating pump of claim 11, wherein the rotating shaft comprises a first channel axially penetrating the rotating shaft (110), wherein the first channel is in communication with the pump cavity.

13. The circulating pump of claim 11 or 12, wherein an outer wall of the pump head is connected to an inlet pipe and an outlet pipe which are both in communication with the pump cavity, an axis of an inlet of the inlet pipe and an axis of an outlet of the outlet pipe are collinear.

14. The circulating pump of claim 13, wherein the axis of the inlet of the outlet pipe is tangent to the outer wall of the pump head.

15. The circulating pump of any one of claims 11 to 14, wherein the electronic control assembly comprises an electronic control box, an outer wall of the electronic control box comprises a boss with a mounting hole for a fastener to pass through, and an end of the stator comprises a first connecting hole matching the mounting hole.

16. The circulating pump of claim 15, wherein the electronic control box comprises a positioning column on a bottom wall of the electronic control box, and the stator comprises a positioning groove matching the positioning column on an outer wall of the stator.

17. The circulating pump of claim 15 or 16, wherein the circulating pump further comprises a first sealing ring sandwiched between the electronic control box and the shielding cover, and a second sealing ring sandwiched between the electronic control box and the stator.

18. An air conditioner, comprising a rotor assembly of any one of claims 1 to 10, or a circulating pump of any one of claims 11 to 17.

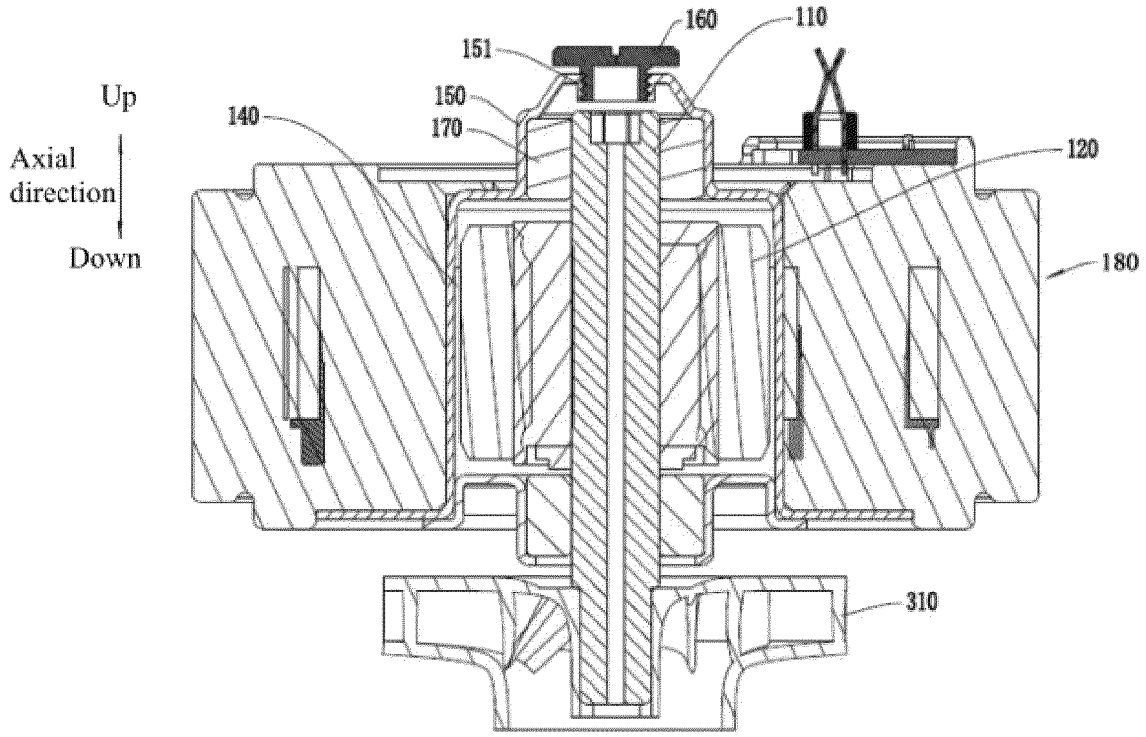


Fig. 1

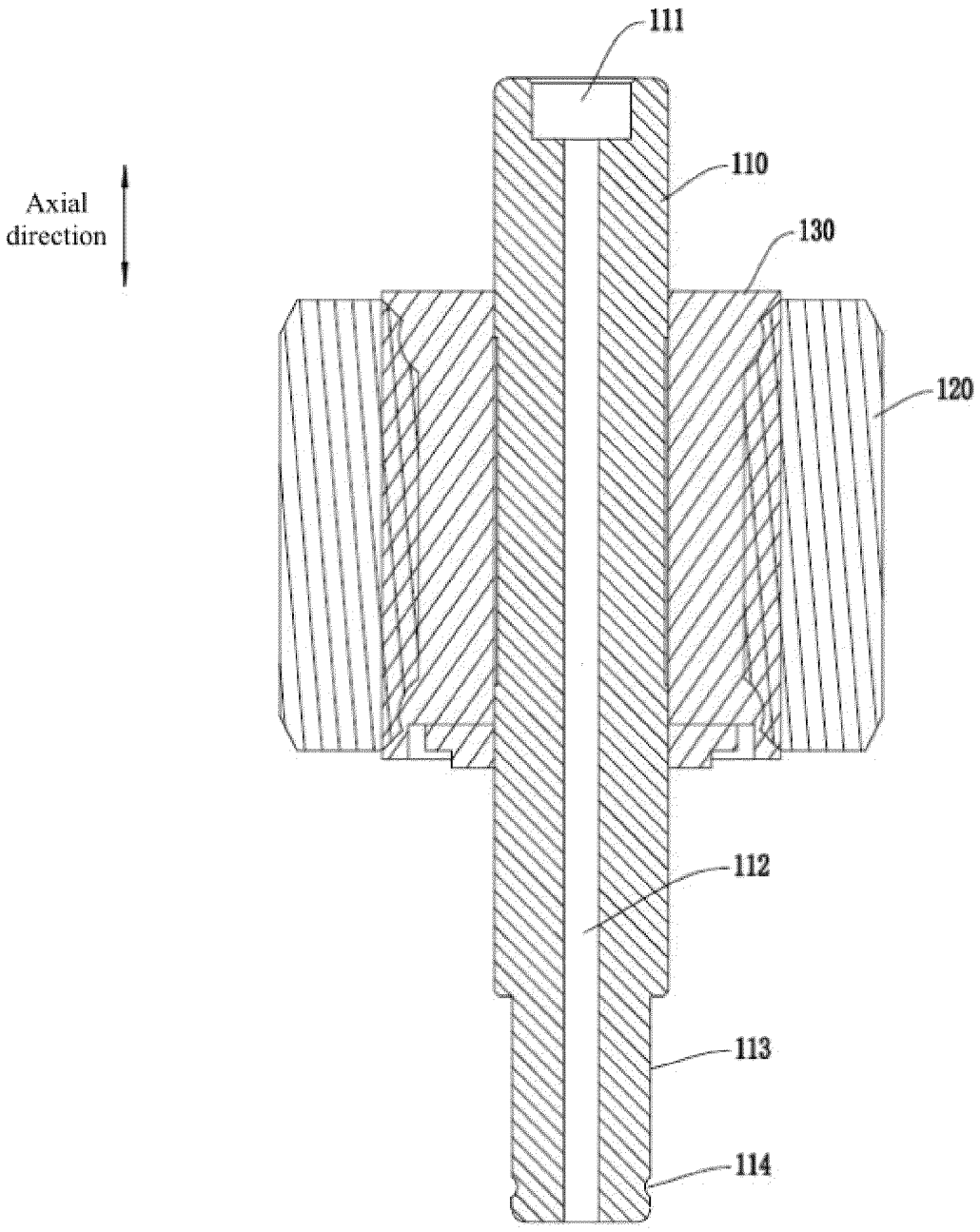


Fig. 2

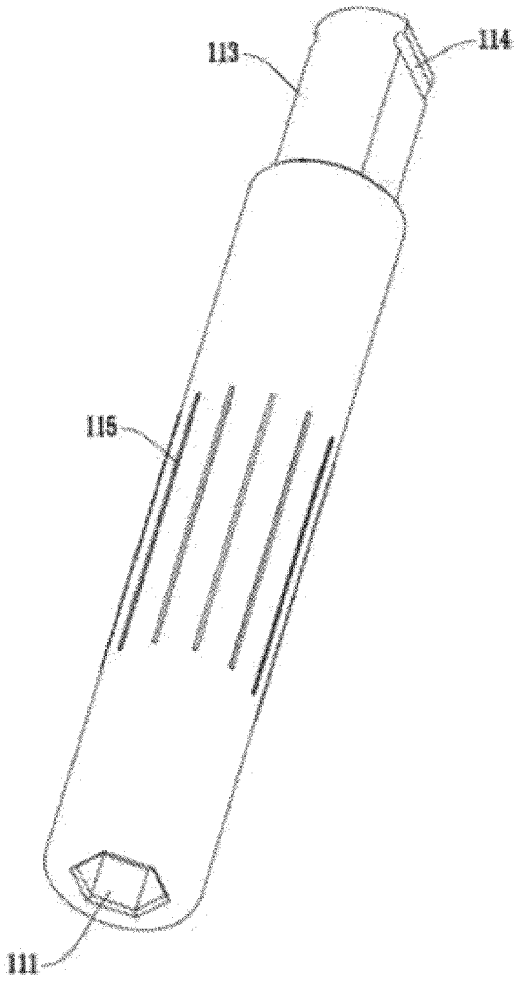
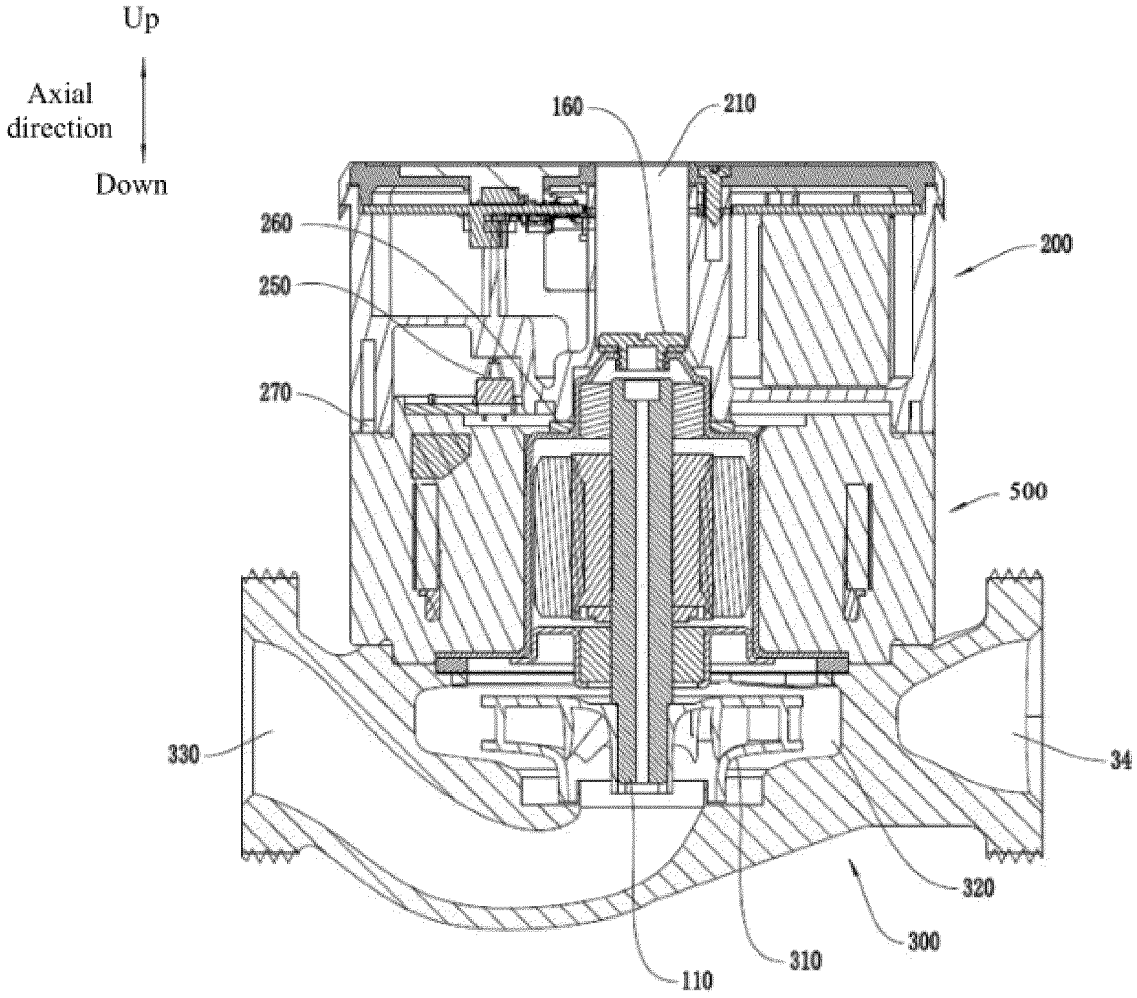


Fig. 3


Up
Axial direction
Down
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210
260
250
270
200
500
330
34
320
300
310
110

Fig. 4

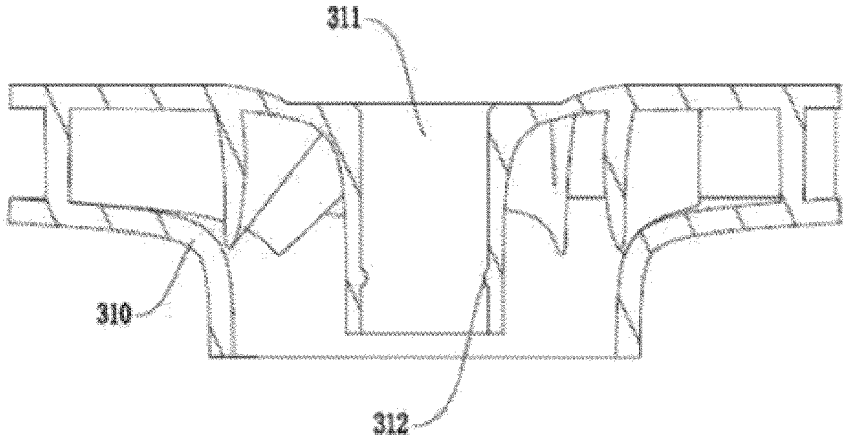
311
310
312

Fig. 5

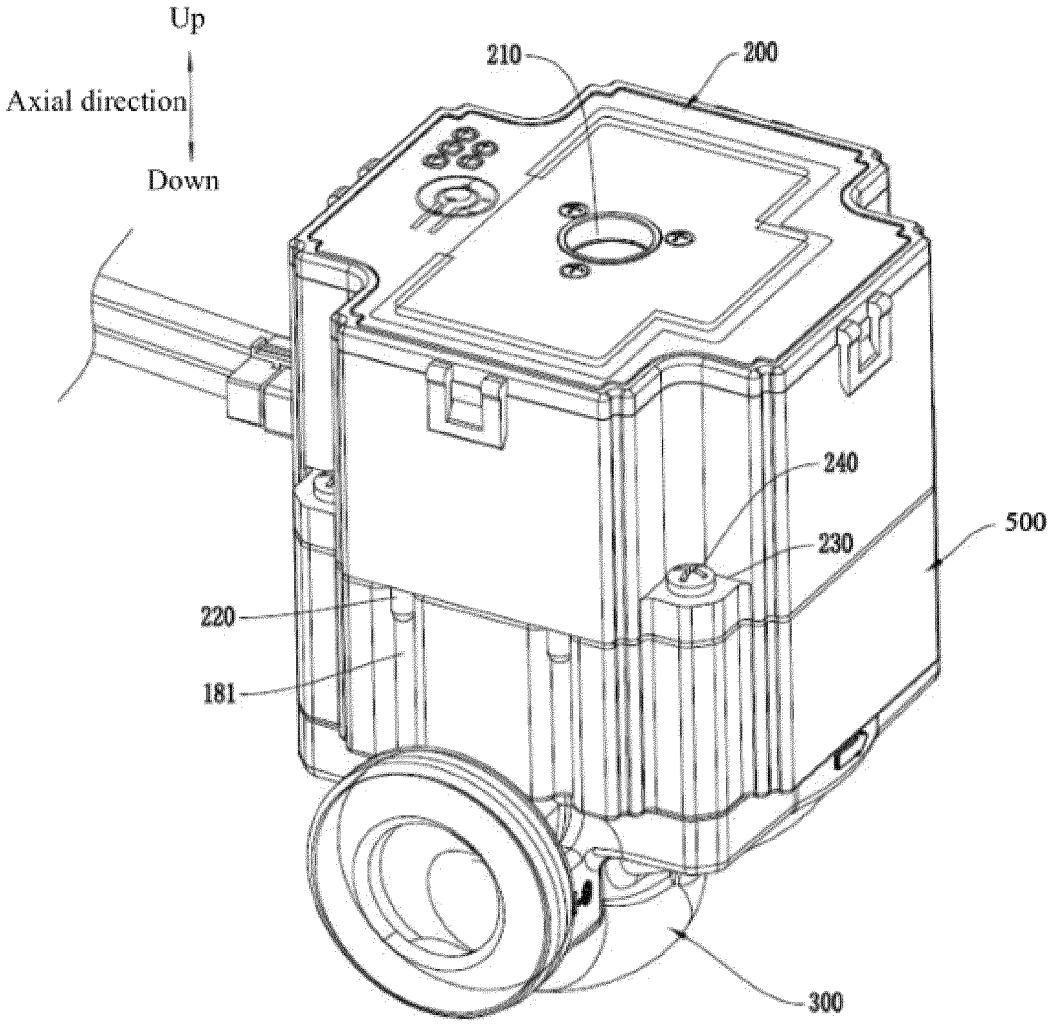

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/080618

A. CLASSIFICATION OF SUBJECT MATTER

F04D29/22(2006.01)i; F04D29/08(2006.01)i; F04D29/62(2006.01)i; F04D13/06(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: F04D

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; CNTXT; VEN; USTXT; EPTXT; WOTXT; CNKI: 威灵, 泵, 屏蔽, 循环, 轴, 电机, 电动机, 马达, 转子, 定子, 放气, 排气, 卡死, 卡住, 螺, 塞, 堵, pump, shield, circulat+, shaft, motor, rotor, stator, air, block, lock, screw, bolt, plug

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 218717684 U (FOSHAN WEILING WASHER MOTOR MANUFACTURING CO., LTD. et al.) 24 March 2023 (2023-03-24) description, paragraphs [0032]-[0057], and figures 1-5	1-12, 18
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PX	CN 115507062 A (FOSHAN WEILING WASHER MOTOR MANUFACTURING CO., LTD. et al.) 23 December 2022 (2022-12-23) description, paragraphs [0038]-[0063], and figures 1-8	1-18
X	CN 203146353 U (HEFEI XINHU CANNED MOTOR PUMP CO., LTD.) 21 August 2013 (2013-08-21) description, paragraphs [0020]-[0027], and figures 1 and 2	1, 2, 5, 6, 8-10, 18
Y	CN 203146353 U (HEFEI XINHU CANNED MOTOR PUMP CO., LTD.) 21 August 2013 (2013-08-21) description, paragraphs [0020]-[0027], and figures 1 and 2	3, 4, 7, 11-18

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

* Special categories of cited documents:
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"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
03 July 2023	**24 July 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/080618

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Y	US 5644178 A (HALM RICHARD) 01 July 1997 (1997-07-01) description, column 3, line 27 to column 5, line 60, and figures 1-4	11-18
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A	CN 109519391 A (DAB PUMPS SPA) 26 March 2019 (2019-03-26) entire document	1-18

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/080618

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 218717684 U	24 March 2023	None	
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		EP 1437819 A1	14 July 2004
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CH 372928 A	31 October 1963	None	
CN 109519391 A	26 March 2019	DE 102018121253 A1	21 March 2019
		US 2019085849 A1	21 March 2019

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- CN 202211407723 **[0001]**
- CN 202211407724 **[0001]**