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(54) **CLEANING ROBOT**

(57) The present disclosure relates to a cleaning robot. The cleaning robot comprises a body and a cleaning assembly. The cleaning assembly comprises a driving unit, a cleaning component and a lifting-lowering unit. The lifting-lowering unit comprises a first transmission component and a second transmission component. The first transmission component is fixedly connected to an output shaft of the driving unit, to be controlled by the output shaft to rotate. The second transmission component is configured to be fixedly connected to the cleaning component, rotatably connected to the driving unit via a limiting shaft sleeve, and axially guided and fitted in the limiting shaft sleeve. One of the first transmission component and the second transmission component is provided with a fitting part, and the other is provided with an extending track. The extending track comprises an inclined section extending obliquely in a height direction along a lateral wall of the first transmission component or the second transmission component. The first transmission component is configured to, during rotation, make the fitting part move along the extending track to drive the

second transmission component to move in the height direction between a cleaning position and an avoidance position.

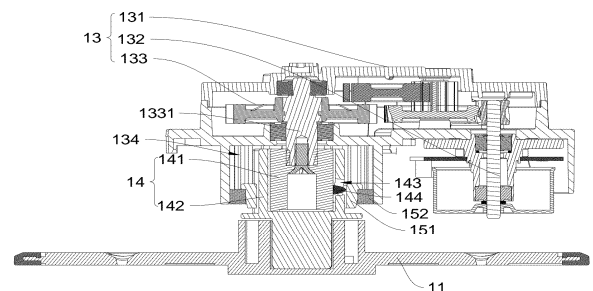


FIG. 7

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Description

[0001] The present application claims priority of Chinese patent application No. 202311188714.5, filed on September 14, 2023 and entitled "CLEANING ROBOT", and Chinese patent application No. 202311188736.1, filed on September 14, 2023 and entitled "CLEANING ROBOT AND CLEANING ASSEMBLY", which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of cleaning machinery, and more specifically relates to a cleaning robot.

BACKGROUND

[0003] With continuous improvement of modern living standards, people's demands for quality of life are also increasing, and automated and intelligent devices are increasingly widely used in daily life. Especially in recent years, intelligent devices, such as intelligent sweeping robots or intelligent window cleaning robots, have emerged continuously. Intelligent robots can perform a large amount of cleaning work in a short period of time, saving people a lot of time; moreover, intelligent devices can free people from tedious household chores, and thus become increasingly popular.

[0004] However, when carpets are present in a home environment, an existing cleaning robot is unable to clean the carpets, and dirt on a cleaning component that comes into contact with the carpets can actually contaminate the carpets. Therefore, when the cleaning robot is working on a carpet or other working surfaces, it is necessary to prevent the cleaning component from wetting the carpet. Therefore, currently, most cleaning robots on the market use a lifting-lowering mechanism to lift the cleaning component before cleaning, in order to avoid secondary contamination of carpets and other working surfaces caused by dirty mop when the cleaning robots return to a base station. However, the design of the lifting-lowering mechanism of the current cleaning robots on the market is unreasonable, resulting in low integration level of the lifting-lowering mechanism and occupation of too much internal space of the cleaning robots.

[0005] At present, in order to enlarge the coverage of cleaning and achieve complete cleaning, some cleaning robots on the market can move the cleaning component laterally relative to a body during the working process, thereby cleaning edges such as the side of walls and corners. However, when the cleaning component moves laterally relative to the body and an obstacle appears in front of the cleaning component, the cleaning component may collide with the obstacle, easily causing structural damage.

SUMMARY

[0006] To solve the problems existing in the prior art, the present disclosure provides a cleaning robot.

[0007] According to a first aspect of the present disclosure, a cleaning robot is provided, comprising a body and a cleaning assembly. The cleaning assembly comprises a driving unit, a cleaning component, and a lifting-lowering unit. The lifting-lowering unit comprises:

a first transmission component, the first transmission component being fixedly connected to an output shaft of the driving unit, to be controlled by the output shaft to rotate; and

a second transmission component, the second transmission component being configured to be fixedly connected to the cleaning component, rotatably connected to the driving unit via a limiting shaft sleeve, and axially guided and fitted in the limiting shaft sleeve.

[0008] One of the first transmission component and the second transmission component is provided with a fitting part, and the other is provided with an extending track. The extending track comprises an inclined section extending obliquely in a height direction along a lateral wall of the first transmission component or the second transmission component. The first transmission component is configured to, during rotation, make the fitting part move along the extending track to drive the second transmission component to move in the height direction between a cleaning position and an avoidance position.

[0009] In one embodiment of the present disclosure, the extending track has a lower stop point and an upper stop point. In the process of the first transmission component rotating in a first direction, the fitting part is configured to move along the extending track to the lower stop point, and the second transmission component is configured to drive the cleaning component to move to the avoidance position.

[0010] In the process of the first transmission component rotating in a second direction, the fitting part is configured to move along the extending track to the upper stop point, and the second transmission component is configured to drive the cleaning component to move to the cleaning position. In the cleaning position, the first transmission component is configured to drive the second transmission component and the cleaning component to rotate synchronously in the second direction, to clean the working surface via the cleaning component.

[0011] In one embodiment of the present disclosure, the extending track is a guide slot formed on a fitting surface of the first transmission component or the second transmission component, and the fitting part is configured to move along the guide slot between the lower stop point and the upper stop point of the guide slot.

[0012] In one embodiment of the present disclosure,

the guide slot perforates a lateral side of the first transmission component or a lateral side of the second transmission component.

[0013] In one embodiment of the present disclosure, the extending track is a guide rail protruding from the fitting surface of the first transmission component or the second transmission component, a blocking wall is arranged at both the end of the lower stop point and the end of the upper stop point of the guide rail, and the blocking walls are configured to prevent the fitting part from moving further.

[0014] In one embodiment of the present disclosure, the guide rail further comprises horizontal sections arranged at the lower stop point and the upper stop point, and the horizontal sections are configured to support the second transmission component in an axial direction when the fitting part is located at the horizontal sections.

[0015] In one embodiment of the present disclosure, the fitting part is a protrusion or a cam, the protrusion is configured to slide along the extending track, and the cam is configured to roll along the extending track.

[0016] In one embodiment of the present disclosure, the lifting-lowering unit further comprises a compression spring arranged between the second transmission component and the driving unit.

[0017] In the process of the first transmission component rotating in the first direction, the second transmission component is configured to overcome at least the elastic force of the compression spring to drive the cleaning component to move to the avoidance position.

[0018] In the process of the first transmission component rotating in the second direction, the fitting part is configured to move along the extending track to the upper stop point, and the second transmission component is configured to drive the cleaning component, at least under the elastic force of the compression spring, to move to the cleaning position.

[0019] In one embodiment of the present disclosure, the cleaning robot is configured to be located above the working surface.

[0020] In the process of the first transmission component rotating in the first direction, the second transmission component is configured to overcome the elastic force of the compression spring and the gravity of the second transmission component and the gravity of the cleaning component to drive the cleaning component to move to the avoidance position.

[0021] In the process of the first transmission component rotating in the second direction, the fitting part is configured to move along the extending track to the upper stop point, and the second transmission component is configured to drive the cleaning component, under the elastic force of the compression spring and the gravity of the second transmission component and the gravity of the cleaning component, to move to the cleaning position.

[0022] In one embodiment of the present disclosure, the limiting shaft sleeve is configured to be sleeved on the

outer side of the second transmission component, and is rotatably connected to the driving unit via a limiting bearing, and the limiting bearing is configured to provide rotational resistance in the first direction and the second direction to the second transmission component.

[0023] In one embodiment of the present disclosure, the limiting bearing is configured to allow the second transmission component to rotate only in the second direction.

[0024] In one embodiment of the present disclosure, one of the outer surface of the second transmission component and the inner surface of the limiting shaft sleeve is provided with a limiting rib extending axially, the other is provided with a limiting groove corresponding to the limiting rib in position, and the limiting rib is configured to be guided and fitted in the limiting groove.

[0025] In one embodiment of the present disclosure, the limiting shaft sleeve is configured to, once the second transmission component drives the cleaning component to move to the avoidance position, overcome the gravity of the second transmission component and the gravity of the cleaning component via rotational resistance, so that the second transmission component and the cleaning component are kept in the avoidance position.

[0026] In one embodiment of the present disclosure, the driving unit comprises a cleaning motor, a reduction gearbox, and a housing. The cleaning motor and the reduction gearbox are arranged in the housing, a rotating shaft of the cleaning motor is fixedly connected to an input shaft of the reduction gearbox, and the first transmission component is fixedly connected to the input shaft of the reduction gearbox.

[0027] A mounting chamber is arranged below the housing, the first transmission component is configured to be arranged in the mounting chamber, and an outer ring of the limiting bearing is fixedly arranged on the inner wall of the mounting chamber.

[0028] In one embodiment of the present disclosure, the cleaning robot further comprises a locomotion assembly and a control unit, wherein the locomotion assembly is configured to drive the cleaning robot to move on the working surface, and the control unit is configured to, when the cleaning robot moves to an area to be avoided, control the lifting-lowering unit to drive the cleaning component to move to the avoidance position.

[0029] According to a second aspect of the present disclosure, a cleaning robot is provided, comprising:

a body;

a cleaning assembly, the cleaning assembly being pivotally connected as a whole to the body, and comprising a cleaning mechanism and a movement mechanism; the cleaning mechanism comprising a cleaning component; the movement mechanism being configured to drive the cleaning assembly to move between a first position and a second position; when in the first position, the edge of the cleaning

component being within a range of the edge of the body; when in the second position, at least a part of the edge of the cleaning component extends beyond the edge of a locomotion range of the body; and

a reset elastic component, the reset elastic component being arranged between the body and the cleaning assembly; and the cleaning assembly being configured to move relative to the body under the action of an external force, and to reset under the action of the reset elastic component once the external force disappears.

[0030] In one embodiment of the present disclosure, when the cleaning component is in the second position, the cleaning component is configured to, under the action of an external force, overcome the force of the reset elastic component and move towards the inside of the body, and to reset once the external force disappears.

[0031] In one embodiment of the present disclosure, the movement mechanism comprises a rotating shaft and a rotating motor, the rotating shaft is rotatably connected to the body, the cleaning assembly is fixed to the rotating shaft, and the rotating motor is configured to drive the rotating shaft to rotate to drive the cleaning assembly to move on an arc between the first position and the second position relative to the body.

[0032] In one embodiment of the present disclosure, an output shaft of the rotating motor is parallel to the rotating shaft, a driving wheel is arranged at the top end of the output shaft, a driven wheel is arranged at the top end of the rotating shaft, and the driving wheel is in transmission connection with the driven wheel.

[0033] In one embodiment of the present disclosure, the movement mechanism further comprises a pivot bracket, the pivot bracket is pivotally connected to the body, and both the rotating shaft and the rotating motor are fixedly arranged on the pivot bracket.

[0034] In one embodiment of the present disclosure, the reset elastic component is a torsion spring that is sleeved on the pivot bracket, one end of the torsion spring abuts against the pivot bracket, and the other end abuts against the body.

[0035] In one embodiment of the present disclosure, the cleaning mechanism is provided with a connecting part, a fixing hole is arranged on the connecting part, the rotating shaft passes through the fixing hole, and the connecting part abuts against the top of the pivot bracket.

[0036] In one embodiment of the present disclosure, an accommodating chamber is arranged at the bottom of the pivot bracket, a fixed shaft that is fixedly connected to the body is arranged in the accommodating chamber, and a lower bearing is arranged between the fixed shaft and an inner wall of the accommodating chamber.

[0037] In one embodiment of the present disclosure, the rotating shaft and the fixed shaft are coaxially arranged, and the cleaning component is configured to, under the action of an external force, make the entire

cleaning assembly move between the first position and the second position.

[0038] In one embodiment of the present disclosure, the cleaning mechanism comprises a housing and a cleaning motor located in the housing, and an output shaft of the cleaning motor is in transmission connection with the cleaning component and is configured to drive the cleaning component to rotate on the working surface to clean the working surface.

[0039] In one embodiment of the present disclosure, a reduction mechanism is arranged in the housing, and the output shaft of the cleaning motor is in transmission connection with the cleaning component via the reduction mechanism.

[0040] In one embodiment of the present disclosure, the body has an inner chamber; an arc-shaped through hole is arranged at the bottom of the body; the cleaning assembly is mounted in the inner chamber of the body; an output end of the reduction mechanism passes through the arc-shaped through hole to connect with the cleaning component; and the cleaning component is configured to move under the constraint of the arc-shaped through hole.

[0041] In one embodiment of the present disclosure, the cleaning assembly is mounted on the body in the form of a module.

[0042] In one embodiment of the present disclosure, the cleaning component is a movable mop plate, and at least one movable mop plate is arranged on the body.

[0043] According to a third aspect of the present disclosure, a cleaning assembly is provided. The cleaning assembly is configured to be pivotally connected as a whole to the body of the cleaning robot, and a reset elastic component is arranged between the body and the cleaning assembly. The cleaning assembly is configured to move relative to the body under the action of an external force, and to reset under the action of the reset elastic component once the external force disappears.

[0044] The cleaning assembly comprises a cleaning mechanism and a movement mechanism. The cleaning mechanism comprises a cleaning component. The movement mechanism is configured to drive the cleaning assembly to move between a first position and a second position. When in the first position, the edge of the cleaning component is within a range of the edge of the body. When in the second position, at least a part of the edge of the cleaning component extends beyond the edge of a locomotion range of the body.

[0045] During the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the driving assembly may drive the first transmission component to rotate to drive the second transmission component to move downward in the height direction relative to the limiting shaft sleeve to the cleaning position, and then drive the second transmission component to rotate relative to the body, thereby driving the cleaning component to move relative to the working surface to clean the working surface. When it needs to avoid

a working surface such as a carpet or an obstacle such as a threshold needs, the driving assembly may drive the first transmission component to rotate to drive the second transmission component to move upward in the height direction to the avoidance position, thereby preventing the cleaning component from coming into contact with the working surface to be avoided such as the carpet or the obstacle such as the threshold, preventing contamination of the working surface to be avoided such as the carpet, and also protecting the cleaning component from collision and damage.

[0046] It can be seen that when the cleaning robot of the present disclosure faces different cleaning scenarios, the driving unit can effectively drive the cleaning component via the lifting-lowering unit to move in the height direction between the cleaning position and the avoidance position, to cope with the different cleaning scenarios. Moreover, the cleaning assembly of the present disclosure can drive the cleaning component to move up and down and rotate relative to the working surface simply via the driving assembly, without the need for a separate structure for driving the cleaning component to move up and down. Thus, the cleaning assembly has a compact overall structure, high integration level, and small occupied space.

[0047] During the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the cleaning assembly is in the first position, the edge of the cleaning component is within the range of the edge of the body, and thus, the cleaning assembly may not be stuck by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly in the present disclosure moves to the second position, the cleaning range of the cleaning component can extend beyond the edge of the locomotion range of the body, thereby completely cleaning corner positions where the body cannot fit.

[0048] When the cleaning component extends to the outside from the body and collides with an obstacle by the side of the body, or when an obstacle lower than the bottom surface of the body appears in front of the cleaning robot and the cleaning component collides with the obstacle, the cleaning assembly can pivot as a whole relative to the body under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component attenuates the impact force and reduces the impact force on the cleaning assembly. Once the cleaning assembly passes through the obstacle, the reset elastic component can automatically drive the cleaning assembly to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

[0049] Other features and advantages of the present disclosure will become clear through the following detailed description of exemplary embodiments of the pre-

sent disclosure with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0050] The accompanying drawings, which are incorporated into and form a part of the specification, illustrate embodiments of the present disclosure and are used together with the description to explain the principles of the present disclosure.

FIG. 1 shows an internal schematic diagram of a cleaning robot provided by an embodiment of the present disclosure when a cleaning component is in a first position;

FIG. 2 shows an internal schematic diagram of a cleaning robot provided by an embodiment of the present disclosure when a cleaning component is in a second position;

FIG. 3 shows a cross-sectional schematic diagram of a cleaning robot provided by an embodiment of the present disclosure;

FIG. 4 shows a partially enlarged schematic diagram of FIG. 3;

FIG. 5 shows an exploded schematic diagram of a cleaning component provided by an embodiment of the present disclosure;

FIG. 6 shows a cross-sectional schematic diagram of another cleaning robot provided by an embodiment of the present disclosure;

FIG. 7 shows a sectional schematic diagram of a cleaning mechanism provided by an embodiment of the present disclosure;

FIG. 8 shows an exploded schematic diagram of a cleaning mechanism provided by an embodiment of the present disclosure;

FIG. 9 shows a perspective schematic diagram of a first transmission component and a second transmission component provided by an embodiment of the present disclosure when the second transmission component is in a cleaning position;

FIG. 10 shows a perspective schematic diagram of a first transmission component and a second transmission component provided by an embodiment of the present disclosure when the second transmission component is in an avoidance position;

FIG. 11 shows a sectional schematic diagram of another cleaning mechanism provided by an embo-

diment of the present disclosure;

FIG. 12 shows an exploded schematic diagram of another cleaning mechanism provided by an embodiment of the present disclosure;

FIG. 13 shows a perspective schematic diagram of a first transmission component and another second transmission component provided by an embodiment of the present disclosure when the second transmission component is in a cleaning position;

FIG. 14 shows a perspective schematic diagram of a first transmission component and another second transmission component provided by an embodiment of the present disclosure when the second transmission component is in an avoidance position;

FIG. 15 shows a sectional schematic diagram of another cleaning mechanism provided by an embodiment of the present disclosure; and

FIG. 16 shows an exploded schematic diagram of another cleaning mechanism provided by an embodiment of the present disclosure.

[0051] The corresponding relationship between component names and reference numerals in FIGS. 1 to 16 is as follows:

10. Cleaning assembly; 1. Cleaning mechanism; 11. Cleaning component; 12. Connecting part; 13. Driving unit; 131. Housing; 132. Cleaning motor; 133. Reduction gearbox; 1331. Output shaft; 134. Mounting chamber; 14. Lifting-lowering unit; 141. First transmission component; 142. Second transmission component; 143. Extending track; 1431. Inclined section; 1432. Horizontal section; 1433. Lower stop point; 1434. Upper stop point; 1435. Blocking wall; 144. Fitting part; 151. Limiting shaft sleeve; 152. Limiting bearing; 161. Limiting rib; 162. Limiting groove; 17. Compression spring; 2. Movement mechanism; 21. Rotating shaft; 22. Rotating motor; 23. Drive wheel; 24. Driven wheel; 25. Pivot bracket; 26. Fixed shaft; 27. Upper bearing; 28. Lower bearing; 29. Compression elastic component; 20. Reset elastic component; 30. Body; 31. Inner chamber; 32. Arc-shaped through hole; 40. Cover.

DETAILED DESCRIPTION

[0052] Various exemplary embodiments of the present disclosure are described in detail below with reference to the accompanying drawings. It should be noted that the relative arrangement of components and steps, numerical expressions, and values described in these embodiments do not limit the scope of the present disclosure unless otherwise specified.

[0053] The following description of at least one exemplary embodiment is merely illustrative and should not be

construed as any limitation on the present disclosure or application or use thereof.

[0054] Techniques, methods, and equipment known to those of ordinary skill in related arts may not be discussed in detail, but in appropriate circumstances, such techniques, methods, and equipment should be considered as part of the specification.

[0055] It should be noted that similar reference numbers and letters denote similar items in the following drawings. Therefore, once an item is defined in one drawing, the item does not need to be further discussed in subsequent drawings.

[0056] Specific implementations of the present disclosure are described below in conjunction with the drawings.

[0057] In this specification, terms such as "upper", "lower", "front", "back", "left", and "right" are merely used to indicate relative positional relationships between related parts, rather than limiting absolute positions of the related parts.

[0058] In this specification, terms such as "first" and "second" are merely used to distinguish one from another, rather than indicating importance and order, as well as the premise of mutual existence.

[0059] In this specification, terms such as "equal" and "identical" are not strictly mathematical and/or geometric limitations, but also include permissible errors that can be understood by those skilled in the art and allowed for manufacturing or use.

[0060] Unless otherwise specified, numerical ranges in this specification include not only the entire range within two endpoints, but also several sub-ranges contained within the entire range.

[0061] The present disclosure provides a cleaning robot, which may be a floor sweeping robot, a floor mopping robot, a floor sweeping and mopping integrated robot, and the like for cleaning floors, or a window cleaning robot used for cleaning windows or glass curtain walls.

[0062] The cleaning robot comprises at least a body, a cleaning assembly, and a reset elastic component. The cleaning assembly is pivotally connected as a whole to the body, and comprises a cleaning mechanism and a movement mechanism. The cleaning mechanism comprises a cleaning component. The movement mechanism is configured to drive the cleaning assembly to move between a first position and a second position. When in the first position, the edge of the cleaning component is within a range of the edge of the body. When in the second position, at least a part of the edge of the cleaning component extends beyond the edge of a locomotion range of the body. Specifically, the cleaning component is arranged at the bottom of the body, and can move relative to a working surface to clean the working surface.

[0063] During a working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the cleaning assembly is in the first position, the edge of the cleaning component is within the range of the edge of the body, and thus, the cleaning assembly may not be stuck

by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly of the present disclosure moves to the second position, the cleaning range of the cleaning component can extend beyond the edge of the locomotion range of the body, thereby completely cleaning corner positions where the body cannot fit.

[0064] In the cleaning robot of the present disclosure, the reset elastic component is arranged between the body and the cleaning assembly. The cleaning assembly is pivotally connected as a whole to the body, and is configured to move relative to the body under the action of an external force, and to reset under the action of the reset elastic component once the external force disappears.

[0065] Thus, when the cleaning component extends to the outside from the body and collides with an obstacle by the side of the body, or when an obstacle lower than the bottom surface of the body appears in front of the cleaning robot and the cleaning component collides with the obstacle, the cleaning assembly can pivot as a whole relative to the body under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component attenuates the impact force and reduces the impact force on the cleaning assembly. Once the cleaning assembly passes through the obstacle, the reset elastic component can automatically drive the cleaning assembly to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

[0066] Specifically, when the cleaning component is in the second position, the cleaning component is configured to overcome the force of the reset elastic component and move towards the inside of the body under the action of an external force, and to reset once the external force disappears.

[0067] As described above, in order to completely clean the corner positions where the body cannot fit, when the cleaning assembly moves to the second position and the cleaning component collides with the obstacle by the side of the body, the cleaning assembly can overcome the force of the reset elastic component and move towards the inside of the body under the action of an external force to avoid the obstacle, and the reset elastic component attenuates the impact force and reduces the impact force on the cleaning assembly. Once the cleaning assembly passes through the obstacle and the external force disappears, the reset elastic component can automatically drive the cleaning assembly to reset to the second position via the elastic force, thereby continuing to clean the corner positions where the body cannot fit, ensuring that the cleaning robot can work normally, and effectively improving the user experience.

[0068] The present disclosure provides a cleaning robot, which may be a floor sweeping robot, a floor mopping

robot, a floor sweeping and mopping integrated robot, and the like for cleaning floors, or a window cleaning robot used for cleaning windows or glass curtain walls.

[0069] The cleaning robot comprises at least a body, a cleaning assembly, and a reset elastic component. The cleaning assembly is pivotally connected as a whole to the body, and comprises a cleaning mechanism and a movement mechanism. The cleaning mechanism comprises a cleaning component. The movement mechanism is configured to drive the cleaning assembly to move between a first position and a second position. When in the first position, the edge of the cleaning component is within a range of the edge of the body. When in the second position, at least a part of the edge of the cleaning component extends beyond the edge of a locomotion range of the body. Specifically, the cleaning component is arranged at the bottom of the body, and can move relative to a working surface to clean the working surface.

[0070] During a working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the cleaning assembly is in the first position, the edge of the cleaning component is within the range of the edge of the body, and thus, the cleaning assembly may not be stuck by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly in the present disclosure moves to the second position, the cleaning range of the cleaning component can extend beyond the edge of the locomotion range of the body, thereby completely cleaning corner positions where the body cannot fit.

[0071] In the cleaning robot of the present disclosure, the reset elastic component is arranged between the body and the cleaning assembly. The cleaning assembly is pivotally connected as a whole to the body, and is configured to move relative to the body under the action of an external force, and to reset under the action of the reset elastic component once the external force disappears.

[0072] Thus, when the cleaning component extends to the outside from the body and collides with an obstacle by the side of the body, or when an obstacle lower than the bottom surface of the body appears in front of the cleaning robot and the cleaning component collides with the obstacle, the cleaning assembly can pivot as a whole relative to the body under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component attenuates the impact force and reduces the impact force on the cleaning assembly. Once the cleaning assembly passes through the obstacle, the reset elastic component can automatically drive the cleaning assembly to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

[0073] Specifically, when the cleaning component is in the second position, the cleaning component is config-

ured to overcome the force of the reset elastic component and move towards the inside of the body under the action of an external force, and to reset once the external force disappears.

[0074] As described above, in order to completely clean the corner positions where the body cannot fit, when the cleaning assembly moves to the second position and the cleaning component collides with the obstacle by the side of the body, the cleaning assembly can overcome the force of the reset elastic component and move towards the inside of the body under the action of an external force to avoid the obstacle, and the reset elastic component attenuates the impact force and reduces the impact force on the cleaning assembly. Once the cleaning assembly passes through the obstacle and the external force disappears, the reset elastic component can automatically drive the cleaning assembly to reset to the second position via the elastic force, thereby continuing to clean the corner positions where the body cannot fit, ensuring that the cleaning robot can work normally, and effectively improving the user experience.

[0075] For ease of understanding, the specific structure and working principle of the cleaning robot of the present disclosure are described in detail in conjunction with an embodiment with reference to FIGS. 1 to 16. It should be noted that the present disclosure further provides a cleaning assembly. To keep the text concise, the cleaning assembly will also be introduced in the description of the cleaning robot herein, and will not be separately described.

[0076] As shown in FIGS. 1 and 2, the present disclosure provides a cleaning robot, which may be a floor sweeping robot, a floor mopping robot, a floor sweeping and mopping integrated robot, and the like for cleaning floors, or a window cleaning robot used for cleaning windows or glass curtain walls.

[0077] The cleaning robot comprises at least a body 30, a cleaning assembly 10, and a reset elastic component 20. The cleaning assembly 10 is pivotally connected as a whole to the body 30, and comprises a cleaning mechanism 1 and a movement mechanism 2. The cleaning mechanism 1 comprises a cleaning component 11. The movement mechanism 2 is configured to drive the cleaning assembly 10 to move between a first position and a second position. When in the first position, the edge of the cleaning component 11 is within a range of the edge of the body 30. When in the second position, at least a part of the edge of the cleaning component 11 extends beyond the edge of a locomotion range of the body 30.

[0078] Specifically, the cleaning component 11 is arranged at the bottom of the body 30, and can move relative to a working surface to clean the working surface. It can be understood that the body 30 may also be provided with driving wheels, and the driving wheels are used to drive the cleaning robot of the present disclosure to move and turn on the working surface, so that the cleaning component 11 can clean everywhere of the working surface.

[0079] As shown in FIG. 7, in one embodiment of the present disclosure, the cleaning component 11 is a movable mop plate. At least one movable mop plate is arranged on the body 30, and may be wetted with a cleaning liquid. During a working process of the cleaning robot of the present disclosure, the cleaning assembly 10 can control the movable mop plate to rotate and wipe the working surface. In one embodiment of the present disclosure, a suction port that sucks garbage from a floor with vacuum is further arranged at the bottom of the body 30, and the movable mop plate is arranged behind the suction port. Further, a roller brush for sweeping may be mounted at the suction port, and the body 30 can achieve first sweeping and then wiping for cleaning during a locomotion process. In another embodiment of the present disclosure, the cleaning assembly 10 is a sweeping plate for sweeping a floor, the cleaning assembly 10 is arranged in front of the suction port, and the body 30 achieves first sweeping and then sucking for cleaning during a locomotion process.

[0080] As shown in FIG. 7, in one embodiment of the present disclosure, the cleaning mechanism 1 comprises a housing 131 and a cleaning motor 132 located in the housing 131. An output shaft of the cleaning motor 132 is in transmission connection with the cleaning component 11 and is configured to drive the cleaning component 11 to rotate on the working surface to clean the working surface. Thus, the cleaning motor 132 can drive the cleaning component 11 to rotate on the working surface to clean the working surface. Further, as shown in FIG. 7, in one embodiment of the present disclosure, a reduction gearbox 133 is arranged in the housing 131, and the output shaft of the cleaning motor 132 is in transmission connection with the cleaning component 11 via the reduction gearbox 133. Since the output shaft of the cleaning motor 132 is in transmission connection with the cleaning component 11 via the reduction gearbox 133, an output torque of the cleaning motor 132 may be effectively adapted to a torque required by the cleaning component 11 by reducing an output speed of the cleaning motor 132, thereby reducing requirements for the output torque of the cleaning motor 132 and reducing the occupied volume of the cleaning motor 132. Moreover, by such arrangement, the cleaning motor 132 is located on the side of an output shaft of the reduction gearbox 133, thereby effectively reducing the overall height dimension of the cleaning mechanism 1.

[0081] As shown in FIGS. 3 and 4, in one embodiment of the present disclosure, the body 30 has an inner chamber 31, and an arc-shaped through hole 32 is arranged at the bottom of the body 30. The cleaning assembly 10 is mounted in the inner chamber 31 of the body 30, an output end of the reduction gearbox 133 passes through the arc-shaped through hole 32 to connect with the cleaning component 11, and the cleaning component 11 is configured to move under the constraint of the arc-shaped through hole 32. The cleaning assembly 10 is mounted in the inner chamber 31 of the body 30, the

output end of the reduction gearbox 133 passes through the arc-shaped through hole 32 and is connected with the cleaning component 11, and the cleaning component 11 moves under the constraint of the arc-shaped through hole 32, thus a movement range of the cleaning component 11 can be effectively limited, and excessive garbage can be prevented from entering the inner chamber 31 of the body 30 during the working process of the cleaning robot.

[0082] During the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the cleaning assembly 10 is in the first position, the edge of the cleaning component 11 is within the range of the edge of the body 30, and thus, the cleaning assembly 10 may not be stuck by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body 30 cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly 10 of the present disclosure moves to the second position, the cleaning range of the cleaning component 11 can extend beyond the edge of the locomotion range of the body 30, thereby completely cleaning corner positions where the body 30 cannot fit.

[0083] Specifically, as shown in FIGS. 4 and 5, in one embodiment of the present disclosure, the movement mechanism 2 comprises a rotating shaft 21 and a rotating motor 22. The rotating shaft 21 is rotatably connected to the body 30, the cleaning assembly 10 is fixed to the rotating shaft 21, and the rotating motor 22 is configured to drive the rotating shaft 21 to rotate to drive the cleaning assembly 10 to move on an arc between the first position and the second position relative to the body 30.

[0084] Thus, during the working process of the cleaning robot of the present disclosure, when the cleaning assembly 10 needs to move from the first position to the second position, it is only necessary to control the rotating motor 22 to rotate in a first predetermined direction, and then the rotating shaft 21 rotates to drive the cleaning assembly 10 to move along the arc from the first position to the second position. Similarly, when the cleaning assembly 10 needs to move from the second position to the first position, it is only necessary to control the rotating motor 22 to rotate in a second predetermined direction opposite to the first predetermined direction, and then the rotating shaft 21 rotates to drive the cleaning assembly 10 to move along the arc from the second position to the first position.

[0085] To enable the rotating shaft 21 to drive the cleaning assembly 10 to pivot, as shown in FIGS. 4 and 5, in one embodiment of the present disclosure, the cleaning mechanism 1 is provided with a connecting part 12, a fixing hole is arranged on the connecting part 12, the rotating shaft 21 passes through the fixing hole, and both the cross section of the rotating shaft 21 inside the fixing hole and the fixing hole are obround. Thus, during rotation, the rotating shaft 21 can drive the clean-

ing assembly 10 to pivot. In another embodiment of the present disclosure, the rotating shaft 21 may also be fixedly connected with the cleaning assembly 10 in other manners, so as to achieve the purpose of driving the cleaning assembly 10 to pivot via the rotating shaft 21, and descriptions thereof are omitted herein.

[0086] Further, as shown in FIG. 5, in one embodiment of the present disclosure, an output shaft of the rotating motor 22 is parallel to the rotating shaft 21, a driving wheel 23 is arranged at the top end of the output shaft, a driven wheel 24 is arranged at the top end of the rotating shaft 21, and the driving wheel 23 is in transmission connection with the driven wheel 24.

[0087] Thus, during the working process of the cleaning robot of the present disclosure, when the cleaning assembly 10 needs to move from the first position to the second position, it is only necessary to control the rotating motor 22 to rotate in a first predetermined direction, and then the rotating shaft 21 rotates to drive the cleaning assembly 10 to move along the arc from the first position to the second position. Similarly, when the cleaning assembly 10 needs to move from the second position to the first position, it is only necessary to control the rotating motor 22 to rotate in a second predetermined direction opposite to the first predetermined direction, and then the rotating shaft 21 rotates to drive the cleaning assembly 10 to move along the arc from the second position to the first position.

[0088] Since the output shaft of the rotating motor 22 is parallel to the rotating shaft 21, and the rotating motor 22 and the rotating shaft 21 transmit power via the driving wheel 23 and the driven wheel 24 that are in transmission connection, the rotating motor 22 can be arranged on one side of the rotating shaft 21 without being fixedly arranged with the rotating shaft 21, thereby effectively reducing the overall length of the movement mechanism 2 and effectively utilizing the space inside the body 30. As shown in FIG. 5, in one embodiment of the present disclosure, both the driving wheel 23 and the driven wheel 24 may be gears, and the driving wheel 23 and the driven wheel 24 mesh with each other. In another embodiment of the present disclosure, the driving wheel 23 and the driven wheel 24 may also be belt wheels or sprocket wheels, and power is transmitted between the driving wheel 23 and the driven wheel 24 via a drive sprocket, a synchronous belt, and other devices.

[0089] In another embodiment of the present disclosure, the output shaft of the rotating motor 22 may be directly used as the rotating shaft 21 or fixedly connected with the rotating shaft 21, thereby effectively reducing power loss of the rotating motor 22.

[0090] As described above, in one embodiment of the present disclosure, the rotating motor 22 of the present disclosure may drive the rotating shaft 21 to rotate to drive the cleaning assembly 10 to move on an arc between the first position and the second position relative to the body 30. In another embodiment of the present disclosure, a telescopic mechanism may also be arranged to drive the

cleaning assembly 10 to move in a straight line between the first position and the second position relative to the body 30, the principle of which is relatively simple, and descriptions thereof are omitted herein.

[0091] In the cleaning robot of the present disclosure, the reset elastic component 20 is arranged between the body 30 and the cleaning assembly 10. The cleaning assembly 10 is pivotally connected as a whole to the body 30, and is configured to move relative to the body 30 under the action of an external force, and to reset under the action of the reset elastic component 20 once the external force disappears.

[0092] Thus, when the cleaning component 11 extends to the outside from the body 30 and collides with an obstacle by the side of the body 30, or when an obstacle lower than the bottom surface of the body 30 appears in front of the cleaning robot and the cleaning component 11 collides with the obstacle, the cleaning assembly 10 can pivot as a whole relative to the body 30 under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component 20 attenuates the impact force and reduces the impact force on the cleaning assembly 10. Once the cleaning assembly 10 passes through the obstacle, the reset elastic component 20 can automatically drive the cleaning assembly 10 to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

[0093] Specifically, in one embodiment of the present disclosure, when the cleaning component 11 is in the second position, the cleaning component 11 is configured to overcome the force of the reset elastic component 20 and move towards the inside of the body 30 under the action of an external force, and to reset once the external force disappears.

[0094] As described above, in order to completely clean the corner positions where the body 30 cannot fit, when the cleaning assembly 10 moves to the second position and the cleaning component 11 collides with the obstacle by the outer side of the body 30, the cleaning assembly 10 can overcome the force of the reset elastic component 20 and move towards the inside of the body 30 under the action of an external force to avoid the obstacle, and the reset elastic component 20 attenuates the impact force and reduces the impact force on the cleaning assembly 10. Once the cleaning assembly 10 passes through the obstacle and the external force disappears, the reset elastic component 20 can automatically drive the cleaning assembly 10 to reset to the second position via the elastic force, thereby continuing to clean the corner positions where the body 30 cannot fit, ensuring that the cleaning robot can work normally, and effectively improving the user experience.

[0095] In one embodiment of the present disclosure, the cleaning assembly 10 is mounted on the body 30 in the form of a module, thereby effectively reducing the difficulty in mounting the cleaning assembly 10 and facilitating modular design of the cleaning robot.

[0096] In one embodiment of the present disclosure, when the cleaning assembly 10 moves to the second position, the rotating motor 22 may keep in a self-locking state. Thus, in the process of the cleaning component 11 overcoming the force of the reset elastic component 20 and move towards the inside of the body 30 under the action of the external force, a driven gear will not be driven to rotate via the rotating shaft 21, or further driving the output shaft of the rotating motor 22 to rotate, thereby preventing the driving motor from withstanding the impact force which is withstood rather by the entire cleaning assembly 10, thereby reducing the risk of damage to the driving motor caused by force impact.

[0097] In order to facilitate the cleaning assembly 10 to be pivotally connected to the body 30, as shown in FIGS. 4 and 5, in one embodiment of the present disclosure, the movement mechanism 2 further comprises a pivot bracket 25. The pivot bracket 25 is pivotally connected to the body 30, the rotating motor 22 is fixedly arranged on the pivot bracket 25, and the rotating shaft 21 is rotatably connected to the pivot bracket 25. Thus, when the cleaning assembly 10 moves towards the inside of the body 30 under the action of the external force, the cleaning assembly 10 can pivot relative to the body 30 via the pivot bracket 25, and is driven to pivot towards the inside of the body 30 to avoid the obstacle. Once the cleaning assembly 10 passes through the obstacle and the external force disappears, the reset elastic component 20 can automatically drive the pivot bracket 25 to pivot via the elastic force and further drive the cleaning assembly 10 to reset to the second position, thereby continuing to clean the corner positions where the body 30 cannot fit.

[0098] As shown in FIG. 4, it can be understood that in one embodiment of the present disclosure, during a process of the rotating motor 22 adjusting the cleaning assembly 10, since the driving wheel 23 and the driven wheel 24 are gears that mesh with each other, the rotation directions thereof are necessarily opposite. During the working process of the rotating motor 22 of the present disclosure, the output shaft of the rotating motor 22 and the rotating shaft 21 rotate in opposite directions, the rotating motor 22 and the cleaning assembly 10 also move in opposite directions, and thus the rotating shaft 21 and the pivot bracket 25 also rotate in opposite directions. As shown in FIG. 4, in one embodiment of the present disclosure, in order to enable the rotating shaft 21 and the pivot bracket 25 to rotate relative to each other, an upper bearing 27 is arranged between the rotating shaft 21 and the pivot bracket 25.

[0099] In another embodiment of the present disclosure, when the driving wheel 23 and the driven wheel 24 rotate in the same direction synchronously, the output shaft of the rotating motor 22 and the rotating shaft 21 rotate in the same direction and at the same speed, and the rotating motor 22 and the cleaning assembly 10 also move in the same direction and at the same speed. Therefore, the rotating shaft 21 and the pivot bracket 25 rotate synchronously, and the upper bearing 27 is not

needed. Namely, during the working process of the rotating motor 22 of the present disclosure, when the rotating shaft 21 and the pivot bracket 25 rotate synchronously, the upper bearing 27 is not needed, and when the rotating shaft 21 and the pivot bracket 25 do not rotate synchronously, the upper bearing 27 is needed.

[0100] As shown in FIG. 4, in one embodiment of the present disclosure, a connecting part 12 of the cleaning mechanism 1 abuts against the top of the pivot bracket 25. Since the connecting part 12 abuts against the top of the pivot bracket 25, the pivot bracket 25 may support the connecting part 12, to keep the cleaning assembly 10 at a predetermined height, thereby enabling the cleaning component 11 to fit with the working surface, and avoiding bending of the connecting part 12 due to excessive force.

[0101] In order to enable the pivot bracket 25 to be pivotally connected to the body 30, as shown in FIG. 4, in one embodiment of the present disclosure, an accommodating chamber is arranged at the bottom of the pivot bracket 25. A fixed shaft 26 that is fixedly connected to the body 30 is arranged in the accommodating chamber, and a lower bearing 28 is arranged between the fixed shaft 26 and an inner wall of the accommodating chamber. Since the lower bearing 28 is arranged between the fixed shaft 26 and the inner wall of the accommodating chamber, the pivot bracket 25 can be pivotally connected to the body 30 via the lower bearing 28. Therefore, when the cleaning assembly 10 moves towards the inside of the body 30 under the action of the external force, the cleaning assembly 10 can pivot relative to the body 30 via the pivot bracket 25, and is driven to pivot towards the inside of the body 30 to avoid the obstacle. Once the cleaning assembly 10 passes through the obstacle and the external force disappears, the reset elastic component 20 can automatically drive the pivot bracket 25 to pivot relative to the body 30 via the elastic force and further drive the cleaning assembly 10 to reset to the second position, thereby continuing to clean the corner positions where the body 30 cannot fit.

[0102] As shown in FIG. 4, in one embodiment of the present disclosure, the rotating shaft 21 and the fixed shaft 26 are arranged, and the cleaning component 11 is configured to make the entire cleaning assembly 10 to move between the first position and the second position under the action of the external force. It can be understood that the axis of rotation of the cleaning mechanism 1 when the rotating motor 22 works during rotation of the rotating shaft 21 is the rotating shaft 21, and the axis of rotation of the entire cleaning assembly 10 when the cleaning component 11 is subjected to an external force is the fixed shaft 26. Since the rotating shaft 21 and the fixed shaft 26 are arranged, the axis of rotation of the cleaning mechanism 1 when the rotating motor 22 works and the axis of rotation of the entire cleaning assembly 10 when the cleaning component 11 is subjected to an external force, thereby effectively saving the space inside the body 30. Moreover, since the entire cleaning assem-

bly 10 moves between the first position and the second position when the cleaning component 11 is subjected to the external force, the entire cleaning assembly 10 and the reset elastic component 20 withstand the impact force, thereby reducing the risk of damage to the rotating motor 22, the cleaning component 11, or other single structures caused by excessive impact force.

[0103] As shown in FIGS. 4 and 5, in one embodiment of the present disclosure, the reset elastic component 20 is a torsion spring that is fitted over the pivot bracket 25, one end of the torsion spring abuts against the pivot bracket 25, and the other end abuts against the body 30. Thus, in one embodiment of the present disclosure, when the cleaning assembly 10 moves and pivots towards the inside of the body 30 via the pivot bracket 25 under the action of the external force, two ends of the torsion spring can be compressed. When the cleaning assembly 10 passes through the obstacle and the external force disappears, the torsion spring can automatically stretch and drive the pivot bracket 25 to pivot via the elastic force, thereby driving the cleaning assembly 10 to reset to the second position. Thus, in one embodiment of the present disclosure, when the cleaning assembly 10 moves and pivots towards the inside of the body 30 via the pivot bracket 25 under the action of the external force, two ends of the torsion spring can be stretched. When the cleaning assembly 10 passes through the obstacle and the external force disappears, the torsion spring can automatically contract and drive the pivot bracket 25 to pivot via the elastic force, thereby driving the cleaning assembly 10 to reset to the second position. The principles of the two embodiments are similar and descriptions thereof are omitted herein.

[0104] As shown in FIG. 6, in another embodiment of the present disclosure, the rotating shaft 21 may also be directly rotatably connected to the body 30, and the pivot bracket 25 may be rotatably connected to the rotating shaft 21 to achieve the described functions, and descriptions thereof are omitted herein.

[0105] As shown in FIGS. 15 and 16, in one embodiment of the present disclosure, a compression elastic component 29 is arranged between the cleaning assembly 10 and the pivot bracket 25. The compression elastic component 29 is used to eliminate a fit clearance between the cleaning assembly 10 and the pivot bracket 25, thereby ensuring that the cleaning assembly 10 and the pivot bracket 25 may not shake when the cleaning assembly 10 rotates to any position along the rotating shaft 21.

[0106] As shown in FIGS. 15 and 16, in one embodiment of the present disclosure, the cleaning assembly of the present disclosure may further comprise a cover 40 which is fixed to the body. All structures in the movement mechanism 2 of the present disclosure are arranged in the cover 40. One end of the elastic component 20 abuts against the pivot bracket 25, and the other end abuts against the cover 40. The rotating shaft 21 is rotatably arranged in the housing.

[0107] As shown in FIGS. 7 and 8, in one embodiment of the present disclosure, the cleaning assembly 10 comprises a driving unit 13, the cleaning component 11, and a lifting-lowering unit 14. As described above, in one embodiment of the present disclosure, the driving unit 13 comprises the cleaning motor 132, the reduction gearbox 133, and the housing 131, and the cleaning motor 132 and the reduction gearbox 133 are arranged in the housing 131.

[0108] As shown in FIGS. 7 and 8, the lifting-lowering unit 14 comprises a first transmission component 141 and a second transmission component 142. The first transmission component 141 is fixedly connected to an output shaft 1331 of the driving unit 13, to be controlled by the output shaft 1331 to rotate. In cases where the driving unit 13 comprises the cleaning motor 132 and the reduction gearbox 133, the first transmission component 141 is fixedly connected to the output shaft 1331 of the reduction gearbox 133, and the cleaning motor 132 drives the first transmission component 141 to rotate via the reduction gearbox 133. Specifically, as shown in FIG. 7, the first transmission component 141 may be fixedly connected to the output shaft 1331 via a screw or other fixing components. The second transmission component 142 is configured to be fixedly connected to the cleaning component 11, rotatably connected to the driving unit 13 via a limiting shaft sleeve 151, and axially guided and fitted in the limiting shaft sleeve 151.

[0109] As shown in FIGS. 7 to 10, one of the first transmission component 141 and the second transmission component 142 is provided with a fitting part 144, and the other is provided with an extending track 143. The extending track 143 comprises an inclined section 1431 extending obliquely in a height direction along the lateral wall of the first transmission component 141 or the second transmission component 142. The first transmission component 141 is configured to, during rotation, make the fitting part 144 move along the extending track 143 to drive the second transmission component 142 to move in a height direction between a cleaning position and an avoidance position. The height direction refers to an extending direction from the body 30 to the working surface. When the working surface is a horizontal surface, the height direction is the vertical direction; and when the working surface is a vertical surface, the height direction is the horizontal direction.

[0110] Thus, during the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the driving assembly may drive the first transmission component 141 to rotate to drive the second transmission component 142 to move downward in the height direction relative to the limiting shaft sleeve 151 to the cleaning position, and then drive the second transmission component 142 to rotate relative to the body 30, thereby driving the cleaning component 11 to move relative to the working surface to clean the working surface. When it needs to avoid a working surface such as a carpet or avoid an obstacle such as a threshold, the driving

assembly may drive the first transmission component 141 to rotate to drive the second transmission component 142 to move upward in the height direction to the avoidance position, thereby preventing the cleaning component 11 from coming into contact with the working surface to be avoided such as the carpet or the obstacle such as the threshold, preventing contamination of the working surface to be avoided such as the carpet, and also protecting the cleaning component 11 from collision and damage.

[0111] It can be seen that when the cleaning robot of the present disclosure faces different cleaning scenarios, the driving unit 13 can effectively drive the cleaning component 11 via the lifting-lowering unit 14 to move in the height direction between the cleaning position and the avoidance position, to cope with the different cleaning scenarios. Moreover, the cleaning assembly 10 of the present disclosure can drive the cleaning component 11 to move up and down and rotate relative to the working surface simply via the driving assembly, without the need for a separate structure for driving the cleaning component 11 to move up and down. Thus, the cleaning assembly 10 has a compact overall structure, high integration level, and small occupied space.

[0112] Specifically, as shown in FIGS. 8 to 10, in one embodiment of the present disclosure, the extending track 143 has a lower stop point 1433 and an upper stop point 1434. When the first transmission component 141 rotates in a first direction, the fitting part 144 is configured to move along the extending track 143 to the lower stop point 1433, and the second transmission component 142 is configured to drive the cleaning component 11 to move to the avoidance position. When the first transmission component 141 rotates in a second direction, the fitting part 144 is configured to move along the extending track 143 to the upper stop point 1434, and the second transmission component 142 is configured to drive the cleaning component 11 to move to the cleaning position. In the cleaning position, the first transmission component 141 is configured to drive the second transmission component 142 and the cleaning component 11 to rotate synchronously in a second direction, to clean the working surface via the cleaning component 11.

[0113] As shown in FIGS. 9 and 10, in cases where the fitting part 144 is arranged on the first transmission component 141 and the extending track 143 is arranged on the second transmission component 142, when the first transmission component 141 rotates in the first direction, the fitting part 144 rotates in the first direction, and the extending track 143 and the second transmission component 142 move relative to the limiting shaft sleeve 151 in the height direction until the fitting part 144 moves along the inclined section 1431 of the extending track 143 to the lower stop point 1433. At this point, the second transmission component 142 drives the cleaning component 11 to move to the avoidance position. When the first transmission component 141 rotates in the second direction, the fitting part 144 rotates in the second direc-

tion, and the extending track 143 and the second transmission component 142 move in the height direction until the fitting part 144 moves along the inclined section 1431 of the extending track 143 relative to the limiting shaft sleeve 151 to the upper stop point 1434, and the second transmission component 142 drives the cleaning component 11 to move to the cleaning position. After the second transmission component 142 drives the cleaning component 11 to move to the cleaning position, when the first transmission component 141 continues to rotate in the second direction, the first transmission component 141 can drive the second transmission component 142 and the cleaning component 11 to rotate synchronously in the second direction, to clean the working surface via the cleaning component 11.

[0114] Similarly, as shown in FIGS. 11 to 14, in cases where the extending track 143 is arranged on the first transmission component 141 and the fitting part 144 is arranged on the second transmission component 142, when the first transmission component 141 rotates in the first direction, the extending track 143 rotates in the first direction, and the fitting part 144 and the second transmission component 142 move relative to the limiting shaft sleeve 151 in the height direction until the fitting part 144 moves along the inclined section 1431 of the extending track 143 to the lower stop point 1433. At this point, the second transmission component 142 drives the cleaning component 11 to move to the avoidance position. When the first transmission component 141 rotates in the second direction, the extending track 143 rotates in the second direction, and the fitting part 144 and the second transmission component 142 move in the height direction until the fitting part 144 moves along the inclined section 1431 of the extending track 143 relative to the limiting shaft sleeve 151 to the upper stop point 1434, and the second transmission component 142 drives the cleaning component 11 to move to the cleaning position. After the second transmission component 142 drives the cleaning component 11 to move to the cleaning position, when the first transmission component 141 continues to rotate in the second direction, the first transmission component 141 can drive the second transmission component 142 and the cleaning component 11 to rotate synchronously in the second direction, to clean the working surface via the cleaning component 11.

[0115] Since the extending track 143 comprises the inclined section 1431 extending obliquely in the height direction and has the lower stop point 1433 and the upper stop point 1434, the second transmission component 142 may drive the cleaning component 11 conveniently to the cleaning position or the avoidance position, thereby facilitating the cleaning robot to cope with different scenarios.

[0116] As shown in FIGS. 7 and 11, in one embodiment of the present disclosure, the second transmission component 142 may be sleeved on the outer side of the first transmission component 141, and thus the fitting surface of the first transmission component 141 is the outer sur-

face of the first transmission component 141, and the fitting surface of the second transmission component 142 is the outer surface of the second transmission component 142. In another embodiment of the present disclosure, the second transmission component 142 may be sleeved on the outer side of the first transmission component 141, and thus the fitting surface of the first transmission component 141 is the outer surface of the first transmission component 141, and the fitting surface of the second transmission component 142 is the outer surface of the second transmission component 142.

[0117] The extending track 143 may be in various forms. As shown in FIGS. 8 to 10, in one embodiment of the present disclosure, the extending track 143 is a guide slot formed on the fitting surface of the first transmission component 141 or the second transmission component 142, and the fitting part 144 is configured to move along the guide slot between the lower stop point 1433 and the upper stop point 1434 of the guide slot. Thus, during a process of adjusting the height of the cleaning component 11, when the first transmission component 141 rotates, the fitting part 144 can move along the guide slot to the lower stop point 1433 or the upper stop point 1434, thereby enabling the second transmission component 142 to drive the cleaning component 11 to the cleaning position or the avoidance position.

[0118] Further, as shown in FIGS. 8 to 10, in one embodiment of the present disclosure, the guide slot perforates the lateral side of the first transmission component 141 or the lateral side of the second transmission component 142. Since the guide slot perforates the lateral side of the first transmission component 141 or the lateral side of the second transmission component 142, difficulty in machining the guide slot can be reduced, thereby saving the machining cost of the lifting-lowering unit 14.

[0119] As shown in FIGS. 12 to 14, in another embodiment of the present disclosure, the extending track 143 is a guide rail protruding from the fitting surface of the first transmission component 141 or the second transmission component 142, and a blocking wall 1435 is arranged at both the end of the lower stop point 1433 and the end of the upper stop point 1434 of the guide rail. The blocking walls 1435 are configured to prevent the fitting part 144 from moving further.

[0120] Thus, during a process of adjusting the height of the cleaning component 11, when the first transmission component 141 rotates, the fitting part 144 may move along the guide rail to the lower stop point 1433 or the upper stop point 1434, thereby enabling the second transmission component 142 to drive the cleaning component 11 to the cleaning position or the avoidance position.

[0121] It can be understood that, as shown in FIGS. 12 to 14, in cases where the second transmission component 142 is sleeved on the outer side of the first transmission component 141, when the guide rail is arranged on the outer surface of the first transmission component 141

and the fitting part 144 is arranged on the inner surface of the second transmission component 142, to enable the first transmission component 141 to drive the fitting part 144 to move upward via the guide rail, the fitting part 144 needs to be located above the guide rail. In another embodiment of the present disclosure, when the fitting part 144 is arranged on the outer surface of the first transmission component 141 and the guide rail is arranged on the inner surface of the second transmission component 142, to enable the first transmission component 141 to drive the guide rail to move upward via the fitting part 144, the fitting part 144 needs to be located below the guide rail. In cases where the first transmission component 141 is sleeved on the outer side of the second transmission component 142, the principles are similar, and descriptions thereof are omitted herein.

[0122] Since a blocking wall 1435 is arranged at both the end of the lower stop point 1433 and the end of the upper stop point 1434 of the guide rail, the blocking walls 1435 are configured to prevent the fitting part 144 from moving further, so that the fitting part 144, once reaching the blocking walls 1435, can drive the transmission component where the guide rail is arranged to move or stop moving. Specifically, when the fitting part 144 moves along the guide rail to the blocking wall 1435 at the end of the upper stop point 1434, the second transmission component 142 drives the cleaning component 11 to the cleaning position; when the first transmission component 141 continues to rotate in the second direction, the first transmission component 141 can drive the second transmission component 142 and the cleaning component 11 via the fitting part and the blocking wall that abut against each other to synchronously rotate in the second direction, to clean the working surface via the cleaning component 11. When the fitting part 144 moves along the guide rail to the blocking wall 1435 at the end of the lower stop point 1433, the second transmission component 142 drives the cleaning component 11 to the avoidance position. At this time, the blocking wall 1435 can stop the fitting part 144 from moving via a blocking force, to prevent the first transmission component from continuing to drive the second transmission component 142 to idle.

[0123] Specifically, as shown in FIG. 13, in one embodiment of the present disclosure, the guide rail further comprises horizontal sections 1432 arranged at the lower stop point 1433 and the upper stop point 1434, and the horizontal sections 1432 are configured to support the second transmission component 142 in an axial direction when the fitting part 144 is located at the horizontal section 1432. Thus, when the first transmission component rotates, and the fitting part 144 reaches the horizontal sections 1432 arranged at the lower stop point 1433 and the upper stop point 1434, the horizontal sections 1432 of the guide rail may support the second transmission component 142 in the axial direction. Specifically, as shown in FIG. 14, in cases where the guide rail is arranged on the outer surface of the first transmission

component 141, the fitting part 144 is arranged on the inner surface of the second transmission component 142, and the fitting part 144 is located above the guide rail, when the fitting part 144 reaches the horizontal section 1432 arranged at the lower stop point 1433, the horizontal section 1432 of the guide rail may support the second transmission component 142 in the axial direction, thereby ensuring that the cleaning component 11 can be kept in the avoidance position under the support of the horizontal section 1432, preventing the second transmission component 142 from sliding off the inclined section 1431 of the guide rail due to gravity, and preventing the cleaning component 11 from sliding from the avoidance position to the cleaning position. In other cases, the principles are similar, and descriptions thereof are omitted herein.

[0124] The fitting part 144 may also be in various forms. As shown in FIG. 8, in one embodiment of the present disclosure, the fitting part 144 is a protrusion, and the protrusion is configured to slide along the extending track 143. As shown in FIG. 12, in another embodiment of the present disclosure, the fitting part 144 is a cam, and the cam is configured to roll along the extending track 143, thereby effectively reducing resistance to the fitting part 144 when moving along the extending track 143.

[0125] Specifically, as shown in FIG. 8, in cases where the fitting part 144 is a cam and the extending track 143 is a guide rail, a wheel groove may also be formed on the guide rail, so that the cam can move along the wheel groove, to prevent the first transmission component 141 and the second transmission component 142 from sliding relative to each other in a radial direction, and ensure that the first transmission component 141 is coaxially aligned to the second transmission component 142.

[0126] Moreover, as shown in FIG. 13, in cases where the fitting part 144 is a cam, a groove may be formed on the fitting surface where the cam is mounted, to partially accommodate the cam, thereby ensuring the dimension of the cam and effectively reducing the radial dimension of the lifting-lowering unit 14.

[0127] As shown in FIGS. 11 and 12, in one embodiment of the present disclosure, the lifting-lowering unit 14 further comprises a compression spring 17 arranged between the second transmission component 142 and the driving unit 13. When the first transmission component 141 rotates in the first direction, the second transmission component 142 is configured to overcome at least the elastic force of the compression spring 17 to drive the cleaning component 11 to move to the avoidance position. When the first transmission component 141 rotates in the second direction, the fitting part 144 is configured to move along the extending track 143 to the upper stop point 1434, and the second transmission component 142 is configured to drive the cleaning component 11, at least under the elastic force of the compression spring 17, to move to the cleaning position. Thus, when the cleaning robot of the present disclosure cleans a vertical surface, the cleaning component 11 can be

driven to move to the cleaning position under the elastic force of the compression spring 17, and thus the cleaning component 11 is pressed tightly against the working surface by the compression spring 17, to improve the cleaning effect of the cleaning component 11 on the working surface.

[0128] When the working surface is a horizontal surface or a working surface forming an angle with the vertical surface, in one embodiment of the present disclosure, the cleaning robot is configured to be located on the working surface. When the first transmission component 141 rotates in the first direction, the second transmission component 142 is configured to overcome the elastic force of the compression spring 17 and the gravity of the second transmission component 142 and the gravity of the cleaning component 11 to drive the cleaning component 11 to move to the avoidance position. When the first transmission component 141 rotates in the second direction, the fitting part 144 is configured to move along the extending track 143 to the upper stop point 1434, and the second transmission component 142 is configured to drive the cleaning component 11, under the elastic force of the compression spring 17 and the gravity of the second transmission component 142 and the gravity of the cleaning component 11, to move to the cleaning position. Thus, the cleaning component 11 can be driven to move to the cleaning position under the elastic force of the compression spring 17 and the gravity of the second transmission component 142 and the gravity of the cleaning component 11, and thus the cleaning component 11 is pressed tightly against the working surface by the compression spring 17, which also improves the cleaning effect of the cleaning component 11 on the working surface.

[0129] As shown in FIGS. 7 and 11, in one embodiment of the present disclosure, the limiting shaft sleeve 151 is configured to be sleeved on the outer side of the second transmission component 142, and is rotatably connected to the driving unit 13 via a limiting bearing 152, and the limiting bearing 152 is configured to provide rotational resistance for the second transmission component 142. The limiting bearing 152 may be a load bearing, and the load bearing may bear an axial load and thus can withstand the gravity of the limiting shaft sleeve 151.

[0130] Since the limiting bearing 152 can provide the rotational resistance for the second transmission component 142, when the height of the cleaning component 11 needs to be adjusted, and the first transmission component 141 rotates, the limiting bearing 152 providing the rotational resistance for the second transmission component 142 can prevent the second transmission component 142 from being driven by the first transmission component 141 to idle; instead, the first transmission component 141 drives the second transmission component 142 to move up and down along the limiting shaft sleeve 151 first to reach the cleaning position or the avoidance position. After the second transmission component 142 and the cleaning component 11 move to the

cleaning position, the first transmission component 141 overcomes the rotational resistance of the limiting bearing 152 and drives the second transmission component 142 and the cleaning component 11 to rotate synchronously, so that the cleaning component 11 moves relative to the working surface and cleans the working surface.

[0131] Further, in one embodiment of the present disclosure, the limiting bearing 152 is configured to allow the second transmission component 142 to rotate only in the second direction. Namely, the limiting bearing 152 can prevent the second transmission component 142 from rotating in the first direction. Thus, when rotating in the first direction, the first transmission component 141 can drive the second transmission component 142 to move to the avoidance position. After the second transmission component 142 moves to the avoidance position, under the action of the limiting bearing 152, the first transmission component 141 cannot synchronously drive the second transmission component 142 to rotate in the first direction, thereby effectively preventing the second transmission component 142 and the cleaning component 11 from idling in the avoidance position.

[0132] In order to guide and fit the second transmission component 142 into the limiting shaft sleeve 151 in the axial direction, as shown in FIGS. 8 and 12, in one embodiment of the present disclosure, one of the outer surface of the second transmission component 142 and the inner surface of the limiting shaft sleeve 151 is provided with a limiting rib 161 extending axially, and the other is provided with a limiting groove 162 corresponding to the limiting rib 161 in position. The limiting rib 161 is configured to be guided and fitted in the limiting groove 162. Since the limiting rib 161 is configured to be guided and fitted in the limiting groove 162, the second transmission component 142 can be guided and fitted axially in the limiting shaft sleeve 151.

[0133] Specifically, as shown in FIGS. 8 and 12, in one embodiment of the present disclosure, the outer surface of the second transmission component 142 is provided with a limiting rib 161 extending axially, and the inner surface of the limiting shaft sleeve 151 is provided with a limiting groove 162 corresponding to the limiting rib 161 in position. In another embodiment of the present disclosure, the inner surface of the limiting shaft sleeve 151 is provided with a limiting rib 161 extending axially, and the outer surface of the second transmission component 142 is provided with a limiting groove 162 corresponding to the limiting rib 161 in position.

[0134] It can be understood that in cases where the extending track 143 only comprises the inclined section 1431, when the second transmission component 142 and the cleaning component 11 are in the avoidance position, the second transmission component 142 and the cleaning component 11 may rotate and slide off from the avoidance position to the cleaning position under the gravity of the second transmission component 142 and the gravity of the cleaning component 11 or the resistance of the compression spring 17.

[0135] In order to prevent the second transmission component 142 and the cleaning component 11 from rotating and sliding off from the avoidance position to the cleaning position, as shown in FIG. 7, in one embodiment of the present disclosure, the limiting shaft sleeve 151 is configured to, once the second transmission component 142 drives the cleaning component 11 to move to the avoidance position, overcome the gravity of the second transmission component 142 and the gravity of the cleaning component 11 via rotational resistance, so that the second transmission component 142 and the cleaning component 11 are kept in the avoidance position. The second transmission component 142 and the cleaning component 11 need to rotate in the first direction to slide off from the avoidance position to the cleaning position. Since the limiting bearing 152 can provide the rotational resistance, the second transmission component 142 and the cleaning component 11 can be prevented from rotating freely via the limiting shaft sleeve 151, thereby preventing the second transmission component 142 and the cleaning component 11 from rotating and sliding off from the avoidance position to the cleaning position under the gravity of the second transmission component 142 and the gravity of the cleaning component 11 or the resistance of the compression spring 17, and ensuring that the second transmission component 142 and the cleaning component 11 can be kept in the avoidance position.

[0136] In order to facilitate mounting of the limiting bearing 152 and the limiting shaft sleeve 151, as shown in FIGS. 7 and 11, in one embodiment of the present disclosure, a mounting chamber 134 is arranged on bottom of the housing 131. The first transmission component 141 is configured to be arranged in the mounting chamber 134, and an outer ring of the limiting bearing 152 is fixedly arranged on the inner wall of the mounting chamber 134. Since the mounting chamber 134 is arranged below the housing 131 and the outer ring of the limiting bearing 152 is fixedly arranged on the inner wall of the mounting chamber 134, the limiting bearing 152 and the limiting shaft sleeve 151 can be effectively sleeved on the outer side of the second transmission component 142. Moreover, since the first transmission component 141 is arranged in the mounting chamber 134 and the second transmission component 142 is partially arranged in the mounting chamber 134, during the working process of the cleaning component 11, the outer wall of the mounting chamber 134 can also prevent external dirt from splashing onto the first transmission component 141 and the second transmission component 142, thereby ensuring normal work of the lifting-lowering unit 14.

[0137] In order to further limit the position of the limiting shaft sleeve 151 and protect the first transmission component 141 and the second transmission component 142, as shown in FIG. 11, in one embodiment of the present disclosure, the cleaning component 11 is provided with an accommodating recess for accommodating the limiting shaft sleeve 151, and the limiting shaft sleeve 151 is configured to move up and down in the accom-

modating recess. Thus, since the cleaning component 11 is provided with the accommodating recess for accommodating the limiting shaft sleeve 151, radial movement of the cleaning component 11 can be effectively prevented, thereby ensuring that the cleaning component 11 and the output shaft 1331 are coaxially aligned. Moreover, the outer wall of the mounting chamber 134 and the limiting shaft sleeve 151 can jointly prevent external dirt from splashing onto the first transmission component 141 and the second transmission component 142, thereby further ensuring normal work of the lifting-lowering unit 14.

[0138] In one embodiment of the present disclosure, the cleaning robot of the present disclosure further comprises a locomotion assembly and a control unit. The locomotion assembly is configured to drive the cleaning robot to move on the working surface, and the control unit is configured to, when the cleaning robot moves to an area to be avoided, control the lifting-lowering unit 14 to drive the cleaning component 11 to move to the avoidance position. Specifically, the area to be avoided may include carpets or other work restricted areas set by users.

[0139] In one embodiment of the present disclosure, the cleaning robot of the present disclosure may pre-store a corresponding position of the area to be avoided by mapping in advance, manual input by users, or the like. When the cleaning robot reaches the area to be avoided, the control unit controls the lifting-lowering unit 14 to drive the cleaning component 11 to move to the avoidance position, thereby avoiding carpet contamination or other mis-operation situations. In another embodiment of the present disclosure, a detection sensor for detecting restricted work areas such as carpets may be arranged on the cleaning robot; when the detection sensor detects that the cleaning robot is about to move to a restricted work area such as a carpet, the control unit can control the lifting-lowering unit 14 to drive the cleaning component 11 to move to the avoidance position, thereby avoiding carpet contamination or other mis-operation situations.

[0140] The present disclosure further provides a cleaning assembly 10. The cleaning assembly 10 is configured to be pivotally connected as a whole to the body 30 of the cleaning robot, and a reset elastic component 20 is arranged between the body 30 and the cleaning assembly 10. The cleaning assembly 10 is configured to move relative to the body 30 under the action of an external force, and to reset under the action of the reset elastic component 20 once the external force disappears.

[0141] The cleaning assembly 10 comprises a cleaning mechanism 1 and a movement mechanism 2. The cleaning mechanism 1 comprises the cleaning component 11. The movement mechanism 2 is configured to drive the cleaning assembly 10 to move between a first position and a second position. When in the first position, the edge of the cleaning component 11 is within a range of the edge of the body 30. When in the second position, at

least a part of the edge of the cleaning component 11 extends beyond the edge of a locomotion range of the body 30.

[0142] Thus, in a normal cleaning mode, the cleaning assembly 10 is in the first position, the edge of the cleaning component 11 is within the range of the edge of the body 30, and thus, the cleaning assembly 10 may not be stuck by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body 30 cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly 10 of the present disclosure moves to the second position, the cleaning range of the cleaning component 11 can extend beyond the edge of the locomotion range of the body 30, thereby completely cleaning corner positions where the body 30 cannot fit.

[0143] When the cleaning component 11 extends to the outside from the body 30, or collides with an obstacle by the side of the body 30, or when an obstacle lower than the bottom surface of the body 30 appears in front of the cleaning robot and the cleaning component 11 collides with the obstacle, the cleaning assembly 10 can pivot as a whole relative to the body 30 under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component 20 attenuates the impact force and reduces the impact force on the cleaning assembly 10. Once the cleaning assembly 10 passes through the obstacle, the reset elastic component 20 can automatically drive the cleaning assembly 10 to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

Application scenario I

[0144] The present disclosure provides a cleaning robot, which may be a floor sweeping robot, a floor mopping robot, a floor sweeping and mopping integrated robot, and the like for cleaning floors, or a window cleaning robot used for cleaning windows or glass curtain walls.

[0145] The cleaning robot comprises at least a body 30 and a cleaning assembly 10. The cleaning assembly 10 comprises a driving unit 13, a cleaning component 11, and a lifting-lowering unit 14. The lifting-lowering unit 14 comprises a first transmission component 141 and a second transmission component 142. The first transmission component 141 is fixedly connected to an output shaft 1331 of the driving unit 13, to be controlled by the output shaft 1331 to rotate. The second transmission component 142 is configured to be fixedly connected to the cleaning component 11, rotatably connected to the driving unit 13 via a limiting shaft sleeve 151, and axially guided and fitted in the limiting shaft sleeve 151.

[0146] One of the first transmission component 141 and the second transmission component 142 is provided with a fitting part 144, and the other is provided with an extending track 143. The extending track 143 comprises

an inclined section 1431 obliquely extending in a height direction along a lateral wall of the first transmission component 141 or the second transmission component 142. The first transmission component 141 is configured to, during rotation, make the fitting part 144 move along the extending track 143 to drive the second transmission component 142 to move in a height direction between a cleaning position and an avoidance position.

[0147] Thus, during the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the driving assembly may drive the first transmission component 141 to rotate to drive the second transmission component 142 to move downward in the height direction relative to the limiting shaft sleeve 151 to the cleaning position, and then drive the second transmission component 142 to rotate relative to the body 30, thereby driving the cleaning component 11 to move relative to the working surface to clean the working surface. When it needs to avoid a working surface such as a carpet or to avoid an obstacle such as a threshold, the driving assembly may drive the first transmission component 141 to rotate to drive the second transmission component 142 to move upward in the height direction to the avoidance position, thereby preventing the cleaning component 11 from coming into contact with the working surface to be avoided such as the carpet or the obstacle such as the threshold, preventing contamination of the working surface to be avoided such as the carpet, and also protecting the cleaning component 11 from collision and damage.

[0148] It can be seen that when the cleaning robot of the present disclosure faces different cleaning scenarios, the driving unit 13 can effectively drive the cleaning component 11 via the lifting-lowering unit 14 to move in the height direction between the cleaning position and the avoidance position, to cope with the different cleaning scenarios. Moreover, the cleaning assembly 10 of the present disclosure can drive the cleaning component 11 to move up and down and rotate relative to the working surface simply via the driving assembly, without the need for a separate structure for driving the cleaning component 11 to move up and down. Thus, the cleaning assembly 10 has a compact overall structure, high integration level, and small occupied space.

Application scenario II

[0149] The present disclosure provides a cleaning robot, which may be a floor sweeping robot, a floor mopping robot, a floor sweeping and mopping integrated robot, and the like for cleaning floors, or a window cleaning robot used for cleaning windows or glass curtain walls.

[0150] The cleaning robot comprises at least a body 30, a cleaning assembly 10, and a reset elastic component 20. The cleaning assembly 10 is pivotally connected as a whole to the body 30, and comprises a cleaning mechanism 1 and a movement mechanism 2. The cleaning mechanism 1 comprises the cleaning component 11.

The movement mechanism 2 is configured to drive the cleaning assembly 10 to move between a first position and a second position. When in the first position, the edge of the cleaning component 11 is within a range of the edge of the body 30. When in the second position, at least a part of the edge of the cleaning component 11 extends beyond the edge of a locomotion range of the body 30. Specifically, the cleaning component 11 is arranged at the bottom of the body 30, and can move relative to a working surface to clean the working surface.

[0151] During the working process of the cleaning robot of the present disclosure, in a normal cleaning mode, the cleaning assembly 10 is in the first position, the edge of the cleaning component 11 is within the range of the edge of the body 30, and thus, the cleaning assembly 10 may not be stuck by furniture or other objects on the floor during the working process. Due to a limited accuracy of an edge sensor of the cleaning robot, the body 30 cannot closely fit with wall corners, furniture legs, window frames, and the like in areas to be cleaned. However, when the cleaning assembly 10 of the present disclosure moves to the second position, the cleaning range of the cleaning component 11 can extend beyond the edge of the locomotion range of the body 30, thereby completely cleaning corner positions where the body 30 cannot fit.

[0152] In the cleaning robot of the present disclosure, the reset elastic component 20 is arranged between the body 30 and the cleaning assembly 10. The cleaning assembly 10 is pivotally connected as a whole to the body 30, and is configured to move relative to the body 30 under the action of an external force, and to reset under the action of the reset elastic component 20 once the external force disappears.

[0153] Thus, when the cleaning component 11 extends to the outside from the body 30 and collides with an obstacle by the side of the body 30, or when an obstacle lower than the bottom surface of the body 30 appears in front of the cleaning robot and the cleaning component 11 collides with the obstacle, the cleaning assembly 10 can rotate as a whole relative to the body 30 under the action of an external force, thereby avoiding the obstacle. Additionally, the reset elastic component 20 attenuates the impact force and reduces the impact force on the cleaning assembly 10. Once the cleaning assembly 10 passes through the obstacle, the reset elastic component 20 can automatically drive the cleaning assembly 10 to reset via an elastic force, thereby ensuring that the cleaning robot continues the cleaning and effectively improving the user experience.

[0154] Specifically, when the cleaning component 11 is in the second position, the cleaning component 11 is configured to overcome the force of the reset elastic component 20 and move towards the inside of the body 30 under the action of an external force, and to reset once the external force disappears.

[0155] As described above, in order to completely clean the corner positions where the body 30 cannot

fit, when the cleaning assembly 10 moves to the second position and the cleaning component 11 collides with the obstacle by the outer side of the body 30, the cleaning assembly 10 can overcome the force of the reset elastic component 20 and move towards the inside of the body 30 under the action of an external force to avoid the obstacle, and the reset elastic component 20 attenuates the impact force and reduces the impact force on the cleaning assembly 10. Once the cleaning assembly 10 passes through the obstacle and the external force disappears, the reset elastic component 20 can automatically drive the cleaning assembly 10 to reset to the second position via the elastic force, thereby continuing to clean the corner positions where the body 30 cannot fit, ensuring that the cleaning robot can work normally, and effectively improving the user experience.

[0156] The embodiments of the present disclosure have been described above, the above descriptions are exemplary, not exhaustive, and the present disclosure is not limited to the disclosed embodiments. Without deviating from the scope and spirit of the embodiments described, it would be obvious for those of ordinary skilled in the art to make many modifications and changes. The selection of terms used herein is intended to best explain the principles, practical applications, or technological improvements in the market 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 appended claims.

Claims

1. A cleaning robot, comprising a body (30) and a cleaning assembly (10), the cleaning assembly (10) comprising a driving unit (13), a cleaning component (11), and a lifting-lowering unit (14), the lifting-lowering unit (14) comprising:

a first transmission component (141), the first transmission component (141) being fixedly connected to an output shaft (1331) of the driving unit (13), to be controlled by the output shaft (1331) to rotate; and

a second transmission component (142), the second transmission component (142) being configured to be fixedly connected to the cleaning component (11), rotatably connected to the driving unit (13) via a limiting shaft sleeve (151), and the second transmission component (142) being configured to be axially guided and fitted in the limiting shaft sleeve (151);

wherein one of the first transmission component (141) and the second transmission component (142) is provided with a fitting part (144), and the other is provided with an extending track (143); the extending track (143) comprises an inclined section (1431) extending obliquely in a height

- direction along a lateral wall of the first transmission component (141) or the second transmission component (142); and the first transmission component (141) is configured to, during rotation, make the fitting part (144) move along the extending track (143) to drive the second transmission component (142) to move in the height direction between a cleaning position and an avoidance position.
2. The cleaning robot according to claim 1, wherein the extending track (143) has a lower stop point (1433) and an upper stop point (1434); in a process of the first transmission component (141) rotating in a first direction, the fitting part (144) is configured to move along the extending track (143) to the lower stop point (1433), and the second transmission component (142) is configured to drive the cleaning component (11) to move to the avoidance position; in a process of the first transmission component (141) rotating in a second direction, the fitting part (144) is configured to move along the extending track (143) to the upper stop point (1434), and the second transmission component (142) is configured to drive the cleaning component (11) to move to the cleaning position; and in the cleaning position, the first transmission component (141) is configured to drive the second transmission component (142) and the cleaning component (11) to rotate synchronously in the second direction, to clean a working surface via the cleaning component (11).
 3. The cleaning robot according to claim 2, wherein the extending track (143) is a guide slot formed on a fitting surface of the first transmission component (141) or the second transmission component (142), and the fitting part (144) is configured to move along the guide slot between the lower stop point (1433) and the upper stop point (1434) of the guide slot.
 4. The cleaning robot according to claim 3, wherein the guide slot perforates a lateral side of the first transmission component (141) or a lateral side of the second transmission component (142).
 5. The cleaning robot according to claim 2, wherein the extending track (143) is a guide rail protruding from a fitting surface of the first transmission component (141) or the second transmission component (142), a blocking wall (1435) is arranged at both an end of the lower stop point (1433) and an end of the upper stop point (1434) of the guide rail, and the blocking walls (1435) are configured to prevent the fitting part (144) from moving further.
 6. The cleaning robot according to claim 5, wherein the guide rail further comprises horizontal sections (1432) arranged at the lower stop point (1433) and the upper stop point (1434), and the horizontal sections (1432) are configured to support the second transmission component (142) in an axial direction when the fitting part (144) is located at the horizontal sections (1432).
 7. The cleaning robot according to claim 2, wherein the fitting part (144) is a protrusion or a cam, the protrusion is configured to slide along the extending track (143), and the cam is configured to roll along the extending track (143).
 8. The cleaning robot according to claim 2, wherein the lifting-lowering unit (14) further comprises a compression spring (17) arranged between the second transmission component (142) and the driving unit (13);
in the process of the first transmission component (141) rotating in the first direction, the second transmission component (142) is configured to overcome at least an elastic force of the compression spring (17) to drive the cleaning component (11) to move to the avoidance position; and
in the process of the first transmission component (141) rotating in the second direction, the fitting part (144) is configured to move along the extending track (143) to the upper stop point (1434), and the second transmission component (142) is configured to drive the cleaning component (11), at least under the elastic force of the compression spring (17), to move to the cleaning position.
 9. The cleaning robot according to claim 8, wherein the cleaning robot is configured to be located above the working surface;
in the process of the first transmission component (141) rotating in the first direction, the second transmission component (142) is configured to overcome the elastic force of the compression spring (17) and a gravity of the second transmission component (142) and a gravity of the cleaning component (11) to drive the cleaning component (11) to move to the avoidance position; and
in the process of the first transmission component (141) rotating in the second direction, the fitting part (144) is configured to move along the extending track (143) to the upper stop point (1434), and the second transmission component (142) is configured to drive the cleaning component (11), under the elastic force of the compression spring (17) and the gravity of the second transmission component (142) and the gravity of the cleaning component (11), to move

to the cleaning position.

10. The cleaning robot according to claim 2, wherein the limiting shaft sleeve (151) is configured to be sleeved on an outer side of the second transmission component (142), and is rotatably connected to the driving unit (13) via a limiting bearing (152), and the limiting bearing (152) is configured to provide rotational resistance in the first direction and the second direction for the second transmission component (142).
11. The cleaning robot according to claim 10, wherein the limiting bearing (152) is configured to allow the second transmission component (142) to rotate only in the second direction.
12. The cleaning robot according to claim 10, wherein one of an outer surface of the second transmission component (142) and an inner surface of the limiting shaft sleeve (151) is provided with a limiting rib (161) extending axially, the other is provided with a limiting groove (162) corresponding to the limiting rib (161) in position, and the limiting rib (161) is configured to be guided and fitted in the limiting groove (162).
13. The cleaning robot according to claim 10, wherein the limiting shaft sleeve (151) is configured to, once the second transmission component (142) drives the cleaning component (11) to move to the avoidance position, overcome the gravity of the second transmission component (142) and the gravity of the cleaning component (11) via the rotational resistance, so that the second transmission component (142) and the cleaning component (11) are kept in the avoidance position.
14. The cleaning robot according to claim 10, wherein the driving unit (13) comprises a cleaning motor (132), a reduction gearbox (133), and a housing (131); the cleaning motor (132) and the reduction gearbox (133) are arranged in the housing (131); a rotating shaft of the cleaning motor (132) is fixedly connected to an input shaft of the reduction gearbox (133); the first transmission component (141) is fixedly connected to the input shaft of the reduction gearbox (133); a mounting chamber (134) is arranged below the housing (131); the first transmission component (141) is configured to be arranged in the mounting chamber (134); and an outer ring of the limiting bearing (152) is fixedly arranged on an inner wall of the mounting chamber (134).
15. The cleaning robot according to any one of claims 1-14, further comprising a locomotion assembly and a control unit, wherein the locomotion assembly is configured to drive the cleaning robot to move on the working surface, and the control unit is configured to,

when the cleaning robot moves to an area to be avoided, control the lifting-lowering unit (14) to drive the cleaning component (11) to move to the avoidance position.

16. The cleaning robot according to any one of claims 1-14, wherein the cleaning assembly (10) is pivotally connected as a whole to the body (30), and comprises a cleaning mechanism (1) and a movement mechanism (2); the cleaning mechanism (1) comprises the cleaning component (11); the movement mechanism (2) is configured to drive the cleaning assembly (10) to move between a first position and a second position; when in the first position, an edge of the cleaning component (11) is within a range of an edge of the body (30); when in the second position, at least a part of the edge of the cleaning component (11) extends beyond the edge of a locomotion range of the body (30); and the cleaning robot further comprises a reset elastic component (20); the reset elastic component (20) is arranged between the body (30) and the cleaning assembly (10); and the cleaning assembly (10) is configured to move relative to the body (30) under an action of an external force, and to reset under an action of the reset elastic component (20) once the external force disappears.
17. The cleaning robot according to claim 16, wherein when the cleaning component (11) is in the second position, the cleaning component (11) is configured to, under the action of the external force, overcome the force of the reset elastic component (20) and move towards an inside of the body (30), and to reset once the external force disappears.
18. The cleaning robot according to claim 17, wherein the movement mechanism (2) comprises a rotating shaft (21) and a rotating motor (22), the rotating shaft (21) is rotatably connected to the body (30), the cleaning assembly (10) is fixed to the rotating shaft (21), and the rotating motor (22) is configured to drive the rotating shaft (21) to rotate to drive the cleaning assembly (10) to move on an arc between the first position and the second position relative to the body (30).
19. The cleaning robot according to claim 18, wherein an output shaft (1331) of the rotating motor (22) is parallel to the rotating shaft (21), a driving wheel (23) is arranged at a top end of the output shaft (1331), a driven wheel (24) is arranged at a top end of the rotating shaft (21), and the driving wheel (23) is in transmission connection with the driven wheel (24).
20. The cleaning robot according to claim 18, wherein the movement mechanism (2) further comprises a

pivot bracket (25), the pivot bracket (25) is pivotally connected to the body (30), the rotating motor (22) is fixedly arranged on the pivot bracket (25), and the rotating shaft (21) is rotatably connected to the pivot bracket (25).

21. The cleaning robot according to claim 20, wherein the reset elastic component (20) is a torsion spring that is sleeved on the pivot bracket (25), one end of the torsion spring abuts against the pivot bracket (25), and the other end abuts against the body (30). 10
22. The cleaning robot according to claim 20, wherein the cleaning mechanism (1) is provided with a connecting part (12), a fixing hole is arranged on the connecting part (12), the rotating shaft (21) passes through the fixing hole, and the connecting part (12) abuts against the top of the pivot bracket (25). 15
23. The cleaning robot according to claim 20, wherein an accommodating chamber is arranged at the bottom of the pivot bracket (25), a fixed shaft (26) that is fixedly connected to the body (30) is arranged in the accommodating chamber, and a lower bearing (28) is arranged between the fixed shaft (26) and an inner wall of the accommodating chamber. 20 25
24. The cleaning robot according to claim 23, wherein the rotating shaft (21) and the fixed shaft (26) are coaxially arranged, and the cleaning component (11) is configured to, under the action of the external force, make the entire cleaning assembly (10) move between the first position and the second position. 30
25. The cleaning robot according to claim 16, wherein the cleaning mechanism (1) comprises a housing (131) and a cleaning motor (132) located in the housing (131), and an output shaft (1331) of the cleaning motor (132) is in transmission connection with the cleaning component (11) and is configured to drive the cleaning component (11) to rotate on the working surface to clean the working surface. 35 40
26. The cleaning robot according to claim 25, wherein a reduction mechanism is arranged in the housing (131), and the output shaft (1331) of the cleaning motor (132) is in transmission connection with the cleaning component (11) via the reduction mechanism. 45 50
27. The cleaning robot according to claim 26, wherein the body (30) has an inner chamber (31); an arc-shaped through hole (32) is arranged at the bottom of the body (30); the cleaning assembly (10) is mounted in the inner chamber (31) of the body (30); an output end of the reduction mechanism passes through the arc-shaped through hole (32) to connect with the cleaning component (11); and the cleaning compo- 55

nent (11) is configured to move under constraint of the arc-shaped through hole (32).

28. The cleaning robot according to claim 25, wherein the cleaning assembly (10) is mounted on the body (30) in a form of a module. 5
29. The cleaning robot according to claim 16, wherein the cleaning component (11) is a movable mop plate, and at least one movable mop plate is arranged on the body (30). 10

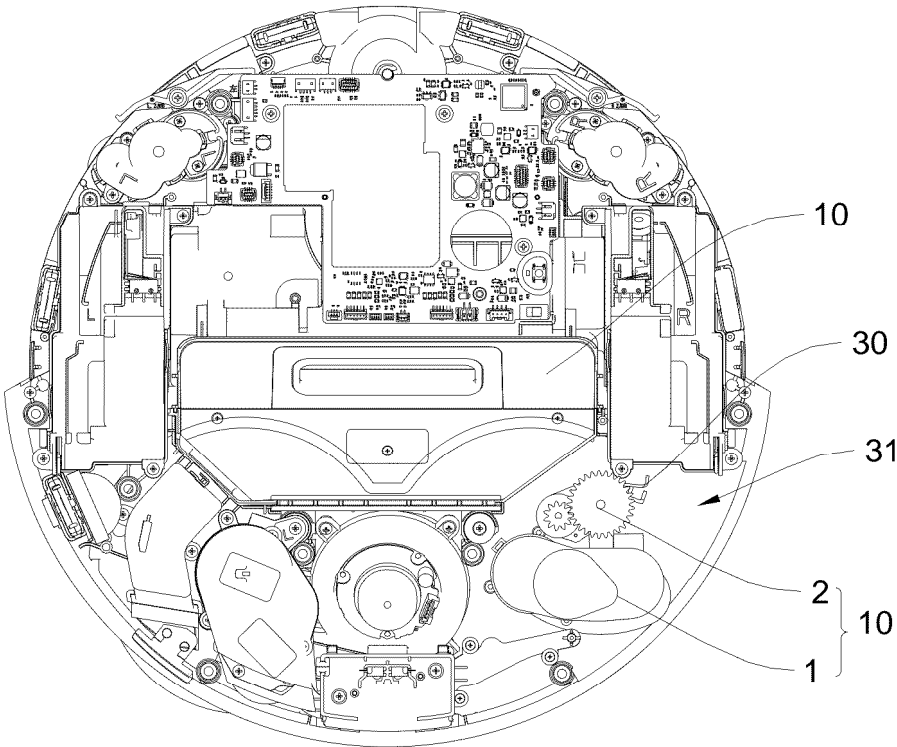


FIG. 1

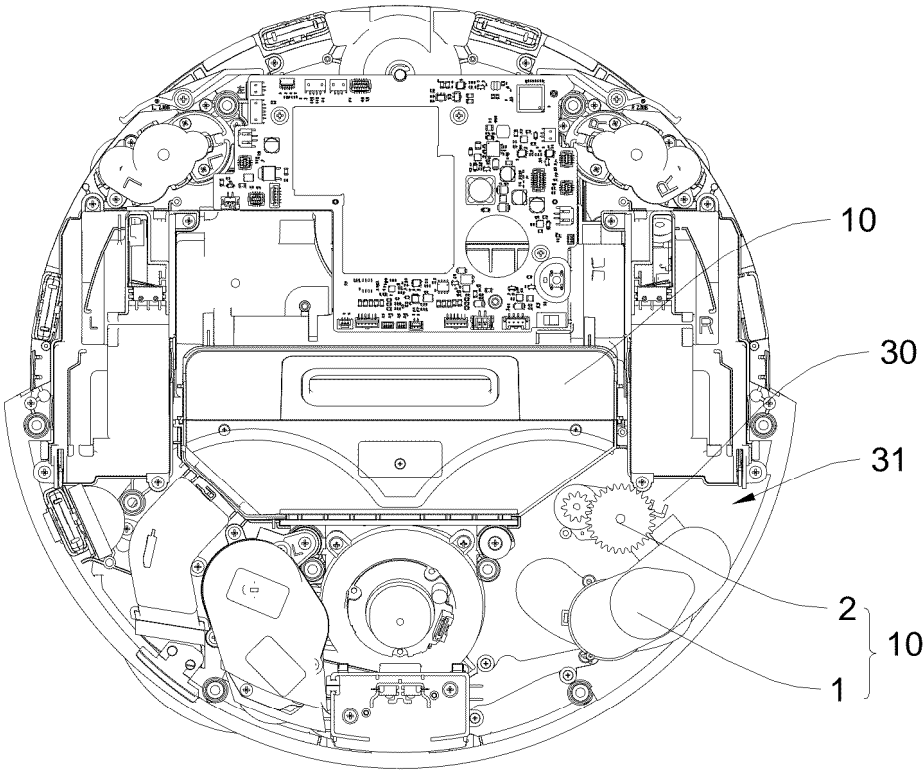


FIG. 2

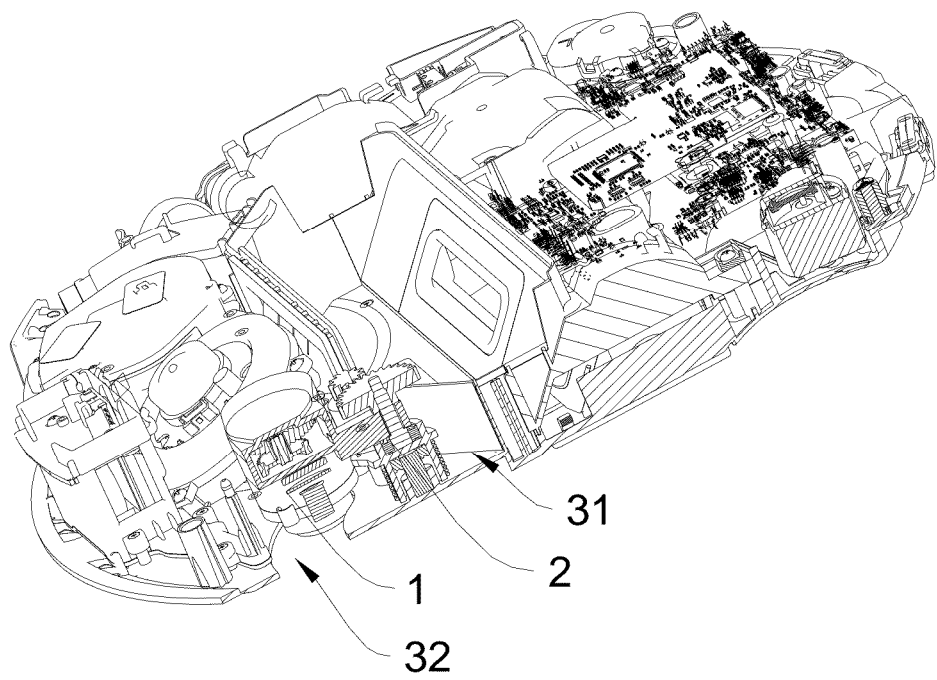


FIG. 3

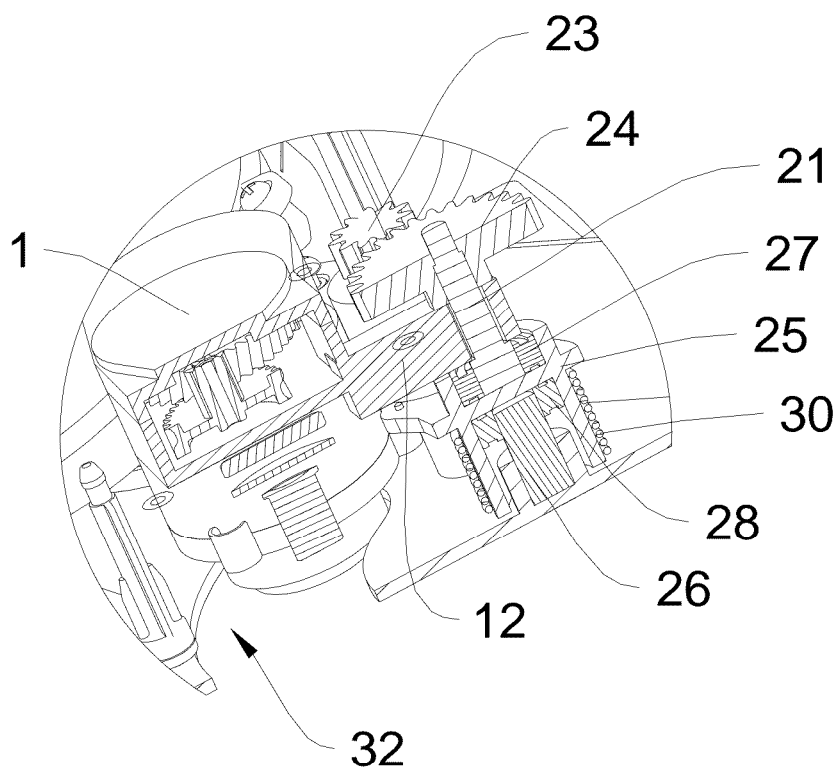


FIG. 4

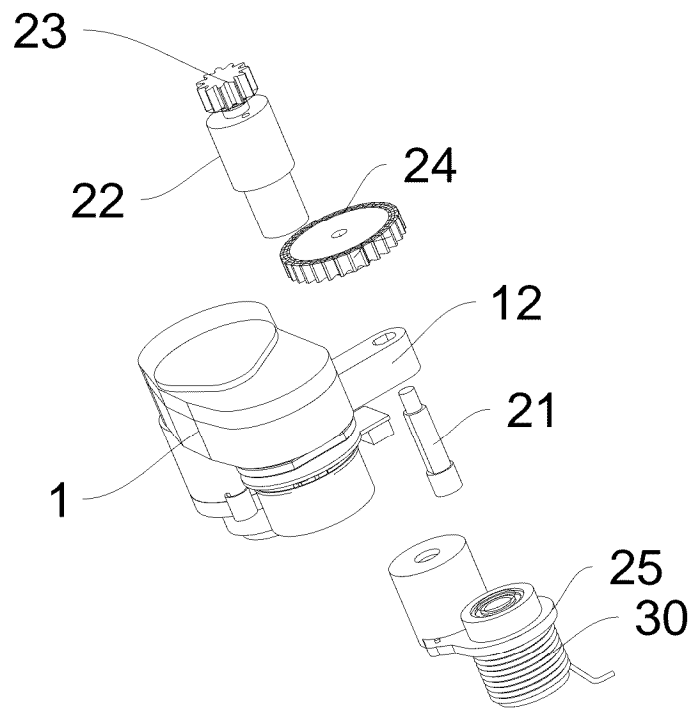


FIG. 5

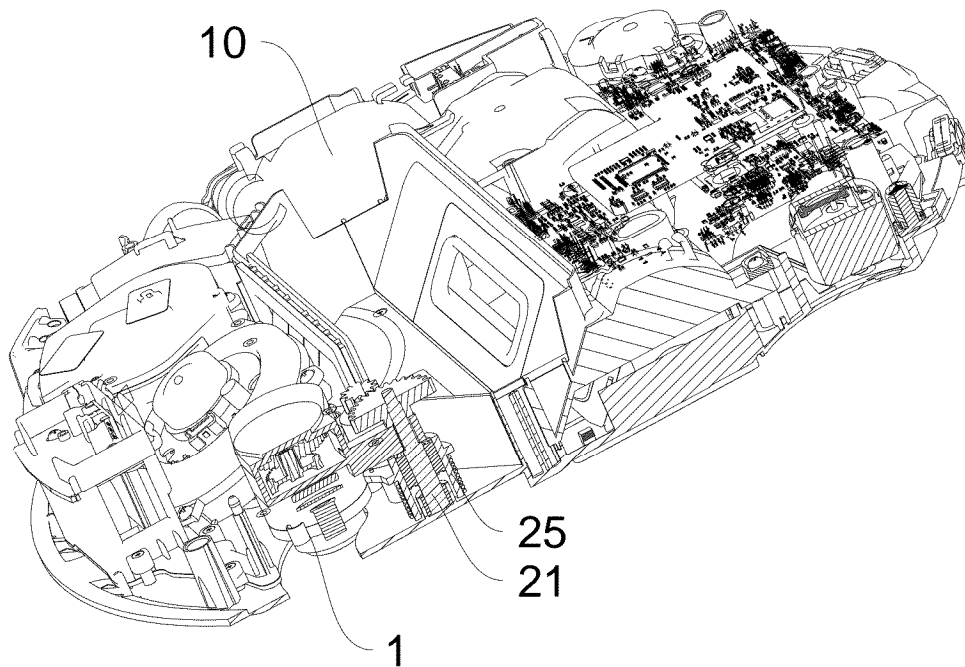


FIG. 6

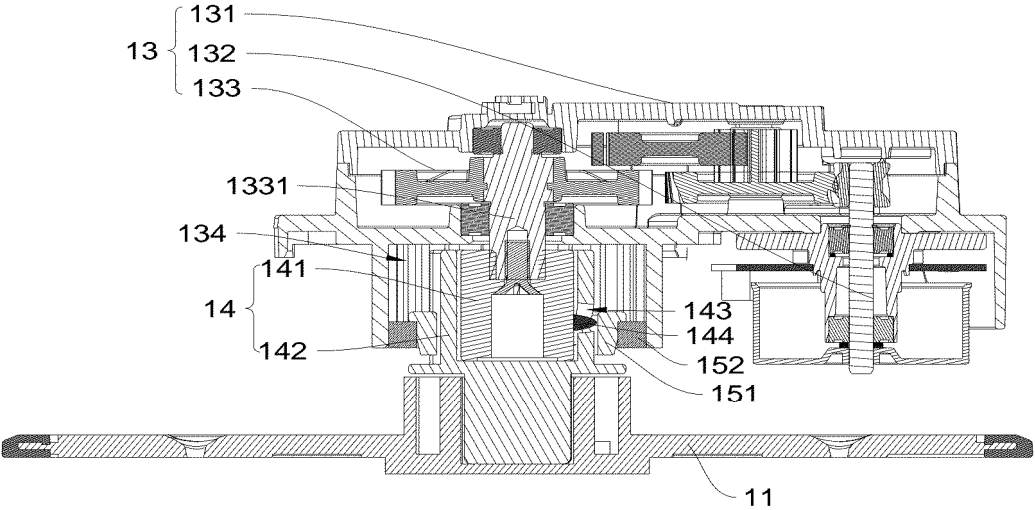


FIG. 7

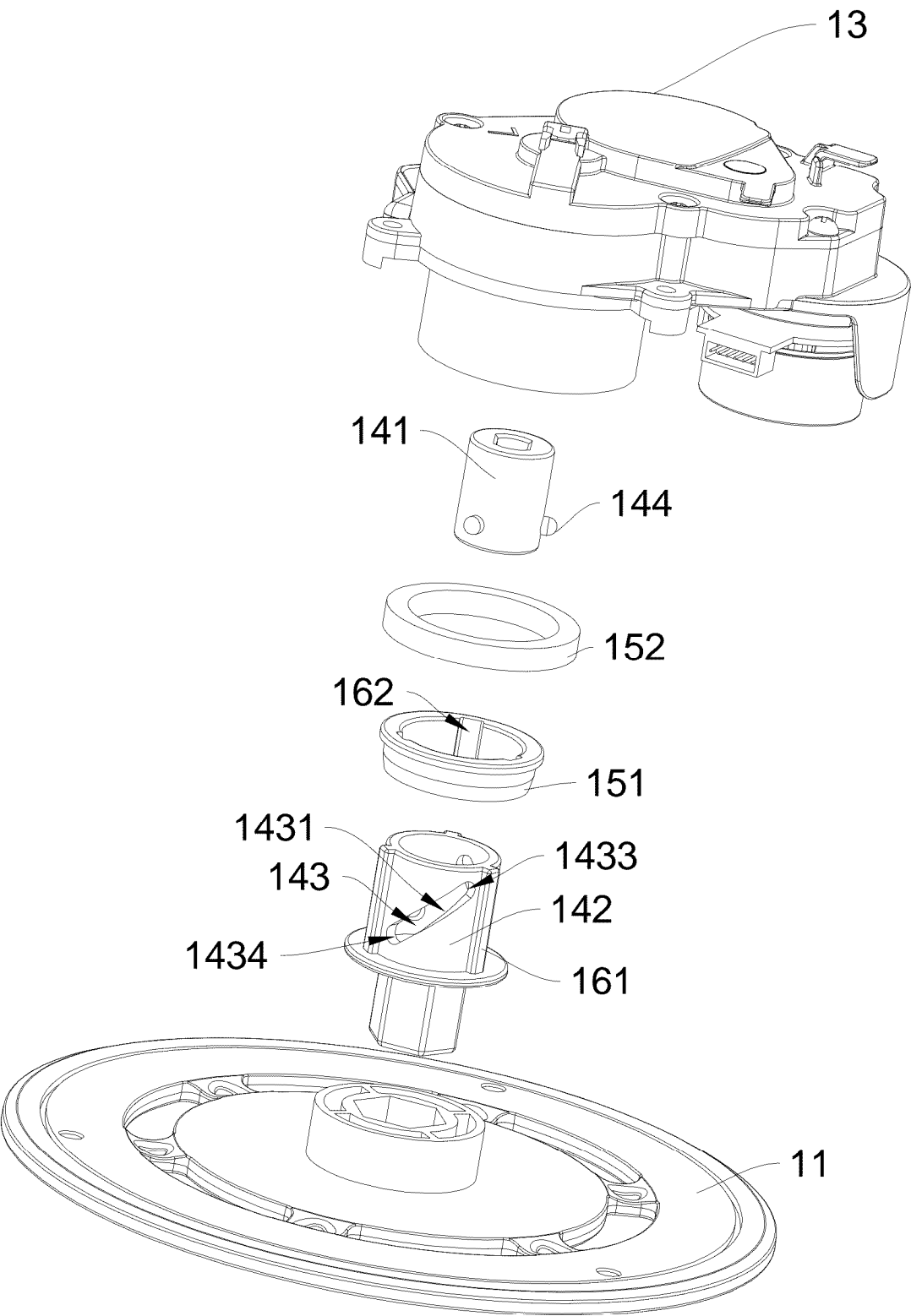


FIG. 8

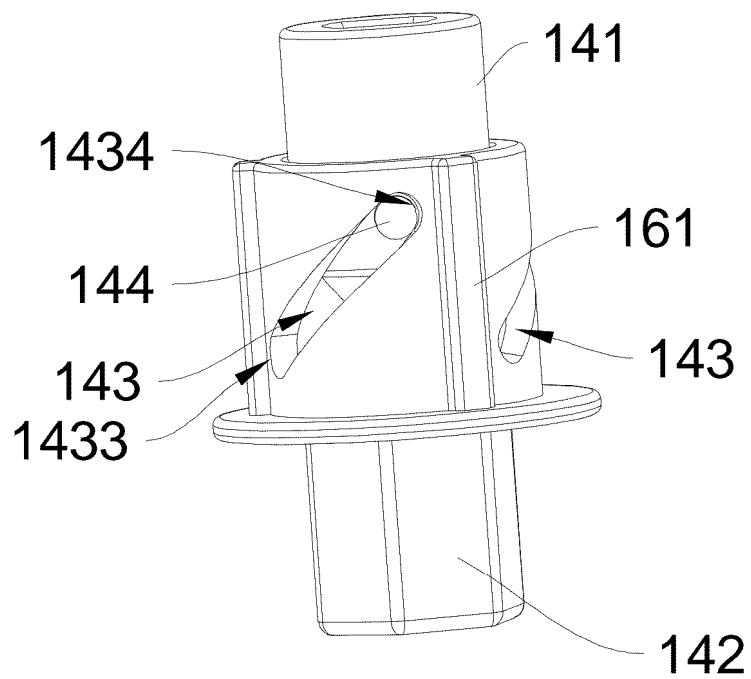


FIG. 9

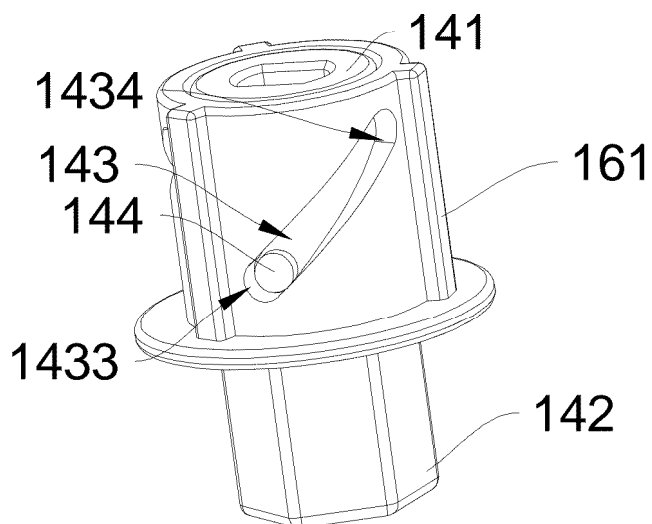


FIG. 10

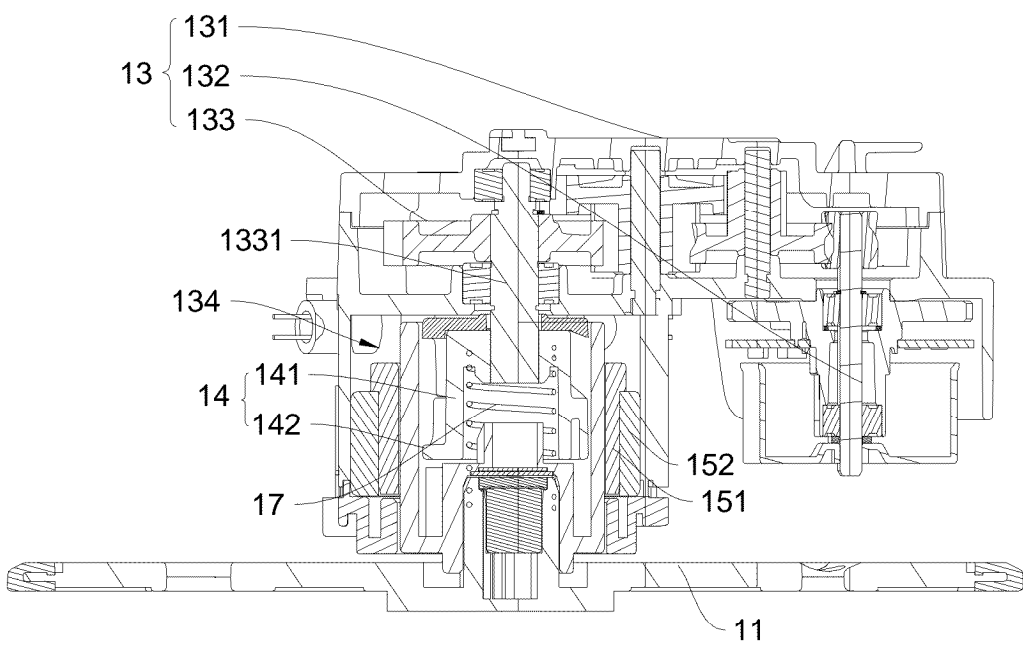


FIG. 11

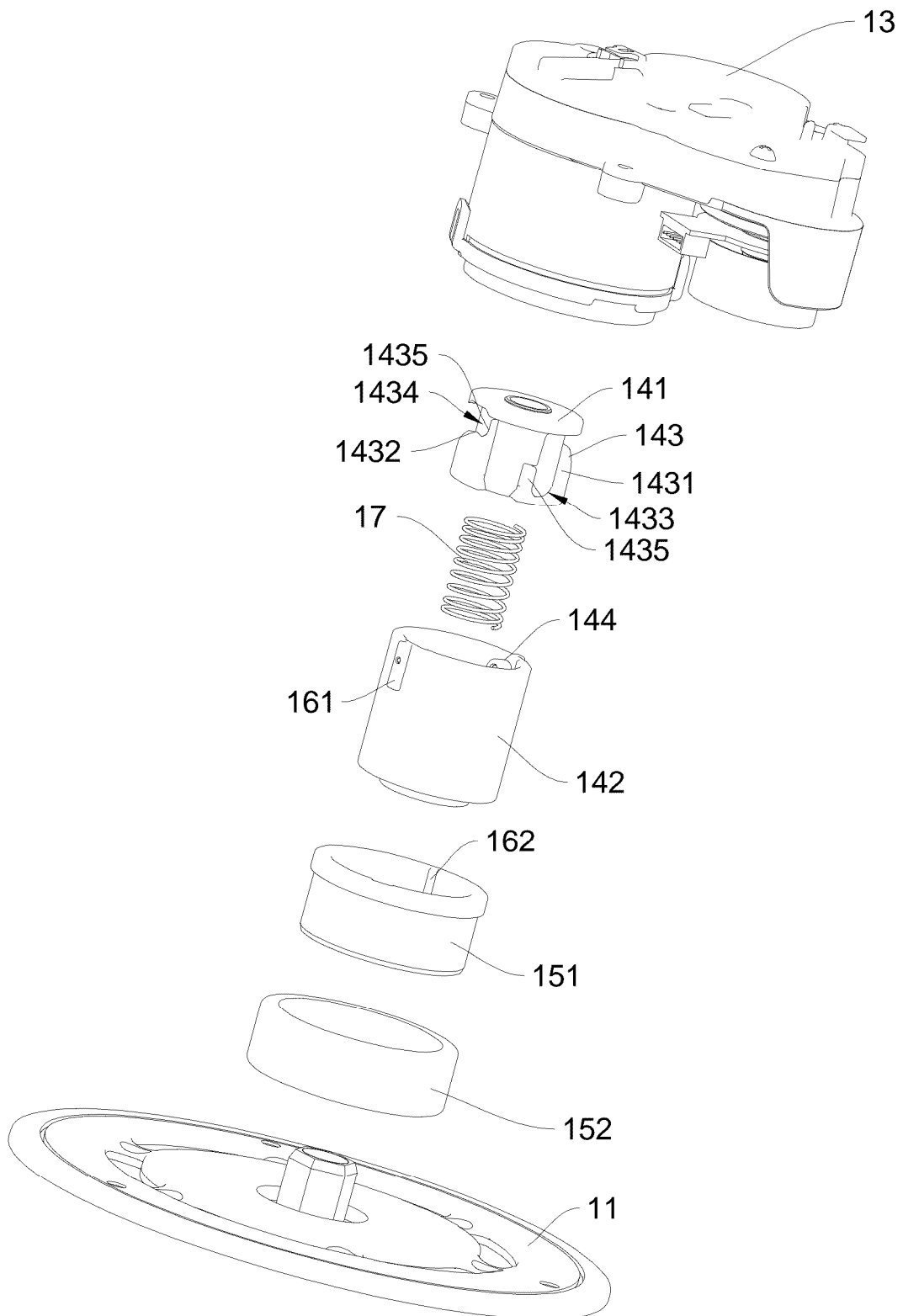


FIG. 12

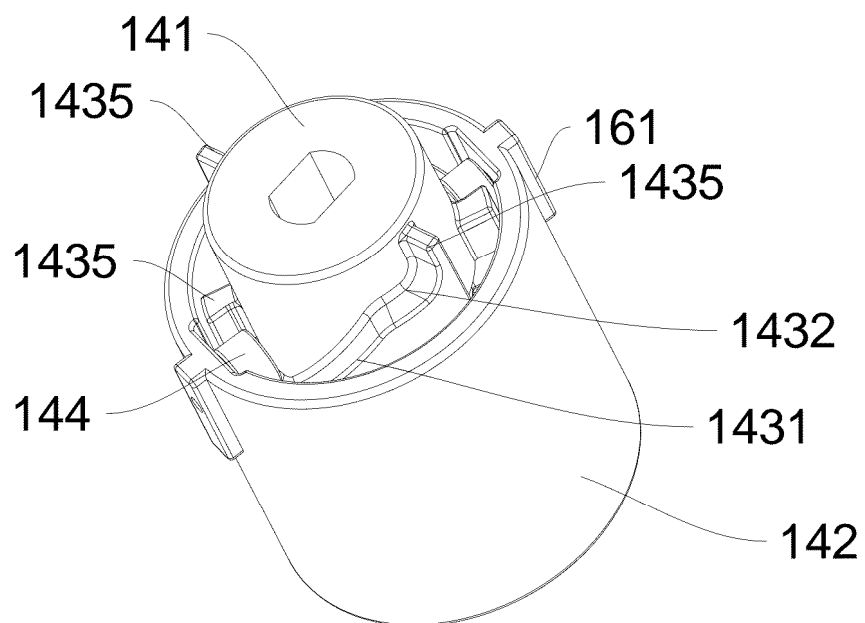


FIG. 13

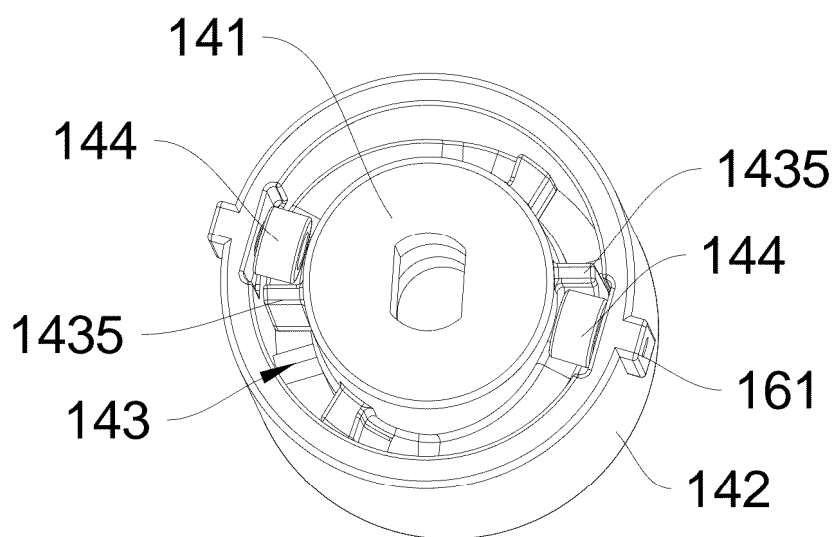


FIG. 14

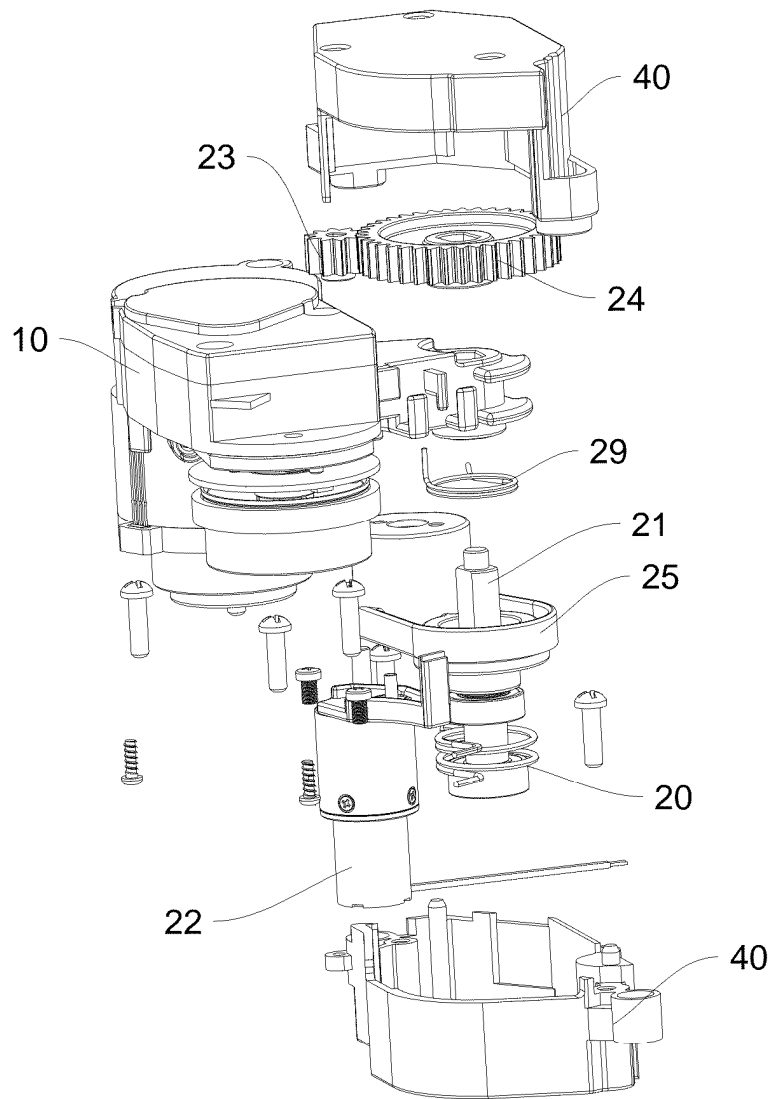


FIG. 15

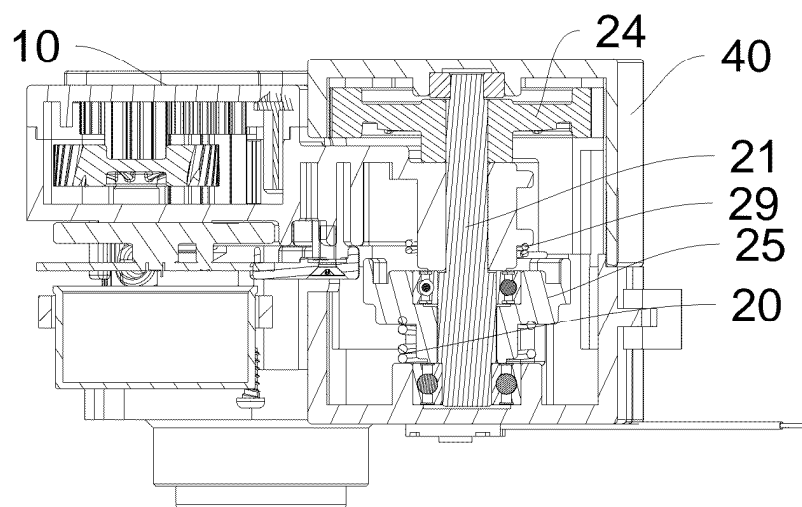


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/100712

A. CLASSIFICATION OF SUBJECT MATTER

A47L11/32(2006.01)i; A47L11/38(2006.01)i; A47L11/24(2006.01)i; A47L1/02(2006.01)i; A47L11/00(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:A47L

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; CNKI; ENTXTC; VEN; USTXT; EPTXT; WOTXT: 升降, 转动, 污染, 倾斜, 轨道, 抬起, 升起, 弄脏, 损坏, 边缘, 墙, 壁, 边, 角, 腿, 超出, 伸出, 移, 障碍, 碰撞, 阻碍, 外力, 弹性, 弹簧, 复位, 缓冲, 区域, 范围, 覆盖, 清洁, 清扫, 擦拭, 地毯, cover+, over+, up, lift+, wall, corner, dirty, clean+, sweeper, pollution, position, side, outward, carpet, rug

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 215838764 U (DREAME INNOVATION TECHNOLOGY (SUZHOU) CO., LTD.) 18 February 2022 (2022-02-18) description, paragraphs [0003]-[0109], and figures 1-5	1-15
Y	CN 215838764 U (DREAME INNOVATION TECHNOLOGY (SUZHOU) CO., LTD.) 18 February 2022 (2022-02-18) description, paragraphs [0003]-[0109], and figures 1-5	16-29
Y	CN 103027634 A (SAMSUNG ELECTRONICS CO., LTD.) 10 April 2013 (2013-04-10) description, paragraphs [0009]-[0139], and figures 1-16	16-29
X	CN 113749574 A (TP-LINK TECHNOLOGIES CO., LTD.) 07 December 2021 (2021-12-07) description, paragraphs [0005]-[0073], and figures 1-9	1-15
Y	CN 113749574 A (TP-LINK TECHNOLOGIES CO., LTD.) 07 December 2021 (2021-12-07) description, paragraphs [0005]-[0073], and figures 1-9	16-29
A	CN 115251772 A (ECOVACS ROBOTICS CO., LTD.) 01 November 2022 (2022-11-01) entire document	1-29

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 29 July 2024	Date of mailing of the international search report 17 August 2024
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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/100712

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20090033608 A (SAMSUNG ELECTRONICS CO., LTD.) 06 April 2009 (2009-04-06) entire document	1-29
A	CN 217744249 U (DREAME INNOVATION TECHNOLOGY (SUZHOU) CO., LTD.) 08 November 2022 (2022-11-08) entire document	1-29

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2024/100712

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	215838764	U	18 February 2022	None			
CN	103027634	A	10 April 2013	None			
CN	113749574	A	07 December 2021	None			
CN	115251772	A	01 November 2022	None			
KR	20090033608	A	06 April 2009	KR	101249864	B1	02 April 2013
CN	217744249	U	08 November 2022	None			

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202311188714 [0001]
- CN 202311188736 [0001]