

CLEANING ROBOT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure is based on the Chinese patent application with the application number 202310546681.0 and the filing date of May 15, 2023, and claims priority of the Chinese patent application. The entire content of the Chinese patent application is incorporated herein by reference.

TECHNICAL FIELD

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

BACKGROUND

[0003] Nowadays, with the development of modern society, there is an increasing number of people focusing their lives on work. They hardly have time to do cleaning for household hygiene, while daily cleaning and maintenance of household hygiene affect people's quality of life all the time. To save time and maintain household hygiene, more and more people have begun to purchase cleaning robots to clean the inside of their houses promptly and conveniently. The cleaning robots can automatically clean the floor in the room with a certain degree of artificial intelligence.

SUMMARY

[0004] The present disclosure provides a cleaning robot, which can improve a cleaning effect.

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

[0006] a machine body;

[0007] a driving system, the driving system being disposed on the machine body and being configured to drive the cleaning robot to operate on a cleaning surface; and

[0008] a cleaning system, the cleaning system being disposed on the machine body, the cleaning system including a main cleaning assembly disposed in parallel relative to the cleaning surface, and the main cleaning assembly being movably disposed relative to the machine body, such that at least part of the main cleaning assembly is capable of extending from a circumferential outer edge of the machine body.

[0009] In one embodiment of the present disclosure, an angle between the main cleaning assembly and a transverse axis of the machine body is less than 90 degrees.

[0010] In one embodiment of the present disclosure, the main cleaning assembly is movably disposed in an arrangement direction of the main cleaning assembly.

[0011] In one embodiment of the present disclosure, the arrangement direction of the main cleaning assembly is parallel to the transverse axis of the machine body.

5 **[0012]** In one embodiment of the present disclosure, the main cleaning assembly includes a fixed support and a cleaning head disposed in the fixed support, and the fixed support is movably disposed on the machine body.

[0013] In one embodiment of the present disclosure, the machine body is provided with a mounting space, and the fixed support is movably disposed in the mounting space, where a
10 channel being in communication with the mounting space is disposed on the circumferential outer edge of the machine body, and the fixed support is capable of being formed by extending through the channel, such that the fixed support has a retracted state in which the fixed support is retracted into the mounting space and an extended state in which the fixed support extends out of the mounting space.

15 **[0014]** In one embodiment of the present disclosure, the cleaning robot also includes a limiting member, the limiting member is connected to the machine body, and the limiting member is in limiting contact with the fixed support to prevent the fixed support from disengaging from the machine body,

[0015] where the fixed support is movably disposed relative to the limiting member.

20 **[0016]** In one embodiment of the present disclosure, the limiting member includes a fixed base and a sliding part, the sliding part is disposed on the fixed base, the fixed base is connected to the machine body, and the fixed support is movably disposed relative to the sliding part,

[0017] where there are at least two limiting members, and the fixed support is clamped between the limiting members.

25 **[0018]** In one embodiment of the present disclosure, the cleaning robot also includes a driving assembly, and the driving assembly is in driving connection with the fixed support to drive the fixed support to move relative to the machine body.

[0019] In one embodiment of the present disclosure, the driving assembly includes:

[0020] a driving part, the driving part being disposed on the machine body;

30 **[0021]** a driving wheel, the driving wheel being connected to the driving part; and

[0022] a connecting rack, the connecting rack being connected to the fixed support, and the connecting rack being engaged with the driving wheel, such that the driving part drives, through the driving wheel and the connecting rack, the fixed support to move.

[0023] In one embodiment of the present disclosure, the cleaning head includes a wet cleaning

head.

[0024] In one embodiment of the present disclosure, the cleaning robot also includes a liquid supply part, the liquid supply part is disposed on the machine body, and the liquid supply part feeds cleaning liquid into the wet cleaning head.

5 **[0025]** In one embodiment of the present disclosure, the cleaning robot also includes a recycling system, the recycling system is disposed on the machine body, the recycling system includes a collecting part, and the collecting part collects residues on the wet cleaning head and/or a surface to be cleaned,

10 **[0026]** where the collecting part and the liquid supply part are disposed in a longitudinal axis direction of the machine body.

[0027] In one embodiment of the present disclosure, the cleaning system is located between the collecting part and the liquid supply part.

15 **[0028]** In one embodiment of the present disclosure, the machine body includes a forward portion and a rearward portion, and the liquid supply part and the collecting part are located in the forward portion and the rearward portion, respectively.

[0029] In one embodiment of the present disclosure, the recycling system also includes a power part, and the power part is in pneumatic communication with the collecting part to collect residues into the collecting part,

20 **[0030]** where a blocking part is disposed on a path through which the power part is in communication with the collecting part.

25 **[0031]** In one embodiment of the present disclosure, the blocking part is disposed in the collecting part to divide the collecting part into a first chamber and a second chamber that are in communication with each other, where the blocking part is provided with a filter hole, such that the first chamber and the second chamber are in communication with each other through the filter hole.

[0032] In one embodiment of the present disclosure, a volume of the first chamber is greater than a volume of the second chamber, the first chamber is provided with an inlet through which the residues are collected into the collecting part, and the second chamber is provided with an outlet through which the second chamber is in communication with the power part.

30 **[0033]** In one embodiment of the present disclosure, the driving system includes a first driving wheel module and a second driving wheel module. The first driving wheel module and the second driving wheel module are disposed along the transverse axis of the machine body, and the transverse axis of the machine body is perpendicular to a movement direction of the cleaning robot.

[0034] In the cleaning robot according to the embodiments of the present disclosure, the cleaning system is disposed on the machine body. The cleaning system includes a main cleaning assembly. The main cleaning assembly is movably disposed relative to the machine body, such that at least part of the main cleaning assembly is capable of extending from the circumferential outer edge of the machine body. That is, the main cleaning assembly according to the present disclosure can reciprocate between the retracted state and the extended state. In one aspect, by allowing the main cleaning assembly to extend from the circumferential outer edge of the machine body, the cleaning area of the main cleaning assembly is increased, and the main cleaning assembly can move left and right to clean special environments such as wall corners; and in another aspect, by allowing the main cleaning assembly to reciprocate between the retracted state and the extended state, the cleaning effect of the main cleaning assembly is improved, thereby improving the cleaning performance of the cleaning robot.

[0035] It should be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not construed as limiting the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] Various objects, features, and advantages of the present disclosure will become more apparent by considering the following detailed description of preferred embodiments of the present disclosure with reference to the drawings. The drawings are only exemplary illustrations of the present disclosure and are not necessarily drawn to scale. In the drawings, the same reference numerals indicate the same or similar components throughout. In the drawings:

[0037] FIG. 1 is a schematic diagram of a structure of a top surface of a cleaning robot according to one exemplary embodiment;

[0038] FIG. 2 is a schematic diagram of a cleaning head of a cleaning robot extending from a circumferential outer edge of a machine body according to one exemplary embodiment;

[0039] FIG. 3 is a schematic diagram of a structure of a bottom surface of a cleaning robot according to one exemplary embodiment;

[0040] FIG. 4 is a schematic diagram of an internal structure of a cleaning robot according to one exemplary embodiment;

[0041] FIG. 5 is a schematic diagram of an internal structure of a cleaning robot according to one exemplary embodiment;

[0042] FIG. 6 is a schematic diagram of a structure of a driving assembly of a cleaning robot according to one exemplary embodiment;

[0043] FIG. 7 is a schematic diagram of a structure of a recycling system of a cleaning robot according to one exemplary embodiment;

[0044] FIG. 8 is a schematic diagram of a structure of a fixed support of a cleaning robot according to one exemplary embodiment from one perspective;

5 **[0045]** FIG. 9 is a schematic diagram of a structure of a fixed support of a cleaning robot according to one exemplary embodiment from another perspective; and

[0046] FIG. 10 is a schematic diagram of a structure of a scraping strip of a cleaning robot according to one exemplary embodiment.

[0047] Description of the reference numerals are as follows:

10 **[0048]** 10, machine body; 11, forward portion; 12, rearward portion; 13, mounting space; 14, channel;

[0049] 20, cleaning system; 21, cleaning head; 22, fixed support; 221, liquid inlet; 222, liquid outlet; 223, accommodating chamber; 224, through hole; 23, auxiliary cleaning assembly; 24, main cleaning assembly;

15 **[0050]** 30, driving system; 31, first driving wheel module; 32, second driving wheel module; 33, driven wheel;

[0051] 40, liquid supply part;

[0052] 50, recycling system; 51, collecting part; 511, first chamber; 512, second chamber; 513, inlet; 514, outlet; 52, power part; 53, blocking part; 531, filter hole; 54, scraping strip; 541, water
20 absorbing port;

[0053] 60, limiting member; 61, fixed base; 62, sliding part;

[0054] 70, driving assembly; 71, driving part; 72, driving wheel; 73, connecting rack;

[0055] 80, sensing system; 81, position determining apparatus; 82, buffer;

[0056] 90, power system;

25 **[0057]** 100, human-machine interaction system.

DETAILED DESCRIPTION

[0058] Typical embodiments embodying the features and advantages of the present disclosure will be described in detail in the following description. It should be understood that the present
30 disclosure can have various changes in different embodiments without departing from the scope of the present disclosure, and the description and the drawings therein are for illustrative purposes in nature and are not intended to limit the present disclosure.

[0059] In the following description of different exemplary embodiments of the present disclosure, reference is made to the drawings. The drawings form a part of the present disclosure,

and different exemplary structures, systems, and steps that may implement various aspects of the present disclosure are shown by way of example. It should be understood that other specific solutions of components, structures, exemplary devices, 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 “on”, “between”, “within”, and the like may be used in this specification to describe different exemplary features and elements of the present disclosure, these terms are used herein for convenience only, for example, according to the directions of the examples in the drawings. Nothing in this specification should be understood as requiring a particular three-dimensional orientation of structures to fall within the scope of the present disclosure.

[0060] As shown in FIGs. 1 to 10, the cleaning robot includes a machine body 10, a cleaning system 20, a driving system 30, a recycling system 50, a detection system, a limiting member 60, a driving assembly 70, a sensing system 80, a control system, a power system 90, and a human-machine interaction system 100.

[0061] As shown in FIGs. 1 to 3, the machine body 10 includes a forward portion 11 and a rearward portion 12, which have an approximately circular shape (both front and rear being circular), and may also have other shapes, including but not limited to an approximately D shape with a rectangular front and a circular rear, and a rectangular or square shape with a rectangular or square front and a rectangular or square rear.

[0062] As shown in FIG. 1, the sensing system 80 includes a position determining apparatus 81 located on the machine body 10, a collision sensor disposed on a buffer 82 of the forward portion 11 of the machine body 10, a proximity sensor disposed on the machine body 10, a cliff sensor disposed on a lower part of the machine body 10, and sensing apparatuses such as a magnetometer, an accelerometer, a gyroscope, and an odometer disposed inside the machine body 10, and is configured to provide various position information and movement state information of the machine to the control system. The position determining apparatus 81 includes, but is not limited to, a camera and a laser distance sensor (LDS).

[0063] As shown in FIG. 1, the forward portion 11 of the machine body 10 may carry a buffer 82. During the cleaning process, when the driving system 30 propels the cleaning robot to travel on the ground, the buffer 82 detects one or more events in a travel path of the cleaning robot via a collision sensor disposed on the buffer. The cleaning robot may control, based on the events detected by the buffer 82, such as an obstacle or a wall, the driving system 30 to cause the cleaning robot to respond to the events, such as moving away from the obstacle.

[0064] The control system is disposed on a main circuit board in the machine body 10, and

includes a computing processor, such as a central processing unit or an application processor, that communicates with a non-transitory memory, such as a hard disk, a flash memory, and a random access memory. The application processor draws a real-time map of an environment in which the cleaning robot is located by using a positioning algorithm, such as simultaneous localization and mapping (SLAM) based on the obstacle information fed back by the laser distance sensor. In addition, with reference to distance information and speed information that are fed back by sensing apparatuses such as the sensor, the cliff sensor, the magnetometer, the accelerometer, the gyroscope, and the odometer disposed on the buffer 82, the current working state and position of the cleaning robot can be comprehensively determined, as well as the current pose of the cleaning robot, such as negotiating a doorsill, getting onto a carpet, being located at a cliff, being stuck from above or below, having a full dust box, or being picked up. In addition, a specific strategy for a next action is given for different cases, so as to provide the cleaning robot with better cleaning performance and user experience.

[0065] As shown in FIG. 3, the driving system 30 may steer the machine body 10 to run across the ground based on driving commands with distance and angle information (e.g., 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 machine body 10. In order to enable the cleaning robot to move on the ground more stably or to have a stronger movement ability, the cleaning robot may include one or more driven wheels 33. The driven wheels 33 include, but are not limited to, universal wheels. The driving wheel module includes a traveling wheel, a drive motor, and a control circuit for controlling the drive motor. The driving wheel module may be further connected to a circuit for measuring a driving current and an odometer. The driving wheel module may be detachably connected to the machine body 10 to facilitate disassembly, assembly, and maintenance. The driving wheel module may be provided with a biased drop suspension system that is movably secured, such as rotatably attached, to the machine body 10 and receives a spring bias that is biased downward and away from the machine body 10. The spring bias allows the driving wheel module to maintain contact with the ground and the traction via a certain ground grip, while a cleaning element of the cleaning robot is also in contact with the ground via a certain pressure.

[0066] The machine body 10 defines a transverse axis and a longitudinal axis. The transverse axis and the longitudinal axis are perpendicular to each other. The transverse axis and the longitudinal axis may be understood as a transverse center line and a longitudinal center line of the machine body 10, respectively.

[0067] The power 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 detection circuit, and a battery undervoltage monitoring circuit. The charging control circuit, the battery pack charging temperature detection circuit, and the battery undervoltage monitoring circuit are then connected to a single-chip microcomputer control circuit. The cleaning robot may be charged through connection to a charging pile via a charging electrode disposed on the machine body, such as the side of the machine body, the bottom of the machine body, or the top of the machine body.

[0068] The human-machine interaction system 100 includes a button on a host panel for a user to select a function, and may also include a display screen and/or an indicator light and/or a speaker, where the display screen, the indicator light, and the speaker show a current state of the machine or function options to the user, and may also include a mobile phone client program. For a path navigation-based automatic cleaning robot, a mobile phone client may show a map of an environment in which the device is located and a location of the machine to the user, providing the user with more abundant and user-friendly function options.

[0069] In the cleaning robot according to the embodiments of the present disclosure, as shown in FIGs. 1 to 6, the cleaning system 20 is disposed on the machine body 10. The cleaning system 20 includes a main cleaning assembly 24. The main cleaning assembly 24 is movably disposed relative to the machine body 10, such that at least part of the main cleaning assembly 24 is capable of extending from the circumferential outer edge of the machine body 10. That is, the main cleaning assembly 24 according to the present disclosure can move left and right relative to the cleaning robot, and reciprocate between the retracted state and the extended state. In one aspect, by allowing the main cleaning assembly to extend from the circumferential outer edge of the machine body 10, the cleaning area of the main cleaning assembly 24 is increased, and the main cleaning assembly can move left and right to clean special environments such as wall corners; and in another aspect, by allowing the main cleaning assembly to reciprocate between the retracted state and the extended state, the cleaning effect of the main cleaning assembly 24 is improved, thereby improving the cleaning performance of the cleaning robot.

[0070] The driving assembly 70 of the cleaning robot may be in driving connection with the main cleaning assembly 24 and may be configured to drive the main cleaning assembly 24 to substantially reciprocate along a target surface. For example, the driving assembly 70 may be configured to drive the main cleaning assembly 24 to substantially reciprocate left and right in a direction parallel to the transverse axis of the machine body 10.

[0071] In one embodiment of the present disclosure, the angle between the main cleaning

assembly 24 and the transverse axis of the machine body 10 is less than 90 degrees, such that when the main cleaning assembly 24 moves with the machine body 10, the main cleaning assembly 24 can have a relatively large cleaning area, thereby improving the cleaning efficiency of the cleaning robot.

5 **[0072]** The angle between the main cleaning assembly 24 and the transverse axis of the machine body 10 may be 0 degrees, 5 degrees, 10 degrees, 15 degrees, 20 degrees, 25 degrees, 30 degrees, 35 degrees, 40 degrees, 45 degrees, 50 degrees, 55 degrees, 60 degrees, or the like.

10 **[0073]** The angle between the main cleaning assembly 24 and the transverse axis of the machine body 10 is an angle between an arrangement direction of the main cleaning assembly 24 and the transverse axis of the machine body 10. A direction in which the driving system 30 drives the cleaning robot to move may be perpendicular to the transverse axis of the machine body 10, such that the angle between the main cleaning assembly 24 and the transverse axis of the machine body 10 may be less than 90 degrees, thereby ensuring that the main cleaning assembly 24 can have a relatively large cleaning area.

15 **[0074]** In one embodiment of the present disclosure, the main cleaning assembly 24 is movably disposed in the arrangement direction of the main cleaning assembly 24, such that the main cleaning assembly 24 can reciprocate in an axial direction of the main cleaning assembly, and a cleaning range of the main cleaning assembly 24 is increased by controlling the movement of the main cleaning assembly 24, thereby increasing the cleaning area of the main cleaning assembly
20 24, and further improving the cleaning efficiency of the cleaning robot.

[0075] The arrangement direction of the main cleaning assembly 24 may be considered as an extension direction of the main cleaning assembly 24. Further, the main cleaning assembly 24 includes a cleaning head 21. The arrangement direction of the main cleaning assembly 24 may be considered as an axial direction of the cleaning head 21.

25 **[0076]** In one embodiment of the present disclosure, the arrangement direction of the main cleaning assembly 24 is parallel to the transverse axis of the machine body 10. The main cleaning assembly 24 is disposed parallel to the transverse axis of the machine body 10. The main cleaning assembly 24 is movably disposed relative to the machine body 10 in the direction parallel to the transverse axis of the machine body 10. That is, the main cleaning assembly 24 reciprocates in
30 the axial direction of the main cleaning assembly. For example, the main cleaning assembly 24 includes the cleaning head 21. The cleaning head 21 includes a cylindrical structure. An extension direction of the center line of the cylindrical structure represents an axial direction of the cylindrical structure. That is, the cleaning head 21 of the main cleaning assembly 24 is movably disposed relative to the machine body 10 in the axial direction of the cylindrical structure. By

allowing the cleaning head 21 to reciprocate in an axial direction of the cleaning head, the cleaning area of the cleaning head 21, which is increased by the extension of the cleaning head from the circumferential outer edge of the machine body 10, can be increased. In addition, a wiping force of the cleaning head 21 on the ground to be wiped can be ensured, thereby
5 improving the cleaning effect on the ground.

[0077] The cleaning head 21 may include a cylindrical structure. The cylindrical structure may be of a hollow structure, or the cylindrical structure may be of a solid structure, which is not limited herein. For example, the cleaning head 21 may be a roller brush. The roller brush may include a cylindrical structure and a tuft disposed on the cylindrical structure. Certainly, it is not
10 excluded that the roller brush may be of a cylindrical structure, and the circumferential outer surface of the roller brush is a cylindrical surface.

[0078] In one embodiment of the present disclosure, the main cleaning assembly 24 is parallel to the transverse axis of the machine body 10, such that the main cleaning assembly 24 is movably disposed in a direction parallel to the transverse axis. That is, a reciprocating direction
15 of the main cleaning assembly 24 is perpendicular to the longitudinal axis of the machine body 10. Since the longitudinal axis of the machine body 10 is parallel to a forward direction of the machine body 10, that is, the reciprocating direction of the main cleaning assembly 24 is perpendicular to the forward direction of the machine body 10. By allowing the reciprocating
20 direction of the main cleaning assembly 24 to be perpendicular to the forward direction of the machine body 10, the cleaning area of the main cleaning assembly 24, which is increased by the extension of the main cleaning assembly from the circumferential outer edge of the machine body 10, can be further increased. In addition, by allowing the reciprocating direction of the main
25 cleaning assembly 24 to be perpendicular to the forward direction of the machine body 10, a wiping force of the main cleaning assembly 24 on the ground to be wiped can be ensured, thereby improving the cleaning effect on the ground.

[0079] Certainly, the main cleaning assembly 24 may not be movably disposed relative to the machine body 10 in the direction of the transverse axis of the machine body 10 of the main cleaning assembly 24. That is, the reciprocating direction of the main cleaning assembly 24 is not
30 parallel to the transverse axis of the machine body 10. For example, there is a certain included angle between the reciprocating direction of the main cleaning assembly 24 and the transverse axis of the machine body 10, such that when the cleaning robot passes through a ground environment such as a tile seam in the forward process, the probability of the main cleaning
assembly 24 being stuck by the seam is reduced, thereby improving the cleaning efficiency of the cleaning robot, and improving the use performance of the cleaning robot. The preset included

angle between the transverse axis and the main cleaning assembly 24 may be an acute angle, and for example, the preset included angle may range from 5° to 70°.

[0080] In one embodiment of the present disclosure, as shown in FIGs. 5 and 6, the cleaning head 21 of the main cleaning assembly 24 may be disposed at the bottom of the machine body 10.

5 For example, the cleaning head 21 may be a roller brush rotating around an axis parallel to a surface to be cleaned. The cleaning head 21 may simultaneously reciprocate left and right in an axial direction of the cleaning head 21 in the rotating process. The driving assembly 70 is configured to drive the cleaning head 21 to substantially reciprocate along the target surface, and the driving assembly 70 is configured to drive the cleaning head 21 to substantially reciprocate
10 left and right in the axial direction of the cleaning head. The target surface is a part of the surface to be cleaned. The cleaning head 21 reciprocates along the surface to be cleaned. The contact surface of the cleaning head 21 with the surface to be cleaned is provided with a cleaning cloth or a cleaning plate, which generates high-frequency friction with the surface to be cleaned through reciprocation, thereby removing stains on the surface to be cleaned. The higher the reciprocating
15 frequency is, the higher the friction frequency is, which means that the number of frictions per unit time is greater. The high-frequency reciprocation is also called reciprocating vibration, and the cleaning capacity is far greater than that of common reciprocation, such as rotation and friction cleaning.

[0081] Certainly, in the cleaning process of the cleaning robot, the cleaning head 21 may first
20 move leftward or rightward in the axial direction of the cleaning head 21, such that the cleaning head 21 is in a retracted state or an extended state, and then the cleaning head 21 may rotate to achieve cleaning.

[0082] In one embodiment of the present disclosure, the cleaning system 20 may be a wet cleaning system 20. The cleaning head 21 includes a wet cleaning head 21. The cleaning system
25 20 also includes a liquid supply part 40. The liquid supply part 40 is disposed on the machine body 10, and the liquid supply part 40 feeds cleaning liquid into the wet cleaning head 21. The cleaning head 21 may be disposed below the liquid supply part 40, and the cleaning solution inside the liquid supply part 40 is delivered to the cleaning head 21 through a water supply mechanism, such that the cleaning head 21 performs wet cleaning on a plane to be cleaned. In
30 other embodiments of the present disclosure, the cleaning solution inside the liquid supply part 40 may also be directly sprayed onto the plane to be cleaned, and the cleaning head 21 cleans the plane by evenly applying the cleaning solution. The cleaning system 20 may also include an auxiliary cleaning assembly 23 for cleaning the plane to be cleaned.

[0083] The friction frequency is close to that of a sound wave, and the cleaning effect is far

superior to that of the rotary friction cleaning at several dozen revolutions per minute. In addition, the tufts on the surface of the cleaning head 21 may extend in the same direction more uniformly under the shaking of high-frequency vibration. Therefore, the overall cleaning effect is more uniform, instead of merely applying a downward pressure to increase the friction force to improve the cleaning effect in the case of low-frequency rotation. The mere downward pressure may not cause the tufts to extend in nearly the same direction. The effect is reflected in that after high-frequency vibration cleaning, water marks on the surface to be cleaned are more uniform without messy water stains left behind.

[0084] In one embodiment of the present disclosure, the machine body 10 includes a fixed support 22. The cleaning head 21 is located in the fixed support 22. The fixed support 22 is provided with a liquid supply channel. The liquid supply part 40 feeds cleaning liquid into the wet cleaning head 21 through the liquid supply channel.

[0085] The liquid supply channel may be formed by a chamber formed inside the fixed support 22. For example, part of the fixed support 22 is hollowed to form a liquid supply channel through which the cleaning liquid circulates. In addition, the liquid supply channel may be formed by a pipe body, such that the cleaning liquid inside the liquid supply part 40 is fed to the wet cleaning head 21, thereby ensuring that the cleaning head 21 effectively cleans the surface to be cleaned. The liquid supply channel includes a liquid inlet 221 and a liquid outlet 222. The liquid inlet 221 is in communication with the liquid supply part 40. The liquid outlet 222 is configured to feed the cleaning liquid into the cleaning head 21.

[0086] In one embodiment of the present disclosure, as shown in FIGs. 8 and 9, the fixed support 22 is provided with the liquid inlet 221 and the liquid outlet 222. One end of the liquid inlet 221 is located on the outer surface of the fixed support 22. The liquid outlet 222 is located on the inner surface of the fixed support 22. A main body portion of the liquid supply channel may be provided between the liquid inlet 221 and the liquid outlet 222, and the main body portion may be in communication with a plurality of liquid outlets 222 at the same time, such that the liquid outlet 222 is configured to feed the cleaning liquid into the cleaning head 21.

[0087] In one embodiment of the present disclosure, as shown in FIGs. 8 and 9, an accommodating chamber 223 is formed on the fixed support 22, and the liquid outlet 222 is located on the chamber wall of the accommodating chamber 223. The liquid outlet 222 may be arranged on a top end of the accommodating chamber 223, or the liquid outlet 222 may be disposed on a side part of the accommodating chamber 223, such that the cleaning liquid delivered by the liquid outlet 222 can be reliably fed into the cleaning head 21.

[0088] In one embodiment of the present disclosure, there may be a plurality of liquid outlets

222. The plurality of liquid outlets 222 are spaced apart from each other in a direction parallel to the cleaning head 21, thereby ensuring that the cleaning liquid can be uniformly fed into various positions of the wet cleaning head 21, and ensuring that the wet cleaning head 21 reliably cleans the surface to be cleaned.

5 [0089] There may be one liquid inlet 221 of the liquid supply channel, and the one liquid inlet 221 corresponds to all liquid outlets 222. Certainly, there may be at least two liquid inlets 221 of the liquid supply channel. Each liquid inlet 221 may correspond to a plurality of liquid outlets 222, separately, thereby reliably feeding the cleaning liquid into the wet cleaning head 21. The liquid inlet 221 may be formed by a columnar structure to connect a tubular structure that feeds
10 the cleaning liquid. The liquid outlet 222 may be a rectangular opening, a circular opening, or another polygonal structure, which is not limited in the present disclosure. The plurality of liquid outlets 222 may be disposed in sequence in the direction parallel to the cleaning head 21.

[0090] In one embodiment of the present disclosure, as shown in FIGs. 4 and 5, the cleaning robot also includes a recycling system 50, the recycling system 50 is disposed on the machine
15 body 10, the recycling system includes a collecting part 51, and the collecting part 51 collects residues on the cleaning head 21 and/or the surface to be cleaned, thereby effectively cleaning the surface to be cleaned, and ensuring the cleanliness of the surface to be cleaned.

[0091] Specifically, the cleaning robot cleans the surface to be cleaned through the rotation, translation, and reciprocation of the cleaning head 21 in the moving process. In this process, the
20 residues on the surface to be cleaned can be adsorbed onto the cleaning head 21, and the collecting part 51 can collect these residues, thereby ensuring the cleanliness of the cleaning head 21. In addition, the collecting part 51 can also collect the residues on the surface to be cleaned, thereby cooperating with the cleaning head 21 to reliably clean the surface to be cleaned.

[0092] The collecting part 51 and the liquid supply part 40 are disposed along the longitudinal
25 axis of the machine body 10, and the cleaning system 20 is located between the collecting part 51 and the liquid supply part 40, such that the liquid supply part 40, the cleaning system 20, and the collecting part 51 are disposed in sequence, thereby helping the collecting part 51 to collect the residues and wastewater on the cleaning head 21.

[0093] The machine body 10 includes a forward portion 11 and a rearward portion 12. The
30 liquid supply part 40 and the collecting part 51 are located in the forward portion 11 and the rearward portion 12, respectively, such that the collecting part 51 can be disposed at the tail of the cleaning robot, thereby removing the collecting part 51 from the cleaning robot for cleaning.

[0094] In one embodiment of the present disclosure, as shown in FIG. 10, the recycling system 50 also includes: a scraping strip 54. The scraping strip 54 is in contact with the cleaning head 21.

The scraping strip 54 removes residues on the cleaning head 21 through interference with the cleaning head 21, such that the residues are collected by the collecting part 51, thereby ensuring the cleanliness of the cleaning head 21, and ensuring that the surface to be cleaned is cleaned effectively.

5 [0095] Specifically, the scraping strip 54 may be of a plate-shaped structure, and the plate-shaped structure interferes with the cleaning head 21. In the rotating process of the cleaning head 21, the plate-shaped structure can remove the residues on the cleaning head 21, such that the residues are collected by the collecting part 51, thereby ensuring that the residues adsorbed onto the surface to be cleaned can be collected by the collecting part 51 in time.

10 [0096] The scraping strip 54 may be disposed on the machine body 10. For example, the scraping strip 54 is detachably disposed on the machine body 10 to facilitate cleaning and replacement of the scraping strip 54.

[0097] The scraping strip 54 is parallel to the cleaning head 21, such that the scraping strip 54 can reliably remove the residues on the cleaning head 21, and can facilitate mounting of the
15 structure.

[0098] The length of the scraping strip 54 may be equal to the length of the cleaning head 21. On the basis of ensuring that the scraping strip 54 can completely interfere with the cleaning head 21, the scraping strip 54 can be prevented from occupying the space in the length direction, thereby ensuring the compactness of the structure.

20 [0099] As shown in FIG. 10, the scraping strip 54 is provided with a water absorbing port 541. The water absorbing port 541 is in communication with the collecting part 51, such that wastewater in the recycling system 50 can be reliably collected into the collecting part 51 through the water absorbing port 541. Specifically, the water absorbing port 541 may face the cleaning head 21. After the scraping strip 54 scrapes off wastewater from the cleaning head 21, the
25 wastewater may flow along the scraping strip 54 and flow to the water absorbing port 541, such that the wastewater may be drawn into the collecting part 51 from the water absorbing port 541 through the recycling system 50.

[00100] The water absorbing port 541 may be located on a side of the scraping strip 54 away from the cleaning head 21. A part of the scraping strip 54 may be configured to gather the
30 wastewater, and the water absorbing port 541 draws the gathered wastewater into the collecting part 51.

[00101] In one embodiment of the present disclosure, as shown in FIGs. 4 and 5, the recycling system 50 also includes: a power part 52, and the power part 52 is in pneumatic communication with the collecting part 51 to collect residues into the collecting part 51. A negative pressure may

be generated between the power part 52 and the collecting part 51, such that residues on the surface to be cleaned and residues on the cleaning head 21 may be sucked into the collecting part 51. Specifically, the negative pressure generated between the power part 52 and the collecting part 51 may suck wastewater into the collecting part 51 through the water absorbing port 541. For example, the power part 52 may be a fan.

[00102] In one embodiment of the present disclosure, an accommodating chamber 223 is formed on the fixed support 22. The cleaning head 21 is located in the accommodating chamber 223. The collecting part 51 is in communication with the accommodating chamber 223, such that residues can enter the collecting part 51 after passing through the accommodating chamber 223.

[00103] Specifically, the fixed support 22 is provided with a through hole 224. The through hole 224 is in communication with the collecting part 51. The through hole 224 is in communication with the accommodating chamber 223. Residues scraped off from the cleaning head 21 by the scraping strip 54 are located in the accommodating chamber 223 of the fixed support 22, such that the negative pressure generated between the power part 52 and the collecting part 51 can draw the residues in the accommodating chamber 223 into the collecting part 51 through the through hole 224.

[00104] The accommodating chamber 223 of the fixed support 22 may form a relatively sealed space with the surface to be cleaned. Therefore, the negative pressure generated between the power part 52 and the collecting part 51 can draw the residues on the surface to be cleaned into the collecting part 51 through the through hole 224.

[00105] As shown in FIG. 5, the collecting part 51 includes an inlet 513 and an outlet 514. The inlet 513 may be in communication with the accommodating chamber 223. Further, the inlet 513 may be in communication with the through hole 224, and the outlet 514 may be in communication with the power part 52, such that the power part 52 may provide power through the outlet 514 of the collecting part 51 to suck the residues from the through hole 224 of the accommodating chamber 223 into the inlet 513 of the collecting part 51. In this way, the residues enter the collecting part 51. When the airflow flows inside the collecting part 51, wastewater, impurities, and the like carried in the airflow remain in the collecting part 51 under the action of gravity. Therefore, when a flow path of the airflow in the collecting part 51 is relatively long, the wastewater, impurities, and the like can be effectively separated from the airflow.

[00106] In one embodiment of the present disclosure, as shown in FIG. 7, the inlet 513 and the outlet 514 of the collecting part 51 may be disposed on the same side of the collecting part 51. For example, the inlet 513 and the outlet 514 of the collecting part 51 are both located on a front side surface of the collecting part 51. The arrangement may effectively extend a flow path of the

airflow in the collecting part 51, such that wastewater, impurities, and the like may be separated from the airflow more effectively.

[00107] In one embodiment of the present disclosure, as shown in FIG. 7, a blocking part 53 is disposed on a path through which the power part 52 is in communication with the collecting part 51, thereby blocking the path through which the power part 52 is in communication with the collecting part 51, and preventing impurities in the collecting part 51 from entering the power part 52.

[00108] As shown in FIG. 7, the blocking part 53 is disposed in the collecting part 51 to divide the collecting part 51 into a first chamber 511 and a second chamber 512 that are in communication with each other. The blocking part 53 is provided with a through hole, such that the first chamber 511 and the second chamber 512 are in communication with each other through the through hole. By allowing the blocking part 53 to be disposed in the collecting part 51, a blocking effect between the first chamber 511 and the second chamber 512 is achieved, and impurities in the first chamber 511 and the second chamber 512 are prevented from entering the other chamber.

[00109] As shown in FIG. 7, the volume of the first chamber 511 is greater than the volume of the second chamber 512, the first chamber 511 is provided with an inlet 513 through which the residues are collected into the collecting part 51, and the second chamber 512 is provided with an outlet 514 through which the second chamber is in communication with the power part 52. The power part 52 is in direct communication with the second chamber 512. The power part 52 forms a negative pressure in the first chamber 511 through the second chamber 512, and then collects impurities through the first chamber 511 with a relatively large volume, such that the impurities in the first chamber 511 are prevented from entering the second chamber 512 through the blocking part 53.

[00110] The blocking part 53 may be a perforated plate having a plurality of filter holes 531, and the diameter of the filter hole 531 is less than the diameter of a common impurity to block impurities on a side of the perforated plate. The plurality of filter holes 531 may be distributed in an array on the perforated plate. The size and the shape of the plurality of filter holes 531 may be the same or different.

[00111] In one embodiment of the present disclosure, the machine body 10 is provided with a mounting space 13, and the fixed support 22 is movably disposed in the mounting space 13. A channel 14 being in communication with the mounting space 13 is disposed on the circumferential outer edge of the machine body 10, and the fixed support 22 is capable of being formed by extending through the channel 14, such that the fixed support 22 has a retracted state in which the fixed support is retracted into the mounting space and an extended state in which the

fixed support extends out of the mounting space. By allowing the cleaning head 21 to be assembled on the fixed support 22, the cleaning head 21 is driven by the fixed support 22 to perform transverse reciprocation. In this way, the rotation of the cleaning head 21 relative to the fixed support is not affected when the cleaning head performs the transverse reciprocation.

5 **[00112]** The channel 14 may be an opening on the machine body 10, and the opening may be of a normally open structure. Alternatively, the machine body 10 may be provided with an opening, and the channel may be provided with a stopper. The stopper is movably provided, such that the stopper can unblock or block the opening. After the blocking member unblocks the opening, the fixed support 22 may drive the cleaning head 21 to extend out of the opening.

10 **[00113]** In one embodiment of the present disclosure, as shown in FIGs. 5 and 6, the cleaning robot also includes a limiting member 60, the limiting member 60 is connected to the machine body 10, and the limiting member 60 is in limiting contact with the fixed support 22 to prevent the fixed support 22 from disengaging from the machine body 10. The fixed support 22 is movably disposed relative to the limiting member 60.

15 **[00114]** In one embodiment of the present disclosure, the limiting member 60 includes a fixed base 61 and a sliding part 62, the sliding part 62 is disposed on the fixed base 61, the fixed base 61 is connected to the machine body 10, and the fixed support 22 is movably disposed relative to the sliding part 62. There are at least two limiting members 60, and the fixed support 22 is clamped between the limiting members 60.

20 **[00115]** The sliding part 62 may be a roller, and the limiting member 60 also includes a support arm. The fixed base 61 is fixedly connected to the machine body 10. One end of the support arm is fixed on the fixed base 61, and the roller is rotatably disposed on the other end of the support arm. The fixed support 22 is located between the machine body 10 and the support arm, and abuts against the fixed support 22 through the roller to be in limiting contact with the fixed support 22,
25 thereby preventing the fixed support 22 from disengaging from the machine body 10.

[00116] A sliding groove is disposed on the fixed support 22, and the sliding part 62 may slide in the sliding groove to limit movement between the sliding part 62 and the fixed support 22 and guide movement of the fixed support 22.

30 **[00117]** As shown in FIG. 6, four limiting members 60 may be provided, and are located at four corner positions of the fixed support 22, respectively, to provide a limiting function for the fixed support 22, thereby improving a limiting effect on the fixed support 22. Certainly, two, three, five, or more limiting members 60 may also be provided, which is not limited in the present disclosure.

[00118] The roller may be a rubber wheel to avoid abnormal noise generated when the roller

abuts against the fixed support 22 and rolls. In addition, a buffering effect when the roller is in contact with the fixed support 22 can be improved.

[00119] In one embodiment of the present disclosure, the cleaning robot also includes a driving assembly 70, and the driving assembly 70 is in driving connection with the fixed support 22 to drive the fixed support 22 to move relative to the machine body 10.

[00120] The driving assembly 70 includes a driving part 71, a driving wheel 72, and a connecting rack 73. The driving part 71 is disposed on the machine body 10. The driving wheel 72 is connected to the driving part 71. The connecting rack 73 is connected to the fixed support 22. The connecting rack 73 is engaged with the driving wheel 72, such that the driving part 71 drives, through the driving wheel 72 and the connecting rack 73, the fixed support 22 to move. The driving wheel 72 is engaged with the connecting rack 73 to drive the fixed support 22, such that the fixed support 22 can move in an extension direction of the connecting rack 73, thereby improving controllability of movement of the fixed support 22.

[00121] The driving part 71 includes a drive motor and a gearbox. The gearbox is connected to an output shaft of the drive motor. The driving wheel is bonded to an output shaft of the gearbox. The driving wheel 72 may be a gear. The tooth profile of the gear matches the tooth pattern of the connecting rack 73.

[00122] The length of the connecting rack 73 is greater than a left-right movement distance of the fixed support 22 to ensure that the driving wheel is always engaged with the connecting rack 73.

[00123] In some other embodiments of the present disclosure, the driving assembly 70 includes: a driving part, a driving wheel, and a conveyor belt. The driving part is disposed on the machine body 10. The driving wheel is connected to the driving part. The conveyor belt is assembled on the driving wheel. The conveyor belt is driven to roll under rotation of the driving wheel. The fixed support 22 abuts against the conveyor belt. When the conveyor belt is driven by the driving part to rotate, the conveyor belt drives the fixed support 22 to move. By controlling a rolling direction of the conveyor belt, a movement direction of the fixed support 22 can be controlled.

[00124] Certainly, for those skilled in the art, other driving mechanisms may also be provided to achieve the left-right movement of the fixed support 22, which is not limited in the present disclosure. Any change in the form of the driving mechanism falls within the protection scope of the present disclosure.

[00125] In one embodiment of the present disclosure, the cleaning robot also includes a rotating assembly, the rotating assembly is connected to the cleaning head 21 to drive the cleaning head 21 to rotate relative to the fixed support.

[00126] The rotating assembly includes a drive motor, a gearbox, and a rotation shaft. The

gearbox is connected to the output shaft of the drive motor. The rotation shaft is connected to the gearbox. The cleaning head 21 is fixed to the rotation shaft. The drive motor drives, through the gearbox, the rotation shaft to rotate, thereby driving the cleaning head 21 to rotate.

[00127] The rotating assembly may be fixed to the fixed support 22 to prevent the left-right movement of the fixed support 22 from affecting the rotation of the cleaning head 21 driven by the rotating assembly.

[00128] Other embodiments of the present disclosure are apparent to those skilled in the art from consideration of the specification and practice of the embodiments disclosed herein. The present disclosure is intended to cover any variations, uses, or adaptations of the present disclosure following the general principles of the present disclosure and including known common knowledge or customary technical means undisclosed in the art of the present disclosure. The specification and example embodiments are only considered as exemplary, and the true scope and spirit of the present disclosure are indicated in the appended claims.

[00129] It should be understood that the present disclosure is not limited to an exact structure that has been described above and illustrated in the drawings, and that various modifications and changes can be made without departing from the scope thereof. The scope of the present disclosure is limited only by the appended claims.

CLAIMS

1. A cleaning robot, comprising:

a machine body (10);

5 a driving system (30), the driving system (30) being disposed on the machine body (10) and being configured to drive the cleaning robot to operate on a cleaning surface; and

a cleaning system (20), the cleaning system (20) being disposed on the machine body (10), the cleaning system (20) comprising a main cleaning assembly (24) disposed in parallel relative to the cleaning surface, and the main cleaning assembly (24) being movably disposed relative to
10 the machine body (10), such that at least part of the main cleaning assembly (24) is capable of extending from a circumferential outer edge of the machine body (10).

2. The cleaning robot according to claim 1, wherein an angle between the main cleaning assembly (24) and a transverse axis of the machine body (10) is less than 90 degrees.

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3. The cleaning robot according to claim 2, wherein the main cleaning assembly (24) is movably disposed in an arrangement direction of the main cleaning assembly (24).

4. The cleaning robot according to claim 3, wherein the arrangement direction of the main
20 cleaning assembly (24) is parallel to the transverse axis of the machine body (10).

5. The cleaning robot according to any one of claims 1 to 4, wherein the main cleaning assembly (24) comprises a fixed support (22) and a cleaning head (21) disposed in the fixed support (22), and the fixed support (22) is movably disposed on the machine body (10).

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6. The cleaning robot according to claim 5, wherein the machine body (10) is provided with a mounting space (13), and the fixed support (22) is movably disposed in the mounting space (13), wherein a channel (14) being in communication with the mounting space (13) is disposed on the circumferential outer edge of the machine body (10), and the fixed support (22) is capable of
30 being formed by extending through the channel (14), such that the fixed support (22) has a retracted state in which the fixed support is retracted into the mounting space (13) and an extended state in which the fixed support extends out of the mounting space (13).

7. The cleaning robot according to claim 5, wherein the cleaning robot also comprises a

limiting member (60), the limiting member (60) is connected to the machine body (10), and the limiting member (60) is in limiting contact with the fixed support (22) to prevent the fixed support (22) from disengaging from the machine body (10),

wherein the fixed support (22) is movably disposed relative to the limiting member (60).

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8. The cleaning robot according to claim 7, wherein the limiting member (60) comprises a fixed base (61) and a sliding part (62), the sliding part (62) is disposed on the fixed base (61), the fixed base (61) is connected to the machine body (10), and the fixed support (22) is movably disposed relative to the sliding part (62),

10 wherein there are at least two limiting members (60), and the fixed support (22) is clamped between the limiting members (60).

9. The cleaning robot according to claim 5, wherein the cleaning robot also comprises a driving assembly (70), and the driving assembly (70) is in driving connection with the fixed support (22) to drive the fixed support (22) to move relative to the machine body (10).

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10. The cleaning robot according to claim 9, wherein the driving assembly (70) comprises:
a driving part (71), the driving part (71) being disposed on the machine body (10);

a driving wheel (72), the driving wheel (72) being connected to the driving part (71); and

20 a connecting rack (73), the connecting rack (73) being connected to the fixed support (22),
and the connecting rack (73) being engaged with the driving wheel (72), such that the driving part (71) drives, through the driving wheel (72) and the connecting rack (73), the fixed support (22) to move.