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(54) **CLEANING APPARATUS AND DRIVING DEVICE**

(57) A cleaning apparatus, a driving device and a quick disassembly structure. The cleaning apparatus comprises a body, a rolling brush and the driving device, wherein the rolling brush is configured to rotate about the axis thereof, and is provided with an inner cavity; the driving device is connected to the body and is provided with a heat dissipation air duct; the driving device is constructed to extend into the inner cavity of the rolling brush and is in transmission fit with a transmission seat located in the inner cavity of the rolling brush; the driving device is provided with an air inlet and a sealing member for sealing the air inlet; and the sealing member is constructed to be pressed by the transmission seat to open the air inlet when the driving device and the rolling brush are assembled together, so as to communicate the heat dissipation duct with the inner cavity, and the sealing member is constructed to seal the air inlet under elastic restoring force when the driving device is disassembled from the rolling brush. The quick disassembly structure realizes a quick disassembly function.

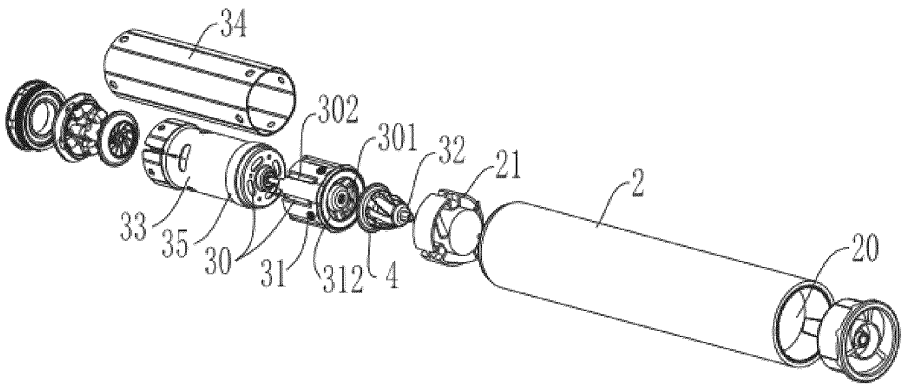

Figure 2

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Description

[0001] This application claims priorities to Chinese Patent Application No. 202210675992.2, titled "CLEANING APPARATUS", filed on June· 15, 2022, Chinese Patent Application No. 202210675816.9, titled "CLEANING APPARATUS AND DRIVING DEVICE", filed on June 15, 2022, and Chinese Patent Application No. 202210710723.5, titled "CLEANING APPARATUS AND QUICK DISASSEMBLY STRUCTURE", filed on June 22, 2022, with the National Intellectual Property Administration, PRC, which are incorporated herein by reference in their entireties.

FIELD

[0002] The present disclosure relates to the technical field of cleaning, and in particular to a cleaning apparatus, and further to a driving device in the above cleaning apparatus.

BACKGROUND

[0003] With the development of social productivity, living standards of people have been improved. Under the premise of the material base has been guaranteed, people began to reduce labor load by using a variety of tools to improve the quality of life, thereby household cleaning apparatuses have been developed. For a scrubber which generally uses water as a cleaning medium, water is sprayed to the cleaning area, with rapid friction between a high-speed rotated roller and the cleaning area, stains on the ground as well as dirt on the roller are sucked into a sewage bucket, achieving the purpose of cleaning.

[0004] In order to reasonably utilize the space, the floor brush motor is installed in a cavity of the roller. However, in a case that the user disassembles the roller for cleaning, the floor brush motor is exposed, and water may enter into the floor brush motor, causing short circuit of the floor brush motor.

SUMMARY

[0005] A cleaning apparatus and a driving device are provided according to the present disclosure, to solve the problems in the conventional art.

[0006] According to a first aspect of the present disclosure, a cleaning apparatus is provided, which includes: a body, a rolling brush and a driving device. The rolling brush is configured to rotate about an axis thereof, the rolling brush has an inner cavity. The driving device is connected to the body and has a heat dissipation duct, where the driving device is configured to extend into the inner cavity of the rolling brush and to cooperate with a transmission seat in the inner cavity, the driving device is provided with an air inlet and a sealing member for sealing the air inlet. The sealing member is configured to open the air inlet under extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct with the inner cavity; and to seal the air inlet under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0007] In an embodiment of the present disclosure, the driving device includes a reduction gearbox, an output end of the reduction gearbox is provided with a coupling, the coupling is configured to move along an axial direction of the reduction gearbox between a first position and a second position; the sealing member is fixed to the coupling and is configured to seal the air inlet in a case that the coupling is in the first position and to open the air inlet in a case that the coupling is in the second position.

[0008] In an embodiment of the present disclosure, the reduction gearbox includes a box and an output shaft penetrating the box, the coupling is connected to the output shaft and is configured to move between the first position and the second position; an installing cavity is provided at an output end of the box, the air inlet is provided on an inner wall of the installing cavity; the sealing member is configured to seal an open end of the installing cavity in a case that the coupling is in the first position.

[0009] In an embodiment of the present disclosure, the installing cavity includes a side wall extending in an axial direction, the sealing member is configured to seal with the side wall.

[0010] In an embodiment of the present disclosure, the box includes a side wall extending in an axial direction, and a flange extending radially inwardly from an end of the side wall; the sealing member abuts against an end surface of the flange in a case that the coupling is in the first position.

[0011] In an embodiment of the present disclosure, a gap is provided between the sealing member and the side wall.

[0012] In an embodiment of the present disclosure, an elastic device is provided between the output shaft of the reduction gearbox and the coupling, and the elastic device is configured to pre-press the coupling in the first position.

[0013] In an embodiment of the present disclosure, the coupling is configured to have an outer contour adapted with the transmission seat and is configured to move from the first position to the second position under the extrusion of the transmission seat.

[0014] In an embodiment of the present disclosure, the driving device includes a reduction gearbox, a coupling is provided at an output end of the reduction gearbox, the sealing member is fixed to the coupling, and the sealing member is configured to be deformed under the extrusion of the rolling brush in a case that the driving device is assembled with the rolling brush, to open the air inlet.

[0015] In an embodiment of the present disclosure, the transmission seat is provided with a press-fit part, the press-fit part is configured to press the sealing member to

be deformed in a case that the driving device is assembled with the rolling brush.

[0016] In an embodiment of the present disclosure, the driving device includes a drive motor, the reduction gearbox is fixed to an end of the drive motor; airflow in the inner cavity of the rolling brush passes through the air inlet and flows into the inside of the drive motor.

[0017] In an embodiment of the present disclosure, the driving device includes a housing, the housing is sleeved on the drive motor and the reduction gearbox; the airflow in the inner cavity of the rolling brush passes through the air inlet and flows into a gap between the housing and the reduction gearbox.

[0018] In an embodiment of the present disclosure, the reduction gearbox includes a box, and an installing cavity provided at an open end of the box; the air inlet penetrates through an inner wall of the installing cavity; an axially extending deflector cavity is further provided on an outer wall of the box; the airflow from the air inlet passes through the deflector cavity and flows into the inside of the drive motor.

[0019] In an embodiment of the present disclosure, a sealing ring is provided between the housing and the drive motor, and the airflow flowing through the gap between the housing and the reduction gearbox enters the inside of the drive motor through a through-hole provided in the drive motor.

[0020] According to a second aspect of the present disclosure, a driving device is further provided. The driving device is configured to extend into an inner cavity of a rolling brush in a cleaning apparatus and to cooperate with a transmission seat in the inner cavity; and the driving device has a heat dissipation duct, the driving device is provided with an air inlet and a sealing member for sealing the air inlet; the sealing member is configured to open the air inlet under extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush, to connect the heat dissipation duct with the inner cavity; and seal the air inlet under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0021] A beneficial effect of the present disclosure is that the cleaning apparatus can open the air inlet by the sealing member to dissipate heat of the driving device in a case that the cleaning apparatus is cooperated with the rolling brush, and seals the air inlet by the sealing member in a case that the cleaning apparatus is disassembled with the rolling brush, avoiding water from entering into the driving device through the air inlet and the heat dissipation duct.

[0022] Other features and advantages of the present disclosure will become clear by the following detailed description of 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 an explosive view of a body and a rolling brush of a cleaning apparatus according to a first embodiment of the present disclosure;

Figure 2 is an explosive view of a rolling brush and a driving device according to the first embodiment of the present disclosure;

Figure 3 is an explosive view of another type of rolling brush and driving device according to the first embodiment of the present disclosure;

Figure 4 is a cross-sectional view of a rolling brush and a driving device according to the first embodiment of the present disclosure;

Figure 5 is a schematic view of a structure according to the first embodiment of the present disclosure in a case that a sealing member seals an air inlet;

Figure 6 is a schematic view of a structure according to the first embodiment of the present disclosure in a case that the sealing member opens the air inlet;

Figure 7 is a schematic view of a sealing member and a side wall according to the first embodiment of the present disclosure;

Figure 8 is a schematic view of a structure according to a second embodiment of the present disclosure in a case that a sealing member seals an air inlet;

Figure 9 is a schematic view of a structure according to the second embodiment of the present disclosure in a case that the sealing member opens the air inlet;

Figure 10 is a schematic view of an overall structure of a cleaning apparatus according to the present disclosure;

Figure 11 is a schematic explosive view of a structure of a cleaning apparatus according to the present disclosure;

Figure 12 is a schematic sectional view of a structure of a cleaning apparatus according to the present disclosure;

Figure 13 is a schematic explosive view of a structure of the cleaning apparatus according to the present disclosure from another perspective of view;

Figure 14 is a schematic view of a structure of a

coupling in the cleaning apparatus according to the present disclosure;

Figure 15 is a schematic view of a structure of a first fan in the cleaning apparatus according to the present disclosure;

Figure 16 is a schematic view of a structure of a drive motor in the cleaning apparatus according to the present disclosure;

Figure 17 is a schematic view of a coupling in a cleaning apparatus according to an embodiment of the present disclosure in a first state;

Figure 18 is a schematic view of a coupling in a cleaning apparatus according to an embodiment of the present disclosure in a second state;

Figure 19 is a schematic view of a coupling and a transmission seat in a cleaning apparatus according to another embodiment of the present disclosure in a first state;

Figure 20 is a schematic view of a coupling in a cleaning apparatus according to another embodiment of the present disclosure in a second state;

Figure 21 is a schematic view of a portion of a structure of a cleaning apparatus according to an embodiment of the present disclosure;

Figure 22 is an explosive view of a portion of the structure of a cleaning apparatus according to an embodiment of the present disclosure;

Figure 23 is a schematic view of a portion of a structure of a rolling brush and a rolling brush cover plate according to an embodiment of the present disclosure;

Figure 24 is an explosive view of a portion of the structure of a rolling brush and a rolling brush cover plate according to an embodiment of the present disclosure;

Figure 25 is an explosive view of a portion of the structure of a rolling brush and a rolling brush cover plate according to another embodiment of the present disclosure;

Figure 26 is an explosive view of a portion of the structure of a rolling brush cover plate according to an embodiment of the present disclosure;

Figure 27 is an explosive view of a portion of the structure of a rolling brush cover plate according to another embodiment of the present disclosure;

Figure 28 is an explosive view of a portion of the structure of a rolling brush cover plate according to an embodiment of the present disclosure from another perspective of view;

Figure 29 is a schematic view of a portion of a structure of a quick disassembly member according to an embodiment of the present disclosure;

Figure 30 is a schematic view of a portion of a structure of the rolling brush cover plate and a quick disassembly member according to an embodiment of the present disclosure;

Figure 31 is a schematic view of a portion of a structure of the quick disassembly member according to an embodiment of the present disclosure after being rotated relative to the rolling brush cover plate;

Figure 32 is a sectional view of a portion of a structure of the rolling brush cover plate and the quick disassembly member according to an embodiment of the present disclosure; and

Figure 33 is a sectional view of a portion of the structure of the quick disassembly member according to an embodiment of the present disclosure after being rotated relative to the rolling brush cover plate.

[0024] The one-to-one correspondence between the names of the components and the reference signs in Figures 1 to 33 is listed as follows:
1, Body; 11, Installing groove; 12, Magnetic attraction head; 13, Circular arc-shaped surface; 14, Floor brush housing; 2, Rolling brush; 20, Inner cavity; 21, Transmission seat; 211, Press-fit part; 22, Transmission cavity; 23, Extrusion part; 30, Heat dissipation duct; 301, Air inlet; 302, Deflector cavity; 31, Reduction gearbox; 310, Box; 311, Output shaft; 312, Installing cavity; 313, Side wall; 314, Flange; 32, Coupling; 33, Drive motor; 331, Motor air inlet; 332, Motor air outlet; 34, Housing; 35, Sealing ring; 4, Sealing member; 5, Elastic device; 6, Rolling brush cover plate; 61, Groove; 62, Installing cavity; 63, Receiving cavity; 7, Magnetic attraction member; 8, Quick disassembly member; 81, Extension part; 82, Holding part; 83, Pin joint part; 831, Pin roll.

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] A cleaning apparatus is provided according to the present disclosure, which may be a handheld scrubber or other cleaning apparatus such as a cleaning robot. The cleaning apparatus includes a body, a rolling brush and a driving device. The rolling brush is configured to rotate about its own axis and has an inner cavity. The driving device is connected to the body and has a heat dissipation duct. The driving device is configured to extend into the inner cavity of the rolling brush and to be cooperated with a transmission seat in the inner cavity of the rolling brush. The driving device is provided with an air inlet, and a sealing member for sealing the air inlet. The sealing member is configured to open the air inlet under the extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct with the inner cavity; and seal the air inlet under the elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0034] In a case that the driving device is cooperated with the rolling brush, the sealing member opens the air inlet under the extrusion of the transmission seat to enable the airflow to enter the heat dissipation duct to take away the heat of the driving device emitted during operation. In a case that the rolling brush is disassembled, the transmission seat is separate from the driving device, the sealing member closes the air inlet to prevent water from entering into the heat dissipation duct through the air inlet and thus causing damage to the driving device.

[0035] The technical solutions of the present disclosure are described in detail below in connection with specific structures.

First Embodiment

[0036] A cleaning apparatus is provided in this embodiment. As shown in Figure 1, the cleaning apparatus includes a body 1, a rolling brush 2, and a driving device. The rolling brush 2 may be rotatable relative to the body to clean the floor. As shown in Figures 2 and 3, the rolling brush 2 has an inner cavity 20, and a transmission seat 21 is provided in the inner cavity 20. The driving device is connected to the body 1, and the driving device is detachably connected to the rolling brush 2 for driving the rolling brush 2 to rotate. The driving device has a heat dissipation duct 30, and an air inlet 301 connected to the heat dissipation duct 30. The driving device is further provided with a sealing member 4, and the sealing member 4 is configured to seal or open the air inlet 301.

[0037] As shown in Figure 4, in a case that the rolling brush 2 is cooperated with the driving device, the driving device can extend into the inner cavity 20 of the rolling brush 2 and be cooperated with the transmission seat 21 in the inner cavity 20 of the rolling brush 2, to drive the rolling brush 2 to rotate via the transmission seat 21. In this case, the sealing member 4 opens the air inlet 301 under the extrusion of the transmission seat 21 to connect the inner cavity 20 of the rolling brush 2 with the heat dissipation duct 30 of the driving device. The inner cavity 20 of the rolling brush 2 is connected to the outside, and airflow from the outside into the inner cavity 20 can enter the heat dissipation duct 30 through the air inlet 301, and the airflow in the heat dissipation duct 30 can take away heat of the driving device and then discharge the heat to the outside to dissipate the heat of the driving device. At least one air inlet 301 is provided, and the sealing member 4 can seal or open all air inlets 301 simultaneously.

[0038] The rolling brush 2 may be provided with blades connected to the inner cavity 20, and outside air is fed into the inner cavity 20 through the blades to form airflow in the inner cavity 20 flowing toward the heat dissipation duct 30. Alternatively, the driving device may be provided with blades connected to the heat dissipation duct 30, and a negative pressure favorable to flow of the airflow is formed through the blades. The blades of the rolling brush 2 and the blades of the driving device may be installed simultaneously to improve heat dissipation efficiency.

[0039] In a case that the rolling brush 2 is separate from the driving device, the sealing member 4 can seal the air inlet 301 under the elastic restoring force, avoiding outside water from entering into the heat dissipation duct 30 via the air inlet 301 and thus causing damage to the driving device.

[0040] In an embodiment of the present disclosure, as

shown in Figures 5 and 6, the driving device includes a reduction gearbox 31, a coupling 32 is provided at an output end of the reduction gearbox 31, and the coupling 32 is cooperated with the transmission seat 21 of the rolling brush. The coupling 32 is configured to move between a first position and a second position along an axial direction of the reduction gearbox 31. The sealing member 4 is fixed to the coupling 32 and is configured to seal the air inlet 301 in a case that the coupling 32 is in the first position and open the air inlet 301 in a case that the coupling 32 is in the second position.

[0041] Specifically, as shown in Figures 5 and 6, the coupling 32 may perform axial movement along the output end of the reduction gearbox 31, the coupling 32 may cooperate with the transmission seat 21 of the rolling brush 2 in a pluggable manner, and the air inlet 301 is provided on the reduction gearbox 31. The coupling 32 is initially located in the first position, at which case the sealing member 4 seals the air inlet 301. In a case that the coupling 32 cooperates with the rolling brush 2, the rolling brush 2 extrudes the coupling 32 along the axial direction of the coupling 32 so as to cause the coupling 32 to move along the output end of the reduction gearbox 31 from the first position to the second position, and the sealing member 4 moves along with the coupling 32 to open the air inlet 301. The reduction gearbox 31 may drive the coupling to rotate via the output end of the reduction gearbox 31, and the coupling 32 may further drive the rolling brush 2 to rotate.

[0042] In an embodiment of the present disclosure, the coupling 32 is configured to have an outer contour adapted with the transmission seat 21 and is configured to move from a first position to a second position under the extrusion of the transmission seat 21. Specifically, as shown in Figure 4, the rolling brush 2 rotates about its own axis, the rotation axis of the rolling brush 2 is parallel to the cleaning surface, and the outer surface of the rolling brush 2 may be provided with cleaning cotton, bristles, or other components for cleaning. The inner cavity 20 is located inside the rolling brush 2, and the transmission seat 21 in the inner cavity 20 is located at an end of the rolling brush 2 close to the coupling 32. The coupling 32 may cooperate with the transmission seat 21 by a keyway, and when installed, the transmission seat 21 may be cooperated with the coupling 32 in an axial direction in a pluggable manner and press the coupling 32 to move from a first position to a second position. In a case that the coupling 32 moves to the second position, the sealing member 4 opens the air inlet 301, and the heat dissipation duct 30 of the driving device may connect with the inner cavity 20 of the rolling brush 2 through the air inlet 301. The end of the rolling brush 2 away from the coupling 32 may cooperate with the body 1 and rotate relative to the body 1. In a case that the rolling brush 2 is installed, the rolling brush 2 may press the coupling 32 against the second position to keep the air inlet 301 open.

[0043] In an embodiment of the present disclosure, as shown in Figures 5 and 6, the reduction gearbox 31 includes a box 310, and an output shaft 311 penetrating the box 310. The output shaft 311 is arranged at the output end of the reduction gearbox 31, and the coupling 32 is connected to the output shaft 311 and is configured to move along the output shaft 311 between the first position and the second position. An installing cavity 312 is provided at the output end of the box 310, and the installing cavity 312 has an open end toward the transmission seat 21. The air inlet 301 is arranged on an inner wall of the installing cavity 312. In a case that the coupling 32 is in a first position, the sealing member 4 is configured to seal the open end of the installing cavity 312, to seal the air inlet 301 on the inner wall of the installing cavity 312; and in a case that the coupling 32 is in a second position, the sealing member 4 is configured to open the open end of the installing cavity 312, to open the air inlet 301 on the inner wall of the installing cavity 312.

[0044] In an embodiment of the present disclosure, as shown in Figure 7, the installing cavity 312 includes a sidewall 313 extending axially along the output shaft 311, and the sealing member 4 is configured to seal together with the sidewall 313, forming a radial sealing pair. Specifically, the installing cavity is enclosed by an end surface of the output end of the box 310 and the side wall 313, the side wall 313 is formed by an edge of the box 310 extending toward the transmission seat 21, the output shaft 311 extends from an open end of the installing cavity 312, and the coupling 32 extends partially into the installing cavity 312 from the open end. The box 310 and the sidewall 313 may be integrally molded by mold casting or by a machining way, which is not limited herein.

[0045] As shown in Figure 7, the sealing member 4 is arranged in the installing cavity 312, and when the coupling 32 moves between the first position and the second position, the sealing member 4 moves along the sidewall 313 in the installing cavity 312. The air inlet 301 is arranged on the sidewall 313, in a case that the coupling 32 is in the first position, the sealing member 4 is located in a position between the air inlet 301 and the open end of the installing cavity 312, and in a case that the coupling 32 is in the second position, the sealing member 4 is located in a position that enables the air inlet 301 to be connected to the open end of the installing cavity 312. When the reduction gearbox 31 drives the coupling 32 to rotate via the output shaft 311, the sealing member 4 abuts against the sidewall 313 and rotates relative to each other to maintain the sealing state.

[0046] In another embodiment of the present disclosure, as shown in Figures 5 and 6, the box 310 includes a side wall 313 extending axially along the output shaft 311, and a flange 314 extending radially inwardly from the end of the side wall 313. The sealing member 4 abuts against the end surface of the flange 314 in a case that the coupling 32 is located in the first position, to form an axial sealing pair. Specifically, the installing cavity is enclosed by an end surface of the output end of the box 310, the side wall 313 and the flange 314, the flange 314 encloses

to form an open end of the installing cavity 312, and the sealing member 4 seals the open end of the installing cavity 312 when abutting against the flange 314, thereby sealing the air inlet 301 of the installing cavity 312. The side wall 313 is formed by the edge of the box 310 extending inwardly toward the rolling brush 2, and the output shaft 311 extends from the open end of the installing cavity 312, and the coupling 32 extends partially from the open end into the installing cavity 312.

[0047] Specifically, the sealing member 4 is arranged in the installing cavity 312 and has a gap with the side wall 313 of the installing cavity 312. The sealing member 4 moves in the installing cavity 312 as the coupling 32 moves between the first position and the second position. In a case that the coupling 32 is in the first position, the sealing member 4 abuts against the inner side of the flange 314 to seal the open end; and in a case that the coupling 32 is in the second position, the sealing member 4 leaves the flange 314 to open the open end, and the air inlet 301 is connected to the open end through the gap between the sealing member 4 and the sidewall 313. When the reduction gearbox 31 drives the coupling 32 to rotate via the output shaft 311, the sealing member 4 rotates following the coupling 32 without contacting with the sidewall 313, thereby reducing wear and tear on the sealing member 4 and thus prolonging the service life.

[0048] The sealing member 4 may be made of a rigid or flexible material. Preferably, the sealing member 4 may be a flexible gasket, which may be in press fit with the side wall 313 or the flange 314, avoiding sealing failure due to wear of the sealing member 4. The sealing member 4 may have an annular structure and is arranged around the coupling 32 at an end of the coupling 32 close to the reduction gearbox 31.

[0049] In an embodiment, the body 310, the sidewall 313, and the flange 314 of the reduction gearbox 31 may be integrally molded by mold casting or by a machining way, which is not limited herein. In another embodiment, as shown in Figures 5 and 6, the sidewall 313 and the flange 314 may form an end cover, the end cover is connected to the output end of the box 310, and the specific connection of the end cover and the box 310 includes, but is not limited to, a snap connection, a plug connection, a screw connection, and the like.

[0050] In an embodiment of the present disclosure, as shown in Figures 5 and 6, an elastic device 5 is provided between the output shaft 311 of the reduction gearbox 31 and the coupling 32, and the elastic device 5 is configured to pre-press the coupling 32 in a first position. When the rolling brush 2 press the coupling 32, the rolling brush 2 may overcome the elastic effect of the elastic device 5, so that the coupling 32 moves from the first position to the second position along the output shaft 311 of the reduction gearbox 31, so as to cause the sealing member 4 to open the air inlet 301, and the driving device can drive the rolling brush 2 to rotate via the coupling 32 to perform a cleaning work. During the cleaning process, the heat dissipation duct 30 of the driving device may dissipate heat through the air inlet 301. In a case that the rolling brush 2 is disassembled with the coupling 32, the elastic device 5 may drive the coupling 32 to move from the second position to the first position under its own elastic restoring force, so as to cause the sealing member 4 to close the air inlet 301, avoiding water from entering the heat dissipation duct 30 of the driving device through the air inlet 301.

[0051] The elastic device 5 includes, but is not limited to, a compression spring, an elastic piece, an elastic block, and the like. In a preferred embodiment, as shown in Figures 5 and 6, the elastic device 5 is a compression spring, the compression spring is sleeved on the output shaft 311 of the reduction gearbox 31, an end of the compression spring cooperates with the output shaft 311 or the box 310, and the other end cooperates with the coupling 32.

[0052] In an embodiment of the present disclosure, as shown in Figure 4, the driving device further includes a drive motor 33, the reduction gear box 31 is fixed to an end of the drive motor 33, and the airflow in the inner cavity 20 of the rolling brush 2 is configured to enter into the inside of the drive motor 33 through the air inlet 301. Specifically, the reduction gearbox 31 has an input end, and is cooperated with an output end of the drive motor 33 through the input end. The drive motor 33 may transmit a torque to the reduction gearbox 31, which is then transmitted from the output end of the reduction gearbox 31 to the rolling brush 2 through the coupling 32. The heat dissipation duct 30 extends from the air inlet 301 along the reduction gearbox 31 to the inside of the drive motor 33. The heat dissipation duct 30 may extend from the inside of the body 310 of the reduction gearbox 31 or from the outside the body 310 of the reduction gearbox 31.

[0053] In an embodiment of the present disclosure, as shown in Figures 3 and 4, the driving device further includes a housing 34, the housing 34 is sleeved on the drive motor 33 and the reduction gearbox 31, and a gap is formed between the housing 34 and the reduction gearbox 31, which is connected to the inside of the drive motor 33. The airflow in the inner cavity 20 of the rolling brush 2 is configured to enter into the gap between the housing 34 and the reduction gearbox 31 through the air inlet 301. Specifically, the housing 34 may have a cylindrical structure and may be fixed to the body 1, the drive motor 33 and the reduction gearbox 31 are distributed along a length direction of the housing 34, and the coupling 32 extends out of an end of the housing 34. The gap between the housing 34 and the reduction gearbox 31 constitutes a part of the heat dissipation duct 30. The drive motor 33 is provided with a through-hole, and the gap between the housing 34 and the reduction gearbox 31 is connected to the inner side of the drive motor 33 through the through-hole, constituting the heat dissipation duct 30. The through-hole may be arranged on an end surface the drive motor 33 close to the reduction gearbox 31, so that the airflow in the gap between the housing 34 and the reduction gearbox 31 can enter into

the inside of the drive motor through the through-hole. The drive motor 33 may be provided with an outlet of the heat dissipation duct 30, and the airflow may flow out through the outlet and take away the heat inside the drive motor 33.

[0054] In an embodiment of the present disclosure, as shown in Figures 2 and 3, a deflector cavity 302 that extends axially is further provided on an outer wall of the box 310. The airflow from the air inlet 301 is configured to flow into the inside of the drive motor 33 through the deflector cavity 302. Specifically, the deflector cavity 302 constitutes a part of the heat dissipation duct 30. The deflector cavity 302 may be arranged in the through groove on the side wall of the box 310, and an end of the deflector cavity 302 is connected to the air inlet 301, and the other end is connected to the inside of the drive motor 33 through the through-hole in the drive motor 33.

[0055] In an embodiment of the present disclosure, as shown in Figure 4, a sealing ring 35 is provided between the housing 34 and the drive motor 33, and the airflow flowing through the gap between the housing 34 and the reduction gearbox 31 is configured to enter the inside of the drive motor 33 through the through-hole in the drive motor 33. The sealing ring 35 may seal the gap between the drive motor 33 and the housing 34 to ensure that all of the airflow in the gap between the housing 34 and the reduction gearbox 31 enters the inside of the drive motor 33 through the through-hole, avoiding the loss of air pressure in the heat dissipation duct 30.

[0056] In the cleaning apparatus of this embodiment, the rolling brush 2, when cooperating with the coupling 32, causes the sealing member 4 to open the air inlet 301 by pushing the coupling 32 to move along the output shaft 311 of the reduction gearbox 31, so as to connect the heat dissipation duct 30 and the inner cavity 20 of the rolling brush 2, so that the airflow in the inner cavity 20 can enter the heat dissipation duct 30 to dissipate heat of the drive motor 33. In a case that the rolling brush 2 is disassembled with the coupling 32, the elastic device 5 drives the coupling 32 to reset, so that the sealing member 4 seals the air inlet 301, thereby preventing water on the ground from entering the heat dissipation duct 30 and thus causing short-circuit of the drive motor 33.

Second Embodiment

[0057] The cleaning apparatus in this embodiment differs from the cleaning apparatus in the first embodiment in that the sealing member 4 opens or seals the air inlet 301 by its own deformation.

[0058] Specifically, the driving device has a heat dissipation duct 30, the rolling brush 2 has an inner cavity 20, and the heat dissipation duct 30 may be connected with the inner cavity 20 through the air inlet 301. The driving device includes a reduction gearbox 31, an output end of the reduction gearbox 31 is provided with a coupling 32, and the sealing member 4 is fixed to the coupling 32.

[0059] As shown in Figures 8 and 9, in a case that the driving device is assembled with the rolling brush 2, the sealing member 4 is configured to be deformed by the extrusion of the rolling brush 2 to open the air inlet 301. Specifically, the reduction gear box 31 includes a box 310, and an output shaft 311 that penetrates out of the box 310, the coupling 32 is fixed to the output shaft 311, and the reduction gear box 31 may drive the coupling 32 to rotate via the output shaft 311. The rolling brush 2 has a transmission seat 21 in the inner cavity 20, and the coupling 32 may cooperate with the transmission seat 21 to drive the rolling brush to rotate.

[0060] The sealing member 4 may be made of a flexible material, such as rubber, which has a certain degree of elasticity. In a case that the driving device is disassembled with the rolling brush 2, the sealing member 4 may seal the air inlet 301 by its own elastic restoring force.

[0061] In an embodiment of the present disclosure, as shown in Figure 9, the transmission seat 21 of the rolling brush 2 is provided with a press-fit part 211, and the press-fit part 211 is configured to press the sealing member 4 to deform in a case that the driving device is assembled with the rolling brush 2. Specifically, the body 310 of the reduction gearbox 31 is provided with an installing cavity 312 at an output end, and the installing cavity 312 has an open end toward the rolling brush 2. The air inlet 301 is provided on an inner wall of the installing cavity 312. The sealing member 4, when in an initial position, seals the open end of the installing cavity 312, so as to seal the air inlet 301; the sealing member 4 bends toward the inside of the installing cavity 312 when being pressed by the press-fit part 211, so as to open the open end of the installing cavity 312, thereby opening the air inlet 301.

[0062] In an embodiment of the present disclosure, as shown in Figures 8 and 9, the installing cavity 312 includes a sidewall 313 extending axially along the output shaft 311, and the sealing member 4 is configured to be sealed together with the sidewall 313 to seal the air inlet 301. In a case that the press-fit part 211 of the transmission seat 21 presses the sealing member 4, the sealing member 4 is separated from the sidewall 313, thereby opening the air inlet 301.

[0063] In another embodiment of the present disclosure, the box 310 includes a sidewall 313 extending axially along the output shaft 311, and a flange 314 extending radially inwardly from an end of the sidewall 313. Specifically, the installing cavity is enclosed by an end surface of the output end of the box 310, the sidewall 313 and the flange 314, and the flange 314 encloses to form the open end of the installing cavity 312, and the sealing member 4, when abutting against the flange 314, seals the open end of the installing cavity 312, thereby sealing the air inlet 301 in the installing cavity 312. In a case that the press-fit part 211 of the transmission seat 21 presses the sealing member 4, the sealing member 4 is separated from the flange 314, thereby opening the air inlet 301.

[0064] In this embodiment, the structure between the

coupling 32 and the output shaft 311 of the reduction gearbox 31 is simple, which facilitates manufacturing and assembly, and can reduce the production cost. Structures and principles of the driving device and the rolling brush 2 may be referred to the description of the first embodiment, which will not be repeated in this embodiment.

[0065] A driving device is further provided according to the present disclosure, which may be applied in the cleaning apparatus described above, with heat dissipation and waterproof function. The driving device may also be applied to other devices to drive a rotating member. In a case of application to a cleaning apparatus, for example, the driving device is configured so as to extend into an inner cavity 20 of a rolling brush 2 in the cleaning apparatus, and to be cooperated with a transmission seat 21 in the inner cavity 20 of the rolling brush 2.

[0066] The driving device has a heat dissipation duct 30, and an air inlet 301 and a sealing member 4 for sealing the air inlet 301 are provided on the driving device. The sealing member 4 is configured to open, in a case that the driving device is assembled with the rolling brush 2, the air inlet 301 under the extrusion of the transmission seat 21 to connect the heat dissipation duct 30 to the inner cavity 20; and seal, in a case that the driving device is disassembled with the rolling brush 2, the air inlet 301 under the elastic restoring force.

[0067] The specific structures and principles of the driving device and the rolling brush 2 may be referred to the descriptions of the first embodiment and the second embodiment, which will not be repeated in this embodiment.

[0068] The present disclosure relates to a cleaning apparatus including a body, a rolling brush, a driving device and a fan assembly. The rolling brush rotates about an axis thereof to clean a cleaning surface, the rolling brush has an inner cavity. The driving device is connected to the body and has a heat dissipation duct, and the driving device is configured to extend into the inner cavity of the rolling brush and be cooperated with the rolling brush. The heat dissipation duct of the driving device is connected with the inner cavity of the rolling brush and constitutes a ventilation duct. The fan assembly is arranged in the ventilation duct and is configured to rotate synchronously with the rolling brush to form a negative pressure in the ventilation duct. With the cleaning apparatus of the present disclosure, when the rolling brush starts to rotate, the fan assembly can form a negative pressure and suck external airflow into the ventilation duct, so that the heat generated by the driving device can be discharged in time when the driving device operates with high power, thereby increasing the service life of the driving device, and reducing the failure rate.

[0069] With the development of social productivity, living standards of people have been improved. Under the premise of the material base has been guaranteed, people began to use a variety of tools to reduce labor load, so as to improve the quality of life, thus scrubbers, sweeping robots and other household cleaning apparatus have been developed.

[0070] At present, a motor of a floor scrubber on the market is mostly located in the outside of the rolling brush, and a torque of a roller motor is transferred to the rolling brush through the transmission part, the installation structure of which is complicated and occupies a large space. In order to solve the problem, a motor built-in installation method may be used, i.e., the motor is extended into the inner cavity of the rolling brush, so that the installation space of the motor can be saved. When the motor is placed in the inside of the roller, although the installation space is saved, it is difficult for the motor to dissipate heat. When the motor operates at a higher power, more heat is generated, if the heat in the motor cannot be discharged timely, the performance, service life, and so on, of the motor will be affected.

[0071] In the cleaning apparatus of the present disclosure, a fan assembly is provided in the inner cavity of the rolling brush, and a ventilation duct is provided in the driving device and the rolling brush. When the rolling brush starts to rotate, the fan assembly rotates to form the negative pressure, to suck external airflow into the ventilation duct, so as to enhance the air flow in the inner cavity of the rolling brush, and dissipate heat from the driving device, so that the heat generated by the driving device can be discharged in a timely manner during the high-power operation of the driving device, increasing the service life of the driving device and reducing the failure rate.

[0072] A cleaning apparatus is provided according to the present disclosure, and the cleaning apparatus of the present disclosure may be a sweeping robot, a floor washing robot, a handheld floor scrubber, and other cleaning apparatus known to those skilled in the field. The cleaning apparatus includes a body, a rolling brush for cleaning a cleaning surface provided on the body, and a driving device that is connected with the rolling brush and drives the rolling brush to operate. The rolling brush is provided with an inner cavity, and an end of the driving device may be fixed to the body, and the other end extends to the inner cavity of the rolling brush and is connected to the rolling brush so that the driving device can drive the rolling brush to rotate.

[0073] A heat dissipation duct is provided in the driving device, and the heat dissipation duct is connected to the inner cavity of the rolling brush, and forms a ventilation duct together with the inner cavity of the rolling brush. A fan assembly is provided in the ventilation duct, and the fan assembly may be a fan, a blower, and other fan assemblies known to those skilled in the art. The fan assembly rotates synchronously with the rolling brush when the rolling brush rotates, and may form a negative pressure during rotation, and the external airflow is sucked into the ventilation duct. The external airflow will flow along the ventilation duct and enter the heat dissipation duct of the ventilation duct to dissipate heat from the inside of the driving device, and finally flow out of the

outlet of the heat dissipation duct.

[0074] In the cleaning apparatus of the present disclosure, the fan assembly is arranged in the inner cavity of the rolling brush, the fan assembly can form a negative pressure during the rotation with the cleaning apparatus when the cleaning apparatus is in operation, and sucks the external airflow into the ventilation duct. The external airflow in the ventilation duct first passes through the inner cavity of the rolling brush and then enters the heat dissipation duct to dissipate heat from the driving device, which can discharge the heat generated by the driving device in a timely manner when the driving device operates at a high power, thereby increasing the service life of the driving device, and reducing the failure rate.

[0075] For ease of understanding, the specific structure and operating principle of the present disclosure are described in detail below with reference to Figures 10 to 20 in combination with specific embodiments.

[0076] In an embodiment of the present disclosure, as shown in Figures 10 and 12, the cleaning apparatus includes a body 1, and the body 1 is used to carry various components in the cleaning apparatus, such as a battery, a dust collection box, a sewage tank, and other components known to those skilled in the art, depending on the structure and function of the cleaning apparatus, and the present disclosure is not limited herein. A rolling brush is provided on the body 1, and the rolling brush is used to clean a surface to be cleaned. The rolling brush is provided with an inner cavity 20, and a driving device is further provided on the body 1, and the driving device is configured to drive the rolling brush to rotate. An end of the driving device is connected to the body 1, and the other end extends to the inner cavity 20 of the rolling brush, and is connected to the rolling brush in a transmission connection, and the transmission connection may be in a manner known to those skilled in the art such as a snap connection, bevel gear connection, and so on, which will not be repeated here.

[0077] The driving device is provided with a heat dissipation duct 30, the heat dissipation duct 30 is connected to the inner cavity 20 of the rolling brush, and forms a ventilation duct 8 together with the inner cavity 20 of the rolling brush. A fan assembly is provided in the ventilation duct 8, and the fan assembly may be an axial fan, a blower, and other fan assemblies that are known to those skilled in the art, which is not limited in the present disclosure. The fan assembly rotates synchronously with the rolling brush when the rolling brush is in operation. In the process of rotating with the rolling brush, a negative pressure is generated, and the negative pressure is utilized to cause the external airflow to enter the ventilation duct 8. In the ventilation duct 8, the external airflow first enters the inner cavity 20 of the rolling brush, and enters the heat dissipation duct 30 after passing through the inner cavity 20 to dissipate heat from the driving device. Moreover, when the driving device is operating at a high power, the rolling brush will also rotates fast, and the fan assembly also rotates fast with the rolling brush, resulting in a rapid flow of air in the ventilation duct 8 and a better heat dissipation effect.

[0078] In an embodiment of the present disclosure, as shown in Figure 10, the rolling brush may be a rolling brush 2 in the shape of a cylinder, and the rotation axis of the rolling brush 2 is parallel to the cleaning surface. An inner cavity 20 of the rolling brush 2 extends through its opposite first and second ends. Cleaning cotton, bristles or other parts for cleaning may be provided on the outer surface of the rolling brush 2.

[0079] The second end of the rolling brush 2 is rotationally connected to the body 1 such that the body 1 can provide support for the second end of the rolling brush 2. An end of the driving device is connected to the body 1, and the other end extends into the inner cavity 20 of the rolling brush 2 through the first end of the rolling brush 2, and is connected with the rolling brush 2, thereby enabling the driving device to provide support for the rolling brush 2. Through the rotation of the output end of the driving device, the rolling brush 2 may be driven to rotate relative to the body 1 to accomplish the cleaning of the cleaning surface.

[0080] In an embodiment of the present disclosure, as shown in Figure 11, the fan assembly includes a first fan 6, and the first fan 6 may be an axial fan, a centrifugal fan, and other fans known to those skilled in the art, which is not limited in the present disclosure. The first fan 6 is provided at a second end of the rolling brush 2 and is fixed to the second end of the rolling brush 2. When the rolling brush 2 starts operating, the first fan 6 rotates synchronously with the rolling brush 2, thereby generating a negative pressure to suck external airflow into the inner cavity 20 of the rolling brush 2. The external airflow may enter into the inner cavity 20 of the rolling brush 2 through the gap between the first fan 6 and the second end of the rolling brush 2. A gap may also be formed on the first fan 6, so that the external airflow can enter into the inner cavity 20 of the rolling brush 2 through the gap on the first fan 6, which is not limited in the present disclosure.

[0081] In a specific embodiment of the present disclosure, as shown in Figures 11, 12 and 15, the first fan 6 includes a base 61, an installing seat 62, and blades between the base 61 and the installing seat 62. The base 61 is hollow and cylindrical, and the first fan 6 may be fixed to the second end of the rolling brush 2 through the base 61 by means of snap-in, bonding, integrally molded, screw fixing, and other connection means known to those skilled in the art, which will not described in detail herein. The installing seat 62 is arranged in a cavity of the base 61 and is connected to the base 61 by blades, and the first fan 6 is rotationally connected to the body 1 by the installing seat 62, for example, an installing hole may be provided on the installing seat 62, and an installing shaft that is cooperated with the installing hole may be provided on the body 1. In a case that the first fan 6 is installed on the body 1, the installing hole and the installing shaft are mutually cooperated with each other, so that the first fan 6 can be rotationally connected to the body 1.

[0082] When the rolling brush 2 starts to operate, the rolling brush 2 starts to rotate by the driving device, thereby driving the base 61 fixedly connected thereto to rotate. The blades rotate synchronously with the base 61, and the blades generate a negative pressure during rotation, so that the external airflow enters the ventilation duct 8 to dissipate heat from the driving device.

[0083] In an embodiment of the present disclosure, as shown in Figures 11 and 15, a coupling 32 is provided at a driving end of the driving device, and the driving device is connected with the rolling brush 2 via the coupling 32 by means of connection including, but not limited to, bolting, gluing, insertion, snap connection, and the like, which is not limited in the present disclosure. In order to facilitate installation and removal of the rolling brush 2, a transmission seat 21 is provided in the rolling brush 2 that is in transmission connection with the coupling 32, and the transmission seat 21 is arranged in the inner cavity 20 of the rolling brush 2 and is detachably connected with the rolling brush 2. The driving device may drive the transmission seat 21 to rotate through the coupling 32, thereby driving the rolling brush 2 to rotate synchronously.

[0084] In an embodiment of the present disclosure, as shown in Figure 14, the coupling 32 is fixed to the output shaft 311 in the driving device, the coupling 32 may be in a round table structure or other shapes known to those skilled in the art. The coupling 32 may be fixed to the output shaft 311 by bolts or other forms known to those skilled in the art, whereby the coupling 32 may be driven to rotate by rotation of the output shaft 311. Continuing to refer to Figure 11, a transmission cavity 22 is provided in the transmission seat 21, and the shape of the transmission cavity 22 is adapted to the shape of the coupling 32, and the coupling 32 may be cooperated with the transmission seat 21 in pluggable manner.

[0085] When performing installation, the rolling brush 2 may be held in the direction of the driving device, so that the driving device extends into the inner cavity 20 of the rolling brush 2, and the coupling 32 extends into the transmission cavity 22 in the transmission seat 21, so that the transmission cavity 22 is cooperated with the coupling 32. When it is required to disassembly, it is only required to pull out the rolling brush 2 in a direction away from the driving device to separate the rolling brush 2 from the driving device.

[0086] The transmission cavity 22 may also be connected with the coupling 32 by means of projections, grooves, and the like, in order to avoid slippage between the transmission cavity 22 and the coupling 32. In an embodiment of the present disclosure, as shown in Figure 11, a spiral-shaped projection structure may be provided on the coupling 32, and the spiral-shaped projection structure, when cooperated with the corresponding groove structure provided on the inner wall of the transmission cavity 22, may drive the transmission cavity 22 and the coupling 32 together to avoid slippage between the transmission cavity 22 and the coupling 32 during the operation of the rolling brush 2, ensuring the stability of the rolling brush 2 during rotation.

[0087] In practice, if the negative pressure is generated only by the rotation of the first fan 6, this may lead to insufficient power of the external airflow in the ventilation duct 8. When the airflow flows to the middle position of the inner cavity 20 of the rolling brush 2, at which position the airflow is already at a certain distance from the first fan 6, the negative pressure generated by the first fan 6 has a reduced effect on the airflow, resulting in the airflow flowing in the inner cavity 20 at a slower flow rate, which reduces the heat dissipation efficiency. In order to solve the above problem, in an embodiment of the present disclosure, as shown in Figure 15, the fan assembly further includes blades arranged in the transmission seat 21, there may be multiple blades, a gap is formed between adjacent blades for the airflow to pass through, and a duct for the airflow to pass through is also provided in the transmission seat 21. When the coupling 32 drives the transmission seat 21 to rotate, the blades rotate synchronously with the transmission seat 21, the blades will generate a negative pressure during rotation, and the airflow is accelerated again when passing through the blades, so that the airflow can continually flow at a high speed in the ventilation duct 8, to improve the heat dissipation efficiency.

[0088] In order to further improve the flow rate of the airflow in the ventilation duct 8 and improve the heat dissipation efficiency, in an embodiment of the present disclosure, as shown in Figure 13, a second fan 7 is provided at an outlet of the heat dissipation duct 30, and the second fan 7 is located at an end of the driving device away from the transmission seat 21. The second fan 7 may be an axial fan, a centrifugal fan, and other fans well known to those skilled in the art, which will not be described herein. The second fan 7 may be connected with the driving device to provide power for the rotation of the second fan 7 through the driving device. When starting to operate, the driving device may synchronously drive the first fan 6, the second fan 7 and the blades in the transmission seat 21 to rotate, so that the external airflow into the ventilation duct 8 can be accelerated when the external airflow enters the ventilation duct 8, enters the middle part of the ventilation duct 8, and flows out of the ventilation duct 8, which greatly improves the heat dissipation efficiency.

[0089] Further, the second fan 7 may also be a fan with a power unit, which can rotate when rotation is required. For example, when the driving device operates at a low power, the heat dissipation requirement is small, and the second fan 7 may not rotate, the airflow normally flows out of the rolling brush 2. When the driving device operates at a high power, the second fan 7 starts to rotate, accelerating the flow rate of the airflow in the ventilation duct 8, so that the airflow flows out of the ventilation duct 8 faster, so that the heat dissipation efficiency is improved.

[0090] In practice, as the user continually use the cleaning apparatus, a cleaning layer on the surface of the rolling brush 2 may wear out and need to be replaced,

at which time the user removes the rolling brush 2 for replacement. Alternatively, when the rolling brush 2 is dirty, the rolling brush 2 may also be disassembled for cleaning. In the process of replacement or in the process of rinsing, water may enter the inside of the driving device through the heat dissipation duct 30, which may easily cause the driving device to malfunction during use and thus reduce the service life of the driving device.

[0091] In order to solve the above problem, in an embodiment of the present disclosure, as shown in Figures 13 and 17, the driving device is provided with an air inlet 301, which is the inlet of the heat dissipation duct 30, and the driving device is also provided with a sealing member 4 for sealing the air inlet 301. The sealing member 4 may be made of a flexible material, such as a rubber, a sponge, and the like, which is not limited in the present disclosure. When the rolling brush 2 and the driving device are driven together, the sealing member 4 opens the air inlet 301 under the extrusion of the transmission seat 21 in the rolling brush 2, so that the heat dissipation duct 30 is connected to the inner cavity 20 of the rolling brush 2, and the external airflow can flow normally. When the user removes the rolling brush 2, the sealing member 4 seals the air inlet 301 on the driving device under the action of the elastic restoring force, so that the outside water vapor will not enter the inside of the driving device through the air inlet 301, avoiding malfunction of the driving device during operation which reduces the service life of the driving device.

[0092] In an embodiment of the present disclosure, as shown in Figures 12 and 13, the driving device includes a reduction gearbox 31, variable speed components such as a gear may be provided in the reduction gearbox 31, the air inlet 301 is arranged at an end of the reduction gearbox 31 near the coupling 32, and there may be multiple air inlets 301, which are spaced apart in a circumferential direction along the reduction gearbox 31. The coupling 32 may move between a first position and a second position along the axial direction of the reduction gearbox 31, and the sealing member 4 is arranged at an end of the coupling 32 near the reduction gearbox 31 and is fixedly connected to the coupling 32. The sealing member 4 is arranged around the circumferential direction of the coupling 32 and extends outwardly along the radial direction of the coupling 32 to seal the air inlet 301 on the reduction gearbox 31. The sealing member 4 is configured to seal the air inlet 301 in a case that the coupling 32 is in the first position and to open the air inlet 301 in a case that the coupling 32 is in the second position.

[0093] The coupling 32 is in the first position in an initial state, as shown in Figure 17, in this case, the sealing member 4 seals the air inlet 301. In a case that the coupling 32 is cooperated with the rolling brush 2, as shown in Figure 18, the rolling brush 2 presses the coupling 32 in the axial direction of the coupling 32 to move the coupling 32 from the first position to the second position, and the sealing member 4 moves following the coupling 32 to open the air inlet 301.

[0094] In an embodiment of the present disclosure, as shown in Figures 13 and 14, an elastic device 5 is provided between the output shaft 311 of the reduction gearbox 31 and the coupling 32, and the elastic device 5 is configured to pre-press the coupling 32 in the first position. When the transmission seat 21 in the rolling brush 2 presses the coupling 32, the transmission seat 21 may overcome the elastic effect of the elastic device 5, so that the coupling 32 moves from the first position to the second position along the output shaft 311 of the reduction gearbox 31, and the sealing member 4 opens the air inlet 301, the driving device may rotate the rolling brush 2 via the coupling 32 to perform cleaning. During the cleaning process, the heat dissipation duct 30 of the driving device can dissipate heat through the air inlet 301. In a case that the rolling brush 2 is disassembled with the coupling 32, the elastic device 5 may drive the coupling 32 from the second position to the first position under its own elastic restoring force, so that the sealing member 4 closes the air inlet 301, avoiding water from entering the heat dissipation duct 30 of the driving device through the air inlet 301.

[0095] The elastic device 5 includes, but is not limited to, a compression spring, an elastic piece, an elastic block, and the like. In a preferred embodiment, as shown in Figures 14 and 15, the elastic device 5 is a compression spring, the compression spring is sleeved on the output shaft 311 of the reduction gearbox 31, where an end of the compression spring cooperates with the output shaft 311 or the box 310, and the other end cooperates with the coupling 32.

[0096] In another embodiment of the present disclosure, the coupling 32 is fixedly connected with the reduction gearbox 31. The air inlet 301 is arranged at an end of the reduction gearbox 31 near the coupling 32. The sealing member 4 is arranged at an end of the coupling 32 near the reduction gearbox 31. In a case that the driving device is not cooperated with the rolling brush 2, as shown in Figure 19, a part of the sealing member 4 extending radially along the coupling 32 seals the air inlet 301. The transmission seat 21 in the rolling brush 2 is provided with an extrusion part 23 at an end near the coupling 32, and the extrusion part 23 may be provided along the circumferential direction of the transmission seat 21, extending toward the coupling 32 along the axis of the transmission seat 21. In a case that the driving device is cooperated with the rolling brush 2, as shown in Figure 20, the extrusion part 23 may extrude the part of the sealing member 4 that extends radially outwardly along the coupling 32, to deform the sealing member 4 so as to open the air inlet 301, so that the inner cavity 20 of the rolling brush 2 is connected with the heat dissipation duct 30 in the driving device, thus the external airflow can dissipate heat from the driving device through the ventilation duct 8. Since the sealing member 4 has a certain degree of elasticity, in a case that the driving device is separated from the rolling brush 2, the sealing member 4

may seal the air inlet 301 by its own elastic restoring force.

[0097] In an embodiment of the present disclosure, as shown in Figures 13 and 14, the reduction gearbox 31 includes a box 310, the box 310 as a whole is in the shape of a hollow cylinder, and the hollow part is used for installing a variable speed component in the reduction gearbox 31, such as a gear, a variable speed shaft, and the like. An installing cavity 312 is provided at an end of the box 310 near the coupling 32, and the end of the installing cavity 312 toward the transmission seat 21 is an open end. An air inlet 301 is provided on an inner wall of the installing cavity 312. In a case that the coupling 32 is assembled with the reduction gearbox 31, a part of the coupling 32 as well as the sealing member 4 are arranged in the installing cavity 312. A deflector cavity 302 is further provided on the outer wall of the box 310, and the deflector cavity 302 is connected to the air inlet 301. The external airflow enters the installing cavity 312 through the open end, and enters the deflector cavity 302 through the air inlet 301, then continues to flow toward the end of the driving device. There may be multiple deflector cavities 302, which are distributed spaced along the circumferential direction of the box 310, and there may be multiple air inlets 301 that are in one-to-one correspondence with the deflector cavities 302, so that the airflow may flow out of the box 310 in multiple directions.

[0098] In an embodiment of the present disclosure, as shown in Figures 12 and 16, the driving device further includes a drive motor 33, and the driving end of the drive motor 33 is connected with an end of the reduction gearbox 31 away from the coupling 32. A motor air inlet 331 is provided at an end of the drive motor 33 near the reduction gearbox 31, and a motor air outlet 332 is provided at an end away from the reduction gearbox 31, and a part of the heat dissipation duct 30 is formed between the motor air inlet 331 and the motor air outlet 332. After passing through the reduction gearbox 31, the airflow enters the drive motor 33 through the motor air inlet 331 to take away the heat inside the drive motor 33, and then the airflow flows out through the motor air outlet 332, and passes through the second fan 7 at the end of the drive motor 33 to flow out of the heat dissipation duct 30.

[0099] In an embodiment of the present disclosure, a housing 34 is further provided on the outer surface of the drive motor 33, the housing 34 is overall in the shape of a cylinder, and the housing 34 is sleeved on and fixedly connected to the drive motor 33 and the reduction gearbox 31. The gap between the housing 34 and the reduction gearbox 31 forms a part of the heat dissipation duct 30. Airflow flowing from the installing cavity 312 may flow in the direction of the drive motor 33 under the restriction of the housing 34 and the deflector cavity 302, and enter into the heat dissipation duct 30 through the air inlet 301.

[0100] In an embodiment of the present disclosure, there is a gap between the housing 34 and the drive motor 33 and a gap between the housing 34 and the reduction gearbox 31, and in order to prevent the airflow in the heat dissipation duct 30 from flowing directly from the gap between the drive motor 33 and the housing 34 to the second fan 7, a sealing ring 35 is provided between the housing 34 and the drive motor 33, as shown in Figure 12, the sealing ring 35 may be arranged at an end close to the motor air inlet 331 of the drive motor 33, so that the airflow can only first enter into the drive motor 33 through the motor air inlet 331, then flow out through the motor air outlet 332, and enter into the gap between the drive motor 33 and the housing 34, and finally flow to the second fan 7.

[0101] The housing 34 may also protect the reduction gearbox 31 and the drive motor 33 to a certain extent, and in a case that the user removes the rolling brush 2, the housing 34 and the sealing member 4 can prevent external water vapor or other substances from directly entering the heat dissipation duct 30, avoiding external substances from entering into the inside of the drive motor 33 through the heat dissipation duct 30 that can cause malfunction, thereby improving the service life of the drive motor 33.

[0102] In an embodiment of the present disclosure, as shown in Figures 12 and 13, the cleaning apparatus further includes a motor installing seat 11 fixedly connected to the body 1, the motor installing seat 11 is located at an end of the drive motor 33 away from the reduction gearbox 31, the housing 34 is fixedly connected to the motor installing seat 11, the end of the drive motor 33 is at a certain distance from the motor installing seat 11, the housing 34 protrudes out of the end of the drive motor, so that a cavity is formed between the motor installing seat 11 and the housing 34, and the second fan 7 is arranged in the cavity. Airflow from the motor air outlet 332 flows out of the motor installing seat 11 after passing through the second fan 7.

[0103] In a case that the cleaning apparatus of the present disclosure is started to operate, the drive motor 33 drives the transmission seat 21 to rotate through the reduction gearbox 31 and the coupling 32, so as to drive the rolling brush 2 to rotate to clean a surface to be cleaned. Driven by the rolling brush 2, the first fan 6 located at the second end of the rolling brush 2 starts to rotate to generate a negative pressure, and the external airflow, under the effect of the negative pressure, enters into the ventilation duct 8, that is, the inner cavity 20 of the rolling brush 2, from the second end of the rolling brush 2. The airflow continues to flow to the middle part of the rolling brush 2 and passes through the blades in the transmission seat 21, at which the airflow is accelerated for the second time and continues to flow in the direction of the heat dissipation duct 30. After passing through the transmission seat 21, the airflow enters the heat dissipation duct 30 between the reduction gearbox 31 and the housing 34 through the air inlet 301 on the reduction gearbox 31, and enters the inside of the drive motor 33 through the motor air inlet 331 to dissipate heat from the drive motor 33. The airflow inside the drive motor 33 flows out through the motor air outlet 332 and enters the gap between the housing 34 and the drive motor 33 and

continues to flow in the direction of the second fan 7, and the airflow is accelerated again after passing through the second fan 7, and finally flows out through the motor installing seat 11 to complete the heat dissipation process. The airflow is accelerated three times in the heat dissipation process, which can complete the entire heat dissipation process more rapidly, greatly improving the heat dissipation efficiency.

[0104] The present disclosure relates to a cleaning apparatus and a quick disassembly structure. The cleaning apparatus includes a floor brush assembly, the floor brush assembly includes: a floor brush housing; a rolling brush, connected to the floor brush housing by a brush cover plate; and a quick disassembly member, hinged to the rolling brush cover plate. The quick disassembly member includes an extension part and a holding part bounded by a hinging axis of the quick disassembly member, the holding part is configured to rotate relative to the rolling brush cover plate to such an extent as to cause the extension part to lift the rolling brush cover plate up from the floor brush housing. By lifting the rolling brush cover plate from the floor brush housing by the extension part of the quick disassembly member, the workload of removing the rolling brush is reduced, effectively improving the user experience.

[0105] With the development of social productivity, living standards of people are constantly improving. Under the premise of the material base has been guaranteed, people began to reduce the amount of labor by using a variety of tools, so as to improve the quality of life at home, household cleaning apparatus is thus developed.

[0106] In many household cleaning apparatus, cleaning machine products with both dust and water absorption capability obtain a large number of consumers with its strong floor cleaning capability. In order to meet the increasing demand of users, the technology related to the cleaning machine products is constantly updated literately. The cleaning part is one of the important parts that determines the cleaning performance of cleaning machine products, the cleaning performance of the cleaning parts can directly determine the cleaning performance of cleaning machine products.

[0107] The cleaning part needs to be regularly disassembled for cleaning or replaced. Most of the existing cleaning parts are fixed in a magnetic way, or fixed in the cleaning machine products by using interference, snap, and the like. In addition, in order to avoid displacement of the cleaning part during the use, a magnetic component with a larger magnetic force will be used to fix the cleaning part.

[0108] The above arrangement inadvertently increases the disassembly difficulty of the user, thus the entire disassembly process becomes time-consuming and cumbersome, which affects the use experience of the user.

[0109] A beneficial effect of the present disclosure is that the cleaning apparatus of the present disclosure simplifies the disassembly process of the rolling brush by placing a quick disassembly part on the basis of the existing structure. When removing the rolling brush, it is only required to rotate the quick disassembly member to rotate the holding part relative to the rolling brush cover plate until the extension part abuts the floor brush housing, and continue to rotate so that the rolling brush cover plate is lifted up from the floor brush housing by a certain distance. In the process of lifting, the extension part extends the force application arm of the quick disassembly member, thereby substantially reducing the force exerted by the user in removing the rolling brush assembly. The problem of removing the rolling brush assembly in the conventional art is solved, and the time and force of the user in removing the rolling brush is reduced, thereby improving the use experience of the user.

[0110] A cleaning apparatus is further provided according to the present disclosure, which may be a handheld cleaning apparatus, such as a handheld cleaning machine, a handheld vacuum cleaner, a handheld floor scrubber, and other handheld cleaning apparatus known to those skilled in the art. The cleaning apparatus may also be a self-moving cleaning apparatus such as a sweeping robot, a mopping robot, a sweeping and mopping robot, and the like.

[0111] The cleaning apparatus of the present disclosure includes a floor brush assembly, the floor brush assembly includes a floor brush housing, and a rolling brush connected to the floor brush housing by a rolling brush cover plate. The rolling brush is rotationally connected to the floor brush housing, whereby a cleaning surface, such as a floor, may be cleaned by rotation of the rolling brush. At least one end of the rolling brush is connected to the floor brush housing by the rolling brush cover plate, e.g. one end of the rolling brush cover plate is connected to the floor brush housing and the other end is connected to the rolling brush. In order to remove the rolling brush, it is only required to simply remove the rolling brush cover plate from the floor brush housing. The cleaning apparatus of the present disclosure further includes a quick disassembly member hinged to the rolling brush cover plate.

[0112] The quick disassembly member includes an extension part and a holding part that re connected thereto bounded by its hinging axis, the extension part and the holding part may be integrally molded. The holding part is configured to rotate relative to the rolling brush cover plate such that the extension part lifts the rolling brush cover plate up from the floor brush housing.

[0113] In an embodiment of the present disclosure, the rolling brush cover plate may be interference cooperated with the floor brush housing by a snap structure such as a groove, a block, or the like, and after the rolling brush cover plate is lifted up from the floor brush housing by the extension part, the interference cooperation between the rolling brush cover plate and the floor brush housing may be released.

[0114] In an embodiment of the present disclosure, the

rolling brush cover plate may also be magnetically connected to the floor brush housing. In order to ensure the strength of the connection between the rolling brush cover plate and the floor brush housing, a strong magnetic material with a high magnetic force is usually used. In a case that the rolling brush cover plate is lifted up from the floor brush housing by the extension part for a certain distance, the magnetic force of the interconnected magnetic elements between the rolling brush cover plate and the floor brush housing are substantially reduced. Further, by disassembling the rolling brush in the above-described manner, the magnetic force of the connection between the rolling brush cover plate and the floor brush housing can be easily overcome, so that the rolling brush can be disassembled from the floor brush housing. With the simple and convenient removing method, the user experience can be improved.

[0115] Apparently, with the cleaning apparatus of the present disclosure, the rolling brush assembly can be disassembled simply and conveniently, and the force exerted by the user during disassembly can also be reduced, thereby reducing the workload of the user in removing the rolling brush.

[0116] For better understanding, the specific structure and operating principle of the cleaning apparatus of the present disclosure are described in detail below in conjunction with a specific embodiment and Figures 21 to 33 of the drawings.

[0117] A cleaning apparatus is provided according to the present disclosure. Referring to Figures 21 and 22, the cleaning apparatus of the present disclosure includes a body and a floor brush assembly in a lower portion of the body. The floor brush assembly includes a floor brush housing 14, a rolling brush 2, and a quick disassembly member 8. The floor brush housing 14 is formed as a cavity for arranging the rolling brush 2 by cooperatively connecting a floor brush lower housing and a floor brush upper housing. The rolling brush 2 is configured to be arranged in the cavity formed by the floor brush housing 14 and is rotatably connected to the floor brush housing 14 by the rolling brush cover plate 6. During cleaning process of the cleaning apparatus, the rolling brush 2 contacts with the surface to be cleaned in order to clean the surface.

[0118] Specifically, referring to Figure 21, the floor brush lower housing is used for installing, and an installing position is provided at the front end of the floor brush lower housing. The rolling brush 2 is rotationally connected to the installing position at the front end of the floor brush lower housing, so that when the floor brush upper housing is snapped together with the floor brush lower housing, the rolling brush 2 can be exposed only from the lower end of the floor brush housing to clean the cleaning surface.

[0119] The rolling brush 2 may be rotationally connected to the floor brush housing 14 in a manner known to those skilled in the art. Continuing to refer to Figure 22, in an embodiment of the present disclosure, an end of the floor brush lower housing is provided with a transmission part, and the rolling brush 2 is connected to the transmission part, and the other end of the rolling brush 2 may be connected to the floor brush lower housing through the rolling brush cover plate 6 of the present disclosure, thereby realizing the installation between the rolling brush 2 and the floor brush housing 14, and enabling the rolling brush 2 to rotate relative to the floor brush housing 14 to complete the cleaning of the cleaning surface.

[0120] In an embodiment of the present disclosure, the transmission part is an output end of the drive motor. Specifically, an end of the drive motor is fixed to the floor brush lower housing, and the other end is extended into the inner cavity of the rolling brush 2, and the output end of the drive motor cooperates with the transmission seat in the inner cavity of the rolling brush 2, whereby the drive motor can drive the rolling brush 2 to rotate around its own axis.

[0121] The rolling brush cover plate 6 of the present disclosure may be connected to the floor brush housing 14 by means of interference, or alternatively, the rolling brush cover plate may be cooperated with the floor brush housing by a snap structure such as a groove, a block, or the like. Further, the rolling brush cover plate 6 may also be connected to the floor brush housing 14 by means of magnetic force.

[0122] In an embodiment of the present disclosure, referring to Figures 24 and 26, the rolling brush cover plate 6 is provided with an installing cavity 62 for rotationally connecting with the rolling brush 2, and a receiving cavity 63.

[0123] Referring to Figure 26 or Figure 28, the installing cavity 62 and the receiving cavity 63 are respectively provided at opposite ends of the rolling brush cover plate 6. Referring to Figure 24, the installing cavity 62 may be rotationally connected to the rolling brush 2 by a bearing and a rolling brush shaft. In a case that the receiving cavity 63 is fixedly connected to the floor brush housing 14, the rolling brush 2 rotationally connected to the installing cavity 62 is also fixedly connected to the floor brush housing 14. The connection between the installing cavity 62 and the rolling brush 2 may also be achieved in other ways known to those skilled in the art, as long as the rolling brush 2 can be rotationally connected to the installing cavity 62, and the present disclosure will not be specifically described herein.

[0124] In an embodiment of the present disclosure, referring to Figure 26, the rolling brush cover plate 6 is provided with a receiving cavity 63 at an end away from the installing cavity 62. The rolling brush cover plate 6 is provided with a magnetic attraction member 7, which is also fixed to the rolling brush cover plate 6 by means known to those skilled in the art. In an embodiment of the present disclosure, the magnetic attraction member 7 is provided at a position on the rolling brush cover plate 6 corresponding to the receiving cavity 63. Further, a magnetic attraction head 12 is provided at a position of the

floor brush housing 14 corresponding to the receiving cavity 63, thereby the magnetic attraction head 12 and the magnetic attraction member 7 are attracted to each other in a case that the rolling brush cover plate 6 is connected to the floor brush housing 14. Based on the magnetic force of mutual attraction between the magnetic attraction head 12 and the magnetic attraction member 7, the floor brush housing 14 and the rolling brush cover plate 6 can be fixedly connected to each other.

[0125] In order to avoid displacement between the magnetic attraction member 7 and the magnetic attraction head 12 due to vibration when the cleaning apparatus is in operation, the magnetic attraction head 12 is configured to extend into the receiving cavity 63, to avoid displacement of the rolling brush cover plate 6 in the radial direction of the magnetic attraction head 12.

[0126] In an embodiment of the present disclosure, referring to Figure 22, the floor brush housing 14 may be provided with an outwardly extending projection part at a position corresponding to the receiving cavity 63, the magnetic attraction head 12 is arranged on the projection part. When the rolling brush cover plate 6 is cooperatively connected to the floor brush housing 14, the magnetic attraction head 12 is configured to extend into the receiving cavity to cooperate with the magnetic attraction member 7, which cause the rolling brush cover plate 6 to be more securely fixedly connected to the floor brush housing 14. The magnetic attraction head 12 and the magnetic attraction member 7 may be made of materials known to those skilled in the art that can be attracted to each other. For example, the magnetic attraction head 12 is made of a magnetic material, and the magnetic attraction member 7 is made of a material that may be attracted by a magnetic material, such as a metallic material. Alternatively, the magnetic attraction member 7 adopts a magnetic material and the magnetic attraction head 12 adopts a material that can be attracted by the magnetic material, such as a metallic material, for example. Alternatively, the magnetic attraction head 12 and the magnetic attraction member 7 both adopt magnetic materials that can be attracted to each other, and the present disclosure is not limited herein.

[0127] In some embodiments of the present disclosure, referring to Figure 26, the rolling brush cover plate 6 further includes a quick disassembly member 8 hinged thereto. The quick disassembly member 8 includes an extension part 81 and a holding part 82 bounded by the hinging axis of the quick disassembly member 8. Referring to Figure 30 and Figure 31, the quick disassembly member 8 may rotate relative to the rolling brush cover plate 6 by rotating the holding part 82, so that the extension part 81 can lift the rolling brush cover plate 6 up from the floor brush housing.

[0128] In an embodiment of the present disclosure, since one end of the rolling brush cover plate 6 is fixed with the rolling brush 2, the rolling brush 2 moves synchronously with the rolling brush cover plate 6 in a case that the rolling brush cover plate 6 is lifted up from the floor brush housing 14, so that the rolling brush 2 can be separated from the drive motor by a certain distance.

[0129] Referring to Figure 29, the quick disassembly member 8 includes a pin joint part 83 provided at an end of the quick disassembly member 8, an extension part 81, and a holding part 82. The extension part 81 is provided on the body of the quick disassembly member 8 at an end close to the pin joint part 83, and extends the length of the quick disassembly member 8 to a certain extent. The holding part 82 is provided on the body of the quick disassembly member 8 at an end away from the pin joint part 83.

[0130] In detail, the holding part 82 is configured to rotate relative to the rolling brush cover plate 6. The holding part 82 is configured to rotate perpendicular to the rotation axis of the quick disassembly member 8 relative to the rolling brush cover plate 6. The extension part 81 extends to some extent the length of the body of the quick disassembly member 8 at an end close to the pin joint part 83. In this way, the quick disassembly member 8 of the present disclosure enables the user to rotate the holding part 82 relative to the rolling brush cover plate 6 using a very small force by means of a lever-like structure with the pin joint axis at the position of the pin joint part 83 as a fulcrum, and the quick disassembly member 8 having the extension part 81 can easily lift the rolling brush cover plate 6 up from the floor brush housing.

[0131] In actual use, the user rotates the holding part 82 so that the extension part 81 abuts against the floor brush housing 14. In this case, the user continues to apply a certain force to the holding part 82 by using the extension part 81 as a force application point, and when the action force for connecting the rolling brush cover plate 6 and the floor brush housing 14 is overcome, the rolling brush cover plate 6 is lifted up from the floor brush housing 14, which in turn can easily disassembly the rolling brush cover plate 6.

[0132] In some embodiments of the present disclosure, the floor brush housing 14 and the rolling brush cover plate 6 are connected together by a magnetic element. Therefore, in a case that the quick disassembly member 8 lifts the rolling brush cover plate 6 up from the floor brush housing 14 by a certain distance, the magnetic force between the rolling brush cover plate 6 and the floor brush housing 14 is substantially reduced, reducing the workload of the user during disassembly.

[0133] In some embodiments of the present disclosure, referring to Figures 32 and 33, in a case that the quick disassembly member 8 is fixed to the floor brush housing 14 via the rolling brush cover plate 6, there is a certain gap between the floor brush housing 14 and the end of the quick disassembly member 8 provided with the extension part 81. Referring to Figure 33, the gap provides a certain rotation space for the quick disassembly member 8, by which the quick disassembly member 8 can rotate with a lighter force, avoiding the need to use a

larger force at the beginning of the rotation in order to overcome the magnetic force between the rolling brush cover plate 6 and the floor brush housing 14 to rotate the quick disassembly member 8. Specifically, in a case that the extension part 81 lifts up the rolling brush cover plate 6, there exists a certain spacing between the floor brush housing 14 and the rolling brush cover 6, which may be considered as a length distance that the extension part 81 extends the quick disassembly member 8. In this way, by changing the length of the extension part 81, the spacing between the floor brush housing 14 and the rolling brush cover plate 6 can be changed. That is, if the extension part 81 is long, the distance that the extension part 81 lifts the rolling brush cover plate 6 up is also long, and thus the spacing that exists between the floor brush housing 14 and the rolling brush cover plate 6 is large.

[0134] If the spacing that exists between the floor brush housing 14 and the rolling brush cover plate 6 is large, the magnetic force of mutual attraction between the floor brush housing 14 and the rolling brush 2 is weaken largely, and vice versa. Further, the weaker the magnetic force, the easier it is for the user to disassembly the rolling brush 2 from the floor brush housing 14. In this way, through the above simple operation, the rolling brush 2 can be disassembled in a time-saving and labor-saving way, which effectively improves the use experience of the user.

[0135] In some embodiments of the present disclosure, referring to Figure 22, the floor brush housing 14 is provided with an installing groove 11, and the shape of the rolling brush cover plate 6 is adapted to the shape of the installing groove 11. In a case that the rolling brush cover plate 6 is fixedly connected to the floor brush housing 14, at least a portion of the rolling brush cover plate 6 is arranged within the installing groove 11, which improves the stability of the connection between the rolling brush cover plate 6 and the floor brush housing 14. A tight cooperation between the rolling brush cover plate 6 and the installing groove 11 can cause the stable connection there between.

[0136] Continually referring to Figure 22, since the shape of the rolling brush cover plate 6 is adapted to the shape of the installing groove 11 and a part of the rolling brush cover plate 6 is located in the installing groove 11 after installation, the corresponding structures of the rolling brush cover plate 6 and the installing groove 11 indirectly constitutes a simple fool-proofing device, which simplifies the installation operation of the user.

[0137] In some embodiments of the present disclosure, the extension part 81 is a flange formed at an end of the quick disassembly member 8. The flange may extend the length of the body of the extension part 81 to some extent. For example, the flange may extend from the location of the pin joint part 83 in a direction away from the holding part 82.

[0138] In some embodiments of the present disclosure, referring to Figure 26, the extension part 81 is a flange with a circular arc-shaped outer surface formed at the end of the quick disassembly member 8. Specifically, referring to Figure 33, the circular arc-shaped outer surface structure enables the extension part 81 to reduce the friction between the extension part 81 and the floor brush housing 14 to a certain extent when the extension part 81 is lifted up from the floor brush housing 14, and also facilitates the flange to slide on the surface of the floor brush housing 14 at a corresponding position. The force exerted when removing the rolling brush 2 is further reduced by this circular arc-shaped surface structure.

[0139] In an embodiment of the present disclosure, the position on the floor brush housing 14 for cooperating with the flange has a circular arc-shaped surface 13 adapted to the flange. when the flange adopts an outer surface structure of a circular arc shape, the circular arc-shaped surface 13 of the floor brush housing 14 slidely cooperates with the flange of the extension part 81 in order to reduce the resistance between the flange and the floor brush housing 14, which facilitates the quick disassembly member 8 to lift up the floor brush housing 14 with a small force.

[0140] The outer surface structure of the extension part 81 may also be in a stepped structure, or other shaped structures. On the basis of realizing the extension of the quick disassembly member 8 and reducing the force to be exerted for the user removing the rolling brush 2, the outer surface structure of the extension part 81 may be set according to actual needs by those skilled in the art.

[0141] In an embodiment of the present disclosure, referring to Figure 26, the holding part 82 and the extension part 81 are integrally molded. In this embodiment, in order to facilitate operation by the user, the holding part 82 is configured as a ring-shaped structure that facilitates the user to apply force thereon. Referring to Figure 23, when the user needs to disassembly the rolling brush 2, the user may pass fingers through the ring structure on the holding part 82 to adjust the angle, and lift the holding part 82 and apply a rotational force perpendicular to the rotation axis of the quick disassembly member 8 thereon, so as to rotate the holding part 82 along the rotation axis.

[0142] The extension part 81 and the holding part 82 are respectively provided at two ends of the rotation axis of the quick disassembly member 8. In some embodiments of the present disclosure, referring to Figure 24, the quick disassembly member 8 is of a plate-like structure, and the pin joint part 83 is hinged to the rolling brush cover plate 6 by a pin roll 831 and is located in a central region in the direction of the hinging axis of the quick disassembly member 8.

[0143] Specifically, continually referring to Figure 26, the rolling brush cover plate 6 is provided with a groove for receiving the pin joint part 83 and the pin roll 831 in a center region in the direction of the hinging axis of the quick disassembly member 8. In a case that a user places the pin joint part 83 in the corresponding groove on the rolling brush cover plate 6, the pin joint part 83 is connected to the middle part of the groove and forms a duct for insertion of the pin roll 831. By inserting the pin roll 831

along the duct, the pin joint part 83 and the rolling brush cover plate 6 may be joined together.

[0144] In an embodiment of the present disclosure, the pin joint part 43 is located in the center of the rolling brush cover plate 6, and in a case that the quick disassembly member 8 lifts the rolling brush cover plate 6 up from the floor brush housing 14, the force of the pin joint part 43 applied on the rolling brush cover plate 6 is also applied to the central region of the rolling brush cover plate 6, so that the force of the overall rolling brush cover plate 6 is even, avoiding fracture of the rolling brush cover plate 6 due to over-concentration of the force of the rolling brush cover plate 6.

[0145] In another embodiment of the present disclosure, referring to Figure 27, the quick disassembly member 8 is U-shaped. The quick disassembly member 8 may be a rod-like structure, and the pin joint part 83 is provided at each of the two ends of the "U-shaped" structure of the quick disassembly member 8. The pin joint part 83 is hinged to the rolling brush cover plate 6 by a pin roll and is located on each of opposite sides of the quick disassembly member 8 in the direction of the axis of rotation of the quick disassembly member 8. In a case that the quick disassembly member 8 lifts the rolling brush cover plate 6 up from the floor brush housing 14, the force of the pin joint part 43 on the rolling brush cover plate 6 is also applied to the opposite sides of the rolling brush cover plate 6, so that the force of the overall rolling brush cover plate 6 is even, avoiding fracture of the rolling brush cover plate 6 due to over-concentration of the force of the rolling brush cover plate 6. In some embodiments of the present disclosure, referring to Figure 21, the holding part 82 is configured to abut against the rolling brush 2 after rotation.

[0146] When the user does not need to use the quick disassembly member 8, the user may rotate the holding part 82 so that the holding part 82 can be in good fit with the rolling brush cover plate 6, avoiding unnecessary cuts of the quick disassembly member 8 protruding from the rolling brush cover plate 6, which can results in loosening between the rolling brush cover plate 6 and the floor brush housing 14.

[0147] In some embodiments of the present disclosure, referring to Figure 23, a groove 61 for receiving the holding part 82 is provided on an end surface of the rolling brush cover plate 6. Thereby, the holding part 82 can rotate into the groove 61 when there is no need to use the quick detachable member 8, to maintain consistency and aesthetics of the whole structure of the machine. In an embodiment of the present disclosure, when the quick disassembly member 8 rotate into the groove 61 and abuts against the rolling brush cover plate 6, the end surface of the rolling brush cover plate 6 may be flush with the outer contour of the holding part 82.

[0148] In some embodiments of the present disclosure, referring to Figure 25, the end of the rolling brush cover plate 6 for receiving the quick disassembly member 8 is adapted to the profile of the quick disassembly member 8, thereby facilitating the stowage of the holding part 82.

[0149] In some embodiments of the present disclosure, the holding part 82 is configured to be made of a metallic material, and the holding part 82 is configured to be positioned by the magnetic attraction head 12 at a position abutting against the rolling brush cover plate 6. Thereby, when the holding part 82 is positioned in the groove 61, a certain attraction force exists between the magnetic attraction head 12 and the holding part 82, so that the holding part 82 can be securely located in the groove 61.

[0150] In addition, since there is a certain distance between the holding part 82 and the magnetic attraction head 12, the attraction force between the holding part 51 and the magnetic attraction head 12 is small, so that the user can pull the holding part 51 with a little force to rotate the holding part 51 relative to the rolling brush cover plate 6, which does not bring an additional burden to the operation of the user.

[0151] In addition to the above cleaning apparatus, a quick disassembly structure is further provided according to the present disclosure. The specific structure and principles of the cleaning apparatus have been described in detail in the above, and will not be repeated herein. The specific structure and principles of the quick disassembly structure of the present disclosure are described in detail below in connection with an embodiment.

[0152] In an embodiment of the present disclosure, a quick disassembly structure is provided, and the quick disassembly structure of the present disclosure may be applied not only in the cleaning apparatus described above, but also in other fields requiring quick disassembly that are well known to those skilled in the art, which will not be described herein.

[0153] The quick disassembly structure of the present disclosure includes a first member, a second member, and a third member that connects the first member and the second member together. The quick disassembly member is hinged to the third member. Bounded by a hinging axis of the quick disassembly member, the quick disassembly member includes an extension part and a holding part connected together. The holding part is configured to rotate relative to the third member to such an extent that the extension part lifts the third member up from the second member.

[0154] In some embodiments of the present disclosure, the third member and the second member are attracted together by a magnetic attraction member. In this way, in a case that the holding part rotates relative to the third member and the extension part is brought into contact with the second member, the holding part continues to rotate, and after overcoming the attraction force between the third member and the second member, the extension part may lift the third member up so that there is a distance between the third member and the second member. In this way, the magnetic force of mutual attraction between the second member and the third member

can be reduced, so that the user can easily remove the third member from the first member and the second member.

[0155] In addition, the second member and the third member may also be connected together through an interference connection by a snap structure, and on the basis of the interference connection there between, those skilled in the art may adopt any known technical means to connect the second member and the third member, which is not limited in the present disclosure.

[0156] The technical solutions in the present disclosure are described below in connection with specific application scenarios to aid understanding. It should be noted that the quick disassembly structure of the present disclosure, in addition to being applied to the above cleaning apparatus, can also be applied to other apparatus that needs disassembly, which will not specifically described herein.

[0157] The technical solutions in the present disclosure are described below in connection with specific application scenarios to aid understanding.

Application Scenario One

[0158] In a case that the cleaning apparatus is not installed with the rolling brush 2, the elastic device 5 pre-presses the coupling 32 in a first position, and the sealing member 4 on the coupling 32 seals the open end of the installing cavity 312 to seal the air inlet 301 on the reduction gearbox 31 to close the heat dissipation duct 30 on the reduction gearbox 31 and the drive motor 33.

[0159] In a case of installing the rolling brush 2, the transmission seat 21 of the rolling brush 2 is inserted and cooperated with the coupling 32, the rolling brush 2 overcomes the elasticity of the elastic device 5 to push the coupling 32 to move, the coupling 32 moves along the output shaft 311 of the reduction gearbox 31 from a first position to a second position, and the sealing member 4 follows the movement of the coupling 32 and opens the open end of the installing cavity 312 to open the air inlet 301 on the reduction gearbox 31, thereby connecting the heat dissipation duct 30 to the inner cavity 20 of the rolling brush 2. When operating, the drive motor 33 drives the rolling brush 2 to rotate through the reduction gearbox 31 and the coupling 32 to clean the floor, and the airflow in the inner cavity 20 of the rolling brush 2 enters the heat dissipation duct 30 through the air inlet 301, and takes away the heat generated during the operation of the drive motor 33.

[0160] In a case of disassembling the rolling brush 2, the elastic device 5 drives the coupling 32 from the second position back to the first position under the elastic restoring force, and the sealing member 4 closes the open end of the installing cavity 312, thereby sealing the air inlet 301, avoiding water on the floor entering the heat dissipation duct 30.

Application Scenario Two

[0161] In a case that the cleaning apparatus is not installed with the rolling brush 2, the sealing member 4 on the coupling 32 is in the initial state and seals the open end of the installing cavity 312 to seal the air inlet 301 on the reduction gearbox 31, thereby closing the heat dissipation duct 30 on the reduction gearbox 31 and the drive motor 33.

[0162] In a case of installing the rolling brush 2, the transmission seat 21 of the rolling brush 2 is inserted and cooperated with the coupling 32, the transmission seat 21 presses the sealing member 4 through the press-fit part 211, and the sealing member 4 deforms and opens the open end of the installing cavity 312 to open the air inlet 301 on the reduction gear box 31 so that the heat dissipation duct 30 is connected to the inner cavity 20 of the rolling brush 2. When operating, the drive motor 33 drives the rolling brush 2 to rotate through the reduction gearbox 31 and the coupling 32 to clean the floor, and the airflow in the inner cavity 20 of the rolling brush 2 enters the heat dissipation duct 30 through the air inlet 301, and takes away the heat generated during the operation of the drive motor 33.

[0163] In a case of disassembling the rolling brush 2, the sealing member 4 closes the open end of the installing cavity 312 under its own elastic restoring force, thereby closing the air inlet 301, thus avoiding water on the floor from entering the heat dissipation duct 30.

Application Scenario Three

[0164] The cleaning apparatus of the present disclosure may be a floor scrubber, when the user starts the cleaning apparatus to start cleaning the floor, for different floor conditions, the user may select different cleaning modes according to the floor conditions, when the user selects a powerful cleaning mode, the drive motor 33 in the cleaning apparatus may operate with a large power to generate more heat.

[0165] During the process of driving the rolling brush 2 to rotate, the drive motor 33 drives the first fan 6, the second fan 7 and the blades on the transmission seat 21 to rotate synchronously, the negative pressure generated by the first fan 6 makes the external airflow enter the ventilation duct 8, and the external airflow first enters the inner cavity 20 through the second end of the rolling brush 2 and flows to the transmission seat 21 in the inner cavity 20, and then the external airflow is accelerated by the blades of the transmission seat 21. The sealing member 4 is in an open state under the extrusion of the transmission seat 21, and the airflow may enter the heat dissipation duct 30 through the air inlet 301, and continually flow in the heat dissipation duct 30 to the motor air inlet 331, then the airflow enters the inside of the drive motor 33 to dissipate the heat of the drive motor 33, and flows out through the motor air outlet 332 to the second fan 7, and finally flows out through the motor installing seat 11 under

the accelerated action of the second fan 7, completing the entire heat dissipation process.

Application Scenario Four

[0166] In a case that the cleaning apparatus is used for a period of time, it is required to disassembly the rolling brush 2 from the cleaning apparatus for cleaning. When the rolling brush 2 is removed from the driving device, as the coupling 32 is detached from the transmission seat 21, the coupling 32 moves from the second position to the first position under the elastic restoring force of the elastic device 5, so that the sealing member 4 on the coupling 32 seals the air inlet 301 of the heat dissipation duct 30. Water from outside can be prevented from entering the inside of the driving device through the air inlet 302, which may cause damage to components inside the driving device.

[0167] In a case of installing, the first end of the rolling brush 2 is sleeved on the driving device, and the coupling 32 of the driving device is inserted with the transmission seat 21, and under the extrusion of the transmission seat 21, the coupling 32 moves from the first position to the second position, the sealing member 4 opens the air inlet 301 of the heat dissipation duct 30, so that the heat dissipation duct 30 is connected with the inner cavity 20 of the rolling brush 2. When the rolling brush 2 rotates, the airflow from the outside will flow through the inner cavity 20 and the heat dissipation duct 30, thereby dissipating heat from the driving device.

Application Scenario Five

[0168] The rolling brush 2 of the present disclosure is connected to the floor brush housing 14 via the rolling brush cover plate 6, one end of the rolling brush 2 is rotationally connected to the floor brush housing 14 in a removable manner, and the other end is connected to the floor brush housing 14 via the rolling brush cover plate 6. The rolling brush cover plate 6 is attracted to the magnetic attraction head 12 on the floor brush housing 14 by means of a magnetic attraction member 7 arranged in an installing cavity 62 thereof.

[0169] When it is required to disassembly the rolling brush 2 for cleaning, replacement or maintenance, the user may hold the holding part 82 to rotate the holding part 82 relative to the rolling brush cover plate 6, and if the user senses that the extension part 81 is abutting against the floor brush housing 14, the user continues to apply a pulling force to the holding part 82, which causes the extension part 81 to rotate until the rolling brush cover plate 6 is lifted up from the floor brush housing 14, and there is a certain distance between the rolling brush cover plate 6 and the floor brush housing 14 in this case. Thereby, the magnetic attraction force between the rolling brush cover plate 6 and the floor brush housing 14 can be reduced, so that the user can easily remove the rolling brush 2 from the floor brush housing 14. Thereby, in the present disclosure, the rolling brush 2 can be disassembled by a simple, convenient and labor-saving method.

[0170] 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. Without departing from the scope and spirit of the illustrated embodiments, many modifications and changes will be apparent to one of ordinary skill in the art. The terminology used herein is chosen to best explain the principles, practical applications, or improvements to techniques in the marketplace of the embodiments, 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.

[0171] Item A1. A cleaning apparatus, including:

a body;

a rolling brush, configured to rotate about an axis of the rolling brush, where the rolling brush has an inner cavity; and

a driving device, connected to the body and having a heat dissipation duct, where the driving device is configured to extend into the inner cavity of the rolling brush and to cooperate with a transmission seat in the inner cavity; the driving device is provided with an air inlet and a sealing member for sealing the air inlet, and where

the sealing member is configured to open the air inlet under extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct with the inner cavity; and to seal the air inlet under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0172] Item A2. The cleaning apparatus according to item A1, where the driving device includes a reduction gearbox, an output end of the reduction gearbox is provided with a coupling, the coupling is configured to move along an axial direction of the reduction gearbox between a first position and a second position; the sealing member is fixed to the coupling and is configured to seal the air inlet in a case that the coupling is in the first position and to open the air inlet in a case that the coupling is in the second position.

[0173] Item A3. The cleaning apparatus according to item A2, where the reduction gearbox includes a box and an output shaft penetrating out of the box, the coupling is connected to the output shaft and is configured to move between the first position and the second position; an installing cavity is provided at an output end of the box, the air inlet is provided on an inner wall of the installing cavity; the sealing member is configured to seal an open

end of the installing cavity (312) in a case that the coupling is in the first position.

[0174] Item A4. The cleaning apparatus according to item A3, where the installing cavity includes a side wall extending in an axial direction, the sealing member is configured to seal with the side wall.

[0175] Item A5. The cleaning apparatus according to item A3, where the box includes a side wall extending in an axial direction, and a flange extending radially inwardly from an end of the side wall; the sealing member abuts against an end surface of the flange in a case that the coupling is in the first position.

[0176] Item A6. The cleaning apparatus according to item A5, where a gap is provided between the sealing member and the side wall.

[0177] Item A7. The cleaning apparatus according to item A3, where an elastic device is provided between the output shaft of the reduction gearbox and the coupling, and the elastic device is configured to pre-press the coupling in the first position.

[0178] Item A8. The cleaning apparatus according to item A2, where the coupling is configured to have an outer contour adapted with the transmission seat and is configured to move from the first position to the second position under the extrusion of the transmission seat.

[0179] Item A9. The cleaning apparatus according to item A1, where the driving device includes a reduction gearbox, a coupling is provided at an output end of the reduction gearbox, the sealing member is fixed to the coupling, and the sealing member is configured to be deformed under the extrusion of the rolling brush in a case that the driving device is assembled with the rolling brush, to open the air inlet.

[0180] Item A10. The cleaning apparatus according to item A9, where the transmission seat is provided with a press-fit part, the press-fit part is configured to press the sealing member to be deformed in a case that the driving device is assembled with the rolling brush.

[0181] Item A11. The cleaning apparatus according to item A2 or item A9, where the driving device includes a drive motor, the reduction gearbox is fixed to an end of the drive motor; airflow in the inner cavity of the rolling brush passes through the air inlet and flows into the inside of the drive motor.

[0182] Item A12. The cleaning apparatus according to item A11, where the driving device includes a housing, the housing is sleeved on the drive motor and the reduction gearbox; the airflow in the inner cavity of the rolling brush passes through the air inlet and flows into a gap between the housing and the reduction gearbox.

[0183] Item A13. The cleaning apparatus according to item A12, where the reduction gearbox includes a box, and an installing cavity provided at an open end of the box; the air inlet penetrates through an inner wall of the installing cavity; an axially extending deflector cavity is further provided on an outer wall of the box; the airflow from the air inlet passes through the deflector cavity and flows into the inside of the drive motor.

[0184] Item A14. The cleaning apparatus according to item A13, where a sealing ring is provided between the housing and the drive motor, and the airflow flowing through the gap between the housing and the reduction gearbox enters the inside of the drive motor through a through-hole provided in the drive motor.

[0185] Item A15. A driving device, where the driving device is configured to extend into an inner cavity of a rolling brush in a cleaning apparatus and to cooperate with a transmission seat in the inner cavity; and
the driving device has a heat dissipation duct, the driving device is provided with an air inlet and a sealing member for sealing the air inlet; the sealing member is configured to open the air inlet under extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush, to connect the heat dissipation duct with the inner cavity; and seal the air inlet under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0186] Item B1. A cleaning apparatus, including:

a body;

a rolling brush, where the rolling brush rotates about its axis to clean a cleaning surface, the rolling brush having an inner cavity;

a driving device, connected to the body and having a heat dissipation duct; where the driving device is configured to extend into the inner cavity of the rolling brush and to cooperate with the rolling brush; the heat dissipation duct of the driving device is connected to the inner cavity of the rolling brush and forms a ventilation duct; and

a fan assembly, where the fan assembly is provided in the ventilation duct and configured to rotate synchronously with the rolling brush to form a negative pressure in the ventilation duct.

[0187] Item B2. The cleaning apparatus according to item B1, where the rolling brush is a cleaning roller having a rotation axis parallel to the cleaning surface, the inner cavity extends through a first end and a second end of the cleaning roller that are opposite to each other; the driving device extends from the first end of the cleaning roller into the inner cavity of the cleaning roller and is connected to the cleaning roller; the second end of the cleaning roller is rotationally connected to the body

[0188] Item B3. The cleaning apparatus according to item B2, where external airflow enters from the second end of the cleaning roller into the inner cavity, and flows out after passing through the heat dissipation duct.

[0189] Item B4. The cleaning apparatus according to item B2, where the fan assembly includes a first fan arranged at the second end of the cleaning roller, the first fan is configured to rotate synchronously with the cleaning roller to form a negative pressure in the ventila-

tion duct.

[0190] Item B5. The cleaning apparatus according to item B4, where the first fan includes a base in a shape of a cylinder, the base is configured to be fixed to the second end of the cleaning roller; an installing seat is provided in a hollow cavity of the base, the installing seat is connected to the body; a blade is provided between the installing seat and the base.

[0191] Item B6. The cleaning apparatus according to item B2, where a coupling is provided at an output end of the driving device, and a transmission seat is provided in the inner cavity of the cleaning roller; the coupling is connected to the transmission seat in a pluggable manner.

[0192] Item B7. The cleaning apparatus according to item B6, where the fan assembly includes a blade provided on the transmission seat; the blade is configured to form a negative pressure in the inner cavity as the cleaning roller rotates.

[0193] Item B8. The cleaning apparatus according to item B6, where the transmission seat has a transmission cavity facing toward the coupling, the coupling is configured to have a shape adapted to the transmission cavity; a passage for air flow is provided in the transmission seat.

[0194] Item B9. The cleaning apparatus according to item B6, where the driving device is provided with an air inlet and a sealing member for sealing the air inlet; the sealing member is configured to open the air inlet under extrusion of the transmission seat in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct with the inner cavity; and to seal the air inlet under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

[0195] Item B10. The cleaning apparatus according to item B9, where the driving device includes a reduction gearbox, the coupling is provided at an output end of the reduction gearbox, the coupling is configured to move along an axial direction of the reduction gearbox between a first position and a second position; the sealing member is fixed to the coupling, the coupling is configured to move from the first position to the second position under the extrusion of the transmission seat to open the air inlet by the sealing member to connect the heat dissipation duct with the inner cavity; or

the driving device includes a reduction gearbox, the coupling is provided at an output end of the reduction gearbox, the sealing member is fixed to the coupling; the sealing member is configured to be deformed under the extrusion of the transmission seat to open the air inlet, to connect the heat dissipation duct with the inner cavity.

[0196] Item B11. The cleaning apparatus according to item B10, where the driving device includes a drive motor, the reduction gearbox is fixed to an end of the drive motor; the driving device further includes a housing, the housing is sleeved on the drive motor and the reduction gearbox; airflow in the inner cavity enters the heat dissipation duct of the drive motor after passing through a gap between the housing and the reduction gearbox from the air inlet.

[0197] Item B12. The cleaning apparatus according to item B11, where the reduction gearbox includes a body, and an installing cavity provided at an open end of the body; the air inlet penetrates an inner wall of the installing cavity; a deflector cavity extending axially is further provided on an outer wall of the body; airflow from the air inlet flows into the heat dissipation duct of the drive motor through a deflector cavity.

[0198] Item B13. The cleaning apparatus according to item B11, where a sealing ring is provided between the housing and the drive motor, and the airflow flowing through the gap between the housing and the reduction gearbox enters into the heat dissipation duct of the drive motor through an inlet provided on the drive motor.

[0199] Item B14. The cleaning apparatus according to item B11, where the fan assembly includes a second fan fixed to an end of the drive motor away from the reduction gearbox.

[0200] Item B15. The cleaning apparatus according to item B14, further including a motor installing seat fixed to the body, the housing is installed on the motor installing seat, the second fan is arranged in a cavity between the housing and the motor installing seat; the drive motor is provided with a motor air outlet connected to the heat dissipation duct, airflow from the motor air outlet flows out after passing through the motor installing seat.

[0201] Item C1. A cleaning apparatus including a floor brush assembly, where the floor brush assembly includes:

a floor brush housing;

a rolling brush, where the rolling brush is connected to the floor brush housing by a rolling brush cover plate; and

a quick disassembly member, where the quick disassembly member is hinged to the rolling brush cover plate and includes, bounded by a hinging axis of the quick disassembly member, an extension part and a holding part, and the holding part is configured to rotate relative to the rolling brush cover plate to cause the extension part to lift the rolling brush cover plate up from the floor brush housing.

[0202] Item C2. The cleaning apparatus according to item C1, where the extension part is a flange formed at an end position of the quick disassembly member.

[0203] Item C3. The cleaning apparatus according to item C2, the flange has a circular arc-shaped outer surface.

[0204] Item C4. The cleaning apparatus according to item C3, where the floor brush housing has a circular arc-shaped surface adapted to the flange at a position cooperating with the flange; the circular arc-shaped flange is configured to configured to be slidely cooperated with the circular arc-shaped surface of the floor brush housing

in a case that the holding part rotates relative to the rolling brush cover plate.

[0205] Item C5. The cleaning apparatus according to item C1, where the quick disassembly member is of a plate-like structure, a pin joint part is provided at an end of the quick disassembly member, the pin joint part is hinged to the rolling brush cover plate by a pin roll and is arranged in a central region in a direction of a hinging axis of the quick disassembly member; or

the quick disassembly member is U-shaped, and a pin joint part provided at each of two ends of the U-shaped quick disassembly member, the pin joint parts is hinged to the rolling brush cover plate by the pin roll and is located on opposite sides in the direction of the hinging axis of the quick disassembly member.

[0206] Item C6. The cleaning apparatus according to item C1, where the holding part is configured to be ratable to abut against the rolling brush cover plate.

[0207] Item C7. The cleaning apparatus according to item C6, where the rolling brush cover plate is provided with a groove for receiving the holding part on an end surface of the rolling brush cover plate.

[0208] Item C8. The cleaning apparatus according to item C1, where an end of the rolling brush cover plate is rotationally connected to the rolling brush, and another end is adhered to the floor brush housing by a magnetic attraction member.

[0209] Item C9. The cleaning apparatus according to item C8, where the floor brush housing is provided with an installing groove, a shape of the rolling brush cover plate is adapted to a shape of the installing groove, and the rolling brush cover plate is partially arranged in the installing groove.

[0210] Item C10. The cleaning apparatus according to item C8, where the rolling brush cover plate is provided with an installing cavity for rotationally connecting with the rolling brush, and a receiving cavity; a magnetic attraction member is provided in the rolling brush cover plate at a position corresponding to the receiving cavity; and

the floor brush housing is provided with a magnetic attraction head at a position corresponding to the receiving cavity, the magnetic attraction head is configured to extend into the receiving cavity and to be adhered to the magnetic attraction member.

[0211] Item C11. The cleaning apparatus according to item C10, where the holding part is made of a metal material and is configured to be adhered, by the magnetic attraction head, to a position abutting against to the rolling brush cover plate.

[0212] Item C12. A quick disassembly structure, including:

a first member, a second member, and a third member connecting the first member and the second member together; and

a quick disassembly member, where the quick disassembly member is hinged to the third member and includes, bounded by a hinging axis of the quick disassembly member, an extension part and a holding part, and the holding part is configured to rotate relative to the third member to cause the extension part to lift the third member up from the second member.

[0213] Item C13. The quick disassembly structure according to item C12, where the third member is adhered to the second member by a magnetic attraction member.

Claims

1. A cleaning apparatus, comprising:

a body (1);

a rolling brush, configured to rotate about an axis of the rolling brush, wherein the rolling brush has an inner cavity (20); and

a driving device, connected to the body (1) and having a heat dissipation duct (30), wherein the driving device is configured to extend into the inner cavity (20) of the rolling brush and to cooperate with a transmission seat (21) in the inner cavity (20); the driving device is provided with an air inlet (301) and a sealing member (4) for sealing the air inlet (301), and

the sealing member (4) is configured to open the air inlet (301) under extrusion of the transmission seat (21) in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct (30) with the inner cavity (20); and to seal the air inlet (301) under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

2. The cleaning apparatus according to claim 1, wherein the driving device comprises a reduction gearbox (31), an output end of the reduction gearbox (31) is provided with a coupling (32), the coupling (32) is configured to move along an axial direction of the reduction gearbox (31) between a first position and a second position; the sealing member (4) is fixed to the coupling (32) and is configured to seal the air inlet (301) in a case that the coupling (32) is in the first position and to open the air inlet (301) in a case that the coupling (32) is in the second position.

3. The cleaning apparatus according to claim 2, wherein the reduction gearbox (31) comprises a box (310) and an output shaft (311) penetrating out of the box, the coupling (32) is connected to the output shaft (311) and is configured to move between the first position and the second position; an installing cavity (312) is provided at an output end of the box (310), the air inlet (301) is provided on an inner wall of the

installing cavity (312); the sealing member (4) is configured to seal an open end of the installing cavity (312) in a case that the coupling (32) is in the first position.

4. The cleaning apparatus according to claim 3, wherein the installing cavity (312) comprises a side wall (313) extending in an axial direction, the sealing member (4) is configured to seal with the side wall (313).

5. The cleaning apparatus according to claim 3, wherein the box (310) comprises a side wall (313) extending in an axial direction, and a flange (314) extending radially inwardly from an end of the side wall (313); the sealing member (4) abuts against an end surface of the flange (314) in a case that the coupling (32) is in the first position.

6. The cleaning apparatus according to claim 5, wherein a gap is provided between the sealing member (4) and the side wall (313).

7. The cleaning apparatus according to claim 3, wherein an elastic device (5) is provided between the output shaft (311) of the reduction gearbox (31) and the coupling (32), and the elastic device (5) is configured to pre-press the coupling (32) in the first position.

8. The cleaning apparatus according to claim 2, wherein the coupling (32) is configured to have an outer contour adapted with the transmission seat (21) and is configured to move from the first position to the second position under the extrusion of the transmission seat (21).

9. The cleaning apparatus according to claim 1, wherein the driving device comprises a reduction gearbox (31), a coupling (32) is provided at an output end of the reduction gearbox (31), the sealing member (4) is fixed to the coupling (32), and the sealing member (4) is configured to be deformed under the extrusion of the rolling brush in a case that the driving device is assembled with the rolling brush, to open the air inlet (301).

10. The cleaning apparatus according to claim 9, wherein the transmission seat (21) is provided with a press-fit part (211), the press-fit part (211) is configured to press the sealing member (4) to be deformed in a case that the driving device is assembled with the rolling brush.

11. The cleaning apparatus according to claim 2 or 9, wherein the driving device comprises a drive motor (33), the reduction gearbox (31) is fixed to an end of the drive motor (33); airflow in the inner cavity (20) of the rolling brush passes through the air inlet (301) and flows into the inside of the drive motor (33).

12. The cleaning apparatus according to claim 11, wherein the driving device comprises a housing (34), the housing (34) is sleeved on the drive motor (33) and the reduction gearbox (31); the airflow in the inner cavity (20) of the rolling brush passes through the air inlet (301) and flows into a gap between the housing (34) and the reduction gearbox (31).

13. The cleaning apparatus according to claim 12, wherein the reduction gearbox (31) comprises a box (310), and an installing cavity (312) provided at an open end of the box (310); the air inlet (301) penetrates through an inner wall of the installing cavity (312); an axially extending deflector cavity (302) is further provided on an outer wall of the box (310); the airflow from the air inlet (301) passes through the deflector cavity (302) and flows into the inside of the drive motor (33).

14. The cleaning apparatus according to claim 13, wherein a sealing ring is provided between the housing (34) and the drive motor (33), and the airflow flowing through the gap between the housing (34) and the reduction gearbox (31) enters the inside of the drive motor (33) through a through-hole provided in the drive motor (33).

15. A driving device, wherein the driving device is configured to extend into an inner cavity (20) of a rolling brush in a cleaning apparatus and to cooperate with a transmission seat (21) in the inner cavity (20); and the driving device has a heat dissipation duct (30), the driving device is provided with an air inlet (301) and a sealing member (4) for sealing the air inlet (301); the sealing member (4) is configured to open the air inlet (301) under extrusion of the transmission seat (21) in a case that the driving device is assembled with the rolling brush, to connect the heat dissipation duct (30) with the inner cavity (20); and seal the air inlet (301) under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

16. The cleaning apparatus according to claim 1, comprising:

a body (1);
a rolling brush, wherein the rolling brush rotates about its axis to clean a cleaning surface, and the rolling brush has an inner cavity (20);
a driving device, connected to the body (1) and having a heat dissipation duct (30); wherein the driving device is configured to extend into the inner cavity (20) of the rolling brush and to cooperate with the rolling brush; the heat dissipation duct (30) of the driving device is connected

to the inner cavity (20) of the rolling brush and forms a ventilation duct (8); and
a fan assembly, wherein the fan assembly is provided in the ventilation duct (8) and configured to rotate synchronously with the rolling brush to form a negative pressure in the ventilation duct (8).

17. The cleaning apparatus according to claim 16, wherein the rolling brush is a rolling brush (2) having a rotation axis parallel to the cleaning surface, the inner cavity (20) extends through a first end and a second end of the rolling brush (2) that are opposite to each other; the driving device extends from the first end of the rolling brush (2) into the inner cavity (20) of the rolling brush (2) and is connected to the rolling brush (2); the second end of the rolling brush (2) is rotationally connected to the body (1).

18. The cleaning apparatus according to claim 17, wherein external airflow enters from the second end of the rolling brush (2) into the inner cavity (20), and flows out after passing through the heat dissipation duct (30).

19. The cleaning apparatus according to claim 17, wherein the fan assembly comprises a first fan (6) arranged at the second end of the rolling brush (2), the first fan (6) is configured to rotate synchronously with the rolling brush (2) to form a negative pressure in the ventilation duct (8).

20. The cleaning apparatus according to claim 19, wherein the first fan (6) comprises a base (61) in a shape of a cylinder, the base (61) is configured to be fixed to the second end of the rolling brush (2); an installing seat (62) is provided in a hollow cavity of the base (61), the installing seat (62) is connected to the body (1); a blade is provided between the installing seat (62) and the base (61).

21. The cleaning apparatus according to claim 17, wherein a coupling (32) is provided at an output end of the driving device, and a transmission seat (21) is provided in the inner cavity (20) of the rolling brush (2); the coupling (32) is connected to the transmission seat (21) in a pluggable manner.

22. The cleaning apparatus according to claim 21, wherein the fan assembly comprises a blade provided on the transmission seat (21); the blade is configured to form a negative pressure in the inner cavity (20) as the rolling brush (2) rotates.

23. The cleaning apparatus according to claim 21, wherein the transmission seat (21) has a transmission cavity (22) facing toward the coupling (32), the coupling (32) is configured to have a shape adapted to the transmission cavity (22); a passage for air flow is provided in the transmission seat (21).

24. The cleaning apparatus according to claim 21, wherein the driving device is provided with an air inlet (301) and a sealing member (4) for sealing the air inlet (301); the sealing member (4) is configured to open the air inlet (301) under extrusion of the transmission seat (21)in a case that the driving device is assembled with the rolling brush to connect the heat dissipation duct (30) with the inner cavity (20); and to seal the air inlet (301) under an elastic restoring force in a case that the driving device is disassembled with the rolling brush.

25. The cleaning apparatus according to claim 24, wherein the driving device comprises a reduction gearbox (31), the coupling (32) is provided at an output end of the reduction gearbox (31), the coupling (32) is configured to move along an axial direction of the reduction gearbox (31) between a first position and a second position; the sealing member (4) is fixed to the coupling (32), the coupling (32) is configured to move from the first position to the second position under the extrusion of the transmission seat (21) to open the air inlet (301) by the sealing member (4) to connect the heat dissipation duct (30) with the inner cavity (20); or
the driving device comprises a reduction gearbox (31), the coupling (32) is provided at an output end of the reduction gearbox (31), the sealing member (4) is fixed to the coupling (32); the sealing member (4) is configured to be deformed under the extrusion of the transmission seat (21) to open the air inlet (301), to connect the heat dissipation duct (30) with the inner cavity (20).

26. The cleaning apparatus according to claim 25, wherein the driving device comprises a drive motor (33), the reduction gearbox (31) is fixed to an end of the drive motor (33); the driving device further comprises a housing (34), the housing (34) is sleeved on the drive motor (33) and the reduction gearbox (31); airflow in the inner cavity (20) enters the heat dissipation duct (30) of the drive motor (33) after passing through a gap between the housing (34) and the reduction gearbox (31) from the air inlet (301).

27. The cleaning apparatus according to claim 26, wherein the reduction gearbox (31) comprises a body (310), and an installing cavity (312) provided at an open end of the body (310); the air inlet (301) penetrates an inner wall of the installing cavity (312); a deflector cavity (302) extending axially is further provided on an outer wall of the body (310); airflow from the air inlet (301) flows into the heat dissipation duct (30) of the drive motor (33) through a deflector cavity (302).

28. The cleaning apparatus according to claim 26, wherein a sealing ring (35) is provided between the housing (34) and the drive motor (33), and the airflow flowing through the gap between the housing (34) and the reduction gearbox (31) enters into the heat dissipation duct (30) of the drive motor (33) through an inlet provided on the drive motor (33).

29. The cleaning apparatus according to claim 26, wherein the fan assembly comprises a second fan (7) fixed to an end of the drive motor (33) away from the reduction gearbox (31).

30. The cleaning apparatus according to claim 29, further comprising a motor installing seat (11) fixed to the body (1), the housing (34) is installed on the motor installing seat (11), the second fan (7) is arranged in a cavity between the housing (34) and the motor installing seat (11); the drive motor (33) is provided with a motor air outlet (332) connected to the heat dissipation duct (30), airflow from the motor air outlet (332) flows out after passing through the motor installing seat (11).

31. The cleaning apparatus according to claim 1, comprising a floor brush assembly, wherein the floor brush assembly comprises:

a floor brush housing;
a rolling brush, wherein the rolling brush is connected to the floor brush housing by a rolling brush cover plate; and
a quick disassembly member, wherein the quick disassembly member is hinged to the rolling brush cover plate and comprises, bounded by a hinging axis of the quick disassembly member, an extension part and a holding part, and the holding part is configured to rotate relative to the rolling brush cover plate to cause the extension part to lift the rolling brush cover plate up from the floor brush housing.

32. The cleaning apparatus according to claim 31, wherein the extension part is a flange formed at an end of the quick disassembly member.

33. The cleaning apparatus according to claim 32, wherein the flange has a circular arc-shaped outer surface.

34. The cleaning apparatus according to claim 33, wherein the floor brush housing has a circular arc-shaped surface adapted to the flange at a position cooperating with the flange; the circular arc-shaped flange is configured to configured to be slidely cooperated with the circular arc-shaped surface of the floor brush housing in a case that the holding part rotates relative to the rolling brush cover plate.

35. The cleaning apparatus according to claim 31, wherein the quick disassembly member is of a plate-like structure, a pin joint part is provided at an end of the quick disassembly member, the pin joint part is hinged to the rolling brush cover plate by a pin roll and is arranged in a central region in a direction of a hinging axis of the quick disassembly member; or
the quick disassembly member is U-shaped, and a pin joint part provided at each of two ends of the U-shaped quick disassembly member, the pin joint parts are hinged to the rolling brush cover plate by pin rolls and are located on opposite sides in the direction of the hinging axis of the quick disassembly member.

36. The cleaning apparatus according to claim 31, wherein the holding part is configured to be ratable to abut against the rolling brush cover plate.

37. The cleaning apparatus according to claim 36, wherein the rolling brush cover plate is provided with a groove for receiving the holding part on an end surface of the rolling brush cover plate.

38. The cleaning apparatus according to claim 31, wherein an end of the rolling brush cover plate is rotationally connected to the rolling brush, and another end is adhered to the floor brush housing by a magnetic attraction member.

39. The cleaning apparatus according to claim 38, wherein the floor brush housing is provided with an installing groove, a shape of the rolling brush cover plate is adapted to a shape of the installing groove, and the rolling brush cover plate is partially arranged in the installing groove.

40. The cleaning apparatus according to claim 38, wherein the rolling brush cover plate is provided with an installing cavity for rotationally connecting with the rolling brush, and a receiving cavity; a magnetic attraction member is provided in the rolling brush cover plate at a position corresponding to the receiving cavity; and
the floor brush housing is provided with a magnetic attraction head at a position corresponding to the receiving cavity, the magnetic attraction head is configured to extend into the receiving cavity and to be adhered to the magnetic attraction member.

41. The cleaning apparatus according to claim 40, wherein the holding part is made of a metal material and is configured to be adhered, by the magnetic attraction head, to a position abutting against to the rolling brush cover plate.

42. A quick disassembly structure, comprising:

a first member;
a second member;
a third member connecting the first member and the second member; and
a quick disassembly member, wherein the quick disassembly member is hinged to the third member and comprises, bounded by a hinging axis of the quick disassembly member, an extension part and a holding part, and the holding part is configured to rotate relative to the third member to cause the extension part to lift the third member up from the second member.

43. The quick disassembly structure according to claim 42, wherein the third member is adhered to the second member by a magnetic attraction member.

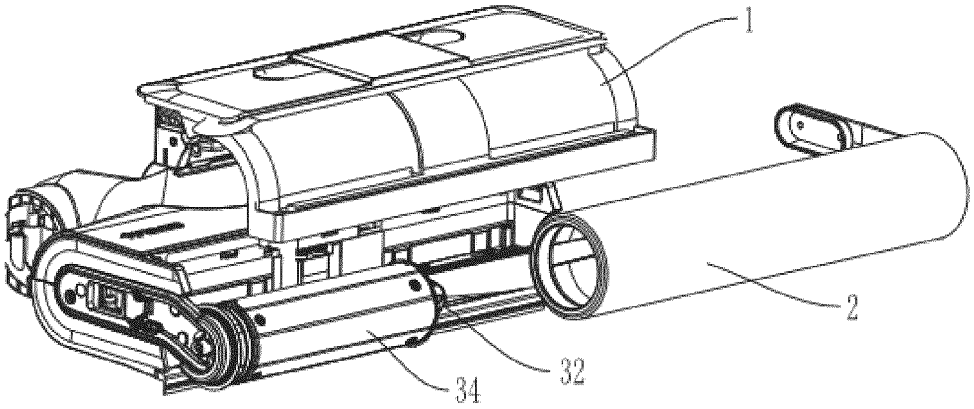


Figure 1

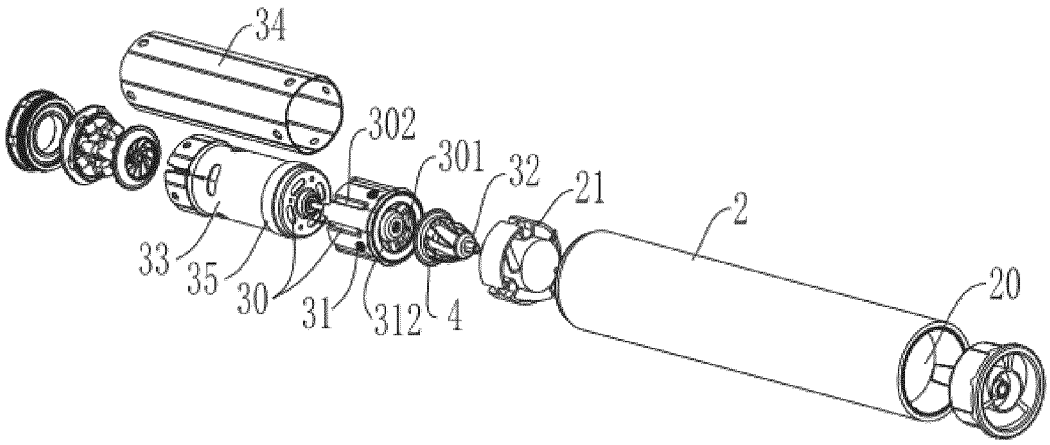


Figure 2

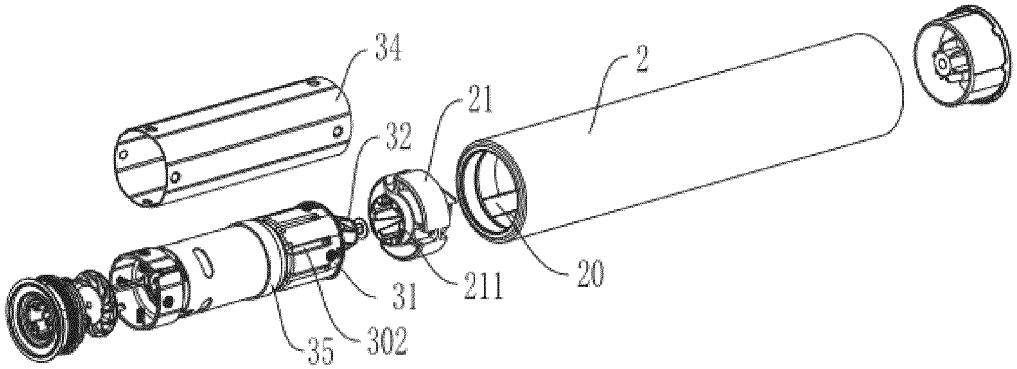


Figure 3

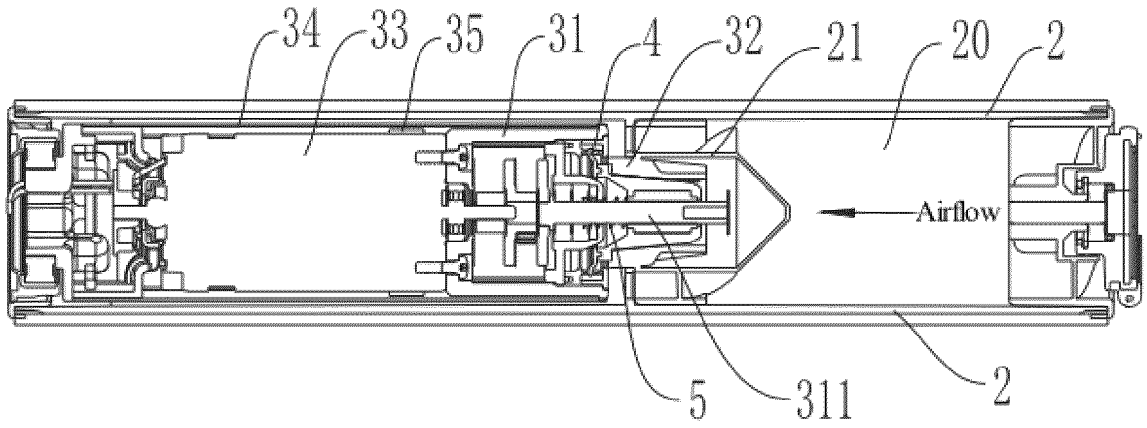


Figure 4

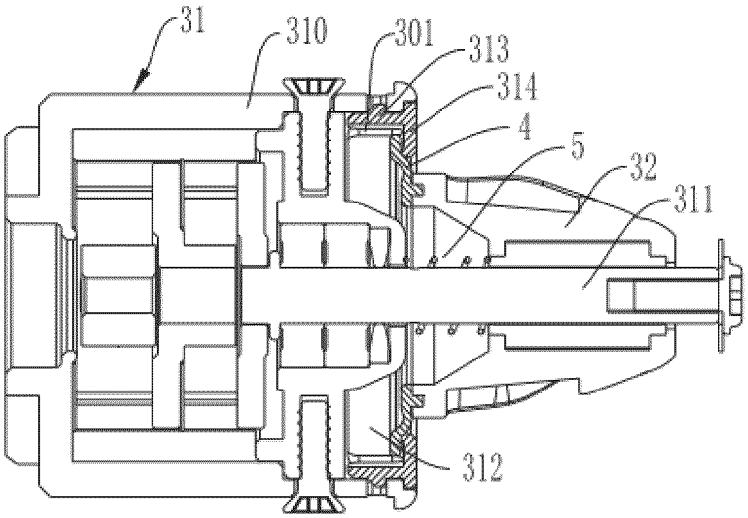
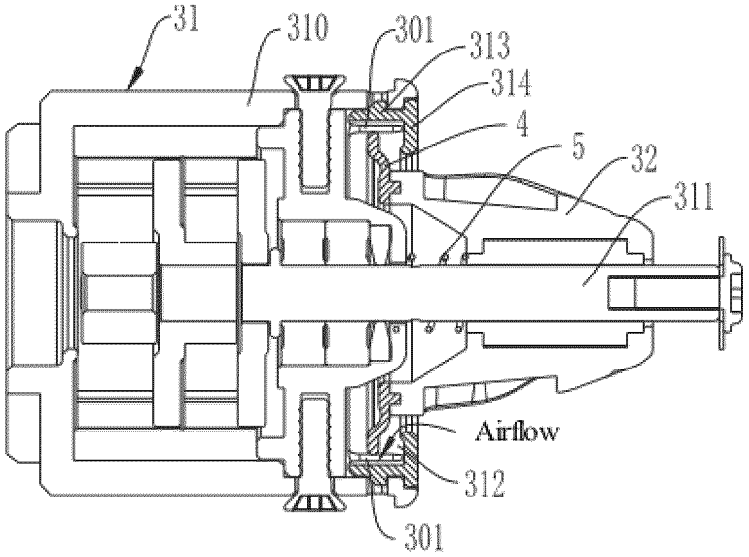


Figure 5



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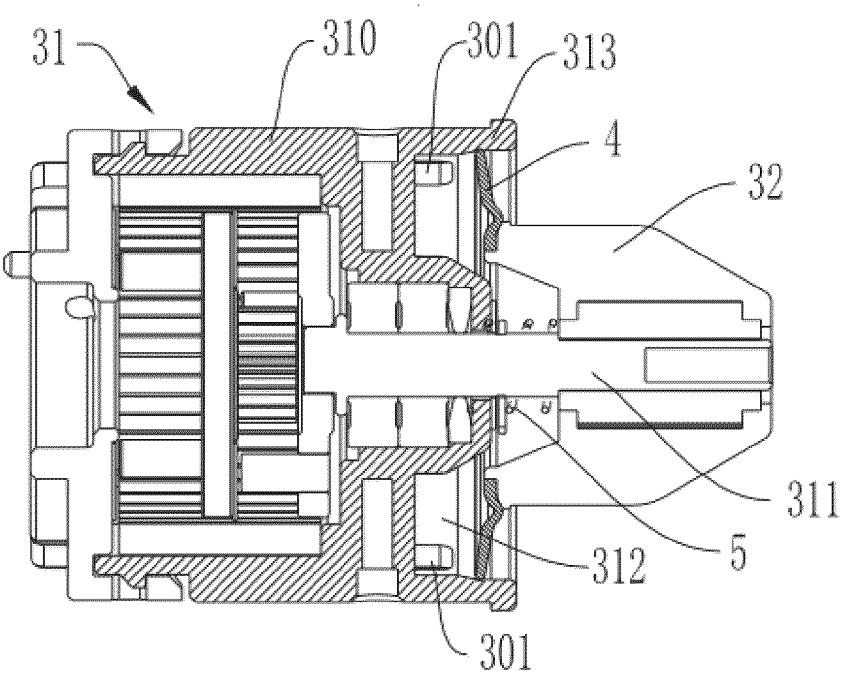
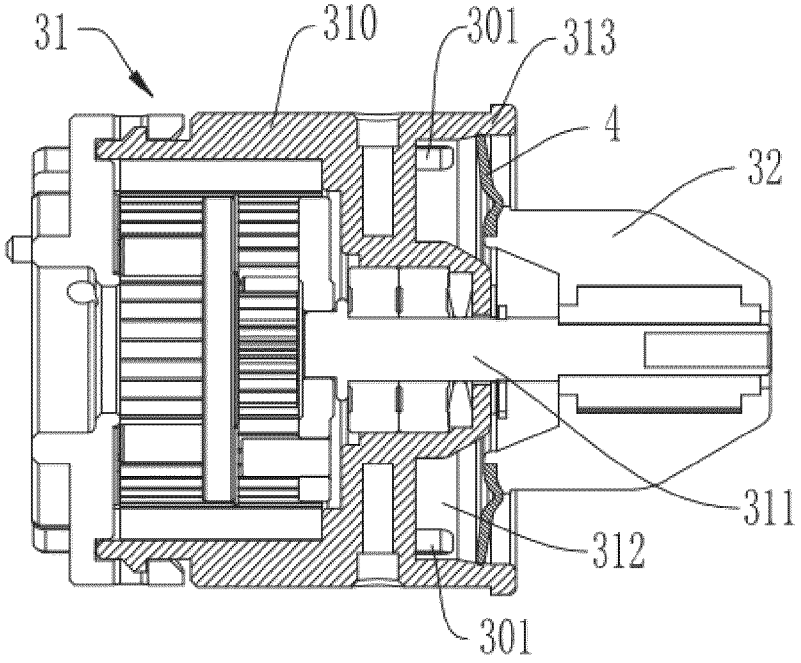


Figure 7



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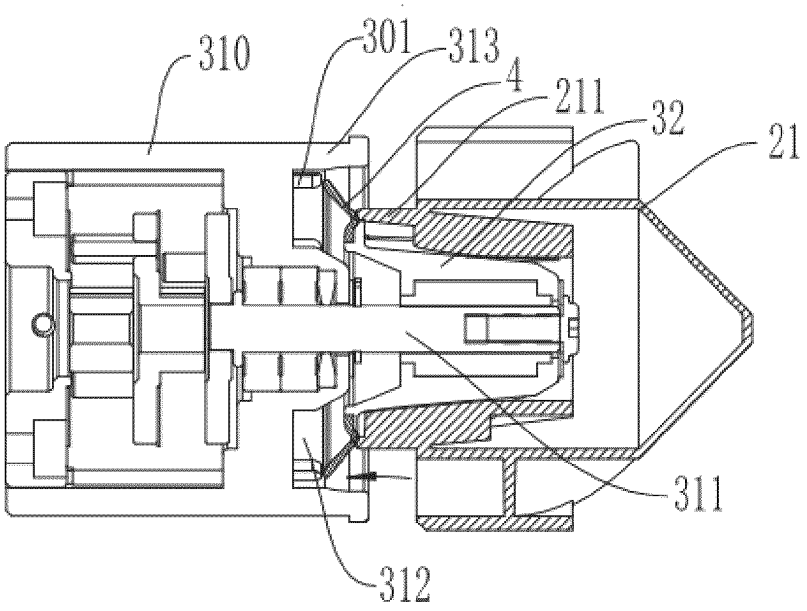
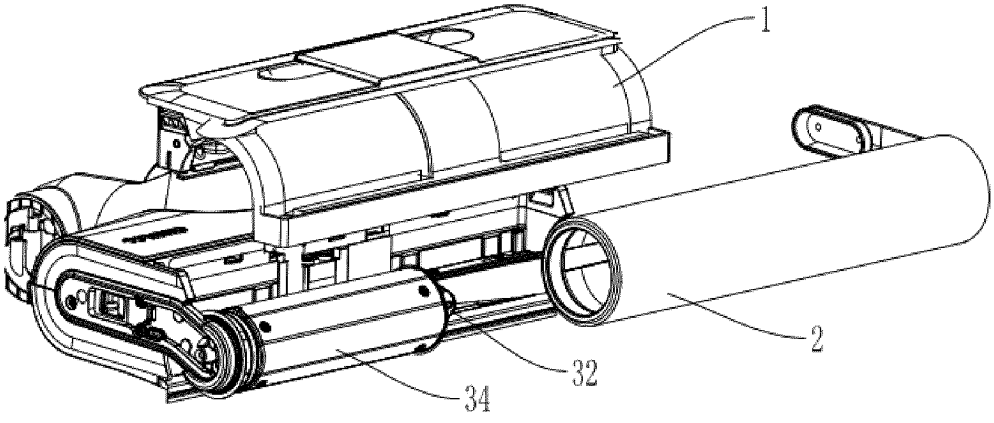


Figure 9



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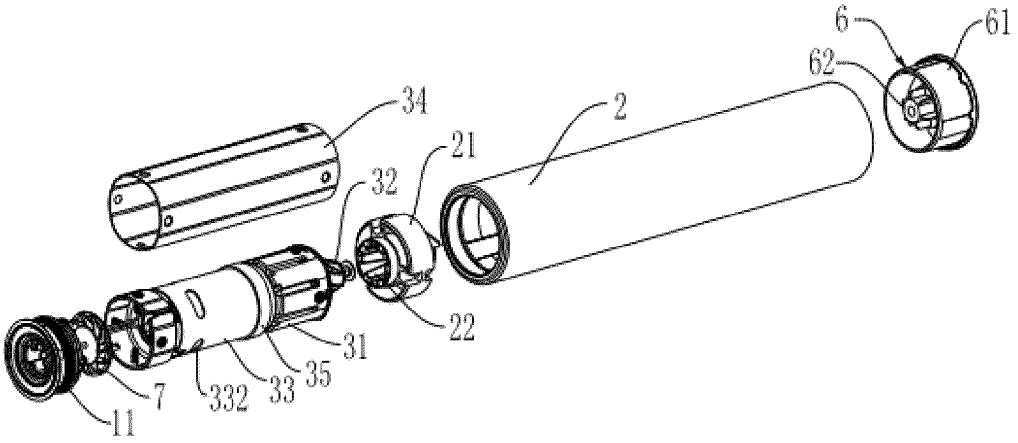
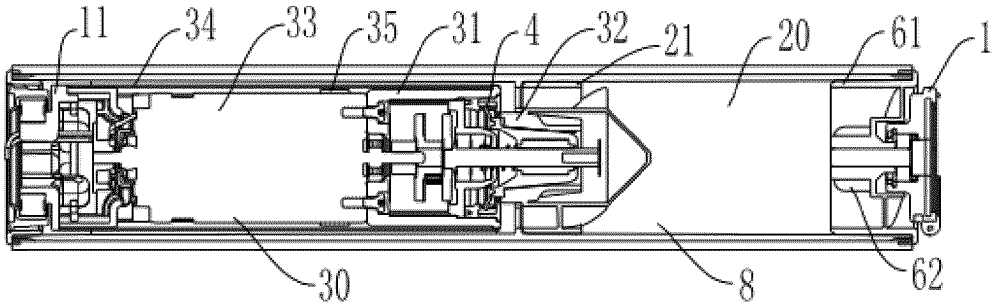


Figure 11



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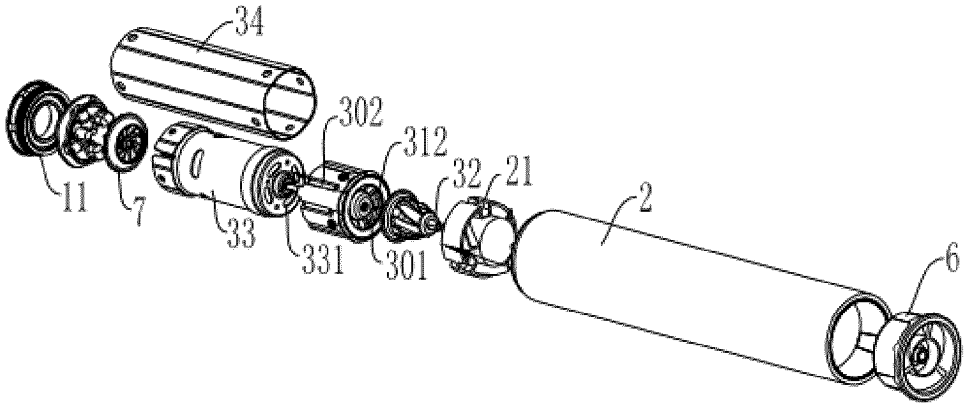


Figure 13

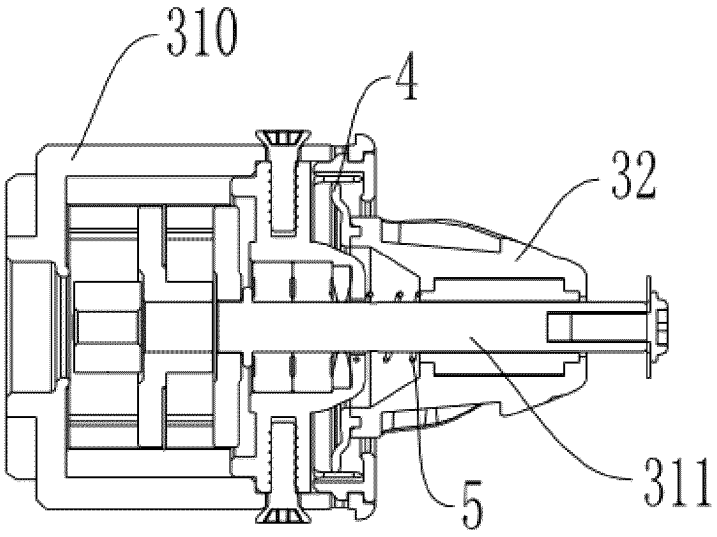


Figure 14

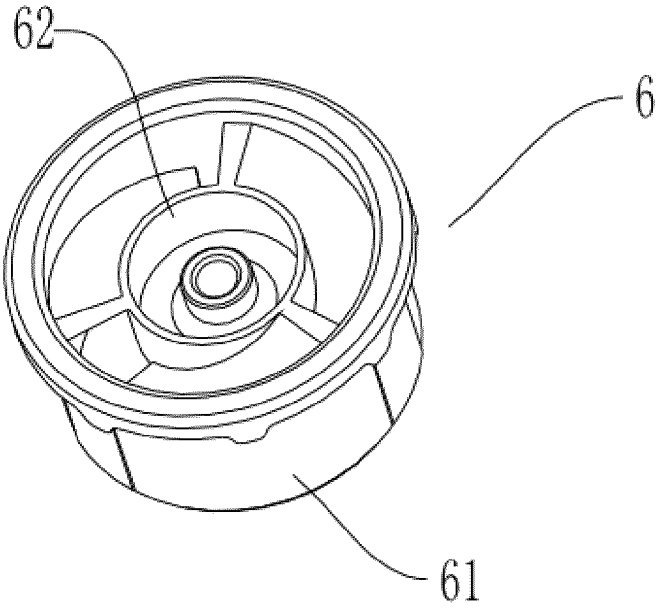
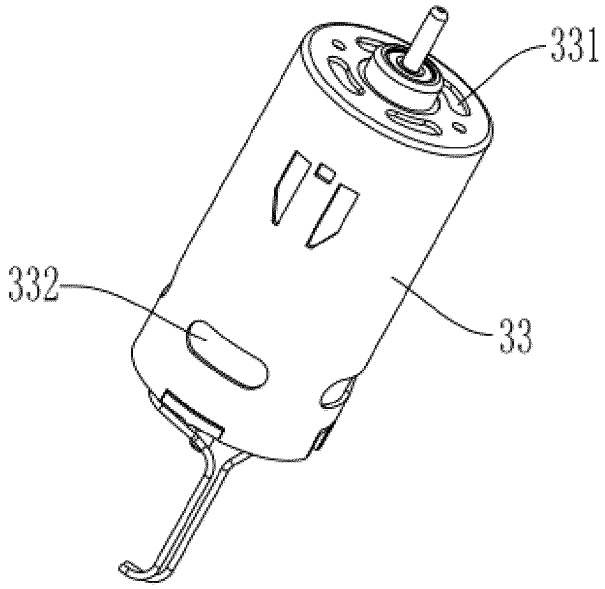


Figure 15



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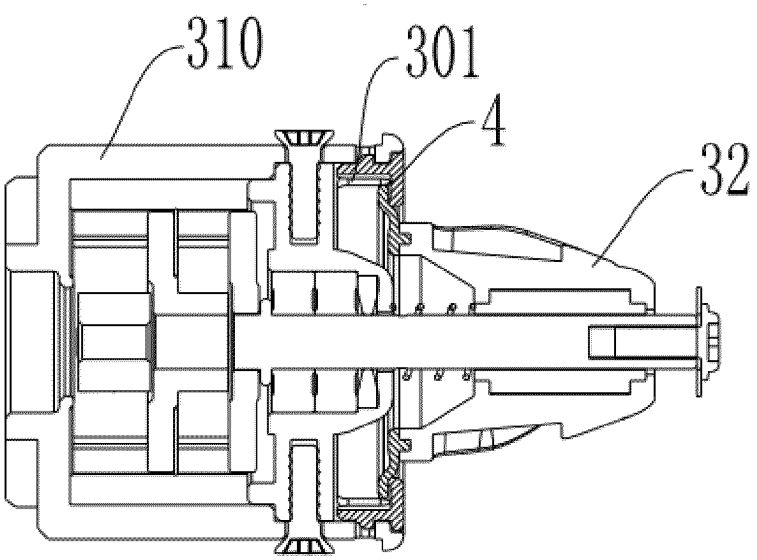


Figure 17

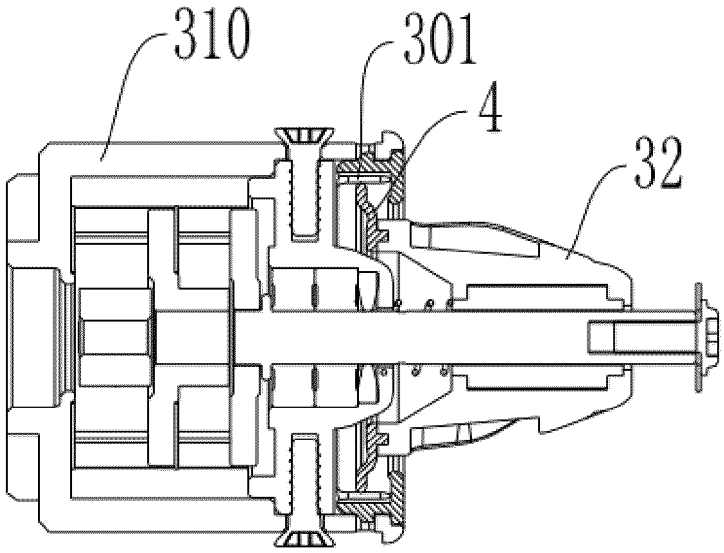


Figure 18

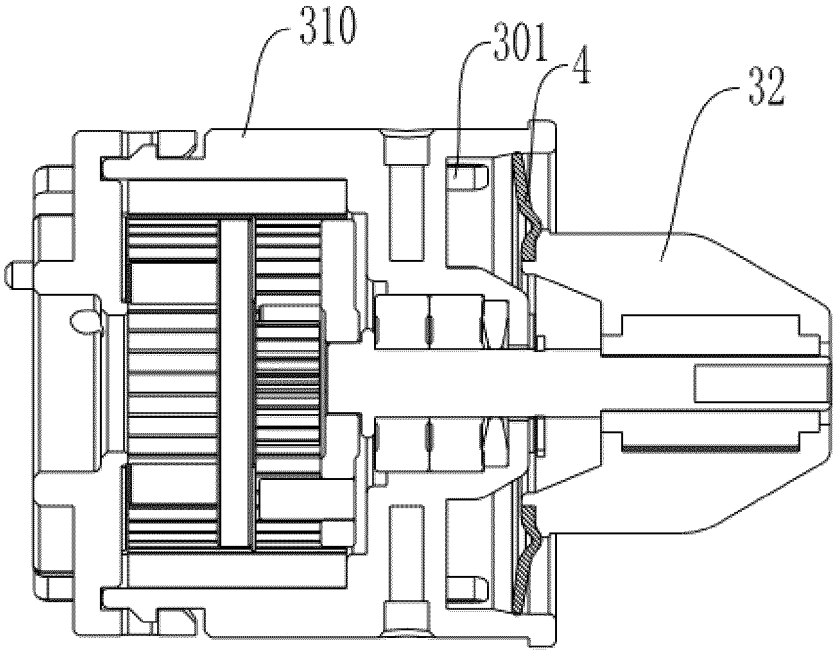


Figure 19

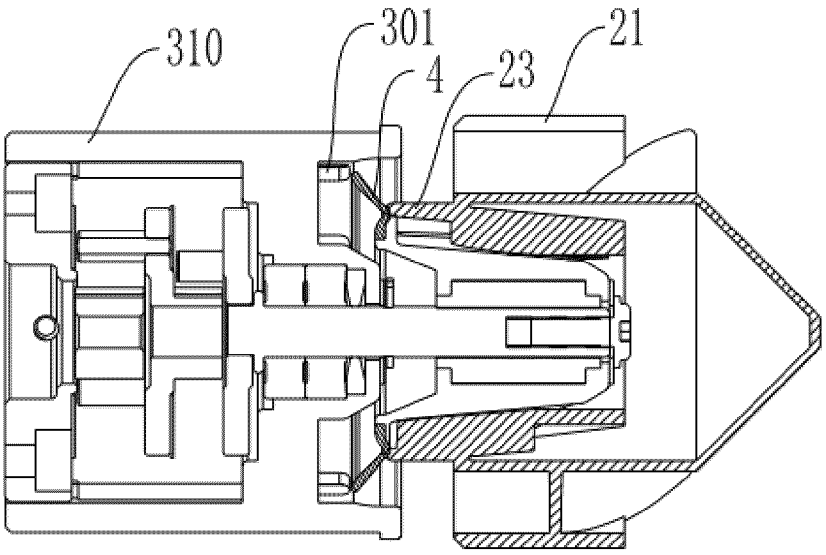


Figure 20

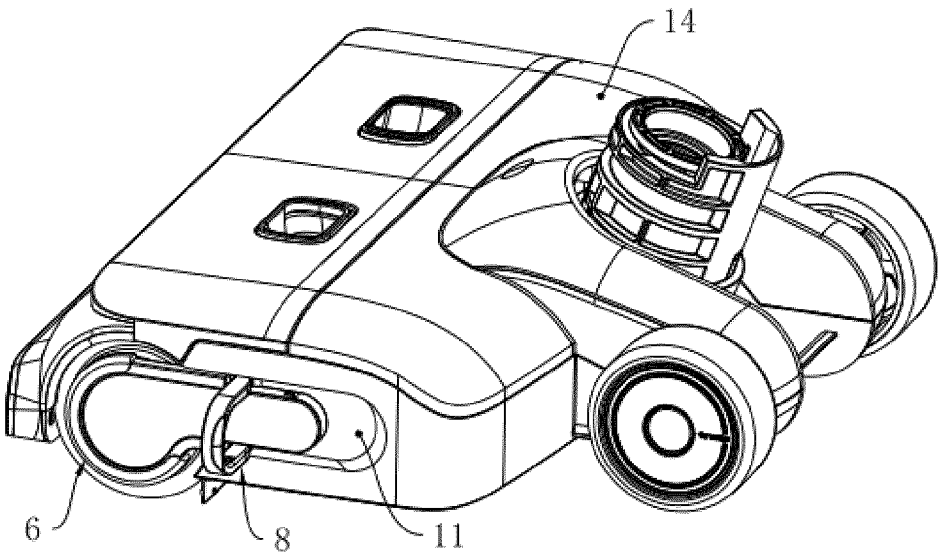
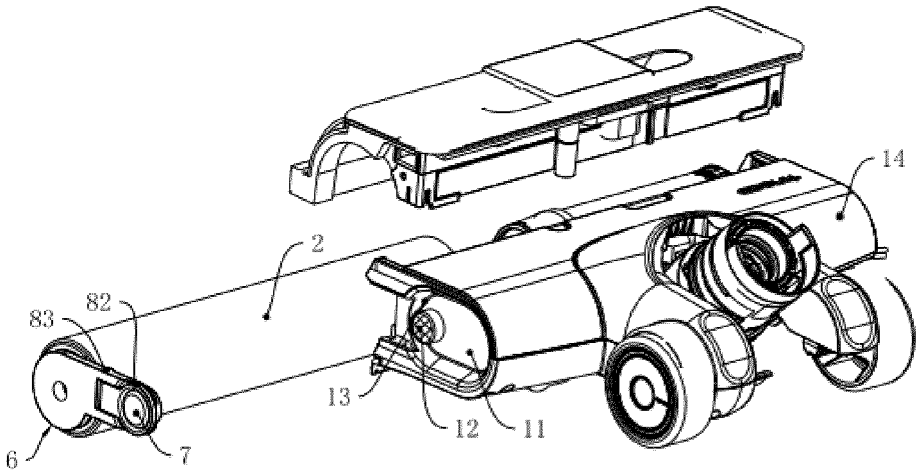


Figure 21



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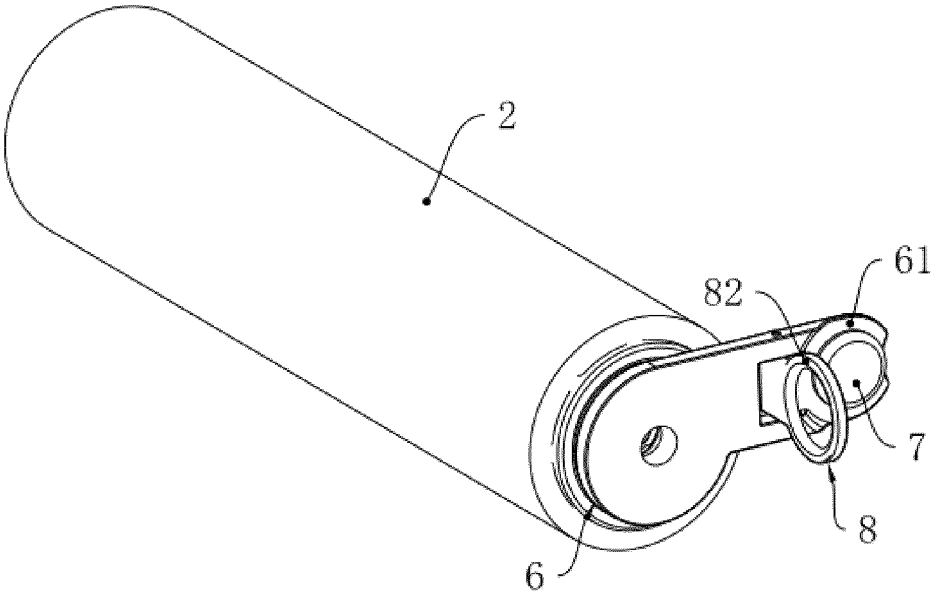
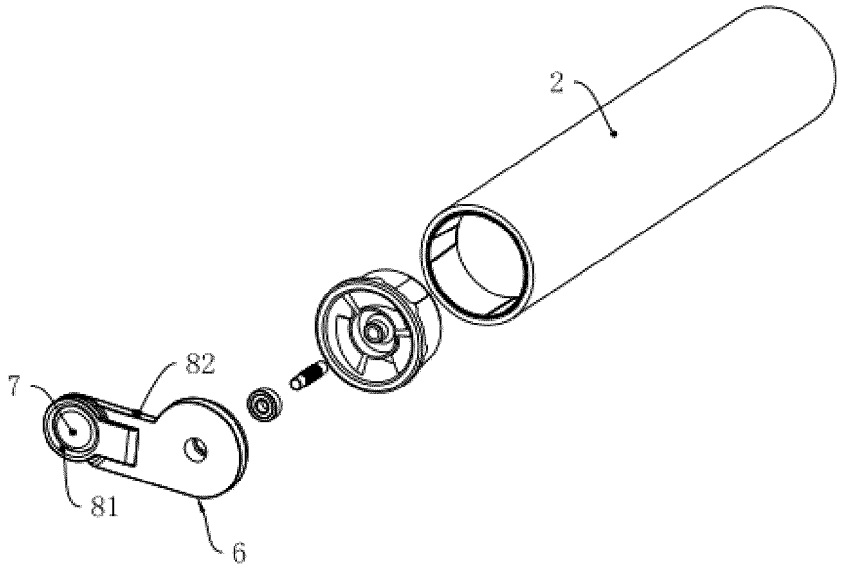


Figure 23



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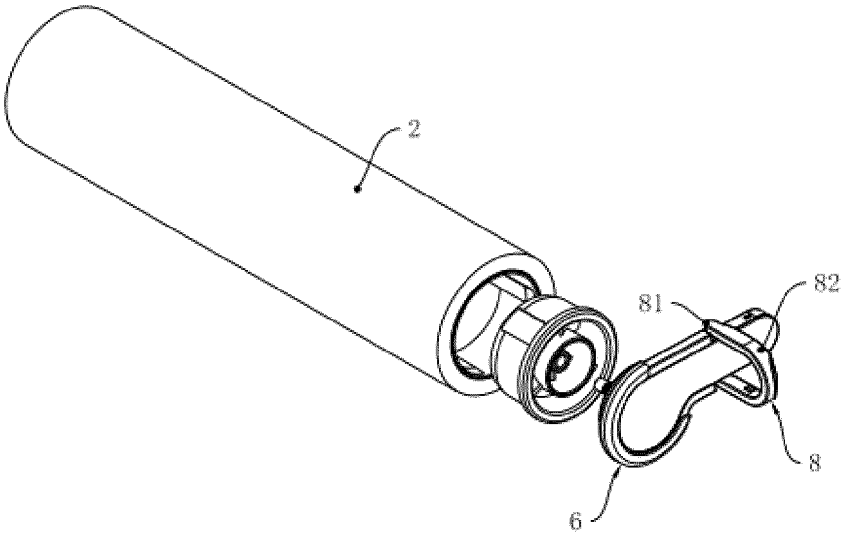

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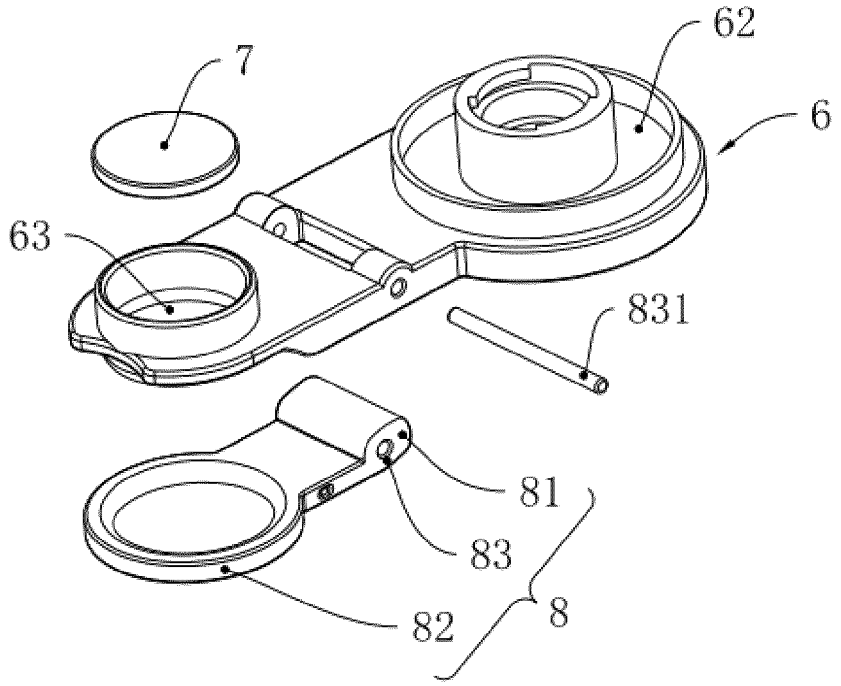

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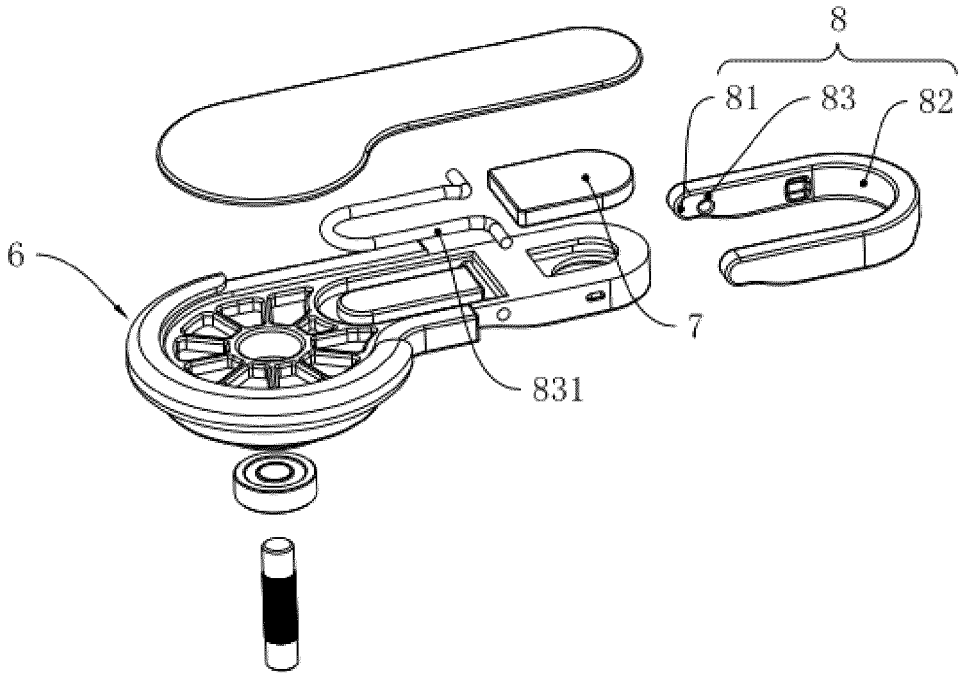

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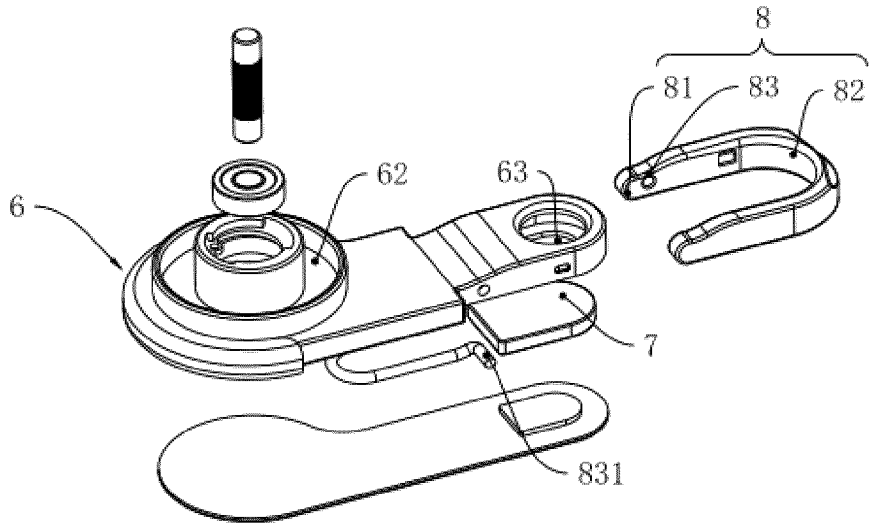
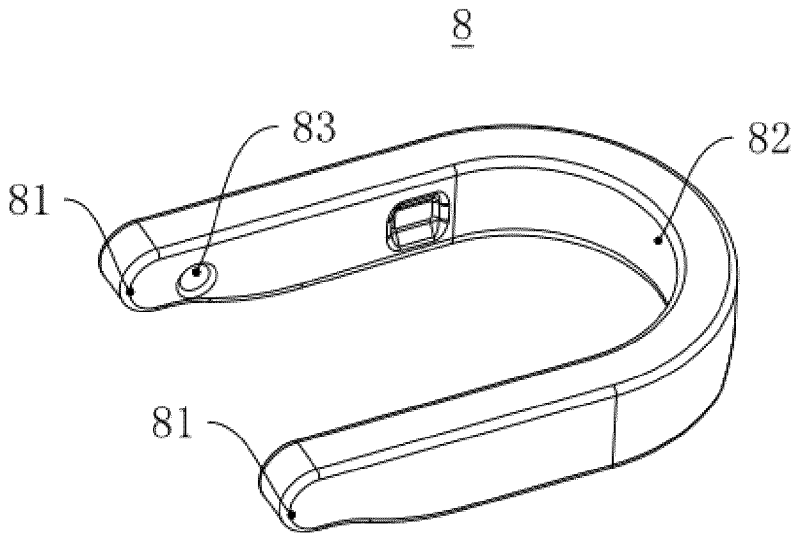


Figure 28



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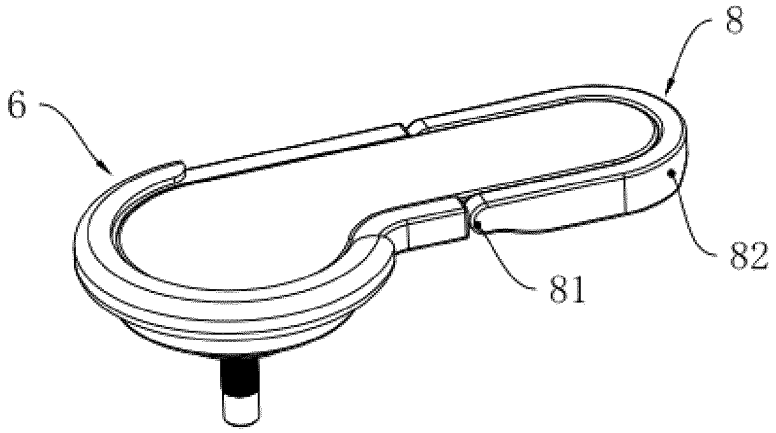

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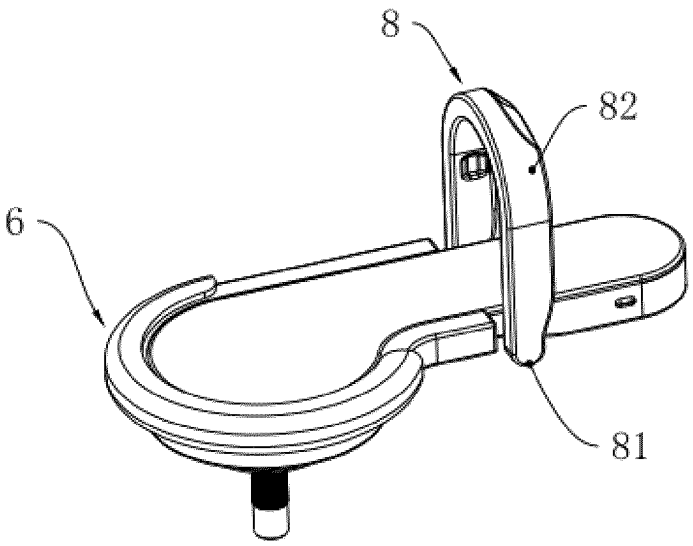

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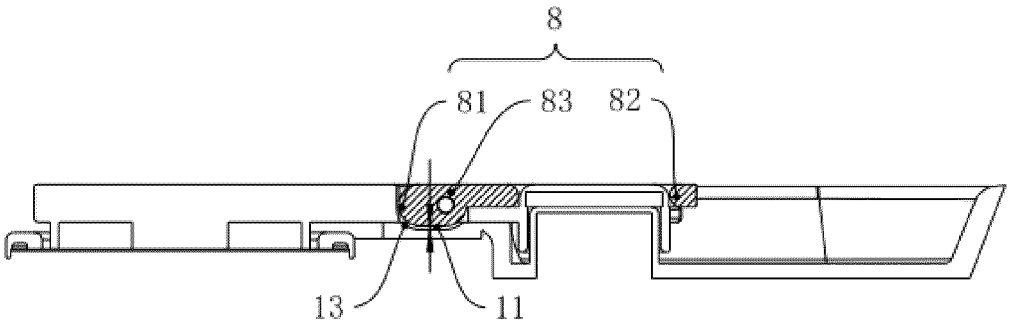

Figure 32

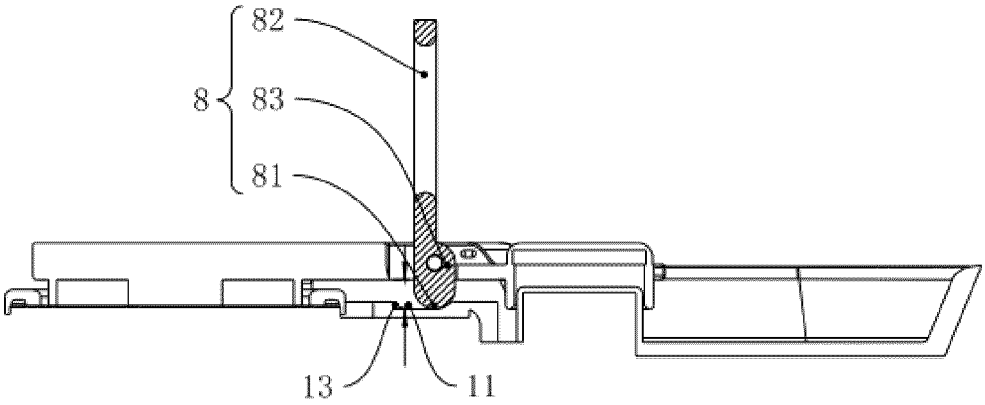

Figure 33

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/095188

A. CLASSIFICATION OF SUBJECT MATTER

A47L11/282(2006.01)i; A47L11/292(2006.01)i; A47L11/40(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:A47L11

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, 百度, BAIDU, CNKI, 万方, WANFANG: 电机, 马达, 电动机, 驱动, 密封, 散热, 弹性, 弹簧, 形变, 变形, 滚刷, 滚筒, 刷体, 快拆, 拆卸 DWPI, WPABS, USTXT, EPTXT, IEEE, ELSEVIER SCIENCE: motor, seal, heat, spring, deformation, brush, disassembly

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 115005718 A (TINECO INTELLIGENT TECHNOLOGY CO., LTD.) 06 September 2022 (2022-09-06) claims 1-15, description paragraphs 4-92, and figures 1-9	1-15
PX	CN 114983282 A (TINECO INTELLIGENT TECHNOLOGY CO., LTD.) 02 September 2022 (2022-09-02) claims 1-15, description paragraphs 4-83, and figures 1-11	1-30
PX	CN 114947663 A (TINECO INTELLIGENT TECHNOLOGY CO., LTD.) 30 August 2022 (2022-08-30) claims 1-13, description paragraphs 6-104, and figures 1-13	42-43
X	CN 112569682 A (ZHUHAI GREE ELECTRIC APPLIANCES INC.) 30 March 2021 (2021-03-30) description, paragraphs 26-84, and figures 1-16	42-43
A	CN 114557652 A (TINECO INTELLIGENT TECHNOLOGY CO., LTD.) 31 May 2022 (2022-05-31) description, paragraphs 4-92, and figures 1-10	1-43

☑ 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
"E" earlier application or patent but published on or after the international filing date
"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
03 August 2023	**06 August 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.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/095188

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 110623595 A (SUZHOU CHO ELECTRIC APPLIANCE CO., LTD.) 31 December 2019 (2019-12-31) entire document	1-43
A	US 2020150670 A1 (RESEARCH FOUNDATION OF THE CITY UNIVERSITY OF NEW YORK et al.) 14 May 2020 (2020-05-14) entire document	1-43

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/095188

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-41 relate to a cleaning apparatus.

Claims 42-43 relate to a quick-release structure.

The two groups of claims do not have a same or corresponding technical feature, i.e., do not have a same or corresponding special technical feature. Therefore, said claims lack unity of invention.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☑ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/095188

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 115005718 A	06 September 2022	CN 218009582 U	13 December 2022
CN 114983282 A	02 September 2022	CN 218009583 U	13 December 2022
CN 114947663 A	30 August 2022	CN 218009611 U	13 December 2022
CN 112569682 A	30 March 2021	CN 214714910 U	16 November 2021
CN 114557652 A	31 May 2022	CN 217524995 U	04 October 2022
CN 110623595 A	31 December 2019	CN 212066613 U	04 December 2020
US 2020150670 A1	14 May 2020	US 11029692 B2	08 June 2021

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202210675992 **[0001]**
- CN 202210675816 **[0001]**
- CN 202210710723 **[0001]**