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(54) CLEANING ROBOT

(57) A cleaning robot, comprising: a machine body (10); and a cleaning system (20). The cleaning system (20) is disposed on the machine body (10), and the cleaning system (20) comprises a cleaning head (21), an auxiliary cleaning head (23) and a liquid supply part (22), wherein the liquid supply part (22) feeds a cleaning liquid into the cleaning head (21) and the auxiliary cleaning head (23), so that a surface to be cleaned can be reliably cleaned by means of the cleaning head (21) and the auxiliary cleaning head (23), thereby improving the cleaning capability of the cleaning robot and improving the use performance of the cleaning robot.

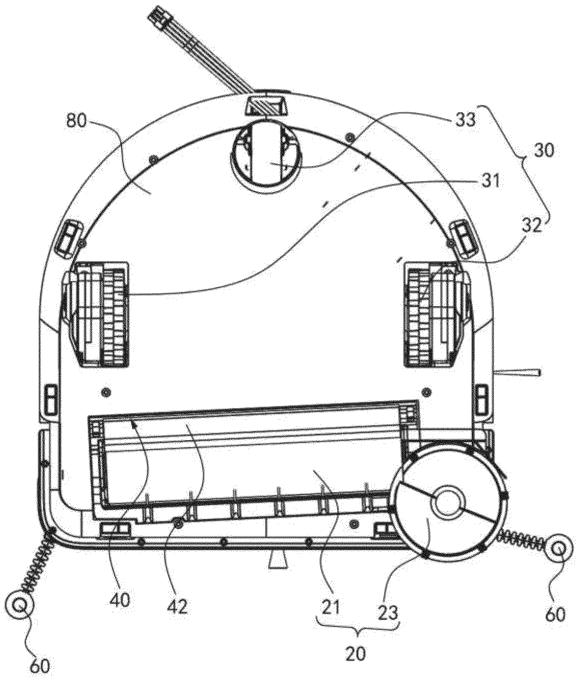


FIG. 2

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Description

[0001] This application claims priority of Chinese Patent Application No. 202210380603.3, filed on April 8, 2022, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of smart home technologies and in particular, to a cleaning robot.

BACKGROUND ART

[0003] In the related art, most of cleaning robots are sweeping robots. When the cleaning robot performs a cleaning task, a cleaning head of the cleaning robot achieves effective cleaning of floor.

SUMMARY OF THE INVENTION

[0004] The present disclosure provides a cleaning robot to improve the use performance of the cleaning robot.

[0005] The present disclosure provides a cleaning robot. The cleaning robot includes:

a robot body; and
a cleaning system disposed on the robot body and including a cleaning head, an auxiliary cleaning head, and a liquid supply part,
where the liquid supply part is configured to feed a cleaning liquid to the cleaning head and the auxiliary cleaning head.

[0006] In an embodiment of the present disclosure, the cleaning system further includes:
a pump, where the pump is in communication with the liquid supply part to feed the cleaning liquid from the liquid supply part to the cleaning head and the auxiliary cleaning head.

[0007] In an embodiment of the present disclosure, the robot body includes a fixed bracket; the cleaning head is disposed in the fixed bracket; the fixed bracket is provided with a liquid supply channel; and the liquid supply part feeds the cleaning liquid to the cleaning head through the liquid supply channel.

[0008] In an embodiment of the present disclosure, the liquid supply channel includes a liquid inlet and a liquid outlet, where the liquid inlet is in communication with the liquid supply part, and the liquid outlet is configured to feed the cleaning liquid to the cleaning head; and
there is a plurality of liquid outlets, and the plurality of liquid outlets is disposed at intervals in a direction parallel to the cleaning head.

[0009] In an embodiment of the present disclosure, the cleaning robot further includes:
a recovery system disposed on the robot body and including a collecting part, the collecting part being configured to collect residues on at least one of the cleaning head, the auxiliary cleaning head, and a surface to be cleaned.

[0010] In an embodiment of the present disclosure, the recovery system further includes:
a scraper configured to be in contact with the cleaning head and remove the residues from the cleaning head by interfering with the cleaning head, so that the residues are collected by the collecting part.

[0011] In an embodiment of the present disclosure, the scraper is parallel to the cleaning head.

[0012] In an embodiment of the present disclosure, the robot body defines a transverse axis and a longitudinal axis; and the cleaning head is parallel to the transverse axis.

[0013] In an embodiment of the present disclosure, the scraper is provided with a liquid suction port and the liquid suction port is in communication with the collecting part.

[0014] In an embodiment of the present disclosure, the recovery system further includes:
a power part, the power part being in pneumatic communication with the collecting part so that the residues is collected to the collecting part.

[0015] In an embodiment of the present disclosure, the collecting part includes an inlet and an outlet; and the cleaning robot further includes:
a plugging assembly disposed on the robot body, at least part of the plugging assembly being adjustable in position so as to close or open the inlet and the outlet of the collecting part.

[0016] In an embodiment of the present disclosure, the plugging assembly includes:

a connecting rod;
a first plugging member disposed on the connecting rod; and
a second plugging member disposed on the connecting rod,
where the connecting rod is movably disposed relative to the robot body, so that the first plugging member and the second plugging member close or open the inlet and the outlet of the collecting part respectively.

[0017] In an embodiment of the present disclosure, the cleaning robot further includes:
a detection system disposed on the robot body, at least part of the detection system extending from an outer edge of the robot body.

[0018] In an embodiment of the present disclosure, at least part of the detection system is movably disposed relative to the robot body.

[0019] In the cleaning robot according to embodiments of the present disclosure, a cleaning system is disposed on a robot body, and includes a cleaning head, an auxiliary cleaning head, and a liquid supply part. The liquid supply part is configured to feed a cleaning liquid to the

cleaning head and the auxiliary cleaning head, so that a surface to be cleaned can be reliably cleaned through the cleaning head and the auxiliary cleaning head, thereby improving the cleaning capability and the use performance of the cleaning robot.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Various objects, features, and advantages of the present disclosure will become more apparent by considering the following detailed descriptions of optional embodiments of the present disclosure in combination with the accompanying drawings. The accompanying drawings are only exemplary illustrations of the present disclosure and are not necessarily drawn to scale. In the accompanying drawings, the same reference numerals denote the same or similar parts. In the accompanying drawings:

FIG. 1 is a structural schematic diagram of a cleaning robot from a first viewing angle according to an example embodiment;
FIG. 2 is a structural schematic diagram of a cleaning robot from a second viewing angle according to an example embodiment;
FIG. 3 is a structural schematic diagram of a cleaning robot from a second viewing angle according to an example embodiment;
FIG. 4 is a structural schematic diagram of a liquid supply part of a cleaning robot according to an example embodiment;
FIG. 5 is a structural schematic diagram of a collecting part of a cleaning robot according to an example embodiment;
FIG. 6 is a structural schematic diagram of a plugging assembly of a cleaning robot according to an example embodiment;
FIG. 7 is a structural schematic diagram of an inlet and an outlet of a collecting part of a cleaning robot according to an example embodiment;
FIG. 8 is a structural schematic diagram of a fixed bracket of a cleaning robot from one viewing angle according to an example embodiment;
FIG. 9 is a structural schematic diagram of a fixed bracket of a cleaning robot from another viewing angle according to an example embodiment;
FIG. 10 is a structural schematic diagram of a scraper of a cleaning robot from one viewing angle according to an example embodiment;
FIG. 11 is a structural schematic diagram of a scraper of a cleaning robot from another viewing angle according to an example embodiment;
FIG. 12 is a structural schematic diagram of a collecting part of a cleaning robot according to an example embodiment;
FIG. 13 is a structural schematic diagram of a plugging assembly of a cleaning robot according to an example embodiment;
FIG. 14 is a structural schematic diagram of a plugging assembly of a cleaning robot according to another example embodiment;
FIG. 15 is a schematic diagram of a partial structure of a cleaning robot from one viewing angle according to another example embodiment;
FIG. 16 is a schematic diagram of a partial structure of a cleaning robot from another viewing angle according to another example embodiment; and
FIG. 17 is a structural schematic diagram of a liquid supply part and a collecting part of a cleaning robot according to an example embodiment.

[0021] Reference numerals in the accompanying drawings:
10, robot body; 11, fixed bracket; 111, liquid inlet; 112, liquid outlet; 113, accommodating chamber; 114, through hole; 12, forward portion; 13, backward portion; 20, cleaning system; 21, cleaning head; 22, liquid supply part; 221, water inlet; 23, auxiliary cleaning head; 231, wet auxiliary cleaning head; 232, main body part; 24, pump; 30, driving system; 31, first driving wheel module; 32, second driving wheel module; 33, driven wheel; 40, recovery system; 41, collecting part; 411, inlet; 412, outlet; 413, drainage port; 414, main body; 415, extending part; 42, scraper; 421, liquid suction port; 43, power part; 50, plugging assembly; 51, connecting rod; 52, first plugging member; 53, second plugging member; 54, driving part; 55, ejector rod; 56, elastic member; 57, sealing member; 60, detection system; 70, perception system; 71, position determining apparatus; 72, buffer; 80, control system; 90, energy system; and 100, human-machine interaction system.

DETAILED DESCRIPTION

[0022] Specific embodiments embodying features and advantages of the present disclosure will be described in detail in the following descriptions. It should be understood that the present disclosure may have various changes in terms of different embodiments, which do not depart from the scope of the present disclosure, and the descriptions and drawings therein are essentially intended for illustration instead of limiting the present disclosure.

[0023] The following descriptions of different example embodiments of the present disclosure are given with reference to the drawings. The drawings form a part of the present disclosure. Different example structures, systems, and steps that can implement multiple aspects of the present disclosure are shown as an example. It should be understood that other specific solutions of components, structures, example apparatuses, systems, and steps may be used, and structural and functional modifications may be made without departing from the scope of the present disclosure. Moreover, although the terms "above", "between", "within" and the like may be used in the description to describe different example

features and elements of the present disclosure, these terms are used herein only for convenience, for example, according to example directions in the drawings. No content in the description should be understood as requiring specific three-dimensional directions of structures to fall within the scope of the present disclosure.

[0024] As shown in FIG. 1 to FIG. 17, a cleaning robot includes a robot body 10, a cleaning system 20, a driving system 30, a recovery system 40, a plugging assembly 50, a detection system 60, a perception system 70, a control system 80, an energy system 90, and a human-machine interaction system 100.

[0025] As shown in FIG. 1, the robot body 10 includes a forward portion 12 and a backward portion 13, and has an approximately circular shape (both the forward portion and the backward portion being circular). The robot body 10 may also have other shapes, including, but not limited, to an approximate D-shape with a square forward portion and a circular backward portion, and a rectangular or square shape with a square forward portion and a square backward portion.

[0026] As shown in FIG. 1, the perception system 70 includes a position determining device 71 disposed on the robot body 10, a collision sensor disposed on a buffer 72 at the forward portion 12 of the robot body 10, a proximity sensor disposed on the robot body 10, a cliff sensor disposed at a lower part of the robot body, and sensing devices such as a magnetometer, an accelerometer, a gyroscope, and an odometer disposed in the robot body 10, which are configured to provide various position information and motion state information of the cleaning robot to the control system 80. The position determining device 71 includes, but is not limited to, a camera and a laser distance sensor (LDS).

[0027] As shown in FIG. 1, the forward portion 12 of the robot body 10 may bear the buffer 72. During the process of cleaning, when the driving system 30 propels the cleaning robot to walk on the floor, the buffer 72 detects one or more events in a travelling path of the cleaning robot via the collision sensor disposed thereon. The cleaning robot may control, according to the events (such as an obstacle and a wall) detected by the buffer 122, the driving system 30, so that the cleaning robot responds to the events, for example, by moving away from the obstacle.

[0028] The control system 80 is disposed on a main circuit board in the robot body 10, and includes a computing processor, such as a central processing unit or an application processor, which communicates with non-temporary memories, such as a hard disk, a flash memory, and a random access memory. The application processor generates, by using a positioning algorithm (for example, simultaneous localization and mapping (SLAM)) according to obstacle information fed back by the laser distance sensor, a simultaneous map of an environment where the cleaning robot is located. The control system 80 comprehensively determines, according to distance information and speed information fed back by the sensing devices (such as the sensor disposed on the buffer 72, the cliff sensor, the magnetometer, the accelerometer, the gyroscope, and the odometer) a current working state, a current position, and a current posture of the cleaning robot, such as crossing over a threshold, crawling onto a carpet, being at a cliff, being stuck from above or below, having a full dust box, or being picked up, etc. The control system 80 may also give specific next-action strategies for different situations, so that the cleaning robot has better sweeping performance and a better user experience is provided.

[0029] As shown in FIG. 2 and FIG. 3, the driving system 30 may control the robot body 10 to travel across the floor based on a driving command having distance and angle information (such as x, y, and θ components). The driving system 30 may include a first driving wheel module 31 and a second driving wheel module 32. The first driving wheel module 31 and the second driving wheel module 32 are disposed along a transverse axis defined by the robot body 10. In order to enable the cleaning robot to move on the floor more stably or to have higher movement capability, the cleaning robot may include one or more driven wheels 33, and the driven wheels include, but are not limited to, a universal wheel. The driving wheel module includes a walking wheel, a driving motor, and a control circuit for controlling the driving motor. The driving wheel module may also be connected to a circuit for measuring a driving current and an odometer. The driving wheel module may be detachably connected onto the robot body 10 for the purpose of attaching, detaching, and maintaining conveniently. The driving wheel may be provided with an offset drop suspension system, which is movably fastened (for example, rotatably attached) to the robot body 10 to receive spring biases that are biased downwards and away from the robot body 10. The spring biases allow the driving wheel to maintain contact and traction with the floor with a certain floor-attaching force, and in the meanwhile, a cleaning element of the cleaning robot is also in contact with the floor with a certain pressure.

[0030] The robot body 10 defines a transverse axis and a longitudinal axis. The transverse axis and the longitudinal axis are perpendicular to each other, and may be understood as a transverse centerline and a longitudinal centerline of the robot body 10, respectively.

[0031] The energy system 90 includes a rechargeable battery, such as a nickel-hydrogen battery and a lithium battery. The rechargeable battery may be connected to a charging control circuit, a battery pack charging temperature detecting circuit, and a battery undervoltage monitoring circuit, all of which are connected to a single-chip microcomputer control circuit. The cleaning robot may be connected to a charging pile for charging via a charging electrode disposed on the robot body, such as disposed on the side, the bottom, or the top of the robot body.

[0032] The human-machine interaction system 100 may include buttons on a host panel for a user to select functions. The human-machine interaction system 100

may further include a display screen and/or an indicator light and/or a speaker, all of which show the user with the current state or the function options of the cleaning robot. The human-machine interaction system 100 may also include a mobile phone client. For a route navigation type of cleaning device, the mobile phone client may show the user with a map of the environment where the cleaning robot is located, and also the location of the cleaning robot, thereby providing the user with richer and more user-friendly function items.

[0033] In the cleaning robot according to embodiments of the present disclosure, the cleaning system 20 is disposed on the robot body 10, and includes a cleaning head 21. The transverse axis of the robot body 10 forms a preset included angle with the cleaning head 21. Thus, the probability can be reduced that the cleaning head 21 gets stuck by floor joints when the cleaning robot passes through floor environments such as tile joints in an advancing process, thereby improving the cleaning efficiency and the use performance of the cleaning robot. The preset included angle between the transverse axis and the cleaning head 21 may be an acute angle, and may range from 5 degrees to 70 degrees.

[0034] In embodiments of the present disclosure, the cleaning system 20 may be a dry cleaning system. The dry cleaning system may include the cleaning head 21, a dust box, a fan, an air outlet, etc. In embodiments of the present disclosure, the cleaning head 21 may be a roller brush which is rotatable about a shaft parallel to the floor. The roller brush having certain interference with the floor sweeps up garbage on the floor, and rolls up it to the front of a dust suction inlet between the roller brush and the dust box. Then, the garbage is sucked into the dust box by air with a suction force, which air is generated by the fan and passes through the dust box. The dust removal capacity of the cleaning robot may be characterized by the dust pickup (DPU) efficiency of the garbage. DPU is affected by the structure and the material of the roller brush, by the utilization rate of air in an air passage formed by the dust suction inlet, the dust box, the fan, the air outlet, and connecting parts among them, and also by the type and the power of the fan. Thus, this is a complex problem for system design.

[0035] In embodiments of the present disclosure, the cleaning system 20 may be a wet cleaning system. The cleaning head 21 includes a wet cleaning head. As shown in FIG. 4, the cleaning system 20 further includes a liquid supply part 22. The liquid supply part 22 feeds a cleaning liquid to the wet cleaning head. The cleaning head 21 may be disposed below the liquid supply part 22. The cleaning liquid in the liquid supply part 22 is delivered to the cleaning head 21 through a water delivery mechanism, so that the cleaning head 21 performs wet cleaning on a surface to be cleaned. In other embodiments of the present disclosure, the cleaning liquid in the liquid supply part 22 may also be directly sprayed onto the surface to be cleaned, and the cleaning head 21 cleans the surface by evenly applying the cleaning liquid.

[0036] In embodiments of the present disclosure, the cleaning head 21 may be disposed at the bottom of the robot body 10. For example, the cleaning head 21 may be a cleaning pad disposed parallel to the surface to be cleaned. In an embodiment, the cleaning head 21 is configured to clean the surface to be cleaned. The driving system 30 is configured to drive the cleaning head 21 to basically reciprocate along a target surface. The target surface is part of the surface to be cleaned. The cleaning head 21 reciprocates along the surface to be cleaned. A cleaning cloth or a cleaning plate is disposed on a surface of the cleaning head 21 in contact with the surface to be cleaned. A high-frequency friction is generated between the cleaning cloth or the cleaning plate and the surface to be cleaned through reciprocating motion, so that stains on the surface to be cleaned are removed.

[0037] The higher the friction frequency is, the larger the number of frictions per unit time is. The high-frequency reciprocating motion, also known as reciprocating vibration, has a cleaning capability which is much higher than that of the ordinary reciprocating motion, such as rotational friction cleaning. Optionally, the friction frequency is approximate to the frequency of sound waves, and the cleaning effect may be much higher than that of the rotational friction cleaning with dozens of revolutions per minute. On the other hand, tufts on the surface of the cleaning head 21 may spread more neatly in the same direction under shaking of the high-frequency vibration, such that the overall cleaning effect is more uniform. This is different from the case where under the condition of low-frequency rotation, only a downward pressure is applied to increase the friction force for the purpose of improving the cleaning effect. The downward pressure alone may not make the tufts spread in approximately the same direction. Therefore, in terms of effect, water marks on the surface to be cleaned are more uniform after cleaning through the high-frequency vibration without chaotic water stains being left. In other embodiments of the present disclosure, the cleaning head 21 may also be of a strip-shaped structure, etc. In embodiments of the present disclosure, the cleaning head 21 may be a roller brush which is rotatable about an axis parallel to the surface to be cleaned, as shown in FIG. 16. The robot body 10 includes a fixed bracket 11. The cleaning head 21 is disposed in the fixed bracket 11. The fixed bracket 11 is provided with a liquid supply channel. The liquid supply part 22 feeds the cleaning liquid into the wet cleaning head through the liquid supply channel.

[0038] The liquid supply channel may be constituted by a cavity formed in the fixed bracket 11, for example, in a way such that part of the fixed bracket 11 is hollow so as to form the liquid supply channel for circulating the cleaning liquid. The liquid supply channel may be formed by a pipe body, so that the cleaning liquid is fed from the liquid supply part 22 to the wet cleaning head, thereby ensuring that the cleaning head 21 effectively cleans the surface to be cleaned.

[0039] In embodiments of the present disclosure, as shown in FIGS. 8 and 9, the liquid supply channel includes a liquid inlet 111 and a liquid outlet 112. The liquid inlet 111 is in communication with the liquid supply part 22. The liquid outlet 112 is configured to feed the cleaning liquid to the cleaning head 21.

[0040] In embodiments of the present disclosure, as shown in FIGS. 8 and 9, the fixed bracket 11 is provided with the liquid inlet 111 and the liquid outlet 112. One end of the liquid inlet 111 is disposed on an outer surface of the fixed bracket 11. The liquid outlet 112 is disposed on an inner surface of the fixed bracket 11. The main body portion of the liquid supply channel may be disposed between the liquid inlet 111 and the liquid outlet 112. The main body portion may be in communication with a plurality of liquid outlets 112 at the same time, so that the liquid outlets 112 feed the cleaning liquid to the cleaning head 21.

[0041] In embodiments of the present disclosure, an accommodating chamber 113 is formed in the fixed bracket 11. The liquid outlet 112 is disposed on a chamber wall of the accommodating chamber 113. The liquid outlet 112 may be arranged at the top or side of the accommodating chamber 113, so as to facilitate reliably feeding the cleaning liquid discharged from the liquid outlet 112 to the cleaning head 21.

[0042] In embodiments of the present disclosure, a plurality of liquid outlets 112 may be provided, and the plurality of liquid outlets 112 is disposed at intervals in a direction parallel to the cleaning head 21. This helps to ensure that the cleaning liquid can be uniformly fed to various positions of the wet cleaning head, thereby enabling the wet cleaning head to reliably clean the surface to be cleaned.

[0043] The liquid supply channel may have one liquid inlet 111, and the one liquid inlet 111 corresponds to all of the liquid outlets 112.

[0044] As an alternative embodiment of the present disclosure, the liquid supply channel may have at least two liquid inlets 111, and each of the liquid inlets 111 may respectively correspond to the plurality of liquid outlets 112, so as to reliably feed the cleaning liquid to the wet cleaning head. The liquid inlet 111 may be formed by a columnar structure so as to connect with a pipe-shaped structure which feeds the cleaning liquid. The liquid outlet 112 may be a rectangular port, a circular port, or other polygonal structure, which is not limited herein. The plurality of liquid outlets 112 is disposed sequentially in the direction parallel to the cleaning head 21.

[0045] In embodiments of the present disclosure, as shown in FIG. 5 and FIG. 6, the recovery system 40 is disposed on the robot body 10, and includes a collecting part 41. The collecting part 41 collects residues on the cleaning head 21 and/or the surface to be cleaned, so that the surface to be cleaned can be effectively cleaned, thereby ensuring the cleanliness of the surface to be cleaned.

[0046] During movement, the cleaning robot achieves the cleaning of the surface to be cleaned through the rotation of the cleaning head 21. In this process, the residues on the surface to be cleaned may be adsorbed onto the cleaning head 21, and the collecting part 41 may collect these residues to ensure the cleanliness of the cleaning head 21. In addition, the collecting part 41 may also collect the residues on the surface to be cleaned, and thus cooperates with the cleaning head 21 to achieve reliable cleaning of the surface to be cleaned. The residues may be water, debris, etc., which is not limited herein.

[0047] In embodiments of the present disclosure, as shown in FIG. 3, the recovery system 42 further includes a scraper 42. The scraper 42 is in contact with the cleaning head 21, and removes the residues from the cleaning head 21 by interfering with the cleaning head 21, so that the residues are collected by the collecting part 41. Thus, the cleanliness of the cleaning head 21 is ensured, thereby ensuring that the surface to be cleaned is effectively cleaned.

[0048] Specifically, the scraper 42 may be of a plate-like structure, and the plate-like structure interferes with the cleaning head 21. The plate-like structure may remove the residues from the cleaning head 21 during rotation of the cleaning head 21, so that the residues are collected by the collecting part 41. Thus, it is ensured that the residues adsorbed from the surface to be cleaned can be collected by the collecting part 41 punctually. The scraper 42 may be disposed on the robot body 10. The scraper 42 is detachably disposed on the robot body 10.

[0049] In embodiments of the present disclosure, the scraper 42 is parallel to the cleaning head 21, so that the scraper 42 can remove the residues from the cleaning head 21 reliably, and the structure can be assembled conveniently.

[0050] Specifically, the length of the scraper 42 may be equal to the length of the cleaning head 21. While ensuring that the scraper 42 can completely interfere with the cleaning head 21, the scraper 42 may be avoided from occupying the space in the length direction, thereby ensuring the compactness of the structure.

[0051] As an alternative embodiment of the present disclosure, the transverse axis of the robot body 10 is parallel to both the cleaning head 21 and the scraper 42.

[0052] In embodiments of the present disclosure, as shown in FIG. 10 and FIG. 11, the scraper 42 is provided with a liquid suction port 421, and the liquid suction port 421 is in communication with the collecting part 41, so that the sewage is reliably collected by the recovery system 40 into the collecting part 41 through the liquid suction port 421.

[0053] Specifically, the liquid suction port 421 may face towards the cleaning head 21. After the sewage on the cleaning head 21 is scraped off by the scraper 42, the sewage may flow along the scraper 42 and flow towards the liquid suction port 421, so that the sewage may be pumped by the recovery system 40 into the collecting part 41 through the liquid suction port 421.

[0054] As an alternative embodiment of the present disclosure, the liquid suction port 421 may be disposed on a side of the scraper 42 away from the cleaning head 21. Part of the scraper 42 may gather the sewage together, and the liquid suction port 421 pumps the gathered sewage into the collecting part 41.

[0055] In embodiments of the present disclosure, as shown in FIG. 7, the recovery system 40 further includes a power part 43, which is in pneumatic communication with the collecting part 41 to collect the residues to the collecting part 41. A negative pressure may be generated between the power part 43 and the collecting part 41, so that the residues on the surface to be cleaned and the residues on the cleaning head 21 can be sucked into the collecting part 41. Specifically, the negative pressure generated between the power part 43 and the collecting part 41 may suck the sewage into the collecting part 41 through the liquid suction port 421. The power part 43 may be a fan.

[0056] In embodiments of the present disclosure, as shown in FIG. 9, the accommodating chamber 113 is formed in the fixed bracket 11. The cleaning head 21 is disposed in the accommodating chamber 113. The collecting part 41 is in communication with the accommodating chamber 113, so that the residues enter the collecting part 41 after passing through the accommodating chamber 113.

[0057] Specifically, the fixed bracket 11 is provided with a through hole 114. The through hole 114 is in communication with the collecting part 41 and the accommodating chamber 113. The residues scraped off from the cleaning head 21 by the scraper 42 are located in the accommodating chamber 113 of the fixed bracket 11. Thus, the negative pressure generated between the power part 43 and the collecting part 41 may suck the residues in the accommodating chamber 113 into the collecting part 41 via the through hole 114. As an alternative embodiment of the present disclosure, the accommodating chamber 113 of the fixed bracket 11 may form a relatively sealed space with the surface to be cleaned. Thus, the negative pressure generated between the power part 43 and the collecting part 41 may suck the residues on the surface to be cleaned into the collecting part 41 via the through hole 114.

[0058] In embodiments of the present disclosure, as shown in FIG. 7, the collecting part 41 includes an inlet 411 and an outlet 412. The inlet 411 may be in communication with the accommodating chamber 113. Further, the inlet 411 may be in communication with the through hole 114, and the outlet 412 may be in communication with the power part 43, so that the power part 43 provides power through the outlet 412 of the collecting part 41 to suck the residues into the inlet 411 of the collecting part 41 from the through hole 114 of the accommodating chamber 113. Thus, the residues enter the collecting part 41. When an airflow flows in the collecting part 41, the sewage, debris, etc. carried in the airflow remain in the collecting part 41 under the action of gravity. Therefore, when the airflow has a relatively long flow path in the collecting part 41, the sewage, debris, etc. may be effectively separated from the airflow.

[0059] In embodiments of the present disclosure, as shown in FIG. 12, the inlet 411 and the outlet 412 of the collecting part 41 may be disposed on the same side of the collecting part 41. For example, the inlet 411 and the outlet 412 of the collecting part 41 are both disposed on a front side of the collecting part 41. Such an arrangement can effectively extend the flow path of the airflow in the collecting part 41, so that sewage, debris, etc. can be separated from the airflow more effectively.

[0060] In embodiments of the present disclosure, as shown in FIG. 5 and FIG. 6, the plugging assembly 50 of the cleaning robot is disposed on the robot body 10. At least part of the plugging assembly 50 is adjustable in position so as to close or open the inlet 411 and the outlet 412 of the collecting part 41, thereby avoiding the debris in the collecting part 41 from being poured out from the inlet 411 or entering the power part 43 from the outlet 412.

[0061] Specifically, the plugging assembly 50 may close the inlet 411 and the outlet 412 of the collecting part 41 when the cleaning robot is not in operation. Thus, the problem can be avoided that the residues are poured out incidentally due to manual movement of the cleaning robot. When the cleaning robot starts to operate, the plugging assembly 50 may open the inlet 411 and the outlet 412 of the collecting part 41, so that the residues may be pumped into the collecting part 41 from the inlet 411.

[0062] In embodiments of the present disclosure, the plugging assembly 50 may be controlled by an independent motor, and may control the closing of the inlet 411 and the outlet 412 of the collecting part 41 at any time, for example, closing the same when the cleaning robot is not in operation. For example, the motor of the plugging assembly 50 may be electrically connected to the control system 80 of the cleaning robot, so that the plugging assembly 50 can be controlled according to the motion state of the cleaning robot fed back by the control system 80. For example, when the control system 80 controls the cleaning robot to stop operating, the plugging assembly 50 may be controlled to close the inlet 411 and the outlet 412 of the collecting part 41. Alternatively, when the control system 80 detects that the cleaning robot is in a tilted state, the plugging assembly 50 may be controlled to close the inlet 411 and the outlet 412 of the collecting part 41. Alternatively, when the control system 80 detects that the cleaning robot is in an idle state for a long period of time, for example, when the cleaning robot is stuck in a fixed position during cleaning and thus cannot advance, the plugging assembly 50 may be controlled by the control system 80 to close the inlet 411 and the outlet 412 of the collecting part 41. Alternatively, when the control system 80 detects that the garbage in the collecting part 41 reaches a certain height, the plugging assembly 50 may be controlled by the control system 80 to close the inlet 411 and the outlet 412 of the collecting part 41.

[0063] In addition, the user may control the plugging assembly 50 using an app to satisfy use requirements, and the closing of the inlet 411 and the outlet 412 of the collecting part 41 may be flexibly controlled.

[0064] In embodiments of the present disclosure, as shown in FIG. 6 and FIG. 13, the plugging assembly 50 includes a connecting rod 51, a first plugging member 52 disposed on the connecting rod 51, and a second plugging member 53 disposed on the connecting rod 51. The connecting rod 51 is movably disposed relative to the robot body 10, so that the first plugging member 52 and the second plugging member 53 close or open the inlet 411 and the outlet 412, respectively. That is, the first plugging member 52 and the second plugging member 53 may close or open the inlet 411 and the outlet 412 synchronously, in order to improve the operating performance of the cleaning robot and ensure that the residues are sucked into the collecting part 41 punctually.

[0065] In embodiments of the present disclosure, as shown in FIG. 6 and FIG. 13, the plugging assembly 50 may include a driving part 54. The driving part 54 may be a motor. The driving part 54 is in driving connection to the connecting rod 51, so as to drive the connecting rod 51 to rotate. Thus, the first plugging member 52 and the second plugging member 53 are driven to rotate to close or open the inlet 411 and the outlet 412.

[0066] As shown in FIG. 13, the first plugging member 52 and the second plugging member 53 are disposed in the middle part of the connecting rod 51 at an interval. One end of the connecting rod 51 is connected to the driving part 54, and the other end of the connecting rod 51 extends beyond the second plugging member 53. The first plugging member 52 is disposed between the driving part 54 and the second plugging member 53. The first plugging member 52 and the second plugging member 53 are disposed at positions of the connecting rod 51 close to two opposite ends of the connecting rod 51, respectively. The first plugging member 52 and the second plugging member 53 are detachably disposed on the connecting rod 51, or both integrally formed on the connecting rod 51.

[0067] As an alternative embodiment of the present disclosure, the driving part 54 may be a cylinder, an oil cylinder, or a telescopic motor, and may be connected to the connecting rod 51. The driving part 54 performs telescopic motion through a telescopic link thereof. That is, the connecting rod 51 may perform telescopic motion. The connecting rod 51 may move forward and backward. Thus, the first plugging member 52 and the second plugging member 53 may move forward and backward, that is, moving along a direction parallel to a plane where the inlet 411 and the outlet 412 of the collecting part 41 are disposed, so that the inlet 411 and the outlet 412 of the collecting part 41 are closed or opened.

[0068] As an alternative embodiment of the present disclosure, the driving part 54 may be a cylinder, an oil cylinder, or a telescopic motor, and may be connected to the connecting rod 51. The driving part 54 performs telescopic motion through a telescopic link thereof. That is, the connecting rod 51 may perform telescopic motion. The connecting rod 51 may move vertically. Thus, the first plugging member 52 and the second plugging member 53 may move vertically, that is, moving along a direction perpendicular to a plane where the inlet 411 and the outlet 412 of the collecting part 41 are disposed, so that the inlet 411 and the outlet 412 of the collecting part 41 are closed or opened.

[0069] As an alternative embodiment of the present disclosure, the first plugging member 52 and the second plugging member 53 of the plugging assembly 50 may be independently disposed on a first driving part and a second driving part. The first driving part and the second driving part drive the first plugging member 52 and the second plugging member 53 respectively to move, so as to close or open the inlet 411 and the outlet 412. The first driving part and the second driving part may operate synchronously, so that the first plugging member 52 and the second plugging member 53 operate synchronously. Thus, the inlet 411 and the outlet 412 are closed or opened synchronously. Each of the first driving part and the second driving part may be a motor, a cylinder, an oil cylinder, or other power mechanism.

[0070] As an alternative embodiment of the present disclosure, as shown in FIG. 14, the plugging assembly 50 may include a connecting rod 51, a first plugging member 52, a second plugging member 53, a driving part 54, and an ejector rod 55. The first plugging member 52 and the second plugging member 53 are connected onto the connecting rod 51. The ejector rod 55 may be connected to the first plugging member 52. The driving part 54 is in driving connection to the ejector rod 55, so that the driving part 54 may drive the ejector rod 55 to move vertically. In this way, the first plugging member 52 and the second plugging member 53 move vertically, or the connecting rod 51 drives the first plugging member 52 and the second plugging member 53 to rotate, thereby synchronously closing or opening the inlet 411 and the outlet 412.

[0071] Alternatively, the plugging assembly 50 may further include an elastic member 56. After the driving part 54 releases power, the elastic member 56 may drive the ejector rod 55 to return to its original position, so that the first plugging member 52 and the second plugging member 53 are moved from a position where the inlet 411 and the outlet 412 are opened to a position where the inlet 411 and the outlet 412 are closed. The elastic member 56 may be a spring. For example, the spring may be sleeved on the connecting rod 51. One end of the spring is abutted against the first plugging member 52, and the other end of the spring may be supported on another component of the cleaning robot. For example, the other end of the spring may be abutted against the robot body 10, so that the spring may be pressed tightly when the ejector rod 55 moves upward, and the spring returns to its original position after the ejector rod 55 loses power. In this way, the first plugging member 52 and the second plug-

ging member 53 are driven to move from a position where the inlet 411 and the outlet 412 are opened to a position where the inlet 411 and the outlet 412 are closed. There may be one spring, and the spring may be sleeved on one end of the connecting rod 51. At this time, the other end of the connecting rod 51 may be passively rotated. For example, the spring may be abutted against the first plugging member 52 or the second plugging member 53. At least two springs may exist. The two springs are disposed at two ends of the connecting rod 51, respectively, and may be abutted against the first plugging member 52 and the second plugging member 53, respectively.

[0072] When the driving part 54 drives the ejector rod 55 to move upward, the connecting rod 51 may rotate in a first direction, so that the first plugging member 52 and the second plugging member 53 open the inlet 411 and the outlet 412. At this time, the elastic member 56 is pressed tightly. After the driving part 54 releases power or the driving part 54 operates reversely, for example, the ejector rod 55 moves upward when the motor rotates forward, and the driving part 54 may not be fixedly connected to the ejector rod 55 when the motor rotates reversely. Then, the connecting rod 51 is driven to rotate in a second direction by a driving force generated when the elastic member 56 restores to its original state, so that the ejector rod 55 is pressed to move downward. In this way, the first plugging member 52 and the second plugging member 53 may plug in the inlet 411 and the outlet 412. The driving part 54 may include a cam mechanism, through which the ejector rod 55 is driven to move upward. At this time, the ejector rod 55 may be in contact with the cam mechanism, but not fixed. Alternatively, the driving part 54 may include an electric push rod. The electric push rod may be only in an insertable connection to the ejector rod 55, but not form an axial fixation. In some embodiments, it is not excluded that the driving part 54 may be fixedly connected to the connecting rod 51, and the elastic member 56 may be cancelled at this time. The driving part 54 drives the ejector rod 55 to move upward. The driving part 54 may include a cam mechanism, a gear mechanism, etc., as long as the driving part 54 can achieve rectilinear motion so that the ejector rod 55 is pushed to perform rectilinear motion.

[0073] In embodiments of the present disclosure, as shown in FIG. 14, the plugging assembly 50 may further include a seal 57, and the seal 57 may be disposed on the collecting part 41. That is, the collecting part 41 may be provided with a through hole. The ejector rod 55 may pass through the through hole and becomes connected to the driving part 54. The seal 57 is configured to plug in a gap between a hole wall of the through hole and the ejector rod 55, so as to avoid the sewage from flowing out of the collecting part 41. The ejector rod 55 may move vertically in the seal 57. The seal 57 may be a sealing ring.

[0074] The collecting part 41 may include at least two sub-chambers, i.e., a first sub-chamber for storing sewage and a second sub-chamber which is an empty chamber in a normal state. Only after the liquid level in the first sub-chamber reaches a certain value, the sewage will flow into the second sub-chamber. The ejector rod 55 penetrates through the second sub-chamber. Therefore, in the normal state, the problem of liquid leakage will not occur in the second sub-chamber. In a case that liquid exists in the second sub-chamber, the second sub-chamber can be effectively prevented from liquid leakage by arranging the seal 57.

[0075] In embodiments of the present disclosure, when the collecting part 41 is assembled in the cleaning robot, the ejector rod 55 may prop open the first plugging member 52 and the second plugging member 53. When the collecting part 41 is taken out, the first plugging member 52 and the second plugging member 53 lose support by the ejector rod 55, and are closed under the action of a spring force.

[0076] When it is detected, through the sensor, that the user turns over the cleaning robot or the cleaning robot leans, etc., a program controls the ejector rod 55 to move, so that the ejector rod 55 cannot support the first plugging member 52 and the second plugging member 53, and the first plugging member 52 and the second plugging member 53 are closed under the action of the spring force.

[0077] In embodiments of the present disclosure, as shown in FIG. 1 and FIG. 2, the cleaning system 20 may be disposed on the forward portion 12 of the robot body 10, and at least part of the driving system 30 may be disposed on the backward portion 13 of the robot body 10. For example, the driven wheel 33 of the driving system 30 may be disposed at an edge position of the backward portion 13. The forward portion 12 may be substantially rectangular, and the backward portion 13 may be substantially semi-circular.

[0078] In embodiments of the present disclosure, as shown in FIG. 2 and FIG. 3, the cleaning system 20 further includes an auxiliary cleaning head 23, and the auxiliary cleaning head 23 is disposed on the robot body 10. With the auxiliary cleaning head 23, the cleaning robot can better clean wall edges, wall corners, and other areas, thereby improving the cleaning effect of the cleaning system 20.

[0079] In embodiments of the present disclosure, as shown in FIG. 1 and FIG. 2, the auxiliary cleaning head 23 is disposed at a corner position of the robot body 10, and part of the auxiliary cleaning head 23 extends beyond the robot body 10. The part of the auxiliary cleaning head 23 extending beyond the robot body 10 is less than a part of the auxiliary cleaning head 23 disposed below the robot body 10, so that on while ensuring a cleaning range of the auxiliary cleaning head 23, the auxiliary cleaning head 23 is also prevented from excessively increasing the occupied area of the cleaning robot.

[0080] The robot body 10 includes the forward portion 12 and the backward portion 13. The forward portion 12 is substantially a rectangular body. That is, in the case that fabrication errors, installation errors, etc. are ignored, a circumferential outer surface of the rectangular body may

include corner areas with rounded transitions. The rectangular body here only emphasizes a general structure of the forward portion 12. The auxiliary cleaning head 23 is disposed at a corner position of the forward portion 12.

[0081] In embodiments of the present disclosure, as shown in FIG. 1 and FIG. 2, the auxiliary cleaning head 23 is disposed at a position of the robot body 10 close to the forward portion 12, and part of the auxiliary cleaning head 23 extends beyond the born buffer 72. Even if the cleaning robot is blocked by an obstacle in front, the auxiliary cleaning head 23 can also clean the gap and other parts in front, thereby improving the cleaning capability of the cleaning robot.

[0082] In embodiments of the present disclosure, a preset included angle is formed between the transverse axis of the robot body 10 and the cleaning head 21. That is, the cleaning head 21 is disposed obliquely. The auxiliary cleaning head 23 is disposed on a side of the cleaning head 21 which is tilted backward, so that the area of the auxiliary cleaning head 23 may be increased. That is, the area of the auxiliary cleaning head 23 can be made relatively large without excessively increasing the part of the auxiliary cleaning head 23 extending beyond the robot body 10, thereby ensuring that the cleaning system 20 has an enough cleaning area. The outer edge of the auxiliary cleaning head 23 is substantially circular. The auxiliary cleaning head 23 is disposed on the side of the cleaning head 21 which is tilted backward. This enables the auxiliary cleaning head 23 to have a relatively large cleaning area, and enables part of the auxiliary cleaning head 23 to overlap with the cleaning head 21.

[0083] In embodiments of the present disclosure, part of the auxiliary cleaning head 23 overlaps with the cleaning head 21. In this way, the problem of missing cleaning between the auxiliary cleaning head 23 and the cleaning head 21 can be avoided, while still ensuring that a combination of the auxiliary cleaning head 23 and the cleaning head 21 increases the cleaning area, thereby improving the cleaning effect of the cleaning system 20.

[0084] In embodiments of the present disclosure, the outer edge of the auxiliary cleaning head 23 extends beyond the outer edge of the robot body 10. That is, the auxiliary cleaning head 23 may clean positions outside the robot body 10, such as wall edges, wall corners, and other areas, thereby increasing the cleaning area of the cleaning system 20 and improving the cleaning performance of the cleaning robot.

[0085] In embodiments of the present disclosure, the auxiliary cleaning head 23 includes a wet auxiliary cleaning head 231. The liquid supply part 22 feeds the cleaning liquid into the wet auxiliary cleaning head 231. The auxiliary cleaning head 23 may be disposed below the liquid supply part 22. The cleaning liquid in the liquid supply part 22 is delivered to the auxiliary cleaning head 23 through a water delivery mechanism, so that the auxiliary cleaning head 23 performs wet cleaning on the surface to be cleaned.

[0086] Specifically, the cleaning system 20 may further include an auxiliary liquid supply channel, through which the liquid supply part 22 feeds the cleaning liquid to the wet auxiliary cleaning head 231. The auxiliary liquid supply channel may be a space formed in the auxiliary cleaning head 23. The cleaning liquid is fed to the wet auxiliary cleaning head 231 through the liquid outlet. The auxiliary liquid supply channel may be a liquid feed pipe to feed the cleaning liquid to the wet auxiliary cleaning head 231.

[0087] In embodiments of the present disclosure, as shown in FIG. 15 and FIG. 16, the cleaning system 20 further includes a pump 24. The pump 24 is in communication with the liquid supply part 22, so as to feed the cleaning liquid from the liquid supply part 22 onto one of the cleaning head 21 and the auxiliary cleaning head 23. The pump 24 may feed the cleaning liquid from the liquid supply part 22 to the cleaning head 21 through the liquid supply channel, and/or feed the cleaning liquid from the liquid supply part 22 to the auxiliary cleaning head 23 through the auxiliary liquid supply channel.

[0088] Specifically, there may be one pump 24, and the one pump 24 is in communication with both the liquid supply channel and the auxiliary liquid supply channel. There may be also two pumps 24, and the two pumps 24 are in communication with both the liquid supply channel and the auxiliary liquid supply channel, respectively. The pump 24 may be a gear pump, a vane pump, a piston pump, a peristaltic pump, or the like. The power/flow of the pump 24 is adjustable. The pump 24 may cooperate with a valve and other devices to control the supply of the cleaning liquid from the liquid supply part 22 to the cleaning head 21 and the auxiliary cleaning head 23.

[0089] In embodiments of the present disclosure, the cleaning head 21 is rotatably disposed around a first axis, and the auxiliary cleaning head 23 is rotatably disposed around a second axis. A certain included angle is formed between the first axis and the second axis. The cleaning head 21 may be a mopping roller brush. The auxiliary cleaning head 23 may include cloth or wool. The cleaning liquid in the liquid supply part 22 is evenly distributed on the auxiliary cleaning head 23 through the centrifugal force and the penetration by the cloth or wool. The auxiliary cleaning head 23 may float vertically to a certain extent.

[0090] In embodiments of the present disclosure, the first axis is perpendicular to the second axis. That is, the first axis may be parallel to the surface to be cleaned, and the second axis may be perpendicular to the surface to be cleaned.

[0091] As an alternative embodiment of the present disclosure, the auxiliary cleaning head 23 may be a side brush. The rotation axis of the side brush is at a certain angle to the floor, so that the residues on the surface to be cleaned can be moved into the cleaning area of the cleaning head 21.

[0092] As an alternative embodiment of the present disclosure, the auxiliary cleaning head 23 may be in the form of a disc brush, a roller brush, or the like.

[0093] As shown in FIG. 4, the auxiliary cleaning head 23 may further include a main body part 232. The wet auxiliary cleaning head 231 is connected onto the main body part 232. The main body part 232 is disposed on the robot body 10. The main body part 232 may include a driving motor. The driving motor may drive the wet auxiliary cleaning head 231 to rotate. The wet auxiliary cleaning head 231 may include cloth or wool. The main body part 232 may include a support structure. The support structure may be a tapered soft rubber support, so that a relatively large torque is transferred, and the wet auxiliary cleaning head 231 is allowed to float vertically to a certain extent, thereby improving the cleaning capability.

[0094] In embodiments of the present disclosure, the liquid supply part 22 and the collecting part 41 are stacked, so that the space utilization ratio of the cleaning robot can be increased, and the cleaning robot can be prevented from being too large.

[0095] In embodiments of the present disclosure, as shown in FIG. 15 and FIG. 16, the liquid supply part 22 is disposed above the collecting part 41. The liquid supply part 22 may be a clean water tank. The collecting part 41 may be a sewage tank. The clean water tank being disposed above can facilitate the supply of the liquid to the cleaning head 21 and the auxiliary cleaning head 23. The sewage tank being disposed below can facilitate the recovery of the residues.

[0096] The clean water tank and the sewage tank may be vertically stacked. That is, as shown in FIG. 15 and FIG. 16, the liquid supply part 22 and the collecting part 41 are vertically stacked. The clean water tank may be disposed above the sewage tank. The clean water tank being disposed above can facilitate the supply of the liquid to the cleaning head 21 and the auxiliary cleaning head 23. The sewage tank being disposed below can facilitate the recovery of the residues. Moreover, the clean water tank and the sewage tank being vertically stacked also enable the center of gravity of the cleaning robot to not change much in the horizontal direction, thereby ensuring the stability of the cleaning robot and avoiding significant shaking during cleaning.

[0097] The collecting part 41 may be disposed in the middle position of the robot body 10. That is, the collecting part 41 may be disposed on a side of the cleaning system 20 away from the born buffer 72. In this way, the center of gravity of the cleaning robot will not change much when the amount of liquid in the collecting part 41 changes. Thus, it is ensured that the cleaning robot can stably clean the surface to be cleaned, and the center of gravity is stable during use.

[0098] In embodiments of the present disclosure, as shown in FIG. 17, the liquid supply part 22 and the collecting part 41 are vertically stacked. The liquid supply part 22 is provided with a water inlet 221. The collecting part 41 is provided with a drainage port 413. The water inlet 221 in the liquid supply part 22 is configured to inject clean water into the liquid supply part 22. The drainage port 413 in the collecting part 41 is configured to discharge sewage in the collecting part 41 out from the collecting part 41. The water inlet 221 may be disposed on a side of the liquid supply part 22. The drainage port 413 may be disposed on a side of the collecting part 41. For example, two orifices may be disposed on the bottom or the side of the robot body 10, and the two orifices may be configured to be connected to a clean water injection structure and a sewage discharge structure. When the cleaning robot is in normal use, the two orifices need to be in a plugged state, so as to avoid water leakage. Alternatively, the water inlet 221 and the drainage port 413 may be plugged with seals. During water injection or drainage, the liquid supply part 22 and the collecting part 41 may be simultaneously removed from the robot body 10. The liquid supply part 22 is connected to the collecting part 41, so that the liquid supply part 22 and the collecting part 41 may be removed from the robot body 10 synchronously.

[0099] The liquid supply part 22 and the collecting part 41 may be removed from the robot body 10, so as to achieve liquid injection into the liquid supply part 22 and sewage discharge out from the collecting part 41. As shown in FIG. 17, the collecting part 41 may be a special-shaped structure, and may include a main body 414 and an extending part 415 connected to the main body 414. The main body 414 and the extending part 415 together form a chamber for collecting the sewage. The main body 414 may be substantially a rectangular body. The extending part 415 is an irregular special-shaped structure. For example, the extending part 415 may be substantially divided into a triangle and a rectangle, or a semicircle and a rectangle, etc., which is not limited here. The space of the extending part 415 for accommodating the sewage is smaller than the space of the main body 414 for accommodating the sewage. With the drainage port 413 disposed on the extending part 415, when the sewage is discharged, the sewage may be gathered at the extending part 415 by tilting the collecting part 41. This ensures that the sewage is discharged smoothly, thereby avoiding sewage, which cannot be discharged, from accumulating in the collecting part 41.

[0100] In embodiments of the present disclosure, a plurality of cliff sensors may be disposed around circumferential edge positions of the robot body 10. The auxiliary cleaning head 23 is disposed at the corner position of the robot body 10. The cliff sensor may be disposed at a position of the robot body 10 close to the auxiliary cleaning head 23. At least two cliff sensors may be disposed at the position of the robot body 10 close to the auxiliary cleaning head 23. The cliff sensor may identify the surface to be cleaned to determine the physical characteristics of the surface to be cleaned, including the surface material, the degree of cleanliness, etc. The control system 80 may control the operating state of the auxiliary cleaning head 23 according to the identification result of the cliff sensor to ensure the cleaning function of the auxiliary cleaning head 23. For example, when the sur-

face to be cleaned is identified by the cliff sensor as a floor board, the auxiliary cleaning head 23 may be controlled to increase humidity, so as to ensure the cleaning effect. Alternatively, when the surface to be cleaned is identified by the cliff sensor as a carpet, the auxiliary cleaning head 23 may be controlled to reduce humidity, so as to avoid wetting the carpet.

[0101] In embodiments of the present disclosure, as shown in FIG. 1, the detection system 60 of the cleaning robot is disposed on the robot body 10. At least part of the detection system 60 extends from the outer edge of the robot body 10, so as to increase the detection range of the detection system 60 and thereby increase the flexible adjustment capability of the cleaning robot. The detection system 60 may be an ultrasonic sensor, an infrared sensor, or other sensors, and is configured to detect the material change of the surface to be cleaned, the level change of the surface to be cleaned, or detect dirt.

[0102] In embodiments of the present disclosure, at least part of the detection system 60 is movably disposed relative to the robot body 10, so that the position of the detection system 60 can be reliably adjusted for adapting to different application environments. The detection system 60 may achieve position adjustment under the driving of the driving mechanism. Alternatively, the detection system 60 may include a flexible mechanism, and achieve position adjustment by deforming the flexible mechanism.

[0103] Specifically, the detection system 60 is retractably disposed on the robot body 10, and has an extended state and a retracted state. When the detection system is extended to the front of the cleaning robot, it may monitor the floor condition in front of the cleaning robot. For example, when the cleaning robot is in a D shape, the detection system 60 may be disposed near the corner of the cleaning robot, so that it is convenient for the detection system 60 to monitor the floor condition in front or at the side in the retracted state. When the cleaning robot is in a circular shape, the detection system 60 may be disposed at the front of the cleaning robot.

[0104] In embodiments of the present disclosure, at least part of the detection system 60 may extend from the outer edge of the robot body 10, so that the detection system 60 has a retracted state, in which the detection system 60 is retracted in the robot body 10, and an extended state, in which the detection system 60 extends from the robot body 10. The control system 80 may control the detection system 60 to move between the retracted state and the extended state. In this way, the detection system 60 can be adjusted in real time according to the operating state or the operating path of the cleaning robot, thereby ensuring that the detection system 60 can accurately determine the state of the surface to be cleaned.

[0105] Specifically, the driving system 30 may drive the cleaning robot to operate on a working surface. At this time, the control system 80 may drive the detection system 60 to move from the retracted state to the extended state, so that the detection system 60 can monitor the state of the working surface in real time. In addition, the detection system 60 has a detection viewing angle towards the working surface, and thus may precisely detect the state of the working surface, such as the material change of the working surface, the level change of the working surface, or detect dirt.

[0106] In embodiments of the present disclosure, as shown in FIG. 1 to FIG. 3, the detection system 60 may be connected to the corner position of the robot body 10. The auxiliary cleaning head 23 may be disposed at a position of the robot body 10 close to the detection system 60. The detection system 60 may identify the surface to be cleaned in advance, so as to determine the physical characteristics of the surface to be cleaned, including the surface material, the degree of cleanliness, etc. The control system 80 may control the operating state of the auxiliary cleaning head 23 according to the identification result of the detection system 60, so as to ensure the cleaning function of the auxiliary cleaning head 23. For example, when the surface to be cleaned is identified by the cliff sensor as a floor board, the auxiliary cleaning head 23 may be controlled to increase humidity, so as to ensure the cleaning effect. Alternatively, when the surface to be cleaned is identified by the cliff sensor as a carpet, the auxiliary cleaning head 23 may be controlled to reduce humidity, so as to avoid wetting the carpet.

[0107] In embodiments of the present disclosure, the detection system 60 is retractably disposed on the forward portion 12 of the robot body 10, so that the detection system 60 can determine the state of the surface to be cleaned earlier, and feed it back to the control system 80. In this way, the control system 80 can adjust the walking route and the cleaning mode of the cleaning robot according to the information fed back by the detection system 60. The detection system 60 is disposed at the corner position of the forward portion 12, so that the detection system 60 can be arranged reasonably and is avoided from occupying a relatively large area. Besides, this also enables the detection system 60 to reliably monitor the state of the working surface at the corner of the robot body 10, thereby ensuring that the cleaning robot can clean the working surface more efficiently.

[0108] In embodiments of the present disclosure, as shown in FIG. 1 and FIG. 4, at least one detection system 60 is disposed adjacent to the auxiliary cleaning head 23, and at least part of the detection system 60 is disposed directly above the auxiliary cleaning head 23. In this way, the detection system 60 can be prevented from interfering with the auxiliary cleaning head 23, and the corner position of the robot body 10 can be utilized to a greater extent. Thus, the positions for assembling the detection system 60 and the auxiliary cleaning head 23 can be reasonably arranged.

[0109] In embodiments of the present disclosure, the control system 80 may be connected to the detection system 60. The control system 80 may control the ex-

tended state and the retracted state of the detection system 60. For example, when the cleaning robot is operating, the control system 80 may control the detection system 60 to move from the retracted state to the extended state. Alternatively, when the cleaning robot stops operating, the control system 80 may control the detection system 60 to move from the extended state to the retracted state. Alternatively, when the detection system 60 detects that the working surface has a recess or the material of the working surface changes, the control system 80 controls the working state of the cleaning system 20 or the driving system 30 to change. The working surface is the surface to be cleaned. For example, when the detection system 60 detects that the working surface has a recess, the control system 80 may control the driving system 30 to decelerate, and the control system 80 may also control the cleaning system 20 to rotate at a decreased speed. For example, when the detection system 60 detects that the material of the working surface changes, for example, changing from carpet to tile, the control system 810 may control the driving system 30 to accelerate, and the control system 80 may also control the cleaning system 20 to rotate at an increased speed.

[0110] The detection system 60 may be configured to detect the material change of the surface to be cleaned, the level change of the surface to be cleaned, or detect dirt, and then feed it back to the control system 80, so that the operating sate of the cleaning robot can be controlled. For example, when the detection system 60 detects that the surface to be cleaned is relatively dirty, the control system 80 may control the cleaning robot to slow down, ensuring that the cleaning system 20 can better clean the surface to be cleaned. Alternatively, when the detection system 60 detects that the surface to be cleaned is a floor board, the control system 80 may control the pump 24 to increase the flow of the cleaning liquid fed from the liquid supply part 22 to the cleaning head 21 and the auxiliary cleaning head 23, so that a reliable cleaning of the floor is ensured. Alternatively, the control system 80 may adjust the walking route and the cleaning mode of the cleaning robot according to the information fed back by the detection system 60. For example, when the detection system 60 is in an extended state, the detection system 60 may be disposed in front of the robot body 10. In this way, the detection system 60 may determine the state of the surface to be cleaned earlier, and feed it back to the control system 80. Thus, the control system 80 may adjust the walking route and the cleaning mode of the cleaning robot according to the information fed back by the detection system 60. The detection system 60 may detect the change of the floor material earlier. For example, when the floor material changes from floor board to carpet, the detection system 60 may provide relevant information to the control system 81 punctually, so that the control system 80 can control the walking direction or the cleaning mode of the cleaning robot punctually. For example, the cleaning robot is controlled to slow down when the floor material changes from floor board to carpet. Alternatively, the cleaning robot is controlled to reduce the amount of liquid supplied to the cleaning head 21 and the auxiliary cleaning head 23 when the floor material changes from floor board to carpet.

[0111] In embodiments of the present disclosure, a plurality of detection systems 60 may be provided, so that the detection range of the detection system 60 may be enlarged. Thus, the working state of the cleaning system 20 or the driving system 30 may be assisted precisely. Two detection systems 60 may also be provided, as shown in FIG. 1, and the two detection systems 60 are disposed at two corner positions of the forward portion 12, respectively.

[0112] Other embodiments of the present disclosure will be apparent to those skilled in the art from consideration of the description and practice of the present disclosure. The present disclosure is intended to cover any variations, uses, or adaptations of the present disclosure which follow the general principle of the present disclosure and include the common general knowledge or customary technical means in the art which is not disclosed in the present disclosure. The description and example embodiments are to be considered as being exemplary only, and the true scope and spirit of the present disclosure are indicated by the appended claims.

[0113] It should be understood that the present disclosure is not limited to the exact structures that have been described above and shown in the accompanying drawings, and that various modifications and changes may be made without departing from the scope thereof. The scope of the present disclosure is only defined by the appended claims.

Claims

1. A cleaning robot, comprising:

   a robot body (10); and
   a cleaning system (20) disposed on the robot body (10) and comprising a cleaning head (21), an auxiliary cleaning head (23), and a liquid supply part (22),
   wherein the liquid supply part (22) is configured to feed a cleaning liquid to the cleaning head (21) and the auxiliary cleaning head (23).

2. The cleaning robot according to claim 1, wherein the cleaning system (20) further comprises:
   a pump (24), wherein the pump (24) is in communication with the liquid supply part (22) to feed the cleaning liquid from the liquid supply part (22) to the cleaning head (21) and the auxiliary cleaning head (23).

3. The cleaning robot according to claim 1 or 2, wherein

the robot body (10) comprises a fixed bracket (11);
the cleaning head (21) is disposed in the fixed bracket (11);
the fixed bracket (11) is provided with a liquid supply channel; and
the liquid supply part (22) feeds the cleaning liquid to the cleaning head (21) through the liquid supply channel.

4. The cleaning robot according to claim 3, wherein

the liquid supply channel comprises a liquid inlet (111) and a liquid outlet (112), the liquid inlet (111) being in communication with the liquid supply part (22), and the liquid outlet (112) being configured to feed the cleaning liquid to the cleaning head (21); and
a plurality of liquid outlets (112) is provided, and the plurality of liquid outlets (112) is disposed at intervals in a direction parallel to the cleaning head (21).

5. The cleaning robot according to any one of claims 1 to 4, further comprising:
a recovery system (40) disposed on the robot body (10) and comprising a collecting part (41), the collecting part (41) being configured to collect residues on at least one of the cleaning head (21), the auxiliary cleaning head (23), and a surface to be cleaned.

6. The cleaning robot according to claim 5, wherein the recovery system (40) further comprises:
a scraper (42), wherein the scraper (42) is configured to be in contact with the cleaning head (21) and remove the residues from the cleaning head (21) by interfering with the cleaning head (21) so that the residues are collected by the collecting part (41).

7. The cleaning robot according to claim 6, wherein the scraper (42) is parallel to the cleaning head (21).

8. The cleaning robot according to any one of claims 1 to 7, wherein the robot body (10) defines a transverse axis and a longitudinal axis, and the cleaning head (21) is parallel to the transverse axis.

9. The cleaning robot according to any one of claims 6 to 8, wherein the scraper (42) is provided with a liquid suction port (421) and the liquid suction port (421) is in communication with the collecting part (41).

10. The cleaning robot according to any one of claims 5 to 9, wherein the recovery system (40) further comprises:
a power part (43), wherein the power part (43) is in pneumatic communication with the collecting part (41) to collect the residues to the collecting part (41).

11. The cleaning robot according to any one of claims 5 to 10, wherein

the collecting part comprises an inlet and an outlet; and
the cleaning robot further comprises:
a plugging assembly disposed on the robot body, at least part of the plugging assembly being adjustable in position to close or release the inlet and the outlet of the collecting part.

12. The cleaning robot according to claim 11, wherein the plugging assembly comprises:

a connecting rod;
a first plugging member disposed on the connecting rod; and
a second plugging member disposed on the connecting rod,
wherein the connecting rod is movably disposed relative to the robot body, so that the first plugging member and the second plugging member close or open the inlet and the outlet of the collecting part respectively.

13. The cleaning robot according to any one of claims 1 to 12, further comprising:
a detection system disposed on the robot body, at least part of the detection system extending from an outer edge of the robot body.

14. The cleaning robot according to claim 13, wherein at least part of the detection system is movably disposed relative to the robot body.

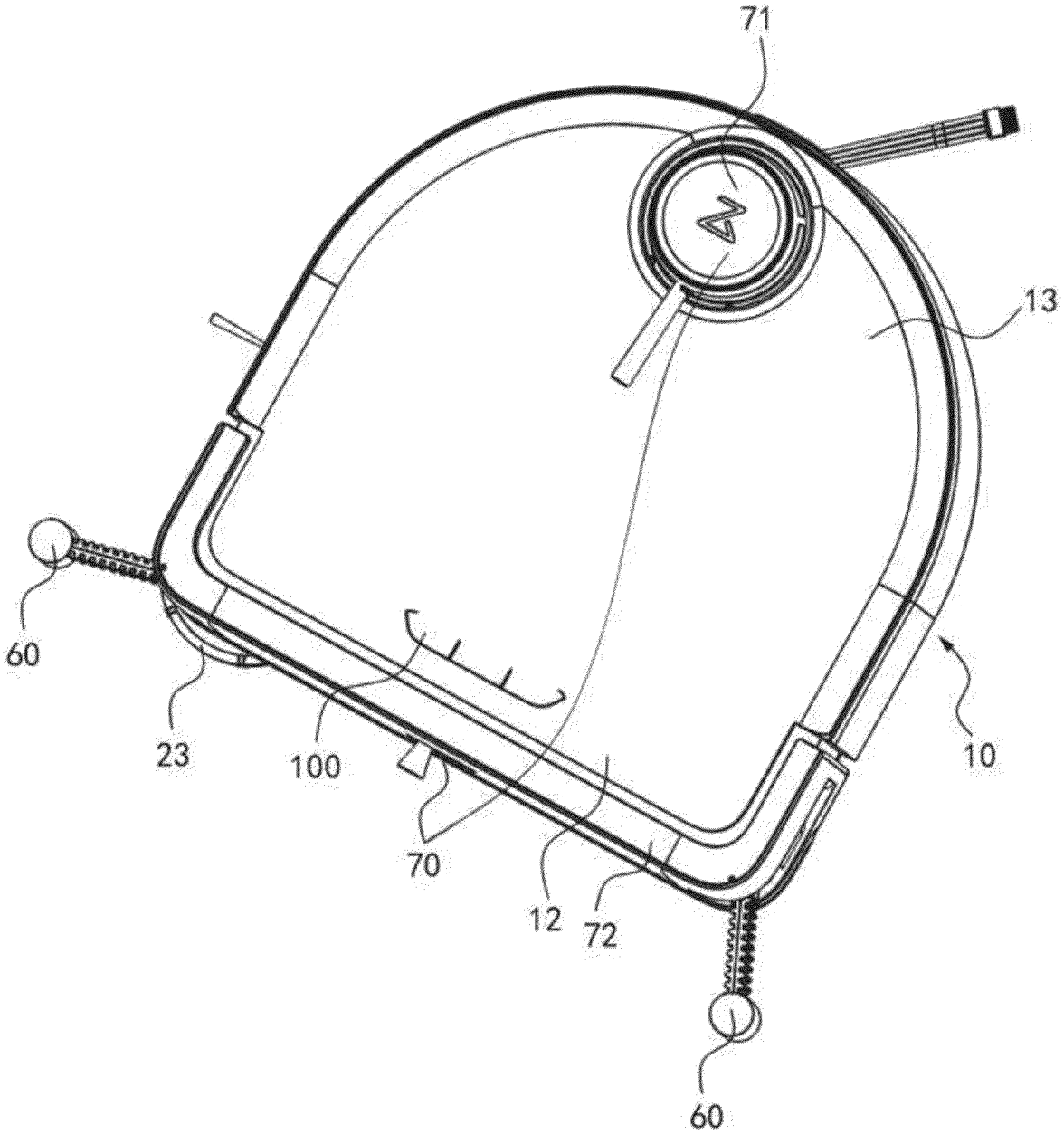


FIG. 1

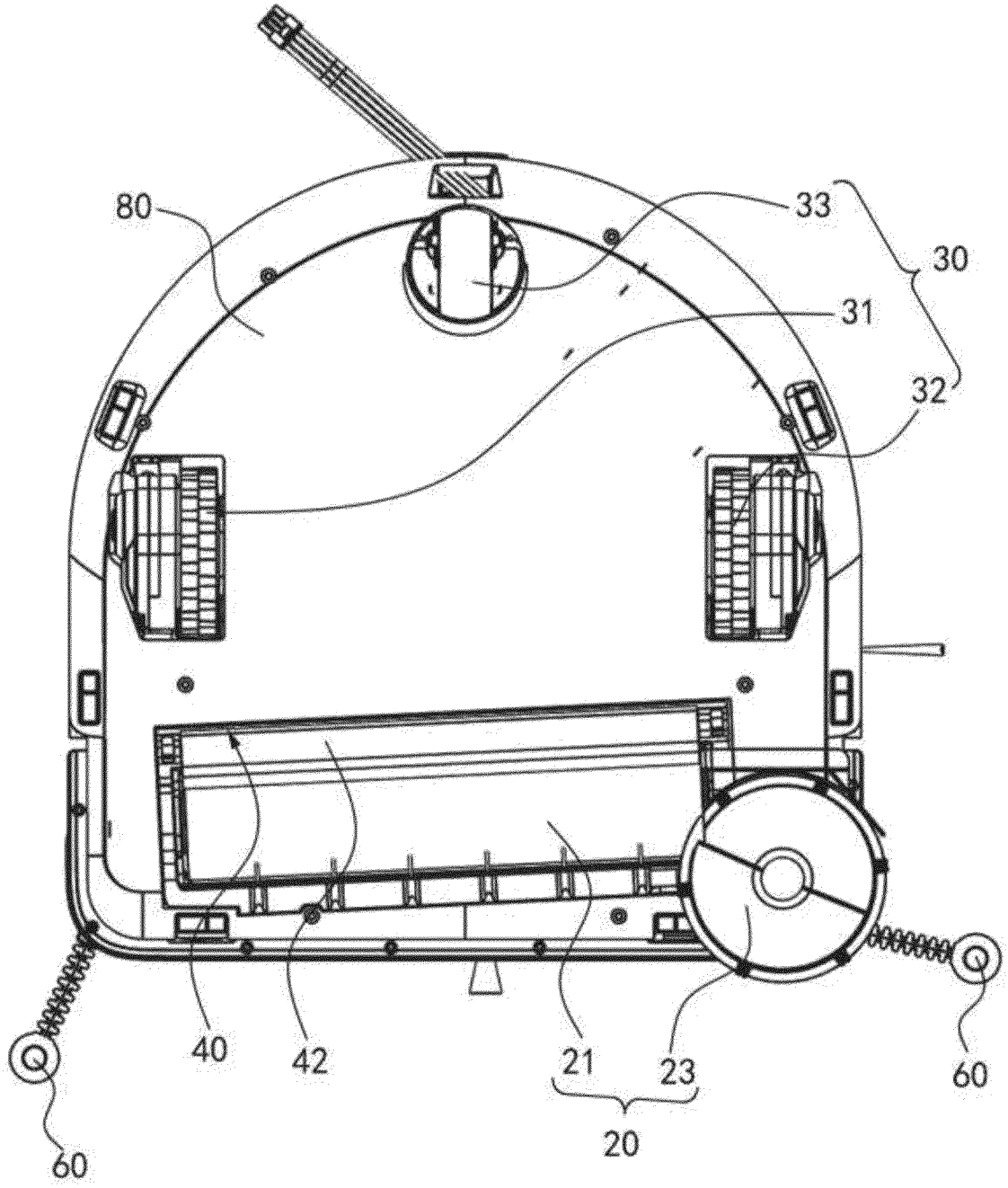


FIG. 2

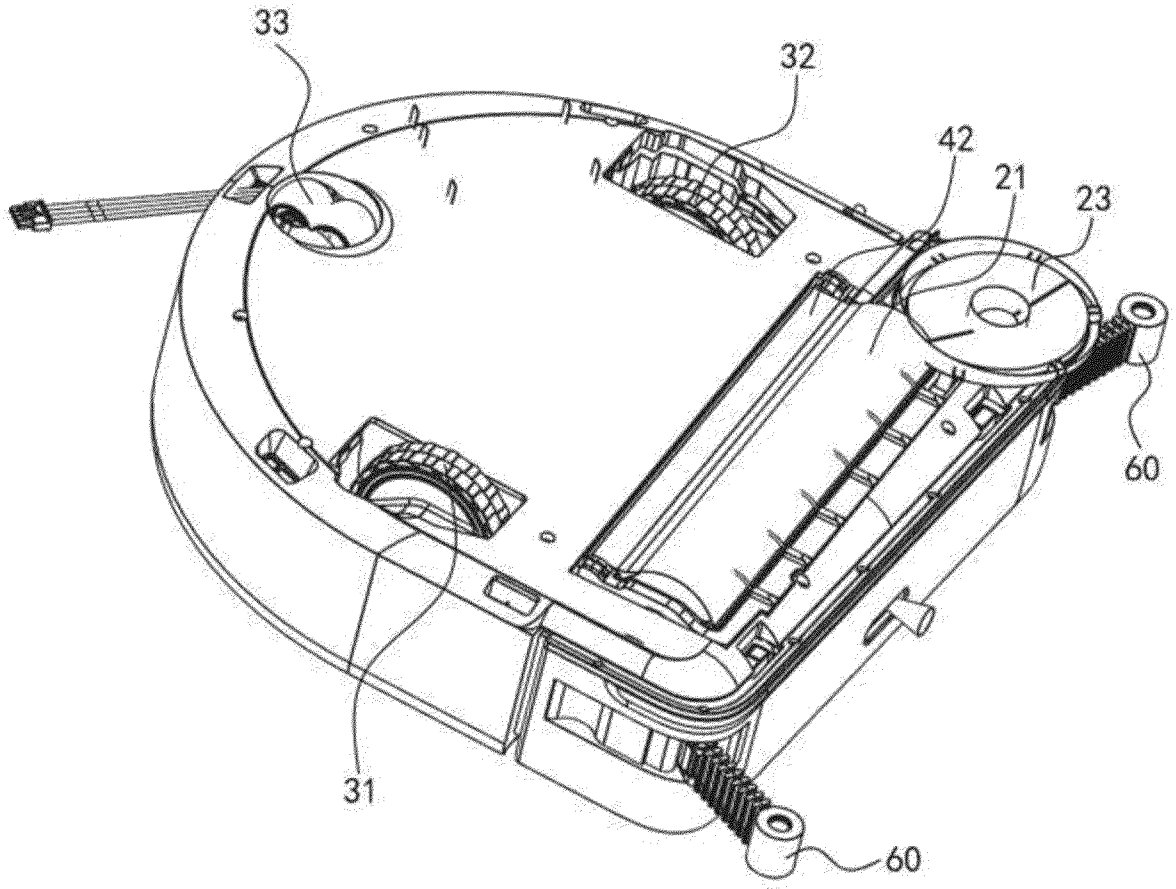


FIG. 3

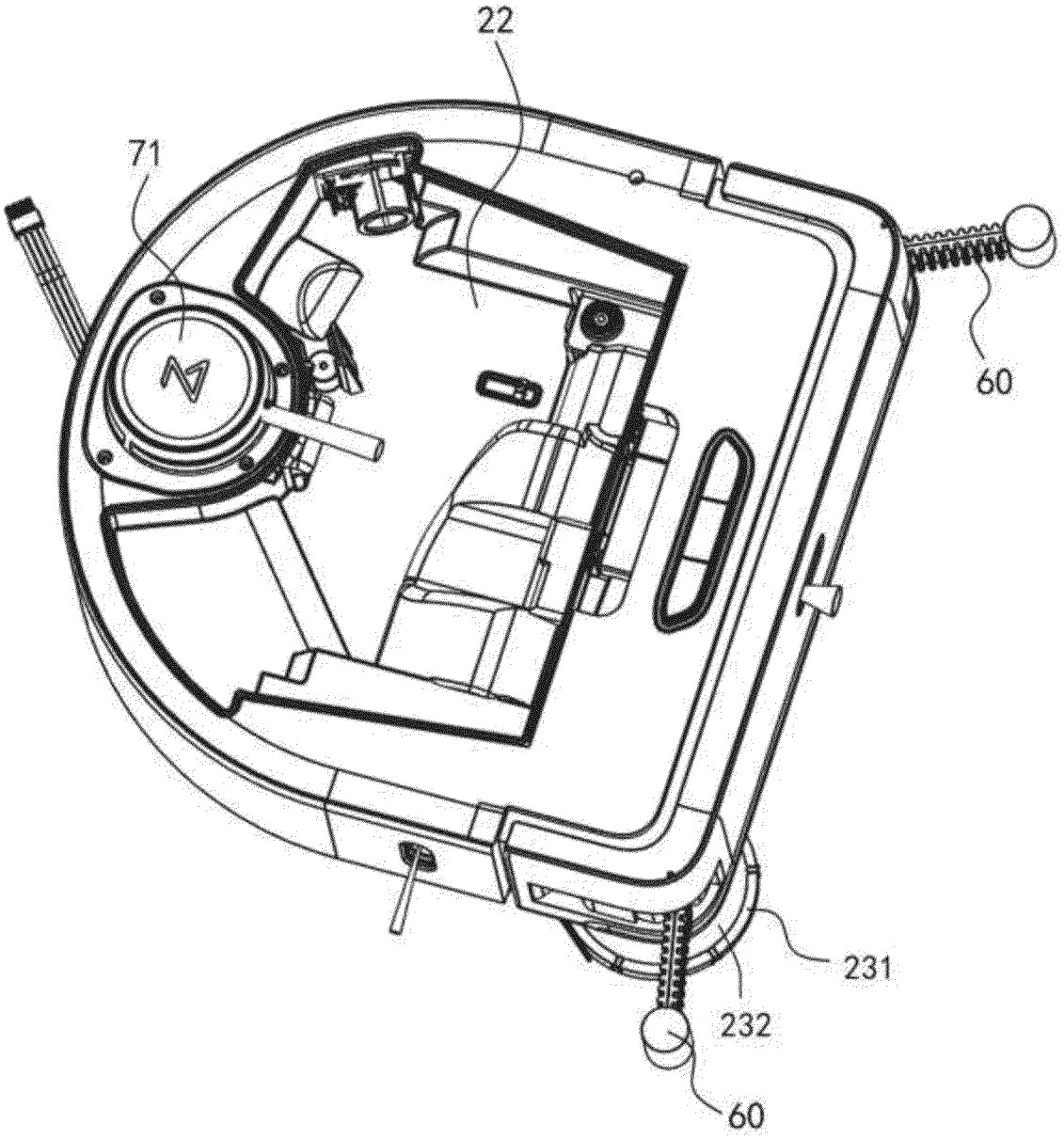


FIG. 4

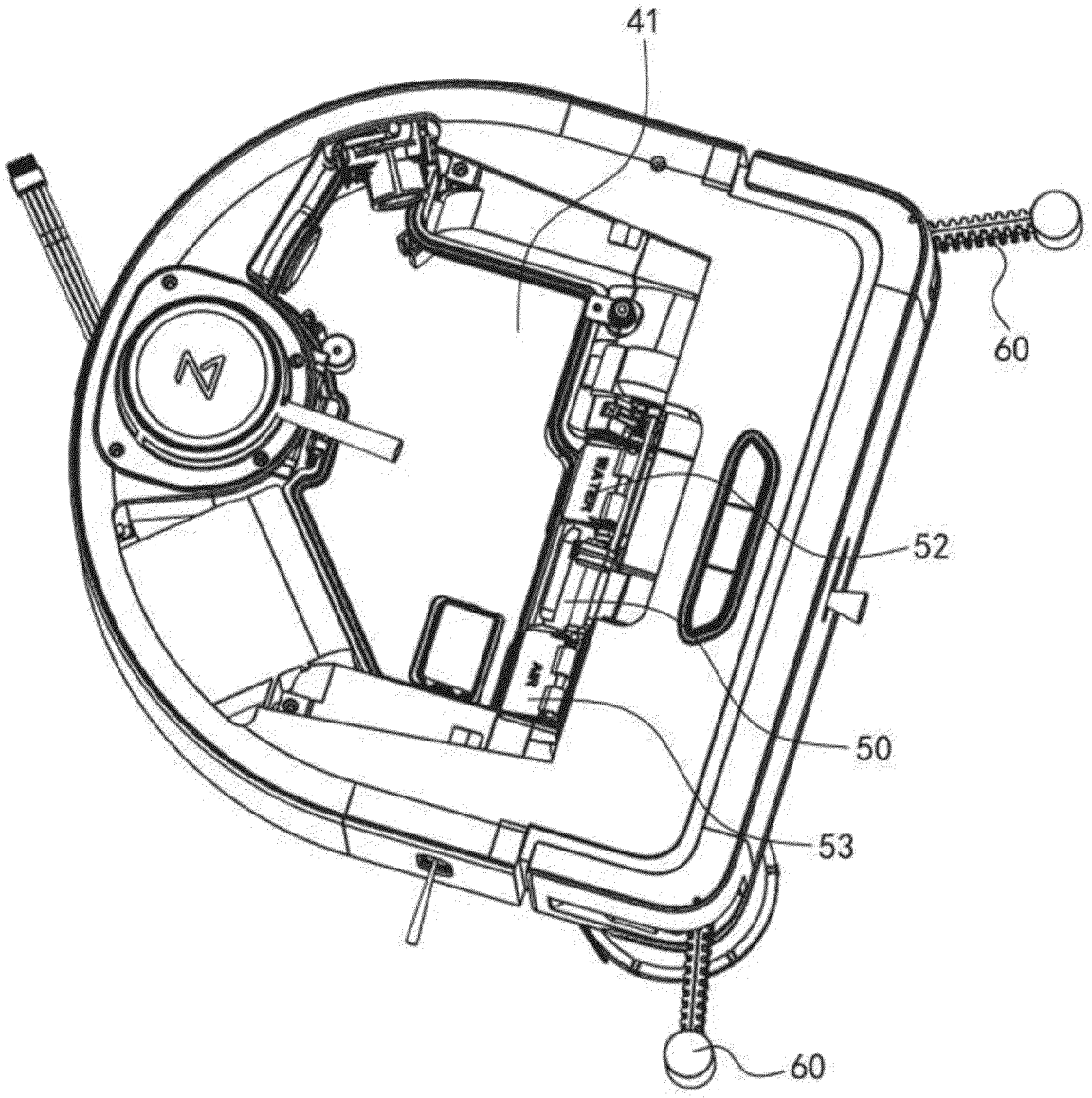


FIG. 5

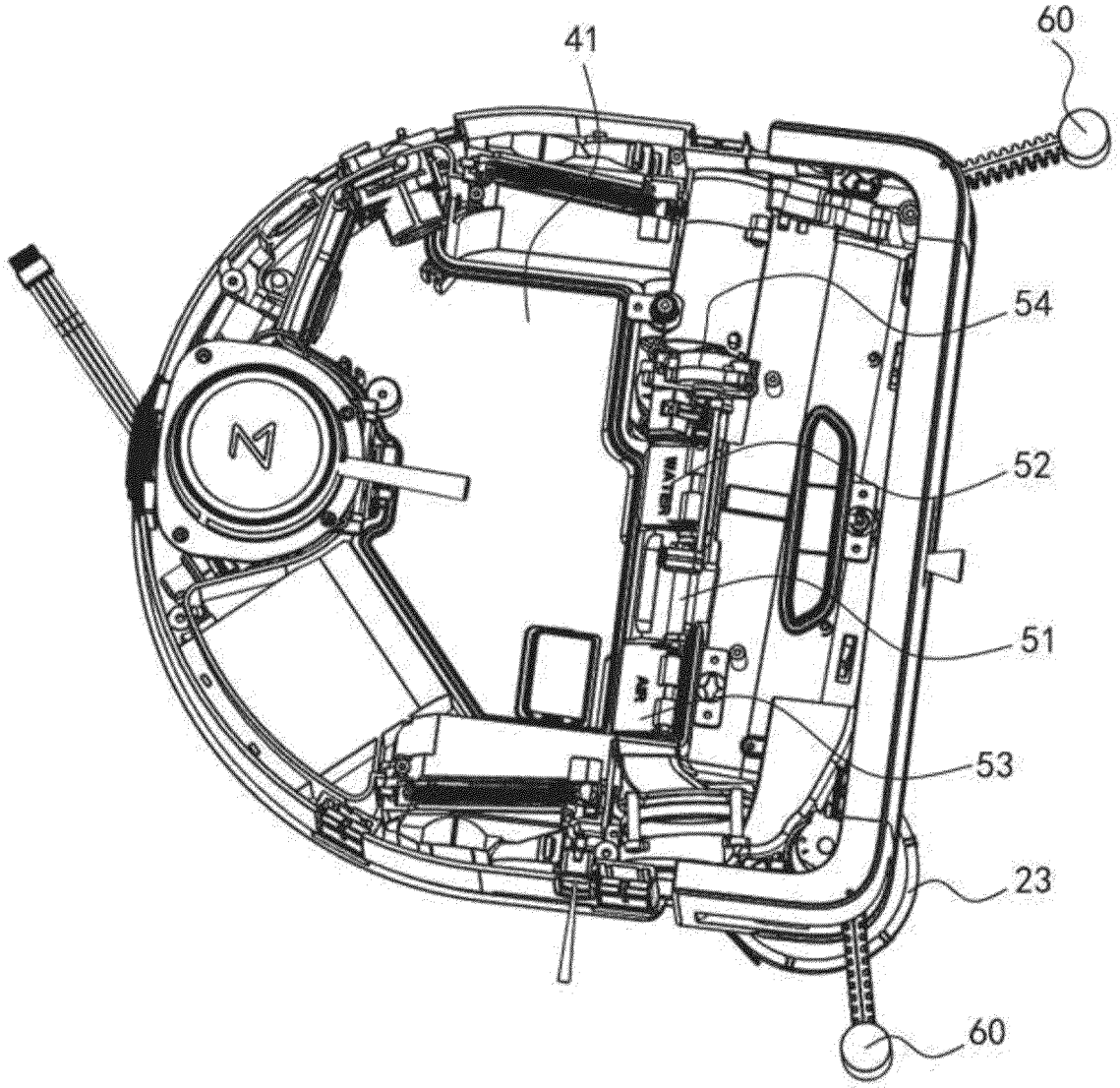


FIG. 6

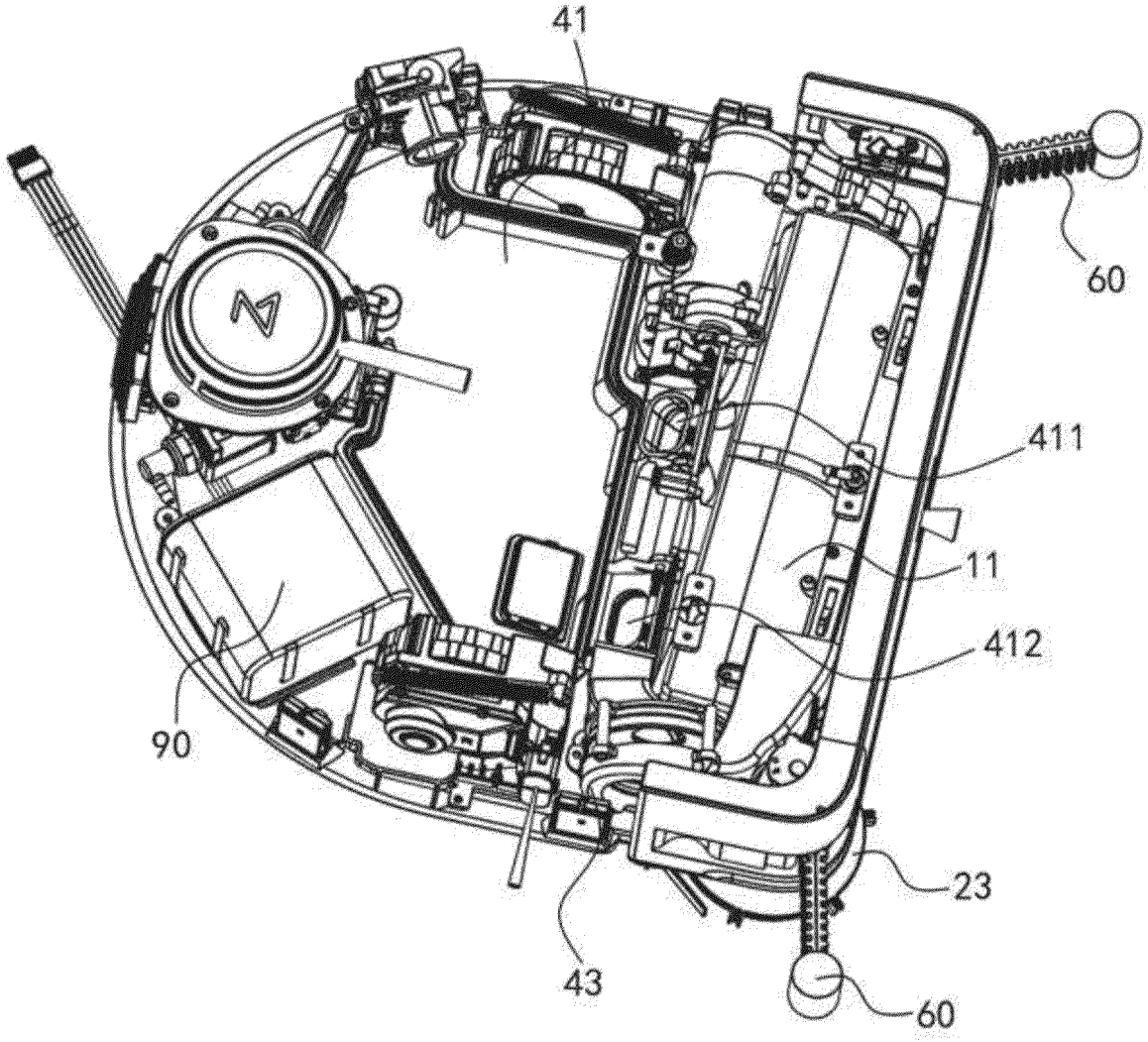


FIG. 7

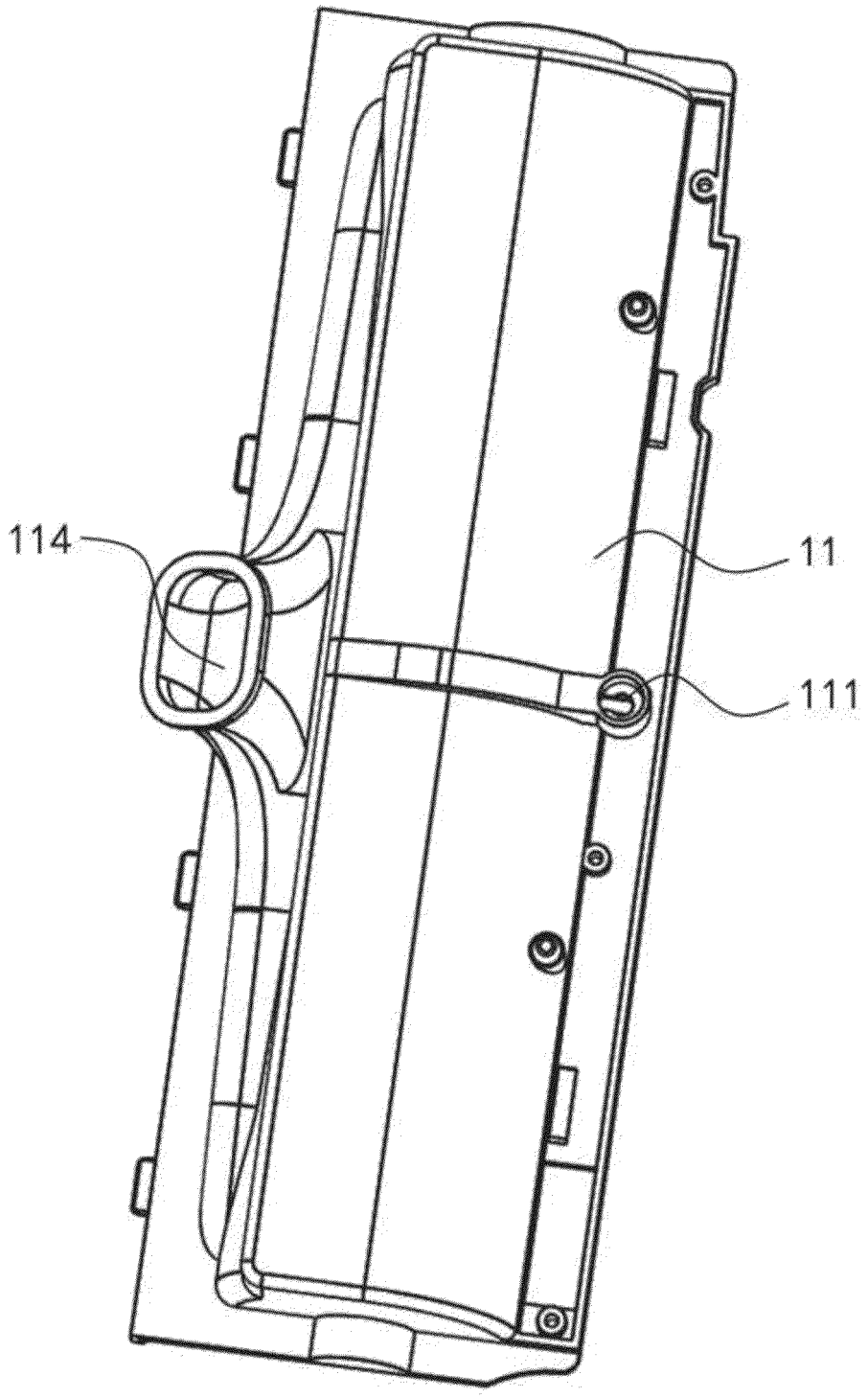


FIG. 8

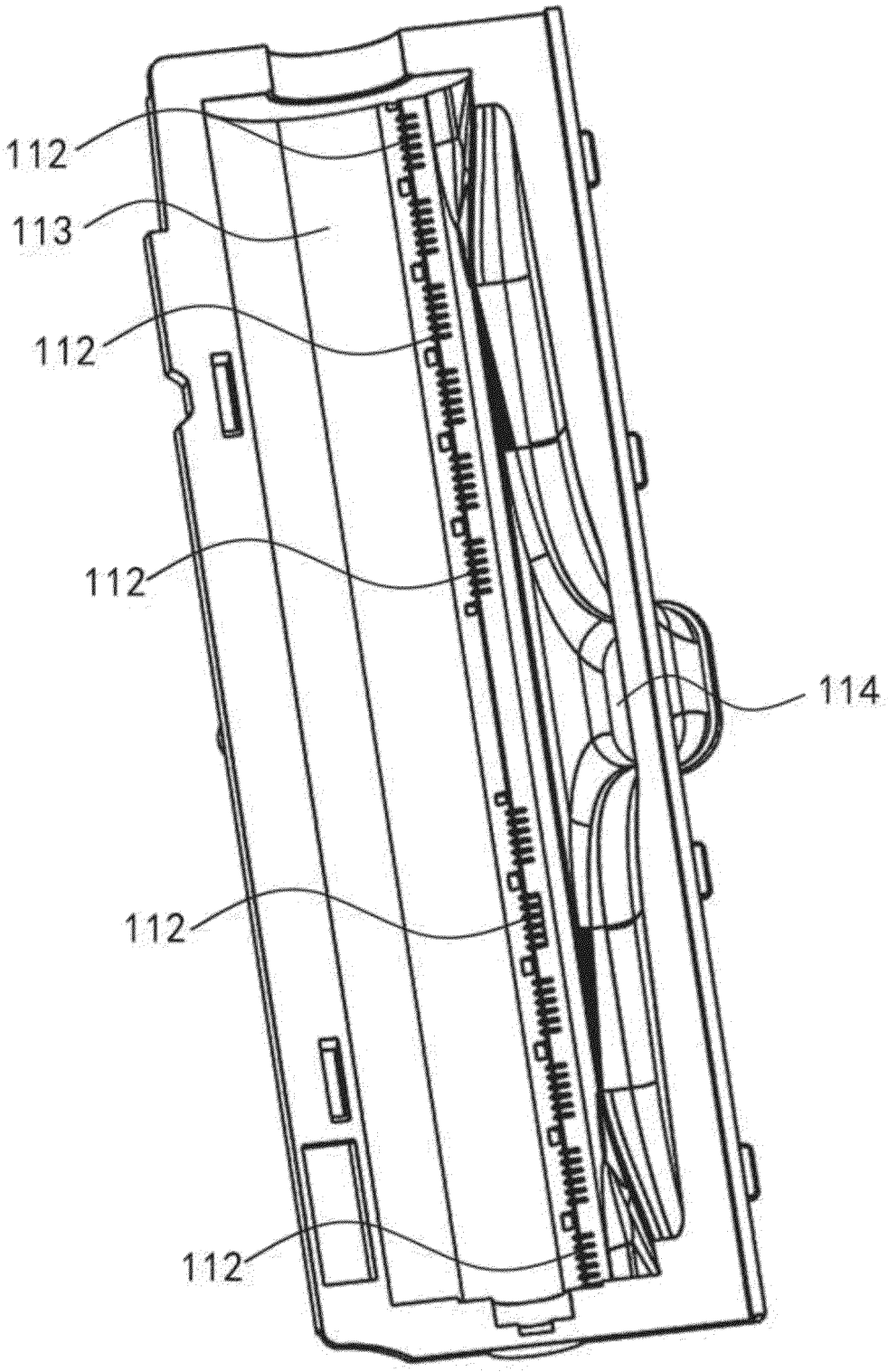


FIG. 9

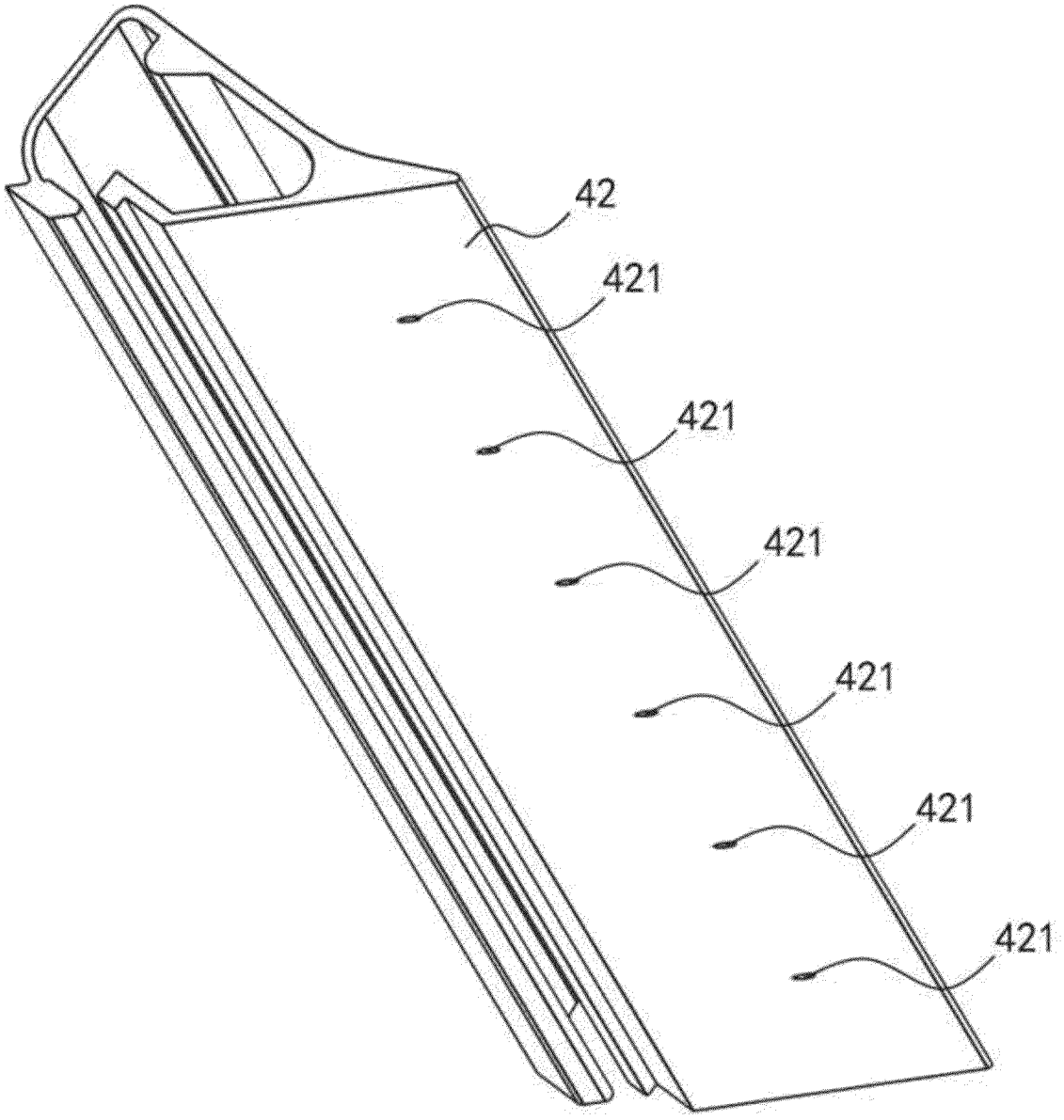


FIG. 10

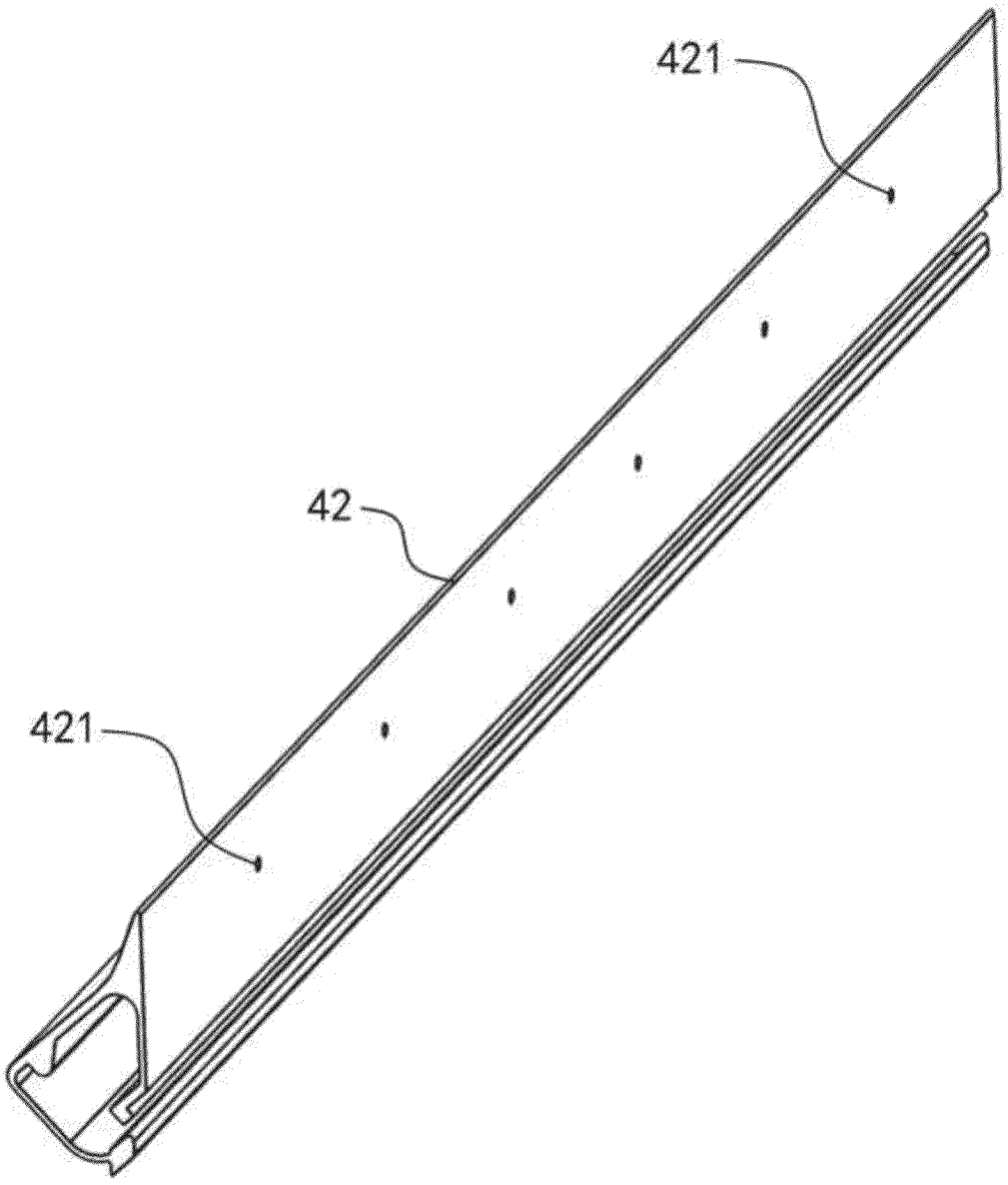


FIG. 11

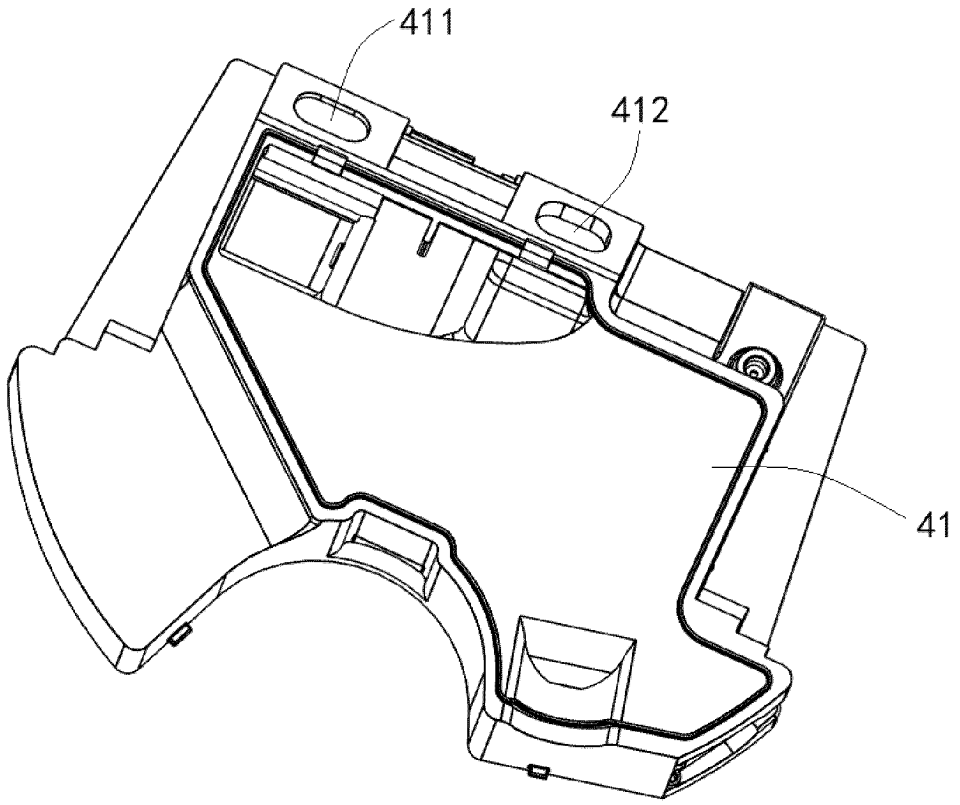


FIG. 12

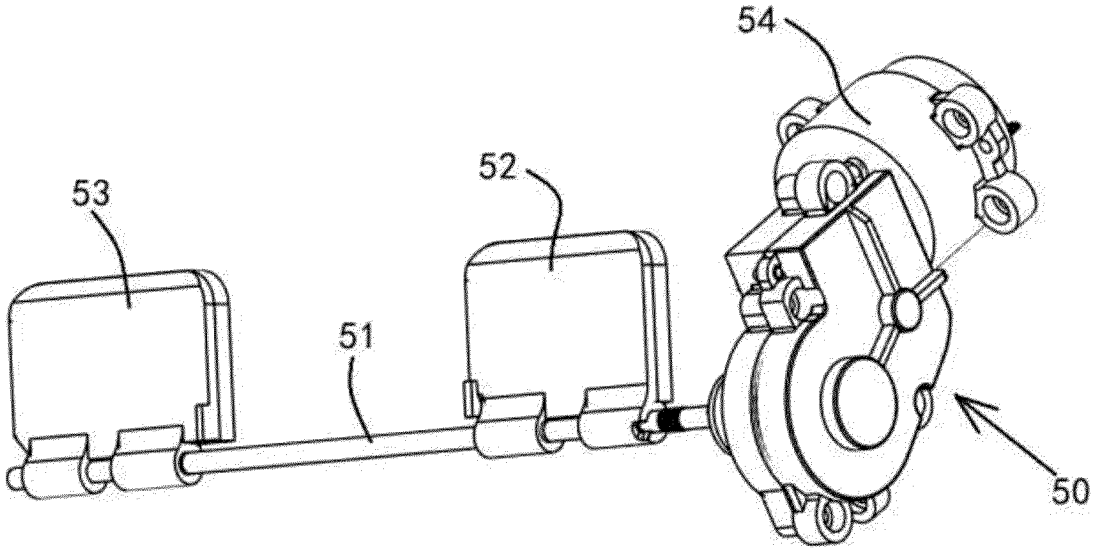


FIG. 13

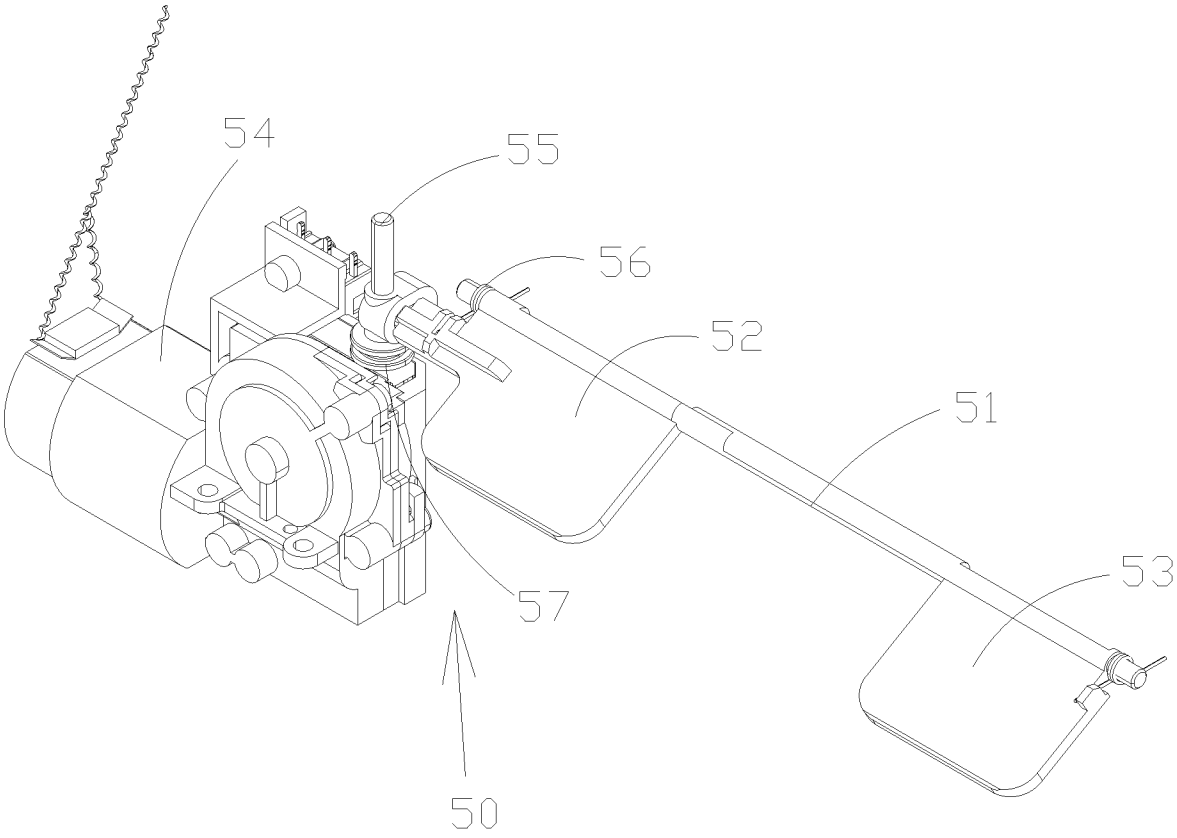


FIG. 14

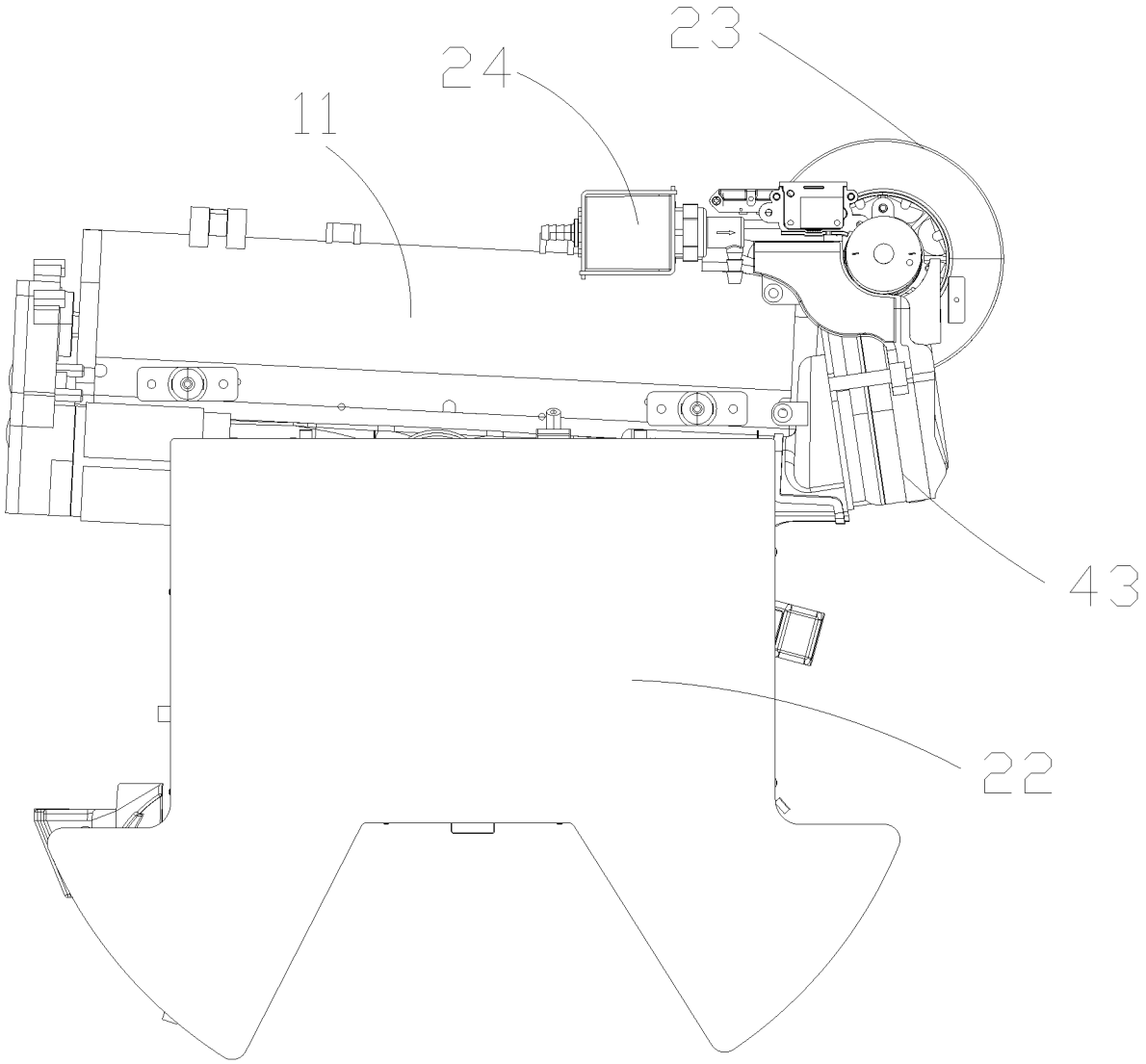


FIG. 15

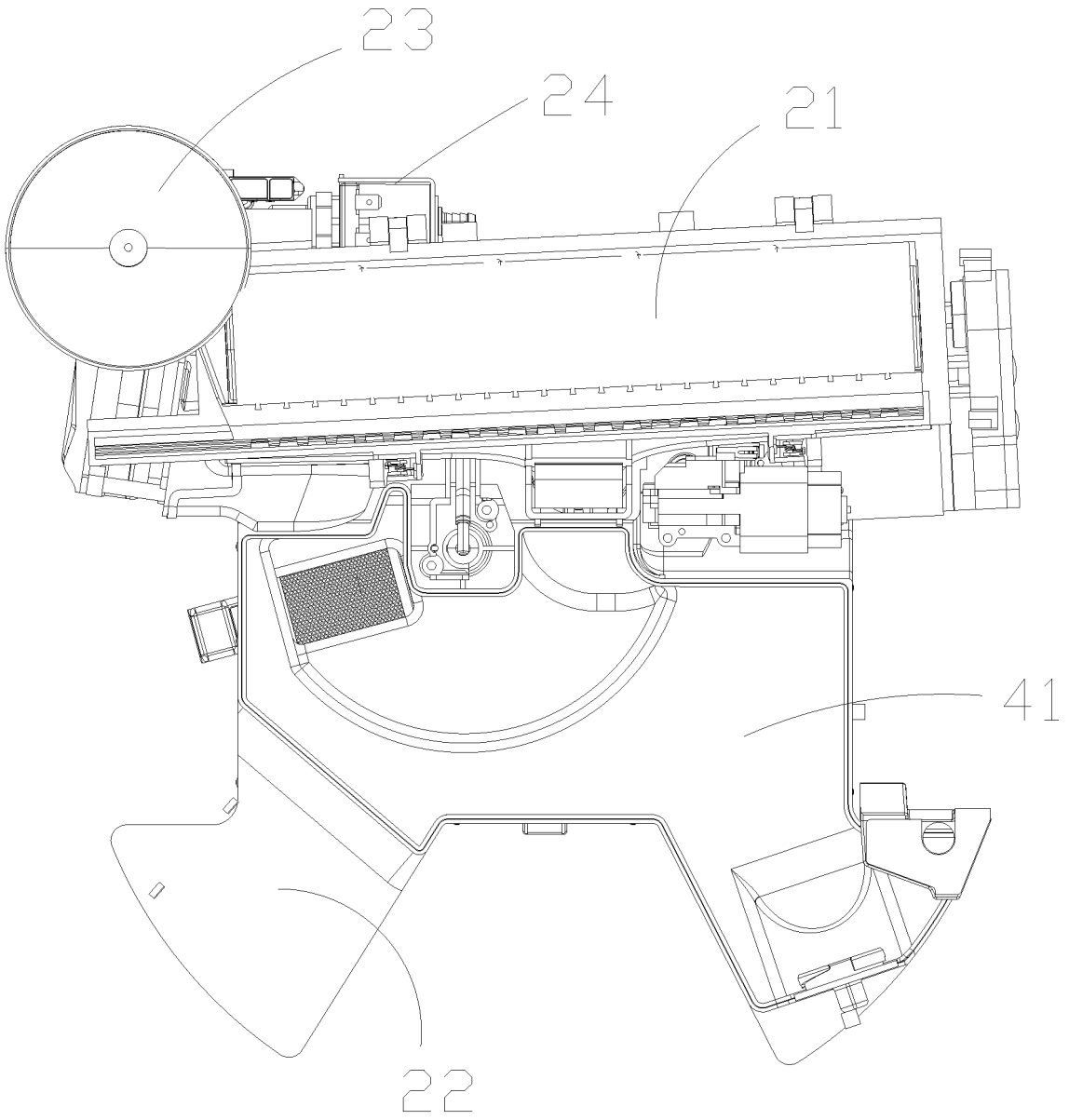


FIG. 16

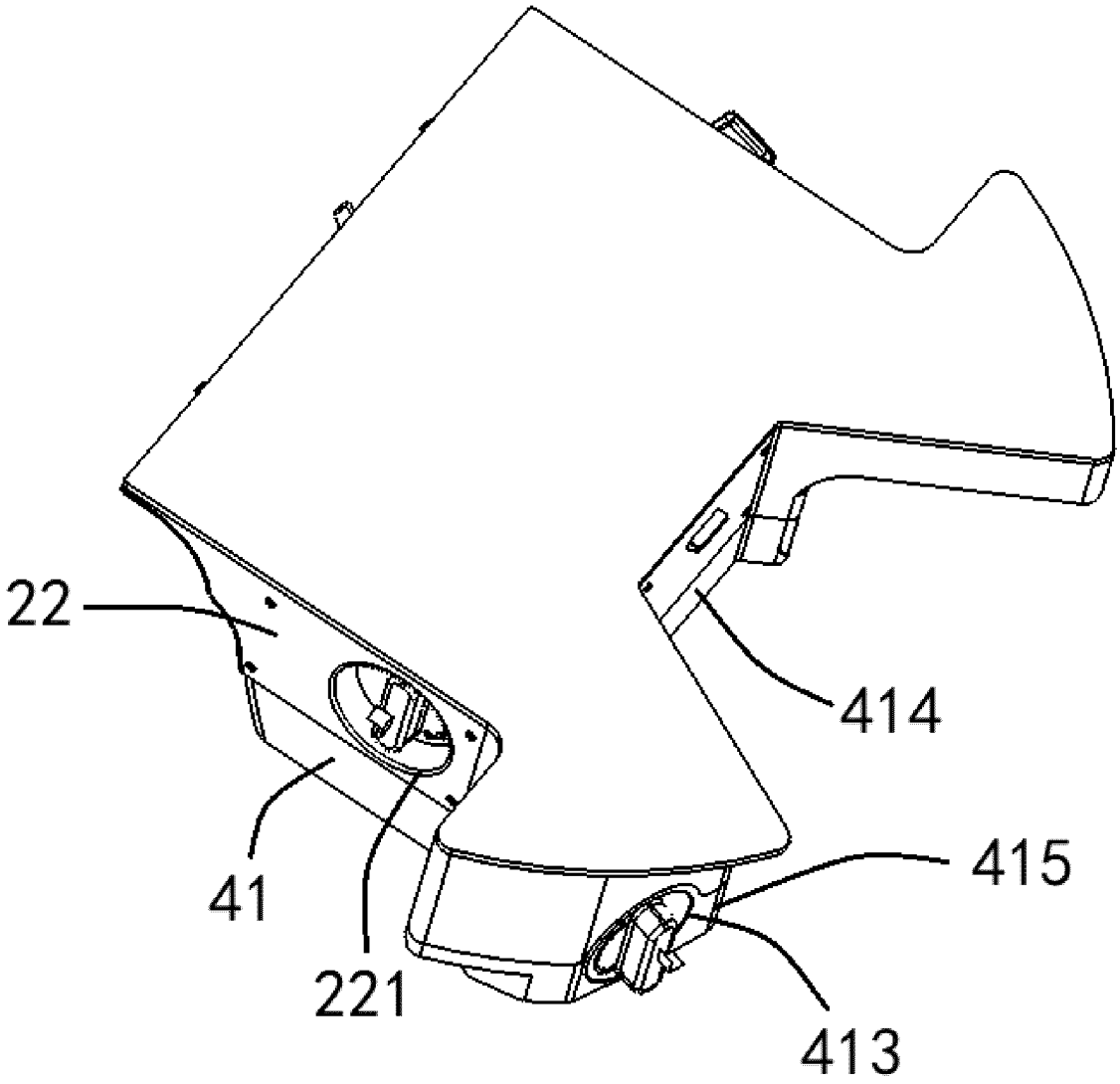


FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/081697

A. CLASSIFICATION OF SUBJECT MATTER

A47L11/29(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)

CNTXT, ENTXTC, ENTXT, VEN: 辅助, 边角, 角落, 沿边, 墙角, 墙脚, 拐角, 墙边, 边缘, 侧, 清洁部件, 清洁元件, 清洁单元, 清洁头, 液, 流体, 水, 湿, 收集, auxiliary, corner, edge, slit, clean+ unit, water, wet, liquid, fluid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 214712352 U (GUANGZHOU COAYU ROBOT CO., LTD.) 16 November 2021 (2021-11-16) description, paragraphs 29-30, and figures 1-3	1-14
Y	CN 111093451 A (CHIBA INSTITUTE OF TECHNOLOGY) 01 May 2020 (2020-05-01) description, paragraph 66, and figures 1-26	1-14
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A	CN 103479303 A (LG ELECTRONICS INC.) 01 January 2014 (2014-01-01) entire document	1-14

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

* Special categories of cited documents:
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 July 2023	**04 July 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/081697

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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PX	CN 218044978 U (BEIJING ROBOROCK TECHNOLOGY CO., LTD.) 16 December 2022 (2022-12-16) claims 1-14	1-14

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/081697

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INTERNATIONAL SEARCH REPORT
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International application No.
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REFERENCES CITED IN THE DESCRIPTION

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