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(54) CLEANING ROBOT, CLEANING SYSTEM, AND CLEANING METHOD

(57) A cleaning robot. The cleaning robot comprises: a body (10); a moving unit (20), arranged on the body (10) and configured to support the body (10) and drive the cleaning robot to move on the surface of a working area; a mopping unit (40), provided with a mopping working head, provided on the body (10), and configured to execute a preset mopping action; and a control unit (50) configured to: when the cleaning robot is in a state of being ready to travel onto a carpet, control the mopping working head to be risen. The rising height of the mopping working head is greater than 6 mm. The cleaning robot can adapt to soft ground materials such as carpets, and adaptability of the cleaning robot is improved.

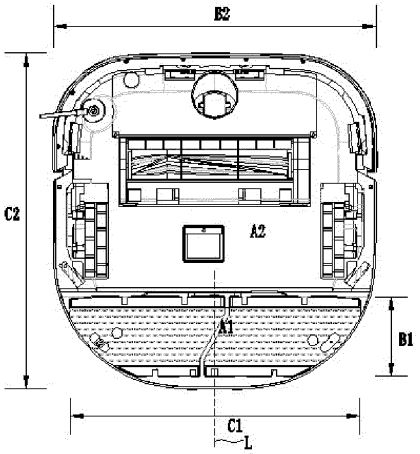

FIG. 17

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Description

[0001] The present disclosure claims priority to Chinese Patent Applications No. 202011403195.6, filed on December 04, 2020 and entitled "CLEANING ROBOT", No. 202022876299.0, filed on December 04, 2020 and entitled "CLEANING ROBOT", No. 202110174062.4, filed on February 09, 2021 and entitled "CLEANING ROBOT", and No. 202111310212.6, filed on November 05, 2021 and entitled "CLEANING ROBOT", all of which are hereby incorporated by reference in their entirety for all purposes as if fully set forth herein.

BACKGROUND

Technical Field

[0002] The present disclosure relates to the technical field of cleaning robots, and in particular, to a cleaning robot, a cleaning system, and a cleaning method.

Related Art

[0003] With the quick development of artificial intelligence technologies, various intelligent products occur in daily life of people. A cleaning robot can intelligently and automatically help the people clean a ground, and becomes one of the most common and favorite household cleaning robot products for the people.

[0004] An existing cleaning robot has a mopping function and can clean a hard ground, but the cleaning robot cannot cope with cleaning of a hard ground having a soft material such as a carpet, for example, often dirty the carpet, affecting adaptability of the robot.

SUMMARY

[0005] In view of this, one of objectives of the present disclosure is to provide a cleaning robot that can adapt to cleaning of a soft material such as a carpet, to improve adaptability of the cleaning robot.

[0006] To achieve the foregoing objective and other objectives, the present disclosure provides a cleaning robot. The cleaning robot includes: a body; a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; a mopping unit provided with a mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action; and a control unit, configured to: control the mopping working head to rise when the cleaning robot is in a state of being about to move onto a carpet, where a rising height of the mopping working head is greater than 6 mm.

[0007] In the cleaning robot in the foregoing embodiment, in a process in which the cleaning robot cleans a ground, to cope with the carpet on the ground, a mop board is controlled to rise by a rising height greater than 6 mm, to prevent the cleaning robot from dirtying the carpet when moving onto the carpet, thereby improving adaptability of the cleaning robot.

[0008] In one embodiment, the cleaning robot further includes: a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action; the cleaning robot is configured to include at least a cleaning mode and a mopping mode; and the control unit is configured to: when the cleaning robot is in the cleaning mode and the cleaning robot detects a carpet, control the mopping working head to rise and control the cleaning robot to move onto the carpet, to make it convenient for the sweeping unit to perform the sweeping action on the carpet, where a rising height of the mopping working head is greater than 6 mm.

[0009] In one embodiment, the control unit is configured to: when the cleaning robot is in the mopping mode and the cleaning robot detects a carpet, control the cleaning robot to switch to a non-mopping mode, control the mopping working head to rise, and control the cleaning robot to move onto the carpet, where a rising height of the mopping working head is greater than 6 mm.

[0010] In one embodiment, the control unit is configured to: when the cleaning robot is in the mopping mode and the cleaning robot detects a carpet, control the cleaning robot to switch to the cleaning mode, control the mopping working head to rise and control the cleaning robot to move onto the carpet to sweep the carpet, where a rising height of the mopping working head is greater than 6 mm.

[0011] In one embodiment, the rising height is simultaneously less than or equal to 20 mm.

[0012] In one embodiment, a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is less than or equal to 0.1.

[0013] In one embodiment, the rising height is simultaneously less than or equal to a difference between a thickness of the body and a height of a bottom surface of the body away from a ground.

[0014] In one embodiment, the rising height is greater than or equal to 6.5 mm.

[0015] In one embodiment, a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is greater than or equal to 0.004.

[0016] In one embodiment, the rising height is greater than or equal to 15 mm.

[0017] In one embodiment, the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, configured to drive the mop board to move up and down along a direction perpendicular to a working surface.

[0018] In one embodiment, the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, at least two acting force points exist between the mopping state switching assembly and the mop board, and the mopping state switching assembly acts on the mop board through the at least two acting force points, to rise and lower the mop board.

[0019] In one embodiment, the mopping state switching assembly includes a first switching member and a second switching member, the first switching member and the second switching member are connected to a mop board and arranged on two sides of a central axis of the mop board, and the first switching member collaborates with the second switching member to drive the mop board to move up and down along a direction perpendicular to a working surface.

[0020] In one embodiment, the central axis of the mop board divides the mop board into two parts, the first switching member and the second switching member are arranged on two sides of the central axis L of the mop board, to jointly drive the mop board to move up and down.

[0021] In one embodiment, the mopping state switching assembly further includes a connection member, configured to drive at least one part of the first switching member and at least one part of the second switching member to simultaneously move up and down in the direction perpendicular to the working surface.

[0022] In one embodiment, at least one part of the mopping state switching assembly is connected to the mop board, and the at least one part of the mopping state switching assembly and the mop board move together.

[0023] In one embodiment, the sweeping working head includes a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region; and the control unit is configured to: control the sweeping working head to switch to the non-sweeping state when the cleaning robot is in the mopping mode; and control the sweeping working head to switch to the sweeping state when the cleaning robot is in the sweeping mode.

[0024] In one embodiment, the sweeping working head includes a roller brush working head and a side brush working head; and the control unit is configured to: control the roller brush working head and the side brush working head to simultaneously rise when the cleaning robot is in the mopping mode.

[0025] In one embodiment, the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may be configured to simultaneously drive the roller brush working head and the side brush working head to move up and down.

[0026] In one embodiment, the sweeping working head includes at least one roller brush working head, having a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the sweeping state, the roller brush working head is in the roller brush working position, and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position.

[0027] In one embodiment, the roller brush working head may switch between the roller brush working position and the roller brush rising position in a rotation manner.

[0028] In one embodiment, when the roller brush working head is in the sweeping state, the roller brush working head rotates around a roller brush shaft, and in a rotating process, the roller brush working head passes through at least a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position.

[0029] In one embodiment, the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may drive the roller brush working head to move up and down.

[0030] In one embodiment, the sweeping state switching assembly includes a first motor and a first cam; and the first cam is configured to follow the first motor to rotate, where the first motor rotates along a preset first direction and drives the first cam to rotate, to rise the roller brush working head; and the first motor rotates along a preset second direction and drives the first cam to rotate, to drive the roller brush working head to descend, and the second direction is opposite to the first direction.

[0031] In one embodiment, the sweeping state switching assembly further includes a sliding groove, the sliding groove wraps at least one part of the first cam, and is connected to the first cam and configured to follow the first cam to rotate and drive the roller brush working head to ascend or descend.

[0032] In one embodiment, the sweeping working head includes at least one side brush working head rotatable around a rotational shaft; and the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly is configured to drive the side brush working head to move up and down.

[0033] In one embodiment, the side brush working head includes a side brush, and when the sweeping working head is in the sweeping state, the side brush working head rotates around the rotational shaft, and in a rotating process, the side brush passes through at least a side brush working position in contact with the surface of the working region and a side brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the side brush is always in the side brush rising position.

[0034] In one embodiment, the sweeping state switching assembly includes a second cam and a second sliding groove; the side brush working head further includes a

driving assembly, and the driving assembly is configured to drive the side brush to rotate around the rotational shaft; the second sliding groove is fixed relative to the driving assembly; when rotating along a first direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around an axis, so that the side brush is in contact with the surface of the working region of the cleaning robot; and when rotating in a reverse direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around the axis in a reverse direction, so that the side brush is out of contact with the surface of the working region of the cleaning robot.

[0035] In one embodiment, the sweeping unit further includes a position sensor configured to detect a position of the side brush; and the control unit is configured to: when the sweeping working head switches from the sweeping state to the non-sweeping state, control the side brush to stop rotating when the position sensor detects that the side brush rotates to a predetermined side brush rising position.

[0036] Currently, a conventional single household cleaning robot cannot have both a "sweeping only" function and a "mopping only" function, has poor working condition adaptability, cannot really help people emancipate both hands, and cannot meet a multifunction requirement of people for intelligent cleaning.

[0037] In view of this, the present disclosure provides a cleaning system, and the cleaning system includes: a base station and a cleaning robot, where the base station is configured to maintain the cleaning robot, and the base station includes: a housing; a liquid addition mechanism, at least partially arranged in the housing and configured to add cleaning liquid to a tank of the cleaning robot water; a dust collection mechanism, at least partially arranged in the housing and configured to collect dust or sundries in a dust accommodation apparatus of the cleaning robot; a maintenance mechanism, at least partially arranged in the housing and configured to maintain a mopping working head of the cleaning robot; and a controller, at least partially arranged in the housing and configured to control the liquid addition mechanism, the maintenance mechanism and the dust collection mechanism to automatically maintain the cleaning robot; the cleaning robot includes: a body; a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action; a mopping unit provided with the mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action, and the mopping working head includes a wiping member; the water tank, where the cleaning liquid is contained in the water tank and is used for wetting the wiping member on the mopping unit of the cleaning robot or directly wetting a working surface on which the cleaning robot moves; and dust accommodation apparatus, configured to accommodate dust or sundries collected by the sweeping unit in a process of performing the preset sweeping action; the cleaning robot is configured to include at least a sweeping mode and a mopping mode; the cleaning robot further includes a control unit, connected to the sweeping unit and the mopping unit; and the control unit is configured to: automatically detect, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switch between modes according to the property of the surface of the working region; in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, control the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid; when it is detected that the wiping member is in a to-be-maintained state, control the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in a clean state; and when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, control the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

[0038] In the cleaning system provided in the foregoing embodiment, in a process of cleaning the working region, the cleaning robot may automatically switch between modes to adapt to different working conditions, detect states of its own function assemblies (for example, the water tank, the wiping member, and the dust accommodation apparatus) in the cleaning process, and return to the base station in a maintenance required state to perform maintenance operations such as automatic liquid supplementation, wiping member maintenance, and automatic dust collection; and may automatically clean the working region and automatically maintain the machine completely without human intervention, to emancipate both hands of a user and meet a requirement of people for intelligent cleaning.

[0039] In one embodiment, the cleaning robot further includes a power supply unit, and the base station includes a charging mechanism, connected to the controller and configured to charge the cleaning robot; and the control unit is configured to: when the power supply unit is in a power to-be-supplied state, control the cleaning robot to return to the base station to dock with the charging mechanism, to charge the power supply unit.

[0040] In one embodiment, the sweeping unit includes at least a roller brush working head, and the base station further includes a roller brush clearing mechanism, connected to a control mechanism and configured to clear the roller brush working head; and the control unit is con-

figured to: when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush working head to return to the base station to dock with the roller brush clearing mechanism, to clear the roller brush working head.

[0041] In one embodiment, the sweeping unit includes at least a roller brush working head, and the cleaning robot further includes a roller brush clearing apparatus, connected to the control unit and configured to clear the roller brush working head; and the control unit is configured to: when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush clearing apparatus to clear the roller brush working head.

[0042] In one embodiment, the control unit includes a working surface material recognition sensor, and the control unit is configured to: automatically recognize a working surface material through the working surface material recognition sensor; when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0043] In one embodiment, the cleaning robot is configured to further include a sweeping and mopping integrated mode; and the control unit is configured to: when the cleaning robot is in the sweeping and mopping integrated mode, control the mopping working head to be in a mopping state and simultaneously control the sweeping working head to be in a sweeping state, so that the cleaning robot has a sweeping and mopping integrated function mode.

[0044] In one embodiment, the control unit includes a working surface material recognition sensor, and the control unit is configured to: automatically recognize a working surface material through the working surface material recognition sensor; when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode or the sweeping and mopping integrated mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0045] Another aspect of the present disclosure further provides a cleaning method, where the method is performed by a control unit of a cleaning robot, and the method includes: automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region; in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, controlling the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid; when it is detected that the wiping member is in a to-be-maintained state, controlling the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in a clean state; and when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, controlling the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

[0046] In the cleaning method provided in the foregoing embodiment, in a process of cleaning the working region, the cleaning robot may automatically switch between modes to adapt to different working conditions, detect states of its own function assemblies (for example, the water tank, the wiping member, and the dust accommodation apparatus) in the cleaning process, and return to the base station in a maintenance required state to perform maintenance operations such as automatic liquid supplementation, wiping member maintenance, and automatic dust collection; and may automatically clean the working region and automatically maintain the machine completely without human intervention, to emancipate both hands of a user and meet a requirement of people for intelligent cleaning.

[0047] In one embodiment, the method further includes: when it is detected that the cleaning robot is in a power to-be-supplied state, controlling the cleaning robot to return to the base station to dock with a charging mechanism, to charge the cleaning robot.

[0048] In one embodiment, the method further includes: when it is detected that a roller brush working head is in a to-be-cleared state, controlling the cleaning robot to return to the base station to dock with a roller brush clearing mechanism, to make it convenient to clear the roller brush working head; or when it is detected that the roller brush working head is in the to-be-cleared state, controlling a roller brush clearing apparatus to clear the roller brush working head.

[0049] In one embodiment, the step of automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region includes: when the working surface is recognized as a soft material, controlling the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, controlling the cleaning robot to operate in the sweeping mode or the mopping

mode or the sweeping and mopping integrated mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, controlling the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0050] Currently, a conventional single household cleaning robot cannot have both a "sweeping only" function and a "mopping only" function, has poor working condition adaptability, cannot really help people emancipate both hands, and cannot meet a multifunction requirement of people for the intelligent cleaning robot.

[0051] Based on this, the present disclosure further provides a single cleaning robot that can provide a plurality of cleaning modes for a user to select and that has both a sweeping function and a mopping function, to improve cleaning performance of the cleaning robot.

[0052] To achieve the foregoing objective and other objectives, an aspect of the present disclosure provides a cleaning robot, including: a body, a moving unit, a sweeping unit provided with a sweeping working head, a mopping unit provided with a mopping working head, and a control unit, where the moving unit is arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; the sweeping unit is arranged on the body and configured to perform a preset sweeping action; the mopping unit is arranged on the body and configured to perform a preset mopping action, and the mopping working head includes a mopping state of being in contact with the surface of the working region and a non-mopping state of being out of contact with the surface of the working region; the cleaning robot is configured to include at least a sweeping mode and a mopping mode; the control unit is configured to: when the cleaning robot is in the sweeping mode, control the mopping working head to automatically switch to the non-mopping state, and control the sweeping unit to automatically perform a sweeping action; and when the cleaning robot is in the mopping mode, control the mopping working head to automatically switch to the mopping state, and control the mopping unit to automatically perform a mopping action.

[0053] In the cleaning robot in the foregoing embodiment, when the cleaning robot is in the sweeping mode, the mopping working head is controlled to automatically switch to the non-mopping state of being out of contact with the surface of the working region, and the sweeping unit is controlled to automatically perform a sweeping action; and when the cleaning robot is in the mopping mode, the mopping working head is controlled to automatically switch to the mopping state of being in contact with the surface of the working region, and the mopping unit is controlled to automatically perform a mopping action. When the cleaning robot switches between the sweeping mode and the mopping mode, the mopping unit may switch between the mopping state and the non-mopping state, so that the cleaning robot has both a sweeping function and a mopping function, and can automatically switch between the sweeping mode and the mopping mode, to prevent a user from interfering with the machine while improving cleaning performance, thereby effectively improving cleaning performance and intelligence of the cleaning robot and really helping people emancipate both hands.

[0054] In one embodiment, the mopping working head may switch between a mopping working position of being in contact with the surface of the working region and a mopping rising position of being out of contact with the surface of the working region; and when the mopping working head is in the mopping state, the mopping working head is in the mopping working position, and when the mopping working head is in the non-mopping state, the mopping working head is in the mopping rising position.

[0055] In one embodiment, when the mopping working head is in the mopping state, the mopping working head under an external force is movable at least in an up-down direction relative to the body.

[0056] In one embodiment, the sweeping working head includes a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region, and the control unit is configured to: control the sweeping working head to switch to the non-sweeping state when the cleaning robot is in the mopping mode, and control the sweeping working head to switch to the sweeping state when the cleaning robot is in the sweeping mode.

[0057] In one embodiment, the sweeping working head includes at least one of a side brush working head, a roller brush working head and a suction mouth working head, and the mopping working head includes a mopping board assembly and a mop assembled to the mopping board assembly.

[0058] In one embodiment, the sweeping working head may switch between a sweeping working position of being in contact with the surface of the working region and a sweeping rising position of being out of contact with the surface of the working region; and when the sweeping working head is in the sweeping state, the sweeping working head is in the sweeping working position, and when the sweeping working head is in the non-sweeping state, the sweeping working head is in the sweeping rising position.

[0059] In one embodiment, the side brush working head includes at least one side brush working head rotatable around a rotational shaft and provided with a side brush, and when the sweeping working head is in the sweeping state, the side brush rotates around the rotational shaft, and in a rotating process, the side brush passes through at least a side brush working position in contact with the surface of the working region and a side brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the side brush is always in the side brush rising position.

[0060] In one embodiment, when the sweeping working head is in the non-sweeping state, the side brush is motionlessly in a side brush rising position.

[0061] In one embodiment, the sweeping unit further includes a position sensor configured to detect a position of the side brush; and the control unit is configured to: when the sweeping working head switches from the sweeping state to the non-sweeping state, control the side brush to stop rotating when the position sensor detects that the side brush rotates to a predetermined side brush rising position.

[0062] In one embodiment, the quantity of side brushes is less than or equal to 2.

[0063] In one embodiment, an angle between the rotational shaft and the surface of the working region is greater than or equal to 80 degrees and less than or equal to 85 degrees.

[0064] In one embodiment, the cleaning robot includes a state switching assembly arranged on the body, to drive state switching of at least one of the mopping working head and the sweeping working head.

[0065] In one embodiment, the state switching assembly includes a mopping state switching assembly and a sweeping state switching assembly, the mopping switching assembly includes a mopping state switching motor configured to drive the mopping working head to switch between the mopping state and the non-mopping state and a mopping connection assembly driven by the mopping state switching motor and connected to the mopping working head, and the sweeping state switching assembly includes a sweeping state switching motor configured to drive the sweeping working head to switch between the sweeping state and the non-sweeping state and a sweeping connection assembly driven by the sweeping state switching motor and connected to the sweeping working head.

[0066] In one embodiment, the cleaning robot is configured to further include a sweeping and mopping integrated mode, and the control unit is configured to: when the cleaning robot is in the sweeping and mopping integrated mode, control the mopping working head to be in a mopping state and simultaneously control the sweeping working head to be in a sweeping state.

[0067] In one embodiment, the cleaning robot is further configured to include an obstacle crossing mode, and the control unit is configured to: when the cleaning robot is in the obstacle crossing mode, control the mopping working head to be in the non-mopping state, and/or control the sweeping working head to be in the non-sweeping state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0068] To describe the technical solutions in the embodiments of the present disclosure more clearly, the following briefly describes the accompanying drawings required in descriptions of the embodiments. Apparently, the accompanying drawings in the following description show merely some embodiments of the present disclosure, and persons of ordinary skill in the art may derive drawings of other embodiments from these accompanying drawings without creative efforts.

FIG. 1 is a schematic structural diagram of a cleaning robot according to a first embodiment of the present disclosure;

FIG. 2 is a schematic structural diagram of a cleaning robot according to a second embodiment of the present disclosure;

FIG. 3 is a schematic structural diagram of a cleaning robot according to a third embodiment of the present disclosure;

FIG. 4a is a schematic structural diagram of a top view of a cleaning robot according to a fourth embodiment of the present disclosure;

FIG. 4b is a schematic structural diagram of a left view of a cleaning robot shown in FIG. 4a;

FIG. 5a is a schematic structural diagram of a left view of a cleaning robot according to a fifth embodiment of the present disclosure;

FIG. 5b is a schematic structural diagram of a left view of a cleaning robot in a mopping only mode shown in FIG. 5a;

FIG. 5c is a schematic structural diagram of a left view of a cleaning robot in a sweeping only mode shown in FIG. 5a;

FIG. 5d is a schematic structural diagram of a left view of a cleaning robot in a returning mode shown in FIG. 5a;

FIG. 6a is a schematic structural diagram of a left view of a cleaning robot according to a sixth embodiment of the present disclosure;

FIG. 6b is a schematic structural diagram of a left view of a cleaning robot in a sweeping unit rising state shown in FIG. 6a;

FIG. 7a is a schematic structural diagram of a left view of a cleaning robot according to a seventh embodiment of the present disclosure;

FIG. 7b is a schematic structural diagram of a left view of a cleaning robot in a side brush unit rising state shown in FIG. 7a;

FIG. 8a is a schematic structural diagram of a left view of a cleaning robot according to an eighth em-

bodiment of the present disclosure;

FIG. 8b is a schematic structural diagram of a left view of a cleaning robot in a side brush unit rising state shown in FIG. 8a;

FIG. 9a is a schematic structural diagram of a left view of a cleaning robot according to a ninth embodiment of the present disclosure;

FIG. 9b is a schematic structural diagram of a left view of a cleaning robot in a side brush unit rising state shown in FIG. 9a;

FIG. 10a is a schematic structural diagram of a left view of a cleaning robot according to a tenth embodiment of the present disclosure;

FIG. 10b is a schematic structural diagram of a left view of a cleaning robot in a mopping unit working state shown in FIG. 10a;

FIG. 10c is a schematic structural diagram of a cross-section A-A of a cleaning robot shown in FIG. 10a;

FIG. 10d is a schematic structural diagram of a mopping unit of a cleaning robot shown in FIG. 10a;

FIG. 10e is a schematic structural diagram of a cleaning robot in a mopping unit rising state shown in FIG. 10a;

FIG. 11a is a schematic structural diagram of a bottom view of a cleaning robot according to an eleventh embodiment of the present disclosure;

FIG. 11b is a schematic structural diagram of a left view of a cleaning robot shown in FIG. 11a;

FIG. 11c is a schematic structural diagram of a bottom view of a cleaning robot according to a twelfth embodiment of the present disclosure;

FIG. 11d is a schematic structural diagram of a left view of a cleaning robot shown in FIG. 11c;

FIG. 12a is a schematic diagram of a roller brush working head of a cleaning robot according to a thirteenth embodiment of the present disclosure;

FIG. 12b is a schematic diagram of FIG. 12a viewed from another angle;

FIG. 12c is a schematic diagram of a roller brush working head according to an embodiment of the present disclosure;

FIG. 12d is a schematic diagram of FIG. 12c viewed from another angle;

FIG. 12e is a schematic diagram of the roller brush working head in FIG. 12c in a state of being away from a ground;

FIG. 12f is a schematic flowchart of switching a working state of a roller brush working head according to an embodiment;

FIG. 13a is a schematic side view of a mopping working head of a cleaning robot in a non-mopping state according to an embodiment of the present disclosure;

FIG. 13b is a schematic side view of a mopping working head of a cleaning robot in a mopping state according to an embodiment of the present disclosure;

FIG. 14 is a schematic side view of a mopping working head of a cleaning robot in a non-mopping state according to another embodiment of the present disclosure;

FIG. 15 is a schematic side view of a mopping working head of a cleaning robot in a non-mopping state according to still another embodiment of the present disclosure;

FIG. 16 is a schematic side view of a mopping working head of a cleaning robot in a non-mopping state according to yet another embodiment of the present disclosure;

FIG. 17 is a schematic bottom view of the cleaning robot in FIG. 13a;

FIG. 18a is a schematic side view of a mopping state switching assembly when a mopping working head of a cleaning robot is in a mopping state in the existing technology;

FIG. 18b is a schematic side view of a mopping state switching assembly when a mopping working head of a cleaning robot is in a non-mopping state in the existing technology;

FIG. 19a is a schematic side view of a mopping state switching assembly when a mopping working head of a cleaning robot is in a mopping state in the present disclosure;

FIG. 19b is a schematic side view of a mopping state switching assembly when a mopping working head of a cleaning robot is in a non-mopping state in the present disclosure;

FIG. 20a is a schematic front view of a mopping state

switching assembly when a mopping working head is in a mopping state in the present disclosure;

FIG. 20b is a schematic front view of a mopping state switching assembly when a mopping working head is in a non-mopping state in the present disclosure; and

FIG. 21 is a schematic diagram of a base station and a cleaning robot in the present disclosure.

DETAILED DESCRIPTION

[0069] For ease of understanding the present disclosure, the present disclosure is described more comprehensively below with reference to the accompanying drawings. Exemplary embodiments of the present disclosure are provided in the accompanying drawings. However, the present disclosure may be implemented in many different forms, and is not limited to the embodiments described in this specification. On the contrary, the embodiments are provided to make understanding of the disclosed content of the present disclosure more comprehensive.

[0070] Unless otherwise defined, meanings of all technical and scientific terms used in this specification are the same as those usually understood by a person skilled in the art to which the present disclosure belongs. In this specification, terms used in the specification of the present disclosure are merely intended to describe objectives of the specific embodiments, but are not intended to limit the present disclosure. The term "and/or" used in this specification includes any and all combinations of one or more related listed items.

[0071] In a case that "include", "have", and "contain" described in this specification are used, unless explicit limitation terms such as "only" and "consist of ... " are used, another component may be further added. Unless otherwise mentioned, a term in a singular form may include a plural form, and cannot be understood as one in quantity. It should be understood that, although terms such as "first" and "second" are used to describe various elements in this specification, these elements are not to be limited to these terms. The terms are merely used for distinguishing one element from another element. For example, without departing from the scope of the present disclosure, a first element may be referred to as a second element, and similarly, a second element may be referred to as a first element. A first element and a second element may be a same element or may be different elements.

[0072] In the present utility model, unless specified or limited otherwise, the terms "connected" and "connection" should be understood broadly, for example, which may be direct connections, indirectly connected with each other through an intermediate medium, or communication inside two elements or an interaction relationship between two elements. A person of ordinary skill in the art can understand specific meanings of the foregoing terms in the present disclosure according to a specific situation.

[0073] Referring to FIG. 1, in an embodiment of the present disclosure, a cleaning robot 100 is provided and includes: a body 10, a moving unit 20, a sweeping unit 30 provided with a sweeping working head, a mopping unit 40 provided with a mopping working head, and a control unit 50, where the moving unit 20 is arranged on the body 10 and configured to support the body 10 and drive the cleaning robot 100 to move on a surface of a working region; the sweeping unit 30 is arranged on the body 10 and configured to perform a preset sweeping action; the mopping unit 40 is arranged on the body 10 and configured to perform a preset mopping action, and the mopping working head (not shown in FIG. 1) includes a mopping state of being in contact with the surface of the working region and a non-mopping state of being out of contact with the surface of the working region; the cleaning robot 100 is configured to include at least a sweeping mode and a mopping mode; and the control unit 50 is configured to: when the cleaning robot is in the sweeping mode, control the mopping working head to automatically switch to the non-mopping state, and control the sweeping unit 30 to automatically perform a sweeping action; and when the cleaning robot 100 is in the mopping mode, control the mopping working head to automatically switch to the mopping state, and control the mopping unit 40 to automatically perform a mopping action.

[0074] Specifically, still referring to FIG. 1, when the cleaning robot is in the sweeping mode, the control unit 50 controls the mopping working head to automatically switch to the non-mopping state of being out of contact with the surface of the working region, and controls the sweeping unit 30 to automatically perform a sweeping action; and when the cleaning robot 100 is in the mopping mode, the control unit 50 controls the mopping working head to automatically switch to the mopping state of being in contact with the surface of the working region, and controls the mopping unit 40 to automatically perform a mopping action. When the cleaning robot 100 switches between the sweeping mode and the mopping mode, the mopping unit 40 may switch between the mopping state and the non-mopping state, so that the cleaning robot has both a sweeping function and a mopping function, and can automatically switch between the sweeping mode and the mopping mode, to prevent a user from interfering with the machine while improving cleaning performance, thereby effectively improving cleaning performance and intelligence of the cleaning robot and really helping people emancipate both hands.

[0075] Further, in an embodiment of the present disclosure, the sweeping working head includes a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region, and the control unit is configured to: control the sweeping working head to switch to the non-sweeping state when the cleaning

robot is in the mopping mode, and control the sweeping working head to switch to the sweeping state when the cleaning robot is in the sweeping mode, to prevent the cleaning robot in the mopping mode from being adversely affected by the sweeping working head.

[0076] Further, in an embodiment of the present disclosure, the cleaning robot includes a state switching assembly arranged on the body, to drive state switching of at least one of the mopping working head and the sweeping working head, so that the cleaning robot implements intelligent state switching based on the state switching assembly.

[0077] Further, in an embodiment of the present disclosure, the state switching assembly includes a mopping state switching assembly and a sweeping state switching assembly, the mopping switching assembly includes a mopping state switching motor configured to drive the mopping working head to switch between the mopping state and the non-mopping state and a mopping connection assembly driven by the mopping state switching motor and connected to the mopping working head, and the sweeping state switching assembly includes a sweeping state switching motor configured to drive the sweeping working head to switch between the sweeping state and the non-sweeping state and a sweeping connection assembly driven by the sweeping state switching motor and connected to the sweeping working head.

[0078] Further, in an embodiment of the present disclosure, the sweeping working head includes at least one of a side brush working head, a roller brush working head and a suction mouth working head, and the mopping working head includes a mopping board assembly and a mop assembled to the mopping board assembly. Further, in an embodiment of the present disclosure, the cleaning robot is configured to further include a sweeping and mopping integrated mode, and the control unit is configured to: when the cleaning robot is in the sweeping and mopping integrated mode, control the mopping working head to be in a mopping state and simultaneously control the sweeping working head to be in a sweeping state, so that the cleaning robot has a sweeping and mopping integrated function mode.

[0079] In an example, still referring to FIG. 1, the cleaning robot 100 may be configured to control, according to an obtained function selection control signal, the sweeping unit 30 and/or the mopping unit 40 to be in contact with the surface of the working region of the cleaning robot 100, and control the moving unit 20 to drive the cleaning robot 100 to move. The single machine performs a function of "sweeping only", "mopping only" or "sweeping and mopping integrated" based on control of the function selection control signal inputted by the user, where the "sweeping and mopping integrated" function may include "first sweeping and then mopping" and "sweeping while mopping", to avoid a case that the user needs to manually replace a working module of the robot in a process of switching a working mode of the cleaning robot while improving cleaning performance.

[0080] Further, Referring to FIG. 1, in an embodiment of the present disclosure, a cleaning robot 100 is provided, the function selection control signal may be configured to include at least two of a sweeping only control signal, a mopping only control signal and a sweeping and mopping integrated control signal, where the sweeping only control signal is used for triggering the control unit 50 to control the sweeping working head of the sweeping unit 30 to be in contact with the surface of the working region of the cleaning robot 100, and control the moving unit 20 to drive the cleaning robot 100 to move, to perform a preset sweeping action; the mopping only control signal is used for triggering the control unit 50 to control the mopping working head of the mopping unit 40 to be in contact with the surface of the working region of the cleaning robot 100, and control the moving unit 20 to drive the cleaning robot 100 to move, to perform a preset mopping action; and the sweeping and mopping integrated control signal is used for triggering the control unit 50 to control the sweeping working head of the sweeping unit 30 and the mopping working head of the mopping unit 40 to be both in contact with the surface of the working region of the cleaning robot 100, and control the moving unit 20 to drive the cleaning robot 100 to move, to simultaneously perform a preset sweeping action and a preset mopping action.

[0081] Further, in an embodiment of the present disclosure, a cleaning robot is provided, and may further include a communication unit and/or an operation unit, where the communication unit is connected to the control unit, and the control unit is connected to a mobile terminal through the communication unit, to obtain a function selection control signal from the mobile terminal, to implement remote intelligent control of the cleaning robot; and the operation unit is connected to the control unit, and the control unit locally receives a function selection control signal from the user through the operation unit, to implement local control of the cleaning robot.

[0082] In an example, referring to FIG. 2, in an embodiment of the present disclosure, a cleaning robot 100 is provided and further includes a communication unit 60, where the communication unit 60 is connected to a control unit 50, and the control unit 50 is connected to a mobile terminal 200 through the communication unit 60, to obtain a function selection control signal from the mobile terminal 200. The single machine performs a function of "sweeping only", "mopping only" or "sweeping and mopping integrated" based on control of the function selection control signal inputted by the user, to avoid a case that the user needs to manually replace a working module of the robot in a process of switching a working mode of the cleaning robot while improving cleaning performance. In this embodiment, the mobile terminal 200 may be at least one of a remote control, a mobile phone, a tablet computer, a computer or an intelligent wearable device.

[0083] In an example, referring to FIG. 3, in an embodiment of the present disclosure, a cleaning robot 100 is

provided and further includes an operation unit 70, where the operation unit 70 is connected to a control unit 50, and the control unit 50 locally receives a function selection control signal from the user through the operation unit 70. The single machine performs a function of "sweeping only", "mopping only" or "sweeping and mopping integrated" based on control of the function selection control signal inputted by the user, to avoid a case that the user needs to manually replace a working module of the robot in a process of switching a working mode of the cleaning robot while improving cleaning performance. In this embodiment, the operation unit 70 may be an equivalent device to which a signal may be inputted, such as a physical key, a touch screen or a sound control unit.

[0084] Further, in an embodiment of the present disclosure, the sweeping working head includes a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region, and the control unit is configured to: control the sweeping working head to switch to the non-sweeping state when the cleaning robot is in the mopping mode, and control the sweeping working head to switch to the sweeping state when the cleaning robot is in the sweeping mode.

[0085] The sweeping working head may switch between a sweeping working position of being in contact with the surface of the working region and a sweeping rising position of being out of contact with the surface of the working region; and when the sweeping working head is in the sweeping state, the sweeping working head is in the sweeping working position, and when the sweeping working head is in the non-sweeping state, the sweeping working head is in the sweeping rising position, to make it convenient to control the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0086] In other words, the control unit is configured to: when the cleaning robot is in the mopping mode, control the sweeping unit to rise, to prevent the cleaning robot in the mopping mode from being adversely affected by the sweeping working head.

[0087] Further, in an embodiment of the present disclosure, the sweeping working head includes a roller brush working head and a side brush working head; and the control unit is configured to: control the roller brush working head and the side brush working head to simultaneously rise when the cleaning robot is in the mopping mode.

[0088] Further, in an embodiment of the present disclosure, the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may be configured to simultaneously drive the roller brush working head and the side brush working head to move up and down.

[0089] Further, in an embodiment of the present disclosure, one end of the side brush working head is arranged on the body, and an other end of the side brush working head is provided with a first cleaning portion; and one end of the roller brush working head is arranged on the body, and an other end of the roller brush working head is provided with a second cleaning portion, where the first cleaning portion and the second cleaning portion are configured to come into contact with the surface to perform a preset sweeping action; and the sweeping state switching assembly is connected to the control unit, and configured to perform a first preset action based on control from the control unit, to drive the first cleaning portion and/or the second cleaning portion to be in contact with or out of contact with the surface.

[0090] Further, referring to FIG. 4a and FIG. 4b, in an embodiment of the present disclosure, a cleaning robot 100 is provided, a sweeping unit includes a side brush working head 31, a roller brush working head 32 and a sweeping state switching assembly (not shown in FIG. 4a and FIG. 4b), one end of the side brush working head 31 is arranged on a body 10, an other end of the side brush working head 31 is provided with a first cleaning portion, and the first cleaning portion may be a side brush having one or more brush whips 316 extending along a radial direction; one end of the roller brush working head 32 is arranged on the body 10, an other end of the roller brush working head 32 is provided with a second cleaning portion, and the second cleaning portion may be a cylindrical rotatable working head extending along a rotational shaft, or an air inlet suction mouth, or an elastic scraping bar, where the first cleaning portion and the second cleaning portion are configured to come into contact with the surface to perform a preset sweeping action; and the sweeping state switching assembly is connected to the control unit, and configured to perform a first preset action based on control from the control unit 50, to drive the first cleaning portion and/or the second cleaning portion to be in contact with or out of contact with the surface. In an embodiment of the present disclosure, at least two side brush working heads 31 may be symmetrically distributed on two sides of the body 10, and the roller brush working head 32 is arranged in the middle of the body 10 and is located between two side brush working heads 31, which can reduce the volume of the body while optimizing structural deployment of the cleaning robot.

[0091] It should be pointed out that, in other embodiments, the sweeping working head may be a combination of at least one of the roller brush working head or the side brush working head and the suction mouth working head. This is not limited in the present disclosure.

[0092] Further, in an embodiment of the present disclosure, the sweeping working head includes at least one roller brush working head, having a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region. When the sweeping working head is in the sweeping state, the roller brush working head is in the roller brush working position, and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position, to make it convenient to control the roller brush

working head in the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0093] Further, in an embodiment of the present disclosure, the roller brush working head may switch between the roller brush working position and the roller brush rising position in a rotation manner.

[0094] Further, in an embodiment of the present disclosure, the roller brush working head rotates around a roller brush shaft, and when the roller brush working head is in the sweeping state, the roller brush working head rotates around a roller brush shaft, and in a rotating process, the roller brush working head passes through at least a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position, to control the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0095] Further, in an embodiment of the present disclosure, the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may drive the roller brush working head to move up and down.

[0096] Further, in an embodiment of the present disclosure, in one embodiment, the sweeping state switching assembly includes a first motor and a first cam; and the first cam is configured to follow the first motor to rotate, where the first motor rotates along a preset first direction and drives the first cam to rotate, to rise the roller brush working head; and the first motor rotates along a preset second direction and drives the first cam to rotate, to drive the roller brush working head to descend, and the second direction is opposite to the first direction.

[0097] Referring to FIG. 5a, FIG. 5b, FIG. 5c and FIG. 5d, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping state switching assembly includes a first motor 35 and a first cam 36, and the first motor 35 is connected to the control unit; the first cam 36 is configured to follow the first motor to rotate, and a free end of the first cam 36 is connected to one end of the roller brush working head 32 away from the second cleaning portion (not shown); according to the received mopping only control signal, the control unit controls the first motor to rotate along a preset first direction to drive the first cam 36 to rotate, to rise the roller brush working head 32 and cause the second cleaning portion to be out of contact with the surface of the working region of the cleaning robot 100; and according to the received sweeping only control signal and/or sweeping and mopping integrated control signal, the control unit controls the first motor 35 to rotate along a preset second direction and drive the first cam 36 to rotate, to drive the roller brush working head 32 to descend, so that the second cleaning portion (not shown) comes into contact with the surface of the working region of the cleaning robot 100, where the second direction is opposite to the first direction.

[0098] Further, in a cleaning robot provided in an embodiment of the present disclosure, the sweeping state switching assembly further includes a sliding groove, the sliding groove wraps at least one part of the first cam, and is connected to the first cam and configured to follow the first cam to rotate and drive the roller brush working head to ascend or descend.

[0099] In an example, still referring to FIG. 5a, FIG. 5b, FIG. 5c and FIG. 5d, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping state switching assembly further includes a sliding groove 37, the sliding groove 37 wraps the first cam 36, and is connected to the first cam 36 and configured to follow the first cam 36 to rotate and drive the roller brush working head 32 to ascend or descend.

[0100] Further, referring to FIG. 9a and FIG. 9b, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping unit further includes a roller brush working head 32 and a sweeping state switching assembly, the sweeping state switching assembly includes an electromagnetic assembly 315, and the electromagnetic assembly 315 is connected to the control unit, where one end of the roller brush working head 32 close to the electromagnetic assembly 315 is at least partially made of a magnetic metal material, and the metal includes at least one of iron, nickel or cobalt; and the control unit is configured to:

according to the received mopping only control signal, control the electromagnetic assembly 315 to be powered on and attract the roller brush working head 32 to be out of contact with the surface of the working region of the cleaning robot 100; and

according to the received sweeping only control signal and/or sweeping and mopping integrated control signal, control the electromagnetic assembly 315 to be powered off and release the roller brush working head 32, so that the second cleaning portion comes into contact with the surface of the working region of the cleaning robot 100.

[0101] Further, in an embodiment of the present disclosure, the sweeping working head includes at least one side brush working head rotatable around a rotational shaft; and the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly is configured to drive the side brush working head to move up and down.

[0102] Further, the side brush working head includes a side brush, and when the sweeping working head is in the sweeping state, the side brush working head rotates around the rotational shaft, and in a rotating process, the side brush passes through at least a side brush working position in contact with the surface of the working region and a side brush rising position out of contact with the

surface of the working region; and when the sweeping working head is in the non-sweeping state, the side brush is always in the side brush rising position. The side brush may be a side brush having a brush whip.

[0103] Further, in an embodiment of the present disclosure, the side brush working head includes at least one side brush working head rotatable around a rotational shaft and provided with a side brush, and when the sweeping working head is in the sweeping state, the side brush rotates around the rotational shaft, and in a rotating process, the side brush passes through at least a side brush working position in contact with the surface of the working region and a side brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the side brush is always in the side brush rising position, to control the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0104] Further, in an embodiment of the present disclosure, when the sweeping working head is in the non-sweeping state, the side brush is motionlessly in a side brush rising position, to prevent the side brush working head in the non-sweeping state from affecting a mopping operation of the mopping unit.

[0105] Further, in an embodiment of the present disclosure, the sweeping state switching assembly includes a second cam and a second sliding groove; the side brush working head further includes a driving assembly, and the driving assembly is configured to drive the side brush to rotate around the rotational shaft; the second sliding groove is fixed relative to the driving assembly; when rotating along a first direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around an axis, so that the side brush is in contact with the surface of the working region of the cleaning robot; and when rotating in a reverse direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around the axis in a reverse direction, so that the side brush is out of contact with the surface of the working region of the cleaning robot.

[0106] Further, referring to FIG. 7a and FIG. 7b, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping unit includes a side brush working head and a sweeping state switching assembly. The side brush working head includes a driving assembly 311 and a side brush 313, and the driving assembly 311 drives the side brush 313 to rotate around a shaft 314; the sweeping state switching assembly further includes a second cam 310 and a second sliding groove 312, the second cam 310 is configured to follow the first motor (not shown in FIG. 7a and FIG. 7b) to rotate, and the second sliding groove 312 is fixed relative to the driving assembly 311; when rotating along a first direction, the second cam 310 drives the second sliding groove 312, the driving assembly 311 and the side brush 313 to synchronously rotate around an axis 317, so that a free end 316 located on the side brush 313 is in contact with the surface of the working region of the cleaning robot 100 (FIG. 7a); and when rotating in a reverse direction, the second cam 310 drives the second sliding groove 312, the driving assembly 311 and the side brush 313 to synchronously rotate around the axis 317 in a reverse direction, so that the free end located on the side brush 313 is out of contact with the surface of the working region of the cleaning robot 100 (FIG. 7b).

[0107] Further, the side brush 313 may be a side brush having brush whips extending along a radial direction, and the quantity of brush whips is less than or equal to 2.

[0108] Further, an angle between the rotational shaft and the surface of the working region is greater than or equal to 80 degrees and less than or equal to 85 degrees.

[0109] The sweeping state switching assembly may simultaneously rise or lower the roller brush working head and the side brush working head, or the roller brush working head and the side brush working head rise or lower through two lifting components independent of each other.

[0110] Further, in an embodiment of the present disclosure, the sweeping unit further includes a position sensor configured to detect a position of the side brush; and the control unit is configured to: when the sweeping working head switches from the sweeping state to the non-sweeping state, control the side brush to stop rotating when the position sensor detects that the side brush rotates to a predetermined side brush rising position, to precisely control a stop position of the side brush and prevent the side brush working head in the non-sweeping state from affecting a mopping operation of the mopping unit.

[0111] For example, a phase of the side brush is detected, to control the side brush to stop at a fixed point in a particular position (for example, 0-degree phase).

[0112] Further, referring to FIG. 8a and FIG. 8b, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping unit further includes a side brush working head and a position sensor 3131, the side brush working head includes a driving assembly 311 fixed to a body 10 and the side brush 313, the driving assembly 311 drives the side brush 313 to rotate around a shaft 314, and the rotational shaft 314 is inclined relative to the body by a specific angle. For example, an angle between the rotational shaft 314 and a height direction of the body may be set to be greater than 5 degrees and less than 10 degrees. The position sensor is connected to the control unit. The side brush 313 may be a side brush having a single brush whip extending along a radial direction. When the single side brush 313 rotates around the shaft 314 to a region right ahead, the brush whip is in contact with the surface of the working region (FIG. 8a), and when the single brush whip rotates to a region right behind (FIG. 8b), the brush whip is out of contact with the surface of the working region. In this case, the position sensor 3131 detects a position signal of the side brush 313, and the control unit controls, based on the

received position signal, the driving assembly 311 to stop rotating, so that the side brush 313 accurately stops in a position right behind. In an embodiment of the present disclosure, the position sensor may be a Hall sensor.

[0113] In the existing technology, the side brush of the cleaning robot has three brush whips, and the three brush whips are evenly distributed along a rotatable working head. In a rising process, one or two brush whips are always in contact with the ground, and the three brush whips cannot simultaneously be out of contact with the ground. As a result, when the cleaning robot is doing mopping work, the service life of the side brush is shortened, or even stains on the side brush may cause secondary pollution to the mopped ground. However, in an embodiment of the present disclosure, a side brush including a single brush whip is selected as the side brush, and through the single brush whip, the following effects may be achieved: 1. In a rising process, the brush whip is out of contact with the ground at least at an angle value, so that in a process of performing no sweeping, the brush whip is out of contact with the ground or carpet, thereby improving the service life of the side brush and avoiding secondary pollution. 2. In a rotation process, a rotation phase is detected, so that the brush whip may stop at a fixed point.

[0114] In another possible implementation of the present disclosure, the side brush may include a plurality of brush whips. When the side brush working head includes a plurality of brush whips, the plurality of brush whips may not be evenly distributed, so that all the brush whips of the side brush working head are out of contact with the ground or carpet at least at an angle value, to improve the service life of the side brush and avoid secondary pollution. For example, the plurality of brush whips are arranged within a 180-degree sweeping range or 180-degree non-sweeping range of rotational circular (360 degrees, where 180 degrees are the sweeping range of the brush whip, and the other 180 degrees are the non-sweeping range of the brush whip) movement of the side brush working head. Further, in the plurality of brush whips, an angle between adjacent brush whips is not greater than a preset value, where the preset value corresponds to the quantity of brush whips. For example, when there are three brush whips, the preset value is set to 60 degrees, and when there are six brush whips, the preset value is set to 30 degrees. When there are nine brush whips, the preset value is set to 20 degrees. Further, the quantity of brush whips is less than or equal to 2, and the two brush whips are both arranged within the circular 180-degree sweeping range or 180-degree non-sweeping range.

[0115] As shown in FIG. 5a, the cleaning robot 100 works in a "sweeping and mopping integrated" state, that is, the sweeping unit and the mopping unit 40 of the cleaning robot 100 are both in contact with the surface of the working region of the cleaning robot 100, and the moving unit 20 drives the cleaning robot 100 to move, to simultaneously perform a preset sweeping action and a preset mopping action.

[0116] As shown in FIG. 5b, the cleaning robot 100 works in a "mopping only" state, namely, the mopping unit 40 of the cleaning robot 100 is in contact with the surface of the working region of the cleaning robot 100, and the moving unit 20 drives the cleaning robot 100 to move, to perform a preset mopping action. In this embodiment, according to the received mopping only control signal, the control unit may be configured to control the first motor to rotate along a preset first direction to drive the first cam 36 to rotate, to rise the roller brush working head 32 and cause the second cleaning portion to be out of contact with the surface of the working region of the cleaning robot 100. While controlling the mopping unit 40 to be in contact with the surface of the working region of the cleaning robot 100, the control unit controls the moving unit 20 to drive the cleaning robot 100 to move, to perform a preset mopping action.

[0117] As shown in FIG. 5c, the cleaning robot 100 works in a "sweeping only" state, namely, the sweeping unit of the cleaning robot 100 is in contact with the surface of the working region of the cleaning robot 100, and the mopping unit 40 is out of contact with the surface. According to the received sweeping only control signal, the control unit controls the first motor 35 to rotate along a preset second direction and drive the first cam 36 to descend, to drive the roller brush working head 32 to descend, so that the second cleaning portion (not shown) comes into contact with the surface of the working region of the cleaning robot 100, where the second direction is opposite to the first direction. While controlling the mopping unit 40 to be out of contact with the surface, the control unit controls the moving unit 20 to drive the cleaning robot 100 to move, to perform a preset sweeping action.

[0118] As shown in FIG. 5d, the cleaning robot 100 works in a "round-trip" state. While controlling the moving unit 20 to drive the cleaning robot 100 to move, the control unit controls both the sweeping unit and the mopping unit 40 to be out of contact with the surface of the working region of the cleaning robot 100. Namely, the cleaning robot 100 only moves but does not perform the preset sweeping action or preset mopping action.

[0119] It should be pointed out that, when the cleaning robot is in each of all working states such as "sweeping only", "mopping only" and "sweeping and mopping integrated", the body may be supported on the ground by an omnidirectional wheel and two driving wheels.

[0120] Further, referring to FIG. 6a and FIG. 6b, in a cleaning robot 100 provided in an embodiment of the present disclosure, a dust accommodation apparatus 34 is further included, the dust accommodation apparatus 34 is located on a side of an air inlet suction mouth away from the surface of the working region, and the dust accommodation apparatus 34 is configured to accommodate dust or sundries collected by the sweeping unit in a process of performing the preset sweeping action. As shown in FIG. 6a, the cleaning robot 100 works in a

"sweeping only" working state or "sweeping and mopping integrated" working state, and the roller brush working head 32 in the sweeping unit is in contact with the surface of the working region of the cleaning robot 100. As shown in FIG. 6b, the cleaning robot 100 works in a "round-trip" working state, and both the sweeping unit and the mopping unit are out of contact with the surface of the working region of the cleaning robot 100.

[0121] Further, in an embodiment of the present disclosure, the mopping working head may switch between a mopping working position of being in contact with the surface of the working region and a mopping rising position of being out of contact with the surface of the working region; and when the mopping working head is in the mopping state, the mopping working head is in the mopping working position, and when the mopping working head is in the non-mopping state, the mopping working head is in the mopping rising position, to prevent the mopping working head from adversely affecting the sweeping working head when the cleaning robot is in the sweeping mode.

[0122] Further, in an embodiment of the present disclosure, when the mopping working head is in the mopping state, the mopping working head under an external force is movable at least in an up-down direction relative to the body.

[0123] In an example, referring to FIG. 10a, FIG. 10b, and FIG. 10c, in a cleaning robot provided in an embodiment of the present disclosure, the sweeping unit is connected to the body of the cleaning robot through movable joints, the movable joints are in clearance fit in a vertical direction, and the movable joints may provide the mopping unit with rotational degrees of freedom in two directions X1 and X2. Moreover, in the mopping state, the mopping unit may freely move in a vertical direction relative to the body, and the body part of the cleaning robot is supported by an omnidirectional wheel and driving wheels.

[0124] Further, still referring to FIG. 10a, FIG. 10b and FIG. 10c, the movable joints include two joints X1 and X2, where the joint X1 is formed by a sliding groove 48 and an arc surface 47, the arc surface 47 is arranged on the mopping unit, and the sliding groove 48 is arranged on the body of the cleaning robot. In this way, the mopping unit is allowed to rotate around X1, and movement of the mopping unit in a vertical direction L1 relative to the body is not limited. The joint X2 is formed by a supporting shaft 44 and a kidney-shaped groove 46, the supporting shaft 44 runs through the kidney-shaped groove 46, the kidney-shaped groove 46 is arranged on the mopping unit, the supporting shaft 44 is arranged on the body, the mopping unit is allowed to rotate around X2, and a length of the kidney-shaped groove 46 in a vertical direction is used for limiting a moving distance of the mopping unit in a vertical direction relative to the body of the cleaning robot, so that the mopping unit adapts to an uneven ground.

[0125] Further, in a cleaning robot provided in an embodiment of the present disclosure, the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, configured to drive the mop board to move up and down along a direction perpendicular to a working surface. The foregoing wiping member may be, for example, a mop, mop paper or sponge.

[0126] Further, in a cleaning robot provided in an embodiment of the present disclosure, the mopping unit includes a mop board, a mop and a mopping state switching assembly, the mopping state switching assembly is fixedly connected to the body, the mopping state switching assembly drives the mop board to move up and down along a vertical direction, and the mop is arranged under the mop board, where the mop is configured to come into contact with the surface of the working region of the cleaning robot to perform a preset mopping action; and the mopping state switching assembly is connected to the control unit and configured to perform a second preset action based on control from the control unit, to drive the mop on the mop board to be in contact with or out of contact with the surface of the working region of the cleaning robot.

[0127] Further, referring to FIG. 10d and FIG. 10e, in a cleaning robot 100 provided in an embodiment of the present disclosure, the mopping state switching assembly further includes a third motor (not shown), a mop board support 45, a mop 42, and a third cam 47, a free end of the third cam 47 is connected to a surface of the mop board support 45 away from the mop 42, and the third cam 47 is configured to follow the third motor to rotate around an axis X3, where the control unit is configured to:

control, according to a received sweeping only control signal, the third motor to rotate along a preset first direction and drive the third cam 47 to rotate, to rise the mop board support 45 to ascend and cause the mop 42 to be out of contact with the surface of the working region of the cleaning robot 100; and

control, according to a received mopping only control signal and/or sweeping and mopping integrated control signal, the third motor to rotate along a preset second direction and drive the third cam 47 to descend, to drive the mop board support 45 to descend and cause the mop 42 to be in contact with the surface of the working region of the cleaning robot 100, where the first direction is opposite to the second direction.

[0128] Further, still referring to FIG. 10a, FIG. 10b, FIG. 10c, FIG. 10d and FIG. 10e, in a cleaning robot 100 provided in an embodiment of the present disclosure, the kidney-shaped groove 46 includes a kidney-shaped hole, and a fixed shaft 44 runs through the kidney-shaped hole, where a length of the kidney-shaped hole is used for limiting a distance by which the mop board support ascends

or descends.

[0129] An existing cleaning robot has a mopping function and can clean a hard ground, but the cleaning robot cannot cope with cleaning of a hard ground having a soft material such as a carpet, for example, often dirty the carpet, affecting adaptability of the robot.

[0130] Based on this, the present disclosure provides a cleaning robot, and the cleaning robot includes: a body; a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; a mopping unit provided with a mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action; and a control unit, configured to: control the mopping working head to rise when the cleaning robot is in a state of being about to move onto a carpet, where a rising height of the mopping working head is greater than 6 mm.

[0131] The state of being about to move onto a carpet that the cleaning robot is in refers to a state that the cleaning robot needs to move onto a carpet, the state that the cleaning robot needs to move onto a carpet may be, for example, a state of sweeping a carpet by the cleaning robot or a state of crossing a carpet, and the state of crossing a carpet refers to a state of not sweeping a carpet.

[0132] For example, if the cleaning robot detects a carpet and a distance to the carpet being less than a preset value, and the cleaning robot is in the sweeping mode, it is determined that the cleaning robot is in the state of sweeping a carpet; or if the cleaning robot detects a carpet and a distance to the carpet being less than a preset value, and the cleaning robot is in the mopping mode, it is determined that the cleaning robot is in the state of crossing a carpet.

[0133] In the cleaning robot in the foregoing embodiment, in a process in which the cleaning robot cleans a ground, to cope with a soft material on the ground such as a carpet, the control unit controls the mop board to rise by a rising height greater than 6 mm, so that when the cleaning robot moves onto the carpet, the mopping working head is out of contact with the carpet, to prevent the cleaning robot from dirtying the carpet when moving onto the carpet, thereby improving adaptability of the cleaning robot.

[0134] Particularly for a carpet with a regular thickness, for example, a carpet with a thickness less than or equal to 1/4 inches (about 6 mm), and particularly a soft-hair carpet, after the cleaning robot is controlled to rise the mopping working head, the mopping working head is separated from the carpet when the cleaning robot is on the carpet. It should be noted that, since the carpet is sunk by a specific height when the machine moves onto the carpet, the rising height is controlled to be greater than a preset height, for example, 6 mm, and the mopping working head is separated from the carpet when the cleaning robot moves onto the carpet; and the foregoing being separated from the carpet may be understood as being out of contact with the carpet.

[0135] To achieve the foregoing objective and other objectives, an embodiment of the present disclosure further provides a cleaning robot. The cleaning robot includes: a body; a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; a mopping unit provided with a mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action; and a control unit, configured to: control a rising height of the mopping working head to be greater than a preset value, so that a gap exists between a lower surface of the risen mopping unit and an upper surface of a carpet.

[0136] In the cleaning robot in the foregoing embodiment, in a process in which the cleaning robot cleans a ground, to cope with the carpet on the ground, the control unit controls the mopping working head to rise, and the gap exists between the lower surface of the risen mopping unit and the upper surface of the carpet when the cleaning robot moves onto the carpet, to avoid a problem that the cleaning robot dirties the carpet when moving onto the carpet, thereby improving adaptability of the cleaning robot.

[0137] For carpets with regular thicknesses (for example, 1/4 inches and less), to cause gaps to exist between a lower surface of the risen mopping unit and upper surfaces of the carpets, in a possible implementation, the rising height of the mopping working head is controlled to be greater than 6 mm, so that gaps exist between the lower surface of the risen mopping unit and the upper surfaces of the carpets when the machine moves onto the carpets with the regular thicknesses.

[0138] In one embodiment, the control unit is configured to: control the mopping working head to rise, so that when the cleaning robot moves onto a carpet, a distance between a lower surface of the risen mopping unit and an upper surface of the carpet is greater than or equal to 1 mm, to prevent the mopping unit from polluting the carpet. Further, the rising height is greater than or equal to 6.5 mm, and a gap of at least 1 mm exists between the lower surface of the mopping unit and the upper surface of the carpet.

[0139] Further, the cleaning robot further includes: a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action; the cleaning robot is configured to include at least a cleaning mode and a mopping mode; and the control unit is configured to: when the cleaning robot is in the cleaning mode and the cleaning robot detects a carpet, control the mopping working head to rise and control the cleaning robot to move onto the carpet, to make it convenient for the sweeping unit to perform the sweeping action on the carpet, where the rising height of the mopping working head is greater than 6 mm, so that the mopping working head is separated from the carpet when the cleaning robot is on the carpet.

[0140] An embodiment provides a sweeping and mopping integrated cleaning robot. The cleaning robot has at least a cleaning mode and a mopping mode. In the cleaning mode, in a case of detecting a carpet and determining to move onto the carpet, the cleaning robot moves onto the carpet in a state of controlling a mopping working head to rise, and controls a sweeping unit to sweep the carpet, thereby cleaning the carpet by the sweeping unit while preventing the mopping working head from polluting the carpet.

[0141] Further, the control unit is configured to: when the cleaning robot is in the mopping mode and the cleaning robot detects a carpet, control the cleaning robot to switch to a non-mopping mode, control the mopping working head to rise, and control the cleaning robot to move onto the carpet, where the rising height of the mopping working head is greater than 6 mm, so that the mopping working head is separated from the carpet when the cleaning robot is on the carpet.

[0142] In a process in which the cleaning robot in the mopping mode cleans a working ground, if a carpet is detected, the cleaning robot is controlled to first switch from the mopping mode to the non-mopping mode. For example, if the cleaning robot further has a cleaning mode, the cleaning robot may switch to the cleaning mode, and the sweeping unit cleans the carpet. If the cleaning robot has only a mopping function or mopping mode, the cleaning robot controls the mopping working head to rise, so that the cleaning robot switches from the mopping mode to a crossing mode. After crossing the carpet, the cleaning robot lowers the mopping working head, and then switches to the mopping mode, to continue to clean the working ground.

[0143] Further, the rising height is simultaneously less than or equal to 20 mm.

[0144] Further, a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is less than or equal to 0.1.

[0145] To cause the overall size of the machine to be not excessively large and the deployment inside the overall machine to be proper, a ratio of the first volume to the second volume is less than or equal to 0.1.

[0146] In a possible implementation of the present disclosure, the rising height is controlled to be less than or equal to 20 mm, to cause a ratio of the first volume to the second volume to be less than or equal to 0.1.

[0147] In an embodiment of the present disclosure, the rising height is simultaneously less than or equal to a sum of a thickness of the body and a height of a bottom surface of the body away from a ground.

[0148] Since excess rising may affect the service life of machine parts or cause collision with other relatively high objects, the rising height needs to be less than or equal to a sum of a thickness of the body and a height of a bottom surface of the body away from a ground.

[0149] In an embodiment of the present disclosure, the rising height is simultaneously less than or equal to a difference between a thickness of the body and a height of a bottom surface of the body away from a ground.

[0150] Since a component such as the body or the mopping unit has a specific thickness, the rising height further needs to be less than or equal to a difference between the thickness of the body and the height of the bottom surface of the body away from the ground. For example, if the thickness of the body is 90 mm, and the height of the bottom surface of the body away from the ground is 10 mm, the rising height is less than or equal to 80 mm.

[0151] It should be noted that, the foregoing height of the bottom surface of the body away from the ground may be understood as a height of the bottom surface of the body away from the surface of the working region, and may also be understood as a height of the bottom surface of the body away from an upper surface of a soft material such as a carpet. This is not limited in the present disclosure.

[0152] In an embodiment of the present disclosure, the rising height is greater than or equal to 6.5 mm.
the rising height is greater than or equal to 6.5 mm, so that when the cleaning robot is on a carpet, a specific gap exists between a bottom surface of the mopping working head and a surface of the carpet, to prevent the mopping unit from polluting the carpet.

[0153] Further, a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is greater than or equal to 0.004.

[0154] To ensure a cleaning effect of the mopping unit when doing mopping work, a ratio of the space volume occupied by the mopping working head in the rising process to the space volume occupied by the body of the cleaning robot should be greater than or equal to 0.004.

[0155] In this embodiment, the rising height is greater than or equal to 6.5 mm, so that when the cleaning robot is on a carpet, a specific gap exists between a bottom surface of the mopping working head and a surface of the carpet, to prevent the mopping unit from polluting the carpet. Meanwhile, to ensure a cleaning effect of the mopping unit when doing mopping work, a ratio of the space volume occupied by the mopping working head in the rising process to the space volume occupied by the body of the cleaning robot should be greater than or equal to 0.004.

[0156] In an embodiment of the present disclosure, considering that thicknesses of some carpets are relatively large, for example, a carpet with a thickness greater than 1/4 inches, a carpet with a thickness of 1/2 inches (about 12.7 mm) is used as an example. To avoid polluting this type of carpets, the rising height needs to be greater than 12.7 mm. For example, the rising height is controlled to be greater than or equal to 13 mm. Further, the rising height is greater than or equal to 13 mm.

[0157] In an embodiment of the present disclosure,

when cleaning the working region, the cleaning robot encounters an obstacle, for example, a step or a toy. Therefore, to avoid polluting the carpet and avoid a case that when the cleaning robot crosses the obstacle, the mopping working head coming into contact with the surface of the working region may cause an adverse effect, for example, be damaged or pollute the ground, the rising height is greater than or equal to 15 mm.

[0158] For ease of understanding, related constraints of the rising height are briefly described below:

In an embodiment of the present disclosure, the mopping working head includes a mop board 41, the mop board 41 has a mop board bottom area A1, and the mopping working head has a rising height H1; the body 10 of the cleaning robot 100 has a body bottom area A2, and the body 10 of the cleaning robot 100 has a body height H2; and a ratio of a product of the mop board bottom area A1 and the rising height H1 of the mopping working head to a product of the body bottom area A2 and the body height H2 falls within a preset range. A mathematical formula is expressed as $X1 \leq \frac{A1*H1}{A2*H2} \leq X2$.

[0159] It may be understood that, the product of the body bottom area A2 and the body height H2 is the space volume occupied by the body 10 of the cleaning robot 100, and the product of the mop board bottom area A1 and the rising height H1 of the mopping working head is the space volume occupied by the mopping working head in the rising process. Referring to FIG. 13a and FIG. 14, in a case that the mop board bottom area A1 is the same, a higher rising height H1 of the mopping working head indicates a larger space volume occupied inside the body 10 the cleaning robot 100. Therefore, volumes or positions of other function modules in the body 10 are affected, and then the overall deployment is affected. Referring to FIG. 15 and FIG. 16, in a case that the rising height H1 of the mopping working head is the same, to reduce the space volume inside the body 10 occupied by the mopping working head, the mop board bottom area A1 may be reduced, but reduction in the mop board bottom area A1 affects the mopping effect. In this case, to increase the rising height H1 of the mopping working head, ensure that the magnitude of the mop board bottom area A1 does not affect the mopping effect, and further balance the space volume inside the body 10 occupied by the mopping working head, the ratio of the product of the mop board bottom area A1 and the rising height H1 of the mopping working head to the product of the body bottom area A2 and the body height H2 needs to fall within a proper preset range, namely, a ratio of the space volume required by the mopping working head in the rising process to the volume of the body 10 needs to fall within a proper range. Only in this way, the machine can meet the sweeping effect, and the deployment inside the body 10 is proper. In this embodiment, the preset range is from X1=0.004 to X2=0.1, namely, $0.004 \leq \frac{A1*H1}{A2*H2} \leq 0.1$.

[0160] In this embodiment, an example in which the body height H2 of the cleaning robot 100 is 87 mm is used. Referring to FIG. 17, when a width B1 of a mop board is 25 mm, and a length C1 of the mop board is 200 mm, the mop board bottom area A1 is roughly a product of the width B1 of the mop board and the length C1 of the mop board, namely, A1=C1*B1; and when a length C2 of the bottom surface of the body is 400 mm, and a width B2 of the bottom surface of the body is 200 mm, the body bottom area A2 is roughly a product of the length C2 of the bottom surface of the body and the width B2 of the bottom surface of the body, namely, A2=C2*B2. The rising height H1 of the mopping working head is greater than or equal to 6.5 mm. In this case, to cause the deployment of the body 10 to be proper, a ratio of a product of the mop board bottom area A1 and the rising height H1 of the mopping working head to a product of the body bottom area A2 and the body height H2 falls within a preset range, and the preset range of the ratio is calculated as: $\frac{A1*H1}{A2*H2} \geq 0.004$.

[0161] An example in which the body height H2 of the cleaning robot 100 is 87 mm is still used. Referring to FIG. 17, when a width B1 of a mop board is 175 mm, and a length C1 of the mop board is 400 mm, the mop board bottom area A1 is a product of the width B1 of the mop board and the length C1 of the mop board, namely, A1=C1*B1; and when a length C2 of the bottom surface of the body is 400 mm, and a width B2 of the bottom surface of the body is 400 mm, the body bottom area A2 is a product of the length C2 of the bottom surface of the body and the width B2 of the bottom surface of the body, namely, A2=C2*B2. The rising height H1 of the mopping working head is less than or equal to 20 mm. In this case, to cause the deployment of the body 10 to be proper, a ratio of a product of the mop board bottom area A1 and the rising height H1 of the mopping working head to a product of the body bottom area A2 and the body height H2 falls within a preset range, and the preset range of the ratio is calculated as: $\frac{A1*H1}{A2*H2} \leq 0.1$.

[0162] In an embodiment of the present disclosure, the rising height H1 of the mopping working head is greater than or equal to 15 mm. The mopping working head is in the mopping rising position, so that the mopping working head is in the non-mopping state. That the mopping working head is in the non-mopping working state includes a scenario that the cleaning robot 100 cleans the carpet. When the cleaning robot 100 cleans the carpet, the mopping working head rises, to prevent the mopping working head from polluting the carpet. When the cleaning robot

100 moves onto the carpet, if the carpet is a soft-hair carpet or long-hair carpet, the cleaning robot 100 is sunk into soft hairs or long hairs of the carpet, and distances of the bottom surface of the body and the bottom surface of the mop board 41 to the carpet are shortened. If the rising height H1 of the mopping working head is insufficiently high, the mop board 41 still comes into contact with the carpet, to pollute the carpet. In this case, the mopping working head needs to be capable of being risen to a larger height, and a rising height of the mopping working head greater than 15 mm can effectively avoid a case of polluting the long-hair or soft-hair carpet. That the mopping working head is in the non-mopping state further includes a scenario that the cleaning robot 100 crosses an obstacle. When the cleaning robot 100 crosses the obstacle, the mopping working head rises, to avoid a case that the mopping working head is in contact with the ground to interfere with the cleaning robot 100 in crossing the obstacle. When the cleaning robot 100 passes through the obstacle, the body 10 is inclined by a specific angle. If the rising height H1 of the mopping working head is insufficiently high, the mop board 41 still comes into contact with the ground, to interfere with the cleaning robot 100 in crossing the obstacle. In this case, the mopping working head needs to be capable of being risen to a larger height, and a rising height of the mopping working head greater than 15 mm can effectively prevent the mopping working head from causing interference when the cleaning robot 100 crosses the obstacle. A largest height of a usual wall-to-wall carpet is about 15 mm, cleaning robots with different specifications may be sunk by 5 to 15 mm in the carpet, and the rising height of the mopping working head of the cleaning robot in the present disclosure is greater than 15 mm. Therefore, when the cleaning robot moves onto the carpet, the mopping working head is risen and does not come into contact with the carpet, to avoid polluting the carpet.

[0163] Further, the rising height H1 of the mopping working head is related to a distance from the bottom surface of the body to the carpet or ground. For setting of the rising height H1 of the mopping working head, reference should be made to the distance from the bottom surface of the body to the carpet or ground. A shorter distance from the bottom surface of the body to the carpet or ground indicates that a larger rising height H1 of the mopping working head is set. A longer distance from the bottom surface of the body to the carpet or ground indicates that a smaller rising height H1 of the mopping working head is set. By setting the rising height H1 of the mopping working head in this way, when the cleaning robot 100 moves onto the carpet or crosses the obstacle, the mopping working head may effectively avoid polluting the carpet or interfering with the cleaning robot 100 in crossing the obstacle.

[0164] Specifically, the distance from the bottom surface of the body to the carpet or ground is related to the weight of the cleaning robot 100 and the diameters of the omnidirectional wheel 21 and the driving wheels 22 of the cleaning robot 100. It may be understood that, a smaller weight of the cleaning robot 100 indicates larger diameters of the driving wheels 22 and the omnidirectional wheel 21 of the cleaning robot 100 and a longer distance from the bottom surface of the body to the carpet or ground; a larger weight of the cleaning robot 100 indicates smaller diameters of the omnidirectional wheel 21 and the driving wheels 22 of the cleaning robot 100 and a shorter distance from the bottom surface of the body to the carpet or ground; a smaller weight of the cleaning robot 100 indicates larger diameters of the driving wheels 22 and the omnidirectional wheel 21 of the cleaning robot 100 and a smaller rising height H1 of the mopping working head that can be set; and a larger weight of the cleaning robot 100 indicates smaller diameters of the omnidirectional wheel 21 and the driving wheels 22 of the cleaning robot 100 and a larger rising height H1 of the mopping working head that needs to be set.

[0165] When the cleaning robot 100 moves onto the carpet to clean the carpet, if the carpet is a long-hair or soft-hair carpet, the cleaning robot 100 is sunk into the carpet. That the cleaning robot 100 is sunk into the carpet means that the omnidirectional wheel 21 and the driving wheels 22 of the cleaning robot 100 are sunk into the carpet. The distance from the body to the carpet is related to a depth by which the cleaning robot 100 is sunk into the carpet. A larger depth by which the cleaning robot 100 is sunk into the carpet indicates a shorter distance from the bottom surface of the body to the carpet and a larger rising height H1 of the mopping working head that needs to be set. A smaller depth by which the cleaning robot 100 is sunk into the carpet indicates a longer distance from the bottom surface of the body to the carpet and a smaller rising height H1 of the mopping working head that can be set. The depth by which the cleaning robot 100 is sunk into the carpet is related to the weight of the cleaning robot 100 and the softness of the carpet. It may be understood that, a larger weight of the cleaning robot 100 indicates a softer carpet and a larger depth by which the cleaning robot 100 is sunk into the carpet.

[0166] In an embodiment of the present disclosure, the mopping state switching assembly is configured to drive the mop board 41 to move up and down along a direction perpendicular to a working surface, at least one part of the mopping state switching assembly is connected to the mop board 41, and the at least one part of the mopping state switching assembly and the mop board 41 move together. The mopping state switching assembly is configured to drive the mop board 41 to move up and down along a direction perpendicular to a working surface, so that the mop on the mop board 41 is in contact with or out of contact with the working surface of the cleaning robot 100. It may be understood that, the connecting at least one part of the mopping state switching assembly to the mop board 41 may be directly connecting the mopping state switching assembly to the mop board 41, or may be indirectly connecting the mopping state switching

assembly to the mop board 41 through another structure. To effectively clean the working surface, the mop on the mop board 41 should be in contact with the working surface and generate a specific pressure on the working surface. Referring to FIG. 18a and FIG. 18b, in the existing technology, to cause the mop on the mop board 41 to effectively clean the working surface, a balance weight 52 is arranged on the mop board 41, to increase the weight of the mop board 41 to generate a specific pressure on the working surface. In such an arrangement, the entire weight of the cleaning robot 100 is increased, the balance weight 52 occupies the space volume inside the body 10 of the cleaning robot 100, and then the height by which the mopping working head can rise is reduced.

[0167] Referring to FIG. 19a and FIG. 19b, in this embodiment, at least one part of the mopping state switching assembly is connected to the mop board 41, and the at least one part of the mopping state switching assembly and the mop board 41 move together, so that the mopping state switching assembly may play a role of the balance weight. The working surface can be effectively cleaned without addition of the balance weight, meanwhile the space inside the body is saved, and then the height by which the mopping working head can rise is increased.

[0168] In other words, at least part of the mopping state switching assembly is arranged on the mop board 41 and follows the mop board 41 to move up and down along the direction perpendicular to the working surface, and the at least part of the mopping state switching assembly arranged on the mop board 41 plays a role of the balance weight 52 while driving the mopping working head to rise. Therefore, the working surface can be effectively cleaned by the mop board 41 without addition of the balance weight 52, meanwhile the space volume inside the body 10 of the cleaning robot 100 is saved, and then the height by which the mopping working head can rise is increased.

[0169] Further, in a cleaning robot provided in an embodiment of the present disclosure, the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, configured to drive the mop board to move up and down along a direction perpendicular to a working surface. The foregoing wiping member may be, for example, a mop, mop paper or sponge.

[0170] Further, in an embodiment of the present disclosure, the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, at least two acting force points exist between the mopping state switching assembly and the mop board, and the mopping state switching assembly acts on the mop board through the at least two acting force points, to rise and lower the mop board.

[0171] For example, the mopping state switching assembly may include two cams, there is one acting force point between each cam and the mop board, and the mopping state switching assembly moves the mop board up and down through acting force points between the two cams and the mop board.

[0172] Alternatively, the mopping state switching assembly may include two rack and pinion structures, the mop board is connected to pinions in the rack and pinion structures, one acting force point exists between each rack and pinion structure and the mop board, a pinion in each rack and pinion structure moves up and down along a rack in the rack and pinion structure, and the mopping state switching assembly acts on the mop board through two acting force points, thereby driving the mop board to move up and down.

[0173] Further, the mopping state switching assembly includes a driving unit, a pinion 53 and a rack 54 meshed with the pinion 53, the driving unit drives the pinion 53 to rotate, to cause one of the pinion 53 and the rack 54 to move up and down along the direction perpendicular to the working surface, and one of the pinion 53 and the rack 54 is connected to the mop board 41, and drives the mop board 41 to move up and down along the direction perpendicular to the working surface. It may be understood that, the moving up and down along the direction perpendicular to the working surface by the mop board 41 may be moving straight up and straight down along a vertical direction by the mop board 41, or may be moving up and down along a slightly inclined direction by the mop board 41. Provided that a displacement in the direction perpendicular to the working surface is generated, any movement may be considered as moving up and down along the direction perpendicular to the working surface. Preferably, the driving unit includes a driving motor 52. An output end of the driving motor 52 is meshed with the pinion 53 to drive the pinion 53 to rotate.

[0174] Furthermore, referring to FIG. 19a and FIG. 19b, the rack 54 is connected to the body 10, the driving unit and the pinion 53 are connected to the mop board 41 and move together with the mop board 41, the driving unit drives the pinion 53 to move on a surface of the rack 54, to drive the mop board 41 to move up and down along the direction perpendicular to the working surface. Referring to FIG. 19, FIG. 20a, and FIG. 20b, the driving unit is relatively fixedly connected to the mop board 41, and the driving unit drives the pinion 53 to rotate, so that the pinion 53 rises or lowers on the surface of the rack 54. While rising or lowering on the surface of the rack 54, the pinion 53 drives the driving unit and the mop board 41 to move up and down, so that the mop board 41 moves up and down along the direction perpendicular to the working surface. Meanwhile, because the driving unit and the pinion 53 are connected to the mop board 41, to add weights of the driving unit and the pinion 53 to the mop board 41, the mop board 41 may effectively clean the working surface.

[0175] FIG. 18a and FIG. 18b show a technical solution in the existing technology in which a pinion collaborates with a rack to rise a mop board, where the pinion is connected to a body, the rack is connected to the mop board, a driving unit is connected to the body and drives the

pinion to rotate, and the pinion rotates and drives the rack to move up and down along a direction perpendicular to a working surface together with the mop board. In such an arrangement, it is still necessary to add a balance weight to the mop board, to enable the mop board to effectively clean the working surface when being in contact with the working surface, and in a rising process of the mop board, the rack moves upward. To accommodate the rack in the body, the height of the body needs to be increased, but an excessively high body disables a robot from entering the bottom of short furniture, which affects a cleaning effect. In this embodiment, the rack 54 is connected to the body 10, the mop board 41 in a rising process is fixed relative to the body 10, the driving unit 52 is connected to the mop board, the pinion is indirectly connected to the mop board 41 through the driving unit 52, and the driving unit 52 drives the pinion 53 to rotate and rise or lower on the surface of the rack 54. While the pinion 53 drives the mop board 41 to move up and down along the direction perpendicular to the working surface, the weights of the pinion 53 and the driving unit 52 are added to the mop board 41. Therefore, even if no balance weight is additionally added, the working surface can be effectively cleaned when the mop board 41 is in contact with the working surface. Moreover, because the pinion 53 is fixed relative to the body 10 in a process of rising the mop board 41, the rack 54 may be accommodated without additionally increasing the height of the body, and the height of the body 10 may be reduced, to make it convenient for the cleaning robot to enter the bottom of short furniture, thereby improving the cleaning effect.

[0176] Further, in an embodiment of the present disclosure, the mopping state switching assembly includes a first switching member and a second switching member, the first switching member and the second switching member are connected to a mop board 41 and arranged on two sides of a central axis L of the mop board, and the first switching member collaborates with the second switching member to drive the mop board 41 to move up and down along a direction perpendicular to a working surface.

[0177] Further, in an embodiment of the present disclosure, the central axis of the mop board divides the mop board into two parts, and the first switching member and the second switching member are arranged on two sides of the central axis L of the mop board, to jointly drive the mop board to move up and down. The central axis of the mop board divides the mop board into two parts, and the foregoing two parts are not completely the same. Certainly, the central axis of the mop board may alternatively divide the mop board into two parts with the same shape and size.

[0178] In this embodiment, the mop board 41 is a flat-board structure, the central axis L of the mop board divides the mop board 41 into two parts with the same shape and size, and the first switching member and the second switching member are arranged on two sides of the central axis L of the mop board, to jointly drive the mop board 41 to move up and down, so that the mop board 41 may be more balanced in the process of moving up and down. Preferably, positions in which the first switching member and the second switching member are connected to the mop board 41 are symmetrical relative to the central axis L of the mop board. In such an arrangement, the mop board 41 may be subjected to a more even force in a rising process and risen more steadily.

[0179] Specifically, referring to FIG. 20a and FIG. 20b, the first switching member includes a first pinion 531 and a first rack 541 meshed with each other, and the second switching member includes a second pinion 532 and a second rack 542 meshed with each other. The first pinion 531 and the first rack 541 are arranged on a side of the central axis L of the mop board, and the second pinion 532 and the second rack 542 are arranged on an other side of the central axis L of the mop board. The first pinion 531 and the second pinion 532 are connected to the mop board 41, and the first pinion 531 and the second pinion 532 rise or lower on surfaces of the first rack 541 and the second rack 542 respectively, to drive the mop board 41 to move up and down along the direction perpendicular to the working surface. The center-of-gravity G of the mop board is located on the central axis L of the mop board, a rising force F to which the mop board 41 is subjected in a rising process is arranged on two sides of the center-of-gravity G of the mop board, and compared with being subjected to a single-side rising force, the mop board being subjected to the two-side rising force F may be more balanced and steady in the rising process.

[0180] In an embodiment of the present disclosure, the mopping state switching assembly further includes a connection member, configured to drive at least one part of the first switching member and at least one part of the second switching member to simultaneously move up and down in the direction perpendicular to the working surface. Further, the mopping state switching assembly further includes a connection member 55, connecting the first switching member and the second switching member, and the driving unit drives the connection member 55 to move to drive at least one part of the first switching member and at least one part of the second switching member to simultaneously move up and down in the direction perpendicular to the working surface. Through the connection member 55, the driving unit may simultaneously drive at least one part of the first switching member and at least one part of the second switching member to move up and down in the direction perpendicular to the working surface, so that the mop board 41 is more steady in the process of moving up and down.

[0181] Specifically, the connection member 55 connects the first pinion 531 and the second pinion 532, and the driving unit drives the connection member 55 to rotate, so that the connection member 55 drives the first pinion 531 and the second pinion 532 to simultaneously rotate, and the first pinion 531 and the second pinion 532 simultaneously rise or lower on surfaces of the first rack

541 and the second rack 542 respectively. In this embodiment, the connection member 55 includes a connecting rod, one end of the connecting rod is connected to the first pinion 531, and an other end of the connecting rod is connected to the second pinion 532. The first pinion 531 and the second pinion 532 are indirectly connected to the mop board 41 through the driving unit and drive the driving unit and the mop board 41 to move up and down along the direction perpendicular to the working surface. In other embodiments, the first pinion 531 and the second pinion 532 may alternatively be directly connected to the mop board 41.

[0182] Further, in an embodiment of the present disclosure, referring to FIG. 11a, FIG. 11b, FIG. 11c and FIG. 11d, the sweeping unit and the mopping unit may at least partially overlap, and the mopping unit may be partially separable from the body; and the control unit is configured to:

according to the at least received mopping only and/or sweeping only control signal, control the moving unit to move and drive the cleaning robot to return to a preset mop loading region (for example, an internal region of a charging base station), to switch between the mopping only state and the sweeping only state.

[0183] A mop board with a preset shape and size is placed in the preset mop loading region, and the state switching process is as follows: When the cleaning robot is in the sweeping only state, the side brush and the roller brush are in contact with the working surface. After the cleaning robot receives the mopping only control signal, the cleaning robot returns and precisely stops in the preset mop loading region. In this case, the side brush working head is precisely in a preset position right above the mop board, to control a mop board clamping mechanism (not shown) arranged in the body to fixedly connect the mop board to the body. Because the side brush is right above the mop board, the side brush is out of contact with the working surface. Meanwhile, the mopping only control signal controls the roller brush rising mechanism to rise the roller brush to be away from the working surface, to complete switching from the sweeping only state to the mopping only state. After the cleaning robot receives the sweeping only control signal, the cleaning robot returns to the mop loading region, unloads the mop board, and controls the roller brush rising mechanism to lower the roller brush working head, so that the roller brush working head and the side brush working head are in contact with the working surface, to complete switching from the mopping only state to the sweeping only state.

[0184] The roller brush working head has a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region. When the sweeping working head is in the sweeping state, the roller brush is in the roller brush working position, and when the sweeping working head is in the non-sweeping state, the roller brush is in the roller brush rising position, to make it convenient to control the roller brush in the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0185] As shown in FIG. 12a, FIG. 12b, FIG. 12c and FIG. 12d, the control unit is further configured to control, according to the obtained mopping only control signal, the roller brush working head to be out of contact with the surface, to prevent the second cleaning portion of the roller brush working head to which dust adheres from polluting the to-be-mopped surface during mopping only.

[0186] In an embodiment, the roller brush working head may switch between the roller brush working position and the roller brush rising position in a rotation manner, the roller brush working head rotates around a roller brush shaft, and when the roller brush working head is in the sweeping state, the roller brush working head rotates around a roller brush shaft, and in a rotating process, the roller brush working head passes through at least a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the roller brush is in the roller brush rising position, to control the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

[0187] Still referring to FIG. 12a, FIG. 12b, FIG. 12c, FIG. 12d, FIG. 12e and FIG. 12f, in a cleaning robot 100 provided in an embodiment of the present disclosure, the sweeping unit 30 and the control unit 50 include a roller brush assembly 32 and a sensor control assembly 51 respectively. The roller brush assembly includes hair brushes 321, adhesive tapes 322 and a roller brush shaft 323, and the hair brushes and the adhesive tapes are circumferentially arranged at intervals on the roller brush. In such an arrangement, a notch region 326 is formed between circumferentially adjacent hair brushes or adhesive tapes. When the notch region 326 of the roller brush faces the ground, any part of the roller brush is out of contact with the ground, and a distance from a lowest point of the roller brush to the ground 328 may be above 2 mm. Meanwhile, a rotational diameter 325 of the adhesive tape is slightly less than a rotational diameter 324 of the hair brush, to reduce working noise and wearing of the adhesive tape. The sensor control assembly includes a magnet 511 and a Hall sensor 512, and the magnet is mounted on a side of the roller brush. In this embodiment, a mounting position of the magnet coincides with the notch region of the roller brush, the Hall sensor is mounted on the robot body on a side on the roller brush corresponding to the magnet and is aligned with a position in which the magnet rotates around the roller brush shaft to the lowest point, and the Hall sensor detects the magnet to detect a rotation phase of the roller brush. When the cleaning robot is working, the roller brush of the roller brush assembly rotates at a high speed, and the hair brush or the adhesive tape is in contact with the ground 328, to perform a cleaning task. When the cleaning task ends or the cleaning task is suspended or

a rising instruction of the cleaning robot is received, a roller brush rising action is performed, and specific steps are as follows: A roller brush motor is started at a low speed, the Hall sensor detects a signal of the magnet, and when the Hall sensor detects the signal (in this case, the notch region of the roller brush faces the ground, and any part of the roller brush is out of contact with the ground 328), the roller brush motor is stopped, thereby preventing the roller brush to which dust adheres from dirtying the to-be-mopped surface at the time of mopping only or returning to the base station.

[0188] Further, still referring to FIG. 11a, FIG. 11b, FIG. 11c and FIG. 11d, in a cleaning robot 100 provided in an embodiment of the present disclosure, the moving unit includes an omnidirectional wheel 21, driving wheels 22, and a sensor group (not shown), and the driving wheels 22 are connected to the control unit; and the sensor group is connected to the control unit and configured to collect position information and/or obstacle information, where the control unit is further configured to:

generate real-time control information according to the received position information and/or obstacle information, to control the driving wheel group to drive the cleaning robot to take an action, where the action includes at least one of positioning, path planning, recharging or obstacle avoidance.

[0189] Further, still referring to FIG. 11a, FIG. 11b, FIG. 11c and FIG. 11d, in a cleaning robot 100 provided in an embodiment of the present disclosure, a dust accommodation apparatus 34 and a blower system 60 are further included, and the blower system 60 is connected to the control unit, where the control unit is further configured to: control, according to an obtained function selection control signal, the blower system to work and generate a suction, to suck sundries on the surface into the dust accommodation apparatus 34.

[0190] Further, in a cleaning robot provided in an embodiment of the present disclosure, a filter is further included, and the filter is arranged in the blower system and configured to filter sundries entering the blower system.

[0191] Further, in a cleaning robot provided in an embodiment of the present disclosure, the mopping unit further includes a water tank and a mopping assembly, and the mopping assembly is in communication with the water tank, where the mopping assembly is configured to come into contact with the surface to perform a preset mopping action.

[0192] Further, in a cleaning robot provided in an embodiment of the present disclosure, the cleaning robot is further configured to include an obstacle crossing mode, and the control unit is configured to: when the cleaning robot is in the obstacle crossing mode, control the mopping working head to be in the non-mopping state, and/or control the sweeping working head to be in the non-sweeping state, to prevent the mopping working head and/or the sweeping working head from adversely affecting the cleaning robot in obstacle crossing.

[0193] Further, in an embodiment of the present disclosure, a cleaning robot is provided, and the cleaning robot is configured to first work in a sweeping mode and perform a preset sweeping action; and after completing the sweeping action, automatically switch to a mopping mode and perform a preset mopping action.

[0194] Further, in an embodiment of the present disclosure, a cleaning robot is provided, and the cleaning robot is configured to automatically detect a property of the surface of the working region, and automatically switch between a sweeping mode and a mopping mode according to the property of the surface of the working region.

[0195] Further, in an embodiment of the present disclosure, a cleaning robot is provided and includes: a body, a moving unit, a sweeping unit provided with a sweeping working head, a mopping unit provided with a mopping working head, and a control unit, where the moving unit is arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region; the sweeping unit is arranged on the body and configured to perform a preset sweeping action; the sweeping working head is optionally in a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region; the mopping unit is arranged on the body and configured to perform a preset mopping action, , and the mopping working head is optionally in a mopping state of being in contact with the surface of the working region and a non-mopping state of being out of contact with the surface of the working region; the cleaning robot further includes a control unit, and the control unit includes an environment sensing assembly and/or an instruction receiver, and stores a plurality of types of movement control logic; and the control unit may autonomously control states of the sweeping working head and the mopping working head according to information collected by the environment sensing assembly and/or an instruction received by the instruction receiver.

[0196] Further, in an embodiment of the present disclosure, a cleaning robot is provided, the environment sensing assembly includes the working surface material recognition sensor, and when the working surface material recognition sensor recognizes the working surface as a carpet, the control unit controls the cleaning robot to operate only in the sweeping mode; when the working surface material recognition sensor recognizes the working surface as a hard material, the control unit controls the cleaning robot to operate in the sweeping mode or the mopping mode; when the cleaning robot is in the mopping mode, and the working surface material recognition sensor recognizes the working surface that the cleaning robot is about to sweep as a carpet, the control unit controls the cleaning robot to automatically switch from the mopping mode to the sweeping mode; and when the working surface material recognition sensor recognizes an obstacle that the cleaning robot needs to cross in an

advancing direction, the control unit autonomously controls the cleaning robot to operate in the obstacle crossing mode. The instruction receiver is configured to control, after receiving a working state switching instruction, the cleaning robot to complete switching between the working states. The control unit stores a working region map and working region partition information, and when performing a cleaning task, the cleaning robot may control, according to the stored working region information and/or according to a preset working instruction, the sweeping unit or the mopping unit to perform the preset work. One type of cleaning logic stored in the control unit is first sweeping and then mopping. Namely, the sweeping mode is first executed on all working surfaces, and after the sweeping mode is completed, the sweeping mode is autonomously switched to the mopping mode and the mopping mode is executed.

[0197] A person of ordinary skill in the art may understand that all or some of procedures of the method in the foregoing embodiments may be implemented by a computer program instructing relevant hardware. The computer program may be stored in a non-volatile computer-readable storage medium. When the computer program is executed, the procedures of the foregoing method embodiments may be implemented. Any reference to a memory, a storage, a database, or another medium used in the embodiments provided in the present disclosure can include a non-volatile and/or volatile memory.

[0198] FIG. 21 shows an embodiment of a base station 600 in the present disclosure. The base station 600 is configured to maintain a cleaning robot 100, and the cleaning robot 100 includes function modules, to complete cleaning of a working surface; and the base station 600 includes: a housing 65; a liquid addition module 61, at least partially arranged in the housing 65 and configured to add a liquid to a tank of the cleaning robot water 100; a paper replacement module 62, at least partially arranged in the housing 65 and configured to replace a wiping member for a mopping unit of the cleaning robot 100; a dust collection module 63, at least partially arranged in the housing 65 and configured to collect trash in a dust box of the cleaning robot 100; and a control module 64, at least partially arranged in the housing 65 and configured to control the liquid addition module 61, the paper replacement module 62 and the dust collection module 63 to automatically maintain the function modules of the cleaning robot 100.

[0199] The foregoing base station 600 can maintain the function modules of the cleaning robot 100 and can automatically add water to the water tank of the cleaning robot 100, automatically replace a wiping member for the mopping unit of the cleaning robot 100, and automatically collect trash in the dust box of the cleaning robot 100, the function modules are spared from manual maintenance, and more labor is saved.

[0200] Preferably, the function modules of the cleaning robot 100 include the water tank, configured to wet the wiping member on the mopping unit of the cleaning robot 100 or directly wet the working surface on which the cleaning robot 100 has moved. After the cleaning robot 100 detects that a liquid amount in the water tank is less than a preset liquid amount, the cleaning robot 100 is controlled to return to the base station 600, to dock with the liquid addition module 61; and the control module 64 controls the liquid addition module 61 to automatically supplement liquid for the water tank. That the cleaning robot 100 detects that a liquid amount in the water tank is less than a preset liquid amount may be that, a liquid level detection unit is arranged in the water tank, and when detecting that a liquid amount in the water tank is less than a lowest liquid level, the liquid level detection unit sends a reminding signal to the cleaning robot 100. A manner in which the liquid addition module 61 automatically supplements liquid for the water tank may be that, clean liquid is stored in the liquid addition module 61, a water outlet of the liquid addition module 61 docks with a water inlet of the water tank, and a predetermined amount of liquid is poured into the water tank.

[0201] Preferably, the function modules of the cleaning robot 100 include the mopping unit, the mopping unit includes a mop board, the mop board is connected to a wiping member, the wiping member comes into contact with and wipes the working surface, and when the cleaning robot 100 detects that the wiping member needs to be replaced, the cleaning robot 100 is controlled to return to the base station 600 to dock with the paper replacement module 62; and the control module 64 controls the paper replacement module 62 to automatically replace the wiping member for the mopping unit. The wiping member may be disposable mop or mop paper. A manner in which the cleaning robot 100 detects that the wiping member needs to be replaced may be that the cleaning robot 100 has moved through a working surface in a predetermined region; or may be that the cleaning robot detects that a dirt amount on the wiping member reaches a preset value. A manner in which the paper replacement module 62 automatically replaces the wiping member for the mopping unit may be that the mop board is unloaded from the cleaning robot 100 and the paper replacement module 62 operates the mop board to replace the wiping member; or may be that the paper replacement module 62 directly operates the mop board on the cleaning robot 100 to replace the wiping member.

[0202] Preferably, the function modules of the cleaning robot 100 includes a sweeping module and a dust box, the sweeping module sweeps trash on a working surface and collects the trash into the dust box, and after the cleaning robot 100 detects that trash in the dust box exceeds a preset trash amount, the cleaning robot 100 is controlled to return to the base station 600, to dock with the dust collection module 63; and the control module 64 controls the dust collection module 63 to automatically collect the trash in the dust box. A manner in which the cleaning robot 100 detects that trash in the dust box exceeds a preset trash amount may be that, a dust fullness detection unit is arranged in the dust box, and when de-

tecting that a trash amount in the dust box is greater than a maximum value, the dust fullness detection unit sends a reminding signal to the cleaning robot 100; or may be that the cleaning robot 100 has moved through a working surface in a predetermined region. A manner in which the dust collection module 63 automatically collects trash in the dust box within may be that the dust collection module 63 includes a suction and dust collection unit, and after a suction mouth of the suction and dust collection unit docks with a dust outlet of the dust box, a negative pressure is formed in the suction and dust collection unit, to suck the trash in the dust box into the suction and dust collection unit; or may be that the dust box is moved and the trash in the dust box is dumped into the dust collection module 63.

[0203] In an embodiment of the present disclosure, the foregoing paper replacement module 62 may be replaced with a washing module, and the washing module is at least partially arranged in the housing and configured to wash the mopping unit of the cleaning robot 100; and the control module 64 is at least partially arranged in the housing 65 and configured to control the washing module to automatically wash the mopping unit of the cleaning robot 100.

[0204] Alternatively, the base station 600 includes the paper replacement module 62 and the washing module, to maintain the cleaning robot 100 having different mopping units. In such an arrangement, the wiping member is replaced for or the mopping unit is washed for the cleaning robot 100 having the corresponding mopping unit in the same base station 600.

[0205] Preferably, the mopping unit of the cleaning robot 100 includes a reusable mopping working head, and when the cleaning robot 100 detects that the mopping working head needs to be washed, the cleaning robot 100 is controlled to return to the base station 600, to dock with the washing module; and the control module 64 controls the washing module to automatically wash the mopping working head. The mopping working head may be connected to washable mop, sponge or the like. A manner in which the cleaning robot 100 detects that the mopping working head needs to be washed may be that the cleaning robot 100 has moved through a working surface in a predetermined region; or may be that the cleaning robot detects that a dirt amount on the mopping working head reaches a preset value. A manner in which the washing module automatically washes the mopping working head may be that the mopping working head is unloaded from the cleaning robot 100 and the washing module washes the mopping working head; or may be that the washing module directly washes the mopping working head on the cleaning robot 100. A manner in which the washing module washes the mopping working head includes, but not limited to, placing the mopping working head into washing liquid, scratching, slapping, rotating, and the like.

[0206] Currently, a conventional single household cleaning robot cannot have both a "sweeping only" function and a "mopping only" function, has poor working condition adaptability, cannot really help people emancipate both hands, and cannot meet a multifunction requirement of people for intelligent cleaning.

[0207] In view of this, the present disclosure provides a cleaning system, including: a base station and a cleaning robot, where the base station is configured to maintain the cleaning robot.

the base station includes: a housing; a liquid addition mechanism, at least partially arranged in the housing and configured to add a cleaning liquid to a tank of the cleaning robot water; a dust collection mechanism, at least partially arranged in the housing and configured to collect dust or sundries in a dust accommodation apparatus of the cleaning robot; a maintenance mechanism, at least partially arranged in the housing and configured to maintain a mopping working head of the cleaning robot; and a controller, at least partially arranged in the housing and configured to control the liquid addition mechanism, the maintenance mechanism and the dust collection mechanism to automatically maintain the cleaning robot;

the cleaning robot includes: a body; a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region;

a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action;

a mopping unit provided with the mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action, and the mopping working head includes a wiping member; the water tank, where the cleaning liquid is contained in the water tank and is used for wetting the wiping member on the mopping unit of the cleaning robot or directly wetting a working surface on which the cleaning robot moves; and dust accommodation apparatus, configured to accommodate dust or sundries collected by the sweeping unit in a process of performing the preset sweeping action; the cleaning robot is configured to include at least a sweeping mode and a mopping mode; the cleaning robot further includes a control unit, connected to the sweeping unit and the mopping unit; and

the control unit is configured to:

automatically detect, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and

automatically switch between modes according to the property of the surface of the working region;

in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, control the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid; when it is detected that the wiping member is in a to-be-maintained state, control the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in a clean state; and

when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, control the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

[0208] Further, in an embodiment of the present disclosure, the foregoing dust accommodation apparatus may be, for example, a dust box; and the wiping member may be, for example, sponge, mop or mop paper, and the wiping member is reusable, or may be disposable. This is not limited in this embodiment.

[0209] It should be pointed out that, the foregoing cleaning process includes covering or traversing only a part of the entire working region by the cleaning work (including the sweeping action or the mopping action) of the cleaning robot, and the foregoing completing the cleaning process includes, but not limited to, covering or traversing the entire working region by the cleaning work (including the sweeping action or the mopping action) of the cleaning robot, for example, traversing the entire working region when the sweeping action is performed; and the foregoing water tank is only a type of liquid accommodation apparatus, and may alternatively be replaced with another box for containing liquid.

[0210] Further, in an embodiment of the present disclosure, the maintenance mechanism may include at least one of the following mechanisms: a replacement mechanism for replacing a wiping member for the cleaning robot, and a washing mechanism for washing a wiping member for the cleaning robot.

[0211] Certainly, in other embodiments, the maintenance mechanism may alternatively include a drying mechanism for drying a wiping member for the cleaning robot, and the drying mechanism may be, for example, a drying instrument based on an electric heating principle.

[0212] Further, in an embodiment of the present disclosure, the step of automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region includes: automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between the sweeping mode and the mopping mode according to the property of the surface of the working region.

[0213] That the water tank is in the liquid to-be-added state includes, but not limited to, the following states: A, the cleaning robot replaces the wiping member; B, the liquid amount in the water tank is less than the preset liquid amount; and C, a liquid addition instruction of a user is received. That the wiping member is in the to-be-maintained state includes, but not limited to, the following states: a, an accumulative working time of the mopping working head or the wiping member reaches a preset duration; b, an accumulative working area of the wiping member reaches a preset area; c, the wiping member traverses a preset region (for example, the mopping action performed by the cleaning robot covers or traverses a working surface in a predetermined region); d, a dirt amount on the wiping member reaches a preset value; and e, a maintenance instruction of a user is received.

[0214] That the dust accommodation apparatus is in the dust to-be-collected state includes, but not limited to, the following states: 1, an accumulative working time of the sweeping working head reaches a preset duration; 2, an accumulative cleaning area of the sweeping working head reaches a preset area; 3, the sweeping working head traverses a working surface in a preset region, for example, traverses a region whose pollution level reaches a preset threshold; or completes sweeping of a room; 4, trash in the dust accommodation apparatus reaches or exceeds a preset trash amount; and 5, an emptying instruction of a user is received.

[0215] Further, in an embodiment of the present disclosure, the cleaning robot further includes a power supply unit, and the base station includes a charging mechanism, connected to the controller and configured to charge the cleaning robot; and

the control unit is configured to: when the power supply unit is in a power to-be-supplied state, control the cleaning robot to return to the base station to dock with the charging mechanism, to charge the power supply unit.

[0216] That the power supply unit is in the power to-be-supplied state includes, but not limited to, the following states: 1, an accumulative working time of the cleaning robot reaches a preset duration; 2, an accumulative cleaning area of the cleaning robot reaches a preset area; 3, the cleaning robot traverses a working surface in a preset region; 4, a power level in the power supply unit is less than a preset threshold; and 5, a charging instruction of a user is received.

[0217] Further, in an embodiment of the present disclosure, the sweeping unit includes at least a roller brush working head, and the base station further includes a roller brush clearing mechanism, connected to a control mechanism and configured to clear the roller brush working head; and

the control unit is configured to: when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush working head to return to the base station to dock with the roller brush clearing mechanism, to clear the roller brush working head.

[0218] Further, in an embodiment of the present disclosure, the sweeping unit includes at least a roller brush working head, and the cleaning robot further includes a roller brush clearing apparatus, connected to the control unit and configured to clear the roller brush working head; and

the control unit is configured to: when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush clearing apparatus to clear the roller brush working head.

[0219] The foregoing roller brush clearing mechanism or roller brush clearing apparatus may be, for example, a cutting knife

[0220] That the roller brush working head is in the to-be-cleared state includes, but not limited to, the following states: a current of the roller brush working head is greater than a preset threshold, an air volume of a dust inlet of the roller brush working head is less than a preset air volume, a pressure of the dust inlet of the roller brush working head is higher than a preset pressure, and a clearing duration of the roller brush working head reaches a preset value. The current of the roller brush working head may be detected through a current sensor arranged on the body and connected to the control unit. The air volume of the dust inlet of the roller brush working head may be detected through an air speed sensor arranged on the body and connected to the control unit. The pressure of the dust inlet of the roller brush working head may be detected through an air pressure sensor arranged on the body and connected to the control unit.

[0221] Specifically, the current sensor or a voltage sensor is configured to detect that an electric signal (for example, a current) of the roller brush working head is greater than the threshold, or the air speed sensor is configured to detect that the air volume of the dust inlet of the roller brush working head is less than the threshold, or the air pressure sensor is configured to detect that the pressure of the dust inlet of the roller brush working head is greater than the threshold, and a timer of the control unit is configured to collect statistics on the working duration of the roller brush working head that reaches the preset value, to determine that the roller brush working head is in the to-be-cleared state (including a state in which the roller brush working head is entangled).

[0222] Further, the control unit includes a working surface material recognition sensor, and the control unit is configured to: automatically recognize a working surface material through the working surface material recognition sensor; when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0223] Further, in an embodiment of the present disclosure, the cleaning robot is configured to further include a sweeping and mopping integrated mode; and the control unit is configured to: when the cleaning robot is in the sweeping and mopping integrated mode, control the mopping working head to be in a mopping state and simultaneously control the sweeping working head to be in a sweeping state, so that the cleaning robot has a sweeping and mopping integrated function mode.

[0224] Further, in an embodiment of the present disclosure, the control unit includes a working surface material recognition sensor, and the control unit is configured to: automatically recognize a working surface material through the working surface material recognition sensor;

when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode or the sweeping and mopping integrated mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0225] The foregoing soft material may be, for example, a carpet, or a floor mat such as a baby creeping mat.

[0226] In the cleaning system provided in the foregoing embodiment, in a process of cleaning the working region, the cleaning robot may automatically switch between modes to adapt to different working conditions, detect states of its own function assemblies (for example, the water tank, the wiping member, and the dust accommodation apparatus) in the cleaning process, and return to the base station in a maintenance required state to perform maintenance operations such as automatic liquid supplementation, wiping member maintenance, and automatic dust collection; and may automatically clean the working region and automatically maintain the machine completely without human intervention, to emancipate both hands of a user and meet a requirement of people for intelligent cleaning.

[0227] Further, if maintenance is performed in a cleaning process, after the maintenance is completed, the cleaning robot returns to a breakpoint position (namely, a position before the maintenance) to continue to work.

If maintenance is performed after cleaning is completed, after the maintenance is completed, the cleaning robot stops in the base station to wait, for example, wait for next sweeping according to a program instruction or a user instruction.

[0228] An embodiment of the present disclosure further provides a cleaning method, where the method is performed by a control unit of a cleaning robot, and the method includes:

automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region;

in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, controlling the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid;

when it is detected that the wiping member is in a to-be-maintained state, controlling the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in a clean state; and when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, controlling the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

[0229] Further, in an embodiment of the present disclosure, the method further includes: when it is detected that the cleaning robot is in a power to-be-supplied state, controlling the cleaning robot to return to the base station to dock with a charging mechanism, to charge the cleaning robot.

[0230] Further, in an embodiment of the present disclosure, the method further includes: when it is detected that a roller brush working head is in a to-be-cleared state, controlling the cleaning robot to return to the base station to dock with a roller brush clearing mechanism, to make it convenient to clear the roller brush working head; or when it is detected that the roller brush working head is in the to-be-cleared state, controlling a roller brush clearing apparatus to clear the roller brush working head.

[0231] Further, in an embodiment of the present disclosure, the step of automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region includes: when the working surface is recognized as a soft material, controlling the cleaning robot to operate in only the sweeping mode; when the working surface is recognized as a hard material, controlling the cleaning robot to operate in the sweeping mode or the mopping mode or the sweeping and mopping integrated mode; and when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, controlling the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

[0232] It should be noted that, the cleaning robot 100 may be a sweeping robot having a sweeping only function, may be a mopping robot having a mopping only function, may be a sweeping and mopping integrated robot having both a sweeping function and a mopping function, or may be a cleaning robot 100 having other additional functions, for example, an air purification function and a voice chat function.

[0233] The technical features in the foregoing embodiments may be randomly combined. For concise description, not all possible combinations of the technical features in the embodiment are described. However, provided that combinations of the technical features do not conflict with each other, the combinations of the technical features are considered as falling within the scope recorded in this specification.

[0234] The foregoing embodiments only describe several implementations of the present disclosure specifically and in detail, but cannot be construed as a limitation to the patent scope of the present disclosure. A person of ordinary skill in the art may make various changes and improvements without departing from the ideas of the present disclosure, which shall all fall within the protection scope of the present disclosure. Therefore, the protection scope of the present disclosure is subject to the protection scope of the appended claims.

Claims

1. A cleaning robot, wherein the cleaning robot includes:

   a body;
   a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region;
   a mopping unit provided with a mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action; and
   a control unit, configured to: control the mopping working head to rise when the cleaning robot is in a state of being about to move onto a carpet, where a rising height of the mopping working

head is greater than 6 mm.

2. The cleaning robot according to claim 1, wherein the cleaning robot further includes: a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action;

the cleaning robot is configured to include at least a cleaning mode and a mopping mode; and the control unit is configured to: when the cleaning robot is in the cleaning mode and the cleaning robot detects a carpet, control the mopping working head to rise and control the cleaning robot to move onto the carpet, to make it convenient for the sweeping unit to perform the sweeping action on the carpet, where a rising height of the mopping working head is greater than 6 mm.

3. The cleaning robot according to any of claims 1 or 2, wherein the control unit is configured to: when the cleaning robot is in the mopping mode and the cleaning robot detects a carpet, control the cleaning robot to switch to a non-mopping mode, control the mopping working head to rise, and control the cleaning robot to move onto the carpet, where a rising height of the mopping working head is greater than 6 mm.

4. The cleaning robot according to claim 2, wherein the control unit is configured to: when the cleaning robot is in the mopping mode and the cleaning robot detects a carpet, control the cleaning robot to switch to the cleaning mode, control the mopping working head to rise and control the cleaning robot to move onto the carpet to sweep the carpet, where a rising height of the mopping working head is greater than 6 mm.

5. The cleaning robot according to claim 1, wherein the rising height is simultaneously less than or equal to 20 mm.

6. The cleaning robot according to claim 5, wherein a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is less than or equal to 0.1.

7. The cleaning robot according to claim 1, wherein the rising height is simultaneously less than or equal to a difference between a thickness of the body and a height of a bottom surface of the body away from a ground.

8. The cleaning robot according to claim 1, wherein the rising height is greater than or equal to 6.5 mm.

9. The cleaning robot according to claim 8, wherein a space volume occupied by the mopping working head in a rising process is a first volume, and a space volume occupied by the body of the cleaning robot is a second volume, where, a ratio of the first volume to the second volume is greater than or equal to 0.004.

10. The cleaning robot according to claim 1, wherein the rising height is greater than or equal to 15 mm.

11. The cleaning robot according to claim 1, wherein the mopping working head includes a mop board, configured to mount a wiping member; and the mopping unit includes a mopping state switching assembly, configured to drive the mop board to move up and down along a direction perpendicular to a working surface.

12. The cleaning robot according to claim 11, wherein the mopping state switching assembly includes a first switching member and a second switching member, the first switching member and the second switching member are connected to a mop board and arranged on two sides of a central axis of the mop board, and the first switching member collaborates with the second switching member to drive the mop board to move up and down along a direction perpendicular to a working surface.

13. The cleaning robot according to claim 12, wherein the central axis of the mop board divides the mop board into two parts, the first switching member and the second switching member are arranged on two sides of the central axis L of the mop board, to jointly drive the mop board to move up and down.

14. The cleaning robot according to any of claims 12 or 13, wherein the mopping state switching assembly further includes a connection member, configured to drive at least one part of the first switching member and at least one part of the second switching member to simultaneously move up and down in the direction perpendicular to the working surface.

15. The cleaning robot according to claim 11, wherein at least one part of the mopping state switching assembly is connected to the mop board, and the at least one part of the mopping state switching assembly and the mop board move together.

16. The cleaning robot according to claim 2, wherein the sweeping working head includes a sweeping state of being in contact with the surface of the working region and a non-sweeping state of being out of contact with the surface of the working region; and the control unit is configured to: control the sweeping working head to switch to the non-sweeping state

when the cleaning robot is in the mopping mode; and control the sweeping working head to switch to the sweeping state when the cleaning robot is in the sweeping mode.

the sweeping working head may switch between a sweeping working position of being in contact with the surface of the working region and a sweeping rising position of being out of contact with the surface of the working region; and when the sweeping working head is in the sweeping state, the sweeping working head is in the sweeping working position, and when the sweeping working head is in the non-sweeping state, the sweeping working head is in the sweeping rising position, to make it convenient to control the sweeping working head to perform state switching between the sweeping state and the non-sweeping state.

17. The cleaning robot according to claim 16, wherein the sweeping working head includes a roller brush working head and a side brush working head; and the control unit is configured to: control the roller brush working head and the side brush working head to simultaneously rise when the cleaning robot is in the mopping mode.

18. The cleaning robot according to claim 17, wherein the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may be configured to simultaneously drive the roller brush working head and the side brush working head to move up and down.

19. The cleaning robot according to claim 16, wherein the sweeping working head includes at least one roller brush working head, having a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the sweeping state, the roller brush working head is in the roller brush working position, and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position.

20. The cleaning robot according to claim 19, wherein the roller brush working head may switch between the roller brush working position and the roller brush rising position in a rotation manner.

21. The cleaning robot according to claim 20, wherein when the roller brush working head is in the sweeping state, the roller brush working head rotates around a roller brush shaft, and in a rotating process, the roller brush working head passes through at least a roller brush working position in contact with the surface of the working region and a roller brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the roller brush working head is in the roller brush rising position.

22. The cleaning robot according to claim 19, wherein the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly may drive the roller brush working head to move up and down.

23. The cleaning robot according to claim 22, wherein the sweeping state switching assembly includes a first motor and a first cam; and the first cam is configured to follow the first motor to rotate, where the first motor rotates along a preset first direction and drives the first cam to rotate, to rise the roller brush working head; and the first motor rotates along a preset second direction and drives the first cam to rotate, to drive the roller brush working head to descend, and the second direction is opposite to the first direction.

24. The cleaning robot according to claim 23, wherein the sweeping state switching assembly further includes a sliding groove, the sliding groove wraps at least one part of the first cam, and is connected to the first cam and configured to follow the first cam to rotate and drive the roller brush working head to ascend or descend.

25. The cleaning robot according to claim 16, wherein the sweeping working head includes at least one side brush working head rotatable around a rotational shaft; and the sweeping unit includes a sweeping state switching assembly, and the sweeping state switching assembly is configured to drive the side brush working head to move up and down.

26. The cleaning robot according to claim 25, wherein the side brush working head includes a side brush, and when the sweeping working head is in the sweeping state, the side brush working head rotates around the rotational shaft, and in a rotating process, the side brush passes through at least a side brush working position in contact with the surface of the working region and a side brush rising position out of contact with the surface of the working region; and when the sweeping working head is in the non-sweeping state, the side brush is always in the side brush rising position.

27. The cleaning robot according to claim 26, wherein the sweeping state switching assembly includes a second cam and a second sliding groove; the side brush working head further includes a driving assembly, and the driving assembly is configured to drive the side brush to rotate around the rotational shaft; the second sliding groove is fixed relative to the driv-

ing assembly; when rotating along a first direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around an axis, so that the side brush is in contact with the surface of the working region of the cleaning robot; and when rotating in a reverse direction, the second cam drives the second sliding groove, the driving assembly and the side brush to synchronously rotate around the axis in a reverse direction, so that the side brush is out of contact with the surface of the working region of the cleaning robot.

28. The cleaning robot according to claim 26, wherein the sweeping unit further includes a position sensor configured to detect a position of the side brush; and the control unit is configured to: when the sweeping working head switches from the sweeping state to the non-sweeping state, control the side brush to stop rotating when the position sensor detects that the side brush rotates to a predetermined side brush rising position.

29. A cleaning system, wherein the cleaning system includes: a base station and a cleaning robot, where the base station is configured to maintain the cleaning robot, and
the base station includes:

a housing;
a liquid addition mechanism, at least partially arranged in the housing and configured to add cleaning liquid to a tank of the cleaning robot water;
a dust collection mechanism, at least partially arranged in the housing and configured to collect dust or sundries in a dust accommodation apparatus of the cleaning robot;
a maintenance mechanism, at least partially arranged in the housing and configured to maintain a mopping working head of the cleaning robot; and
a controller, at least partially arranged in the housing and configured to control the liquid addition mechanism, the maintenance mechanism and the dust collection mechanism to automatically maintain the cleaning robot;
the cleaning robot includes:

a body;
a moving unit, arranged on the body and configured to support the body and drive the cleaning robot to move on a surface of a working region;
a sweeping unit provided with a sweeping working head, where the sweeping unit is arranged on the body and configured to perform a preset sweeping action;
a mopping unit provided with the mopping working head, where the mopping unit is arranged on the body and configured to perform a preset mopping action, and the mopping working head includes a wiping member;
a water tank, where the cleaning liquid is contained in the water tank and is used for wetting the wiping member on the mopping unit of the cleaning robot or directly wetting a working surface on which the cleaning robot moves; and
a dust accommodation apparatus, configured to accommodate dust or sundries collected by the sweeping unit in a process of performing the preset sweeping action;
the cleaning robot is configured to include at least a sweeping mode and a mopping mode;
the cleaning robot further includes a control unit, connected to the sweeping unit and the mopping unit; and
the control unit is configured to:

automatically detect, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switch between modes according to the property of the surface of the working region;
in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, control the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid; when it is detected that the wiping member is in a to-be-maintained state, control the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in a clean state; and
when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, control the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

30. The cleaning system according to claim 29, wherein the cleaning robot further includes a power supply unit, and the base station includes a charging mechanism, connected to the controller and configured to charge the cleaning robot; and the control unit is configured to: when the power supply unit is in a power to-be-supplied state, control the cleaning robot to return to the base station to dock with the charging mechanism, to charge the power supply unit.

31. The cleaning system according to claim 29, wherein the sweeping unit includes at least a roller brush working head, and the base station further includes a roller brush clearing mechanism, connected to a control mechanism and configured to clear the roller brush working head; and
the control unit is configured to:
when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush working head to return to the base station to dock with the roller brush clearing mechanism, to clear the roller brush working head.

32. The cleaning system according to claim 29, wherein the sweeping unit includes at least a roller brush working head, and the cleaning robot further includes a roller brush clearing apparatus, connected to the control unit and configured to clear the roller brush working head; and
the control unit is configured to:
when it is detected that the roller brush working head is in a to-be-cleared state, control the roller brush clearing apparatus to clear the roller brush working head.

33. The cleaning system according to claim 29, wherein the control unit includes a working surface material recognition sensor, and the control unit is configured to:

automatically recognize a working surface material through the working surface material recognition sensor;
when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode;
when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode; and
when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

34. The cleaning system according to claim 29, wherein the cleaning robot is configured to further include a sweeping and mopping integrated mode; and the control unit is configured to: when the cleaning robot is in the sweeping and mopping integrated mode, control the mopping working head to be in a mopping state and simultaneously control the sweeping working head to be in a sweeping state, so that the cleaning robot has a sweeping and mopping integrated function mode.

35. The cleaning system according to claim 34, wherein the control unit includes a working surface material recognition sensor, and the control unit is configured to:

automatically recognize a working surface material through the working surface material recognition sensor;
when the working surface is recognized as a soft material, control the cleaning robot to operate in only the sweeping mode;
when the working surface is recognized as a hard material, control the cleaning robot to operate in the sweeping mode or the mopping mode or the sweeping and mopping integrated mode; and
when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, control the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

36. A cleaning method, wherein the cleaning method is performed by a control unit of a cleaning robot, and the method includes:

automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region;
in a process in which the cleaning robot cleans the working region or after cleaning work of the working region is completed, when it is detected that the water tank is in a liquid to-be-added state, controlling the cleaning robot to return to the base station to dock with the liquid addition mechanism, to make it convenient for the base station to automatically supplement the cleaning liquid;
when it is detected that the wiping member is in a to-be-maintained state, controlling the cleaning robot to return to the base station to dock with the maintenance mechanism, to make it convenient for the base station to maintain the wiping member, so that the wiping member is in

a clean state; and when it is detected that the dust accommodation apparatus is in a dust to-be-collected state, controlling the cleaning robot to return to the base station to dock with the dust collection mechanism, to make it convenient for the base station to empty the dust accommodation apparatus.

37. The cleaning method according to claim 36, wherein the method further includes:
when it is detected that the cleaning robot is in a power to-be-supplied state, controlling the cleaning robot to return to the base station to dock with a charging mechanism, to charge the cleaning robot.

38. The cleaning method according to claim 37, wherein the method further includes:

when it is detected that a roller brush working head is in a to-be-cleared state, controlling the cleaning robot to return to the base station to dock with a roller brush clearing mechanism, to make it convenient to clear the roller brush working head;
or when it is detected that the roller brush working head is in the to-be-cleared state, controlling a roller brush clearing apparatus to clear the roller brush working head.

39. The cleaning method according to claim 38, wherein the step of automatically detecting, in a process in which the cleaning robot cleans the working region, a property of the surface of the working region, and automatically switching between modes according to the property of the surface of the working region includes:

when the working surface is recognized as a soft material, controlling the cleaning robot to operate in only the sweeping mode;
when the working surface is recognized as a hard material, controlling the cleaning robot to operate in the sweeping mode or the mopping mode or the sweeping and mopping integrated mode; and
when the cleaning robot is in the mopping mode, and the working surface that the cleaning robot is about to sweep is recognized as a soft material, controlling the cleaning robot to automatically switch from the mopping mode to the sweeping mode.

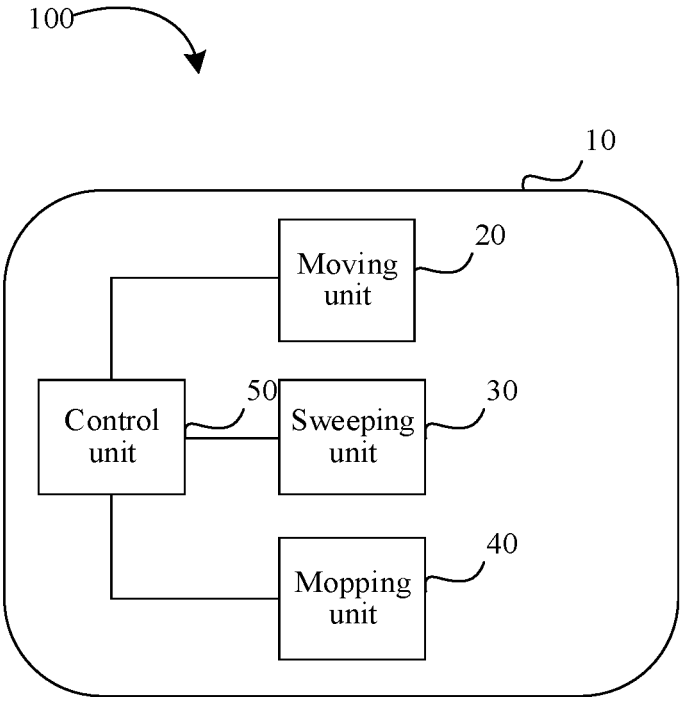
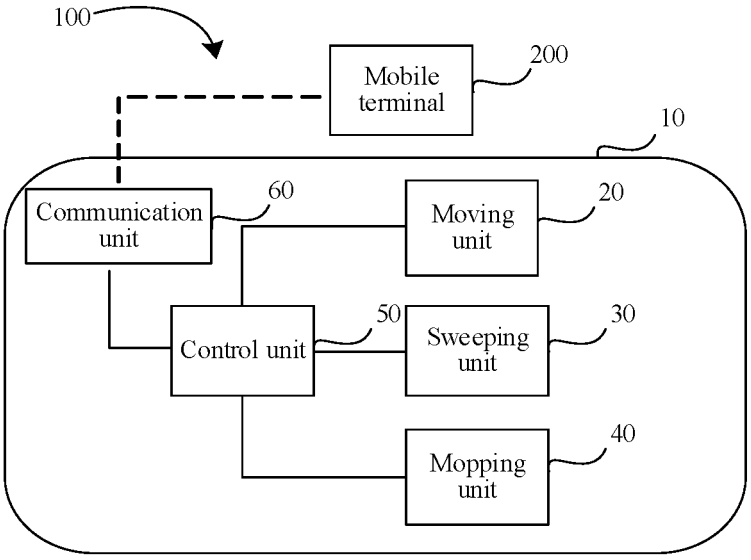

100
10
Moving unit
20
Control unit
50
Sweeping unit
30
Mopping unit
40

FIG. 1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10
Communication unit
60
Moving unit
20
Control unit
50
Sweeping unit
30
Mopping unit
40

FIG. 2

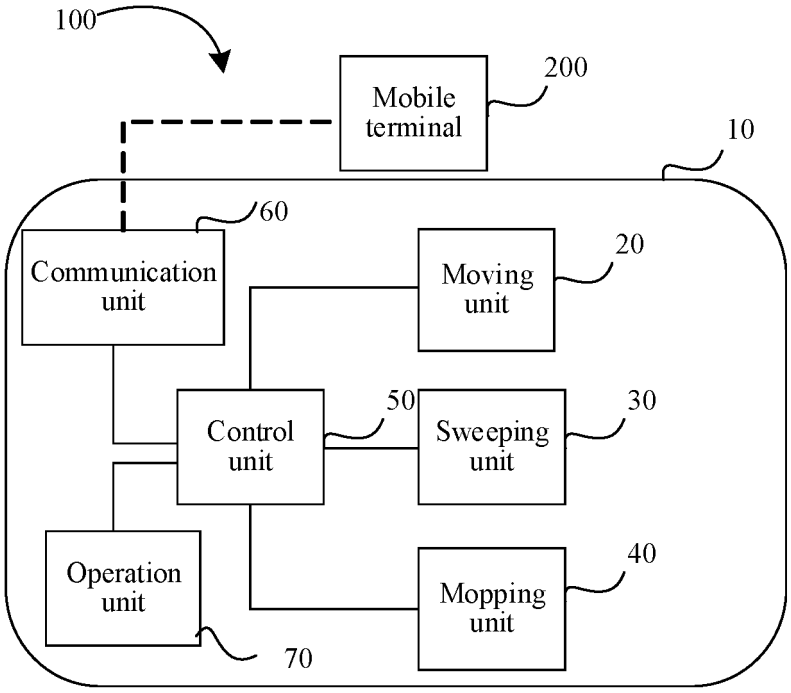
100
Mobile terminal
200
10
60
Communication unit
Moving unit
20
Control unit
50
Sweeping unit
30
Operation unit
Mopping unit
40
70

FIG. 3

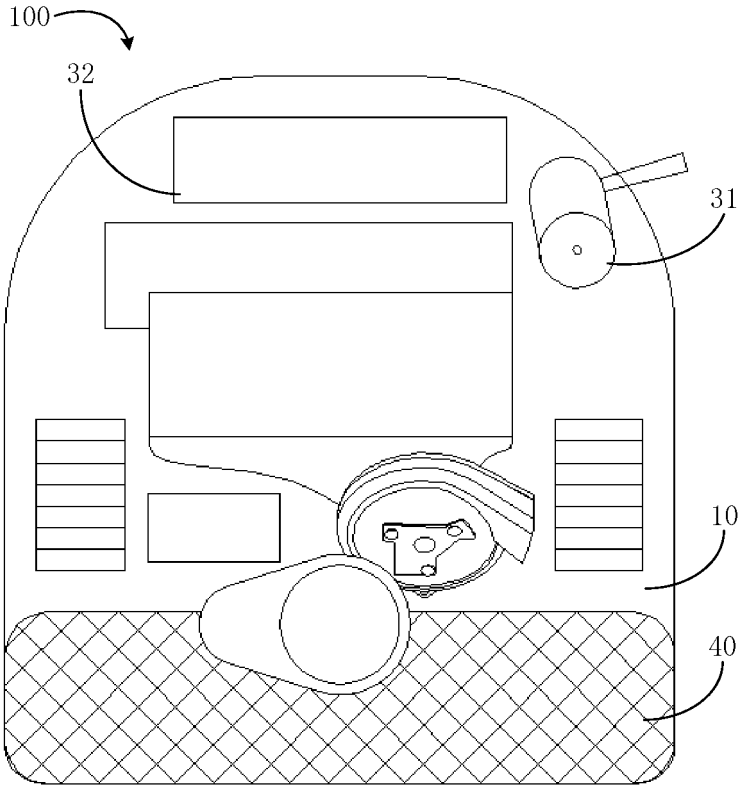
100
32
31
10
40

FIG. 4a

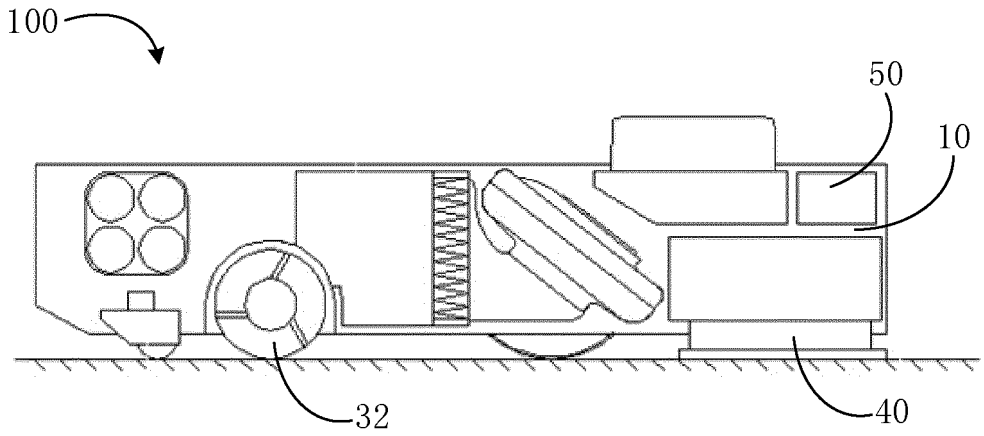

FIG. 4b

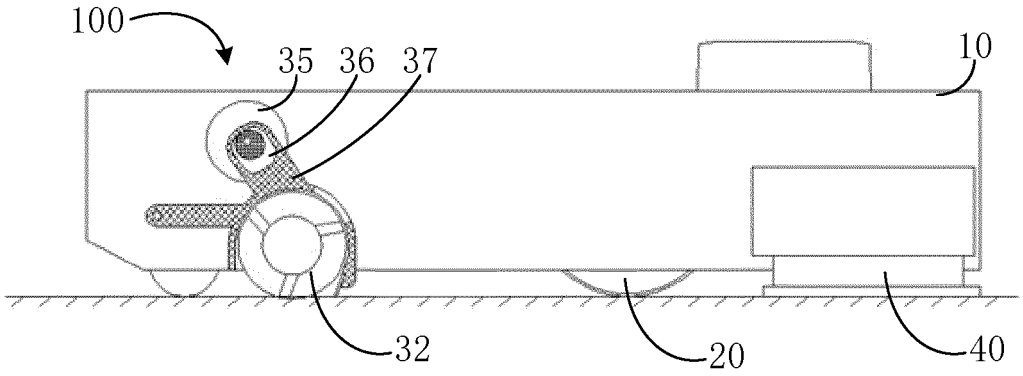

FIG. 5a

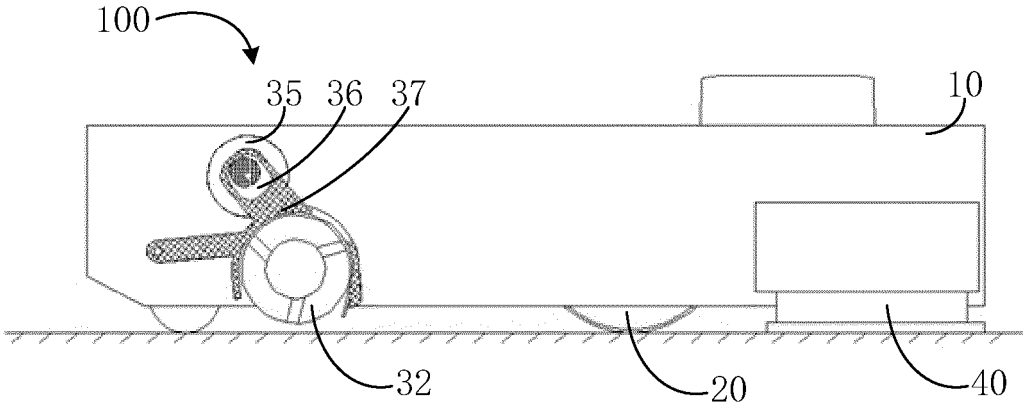

FIG. 5b

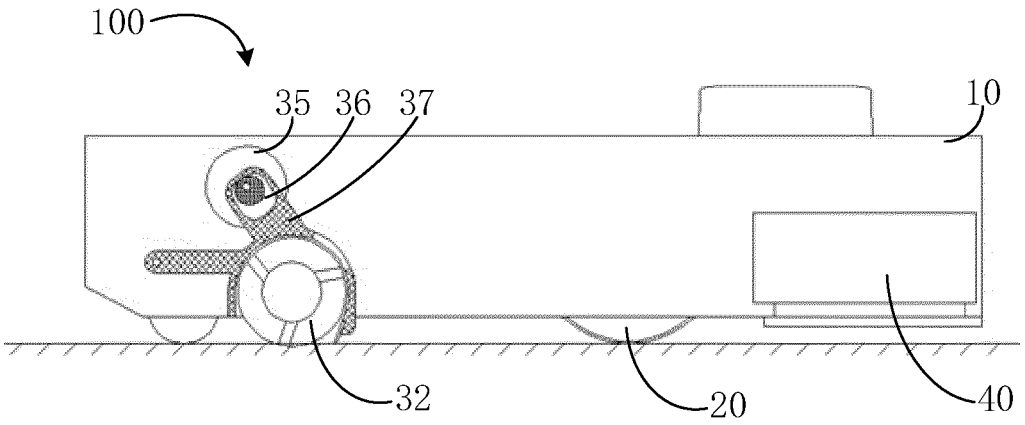

FIG. 5c

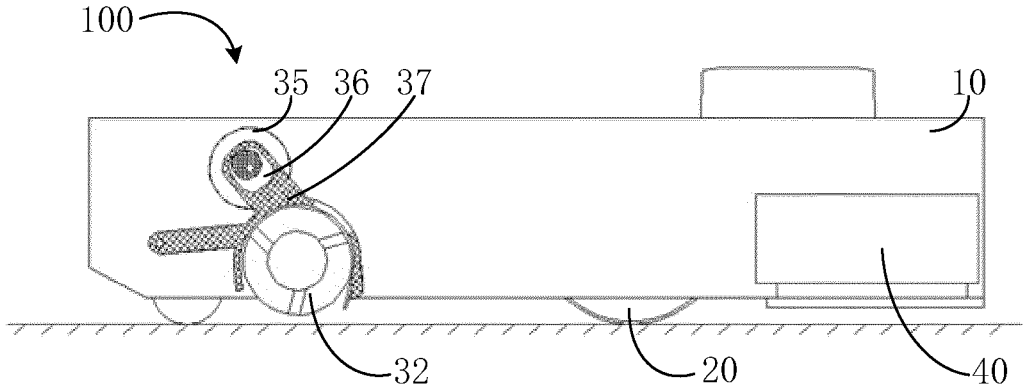

FIG. 5d

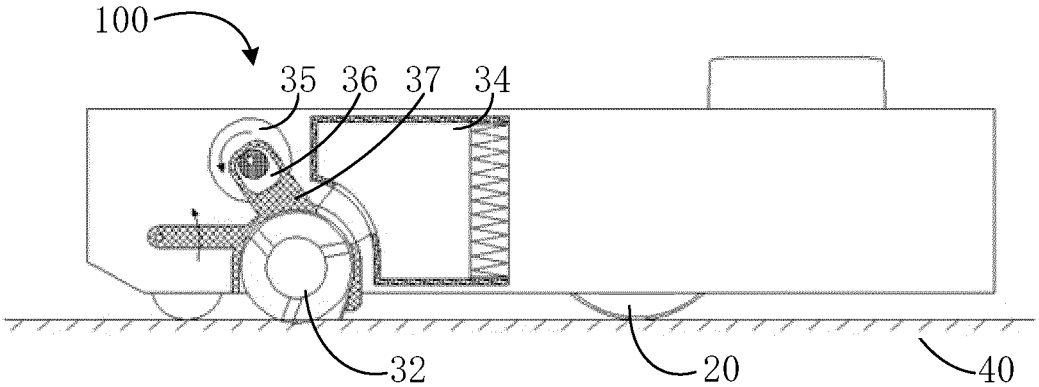

FIG. 6a

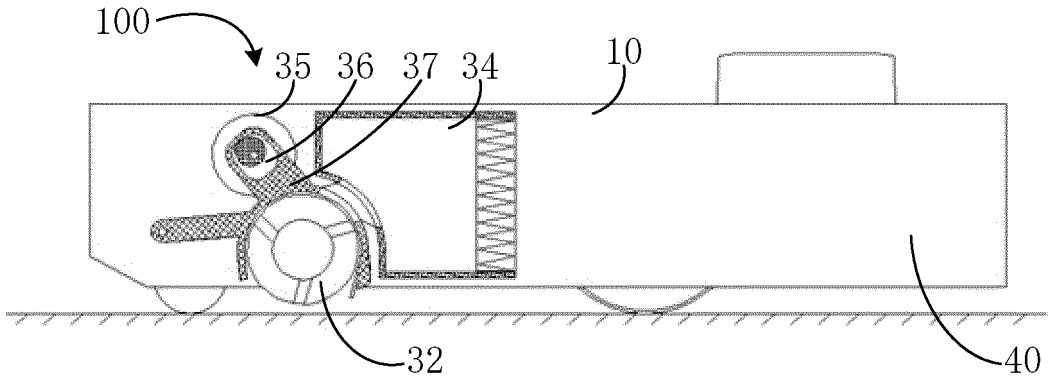

FIG. 6b

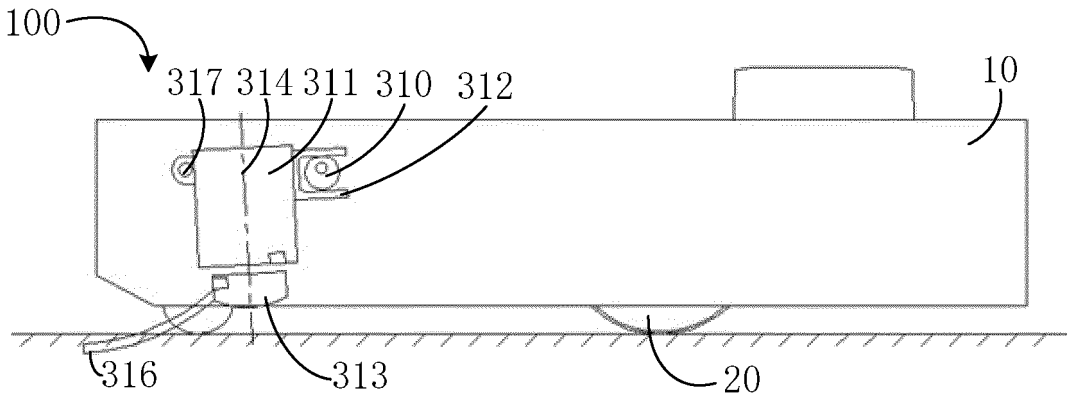

FIG. 7a

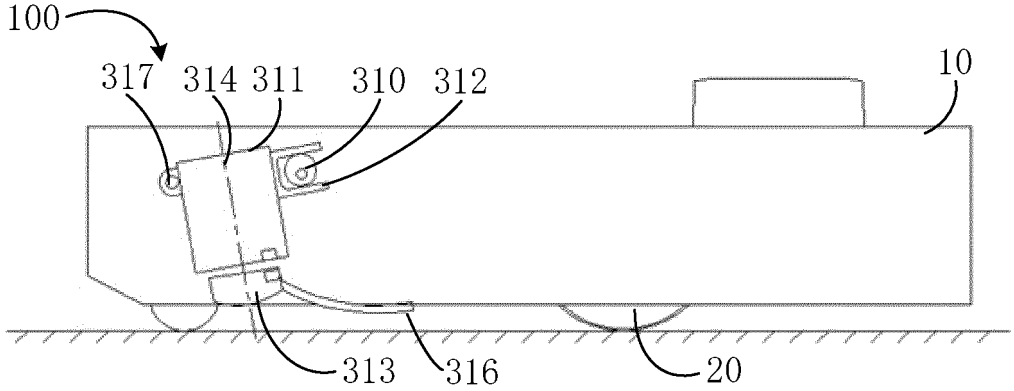

FIG. 7b

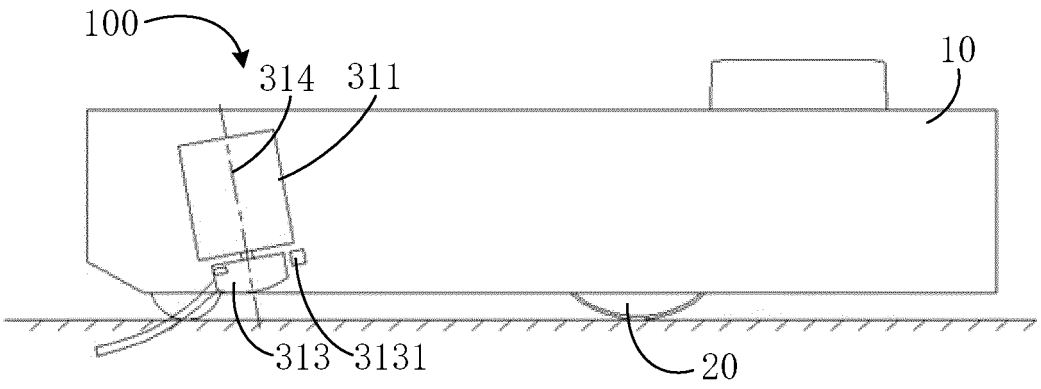

FIG. 8a

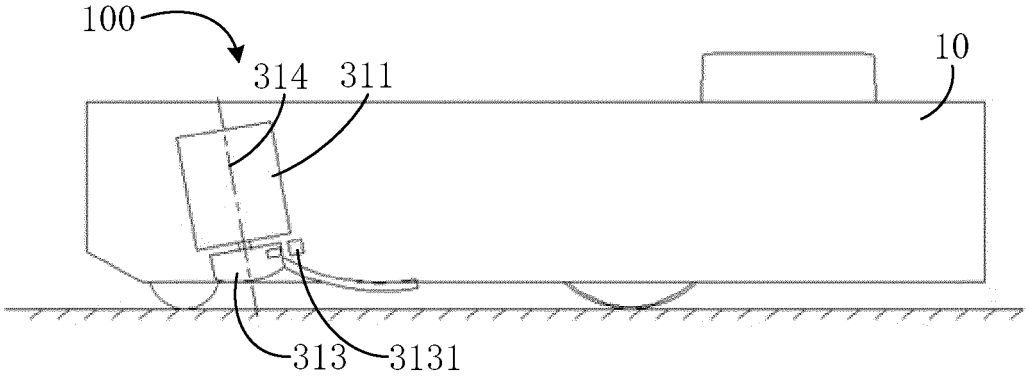

FIG. 8b

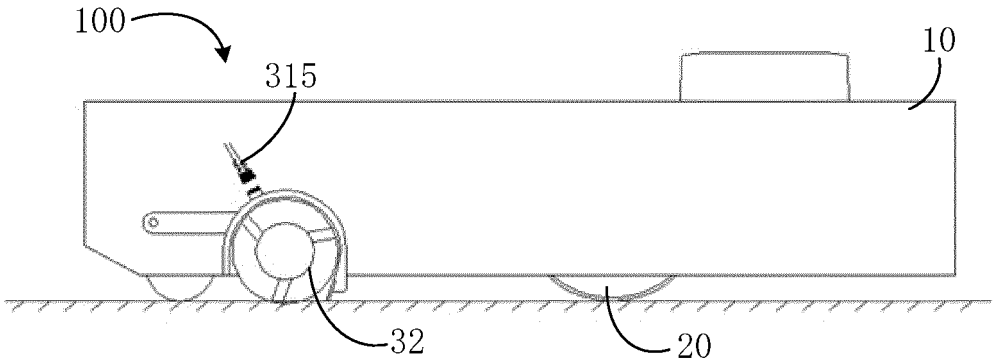

FIG. 9a

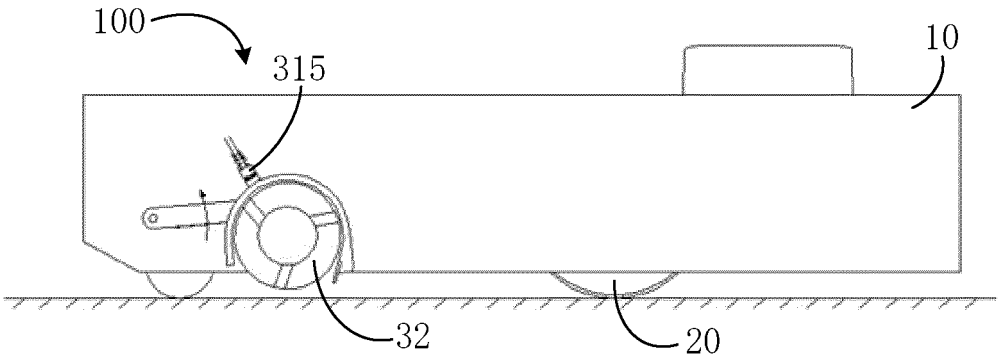

FIG. 9b

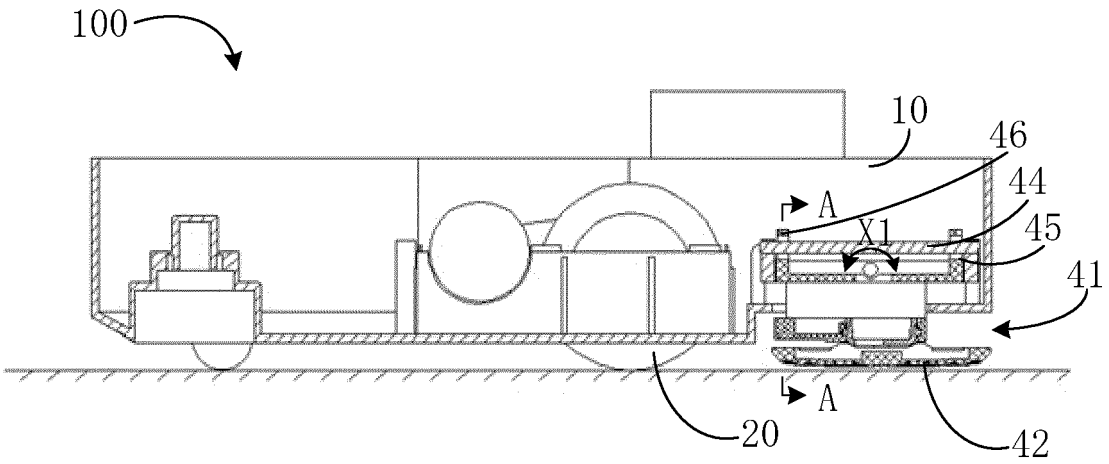

FIG. 10a

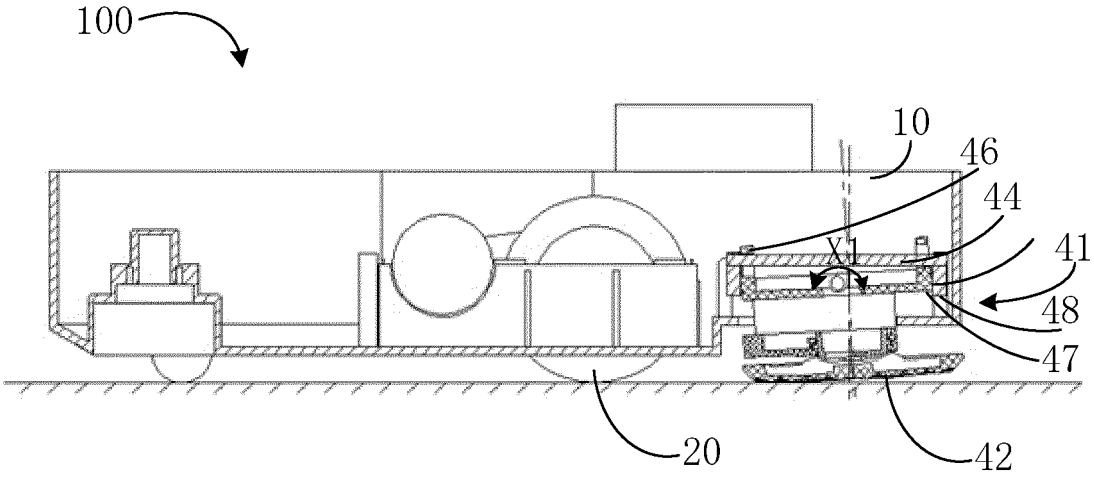

FIG. 10b

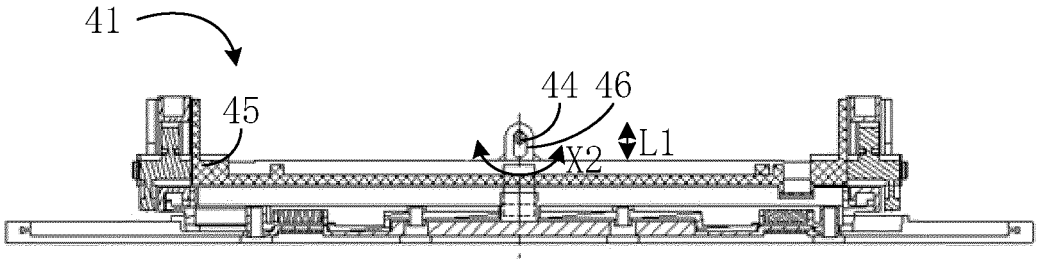

FIG. 10c

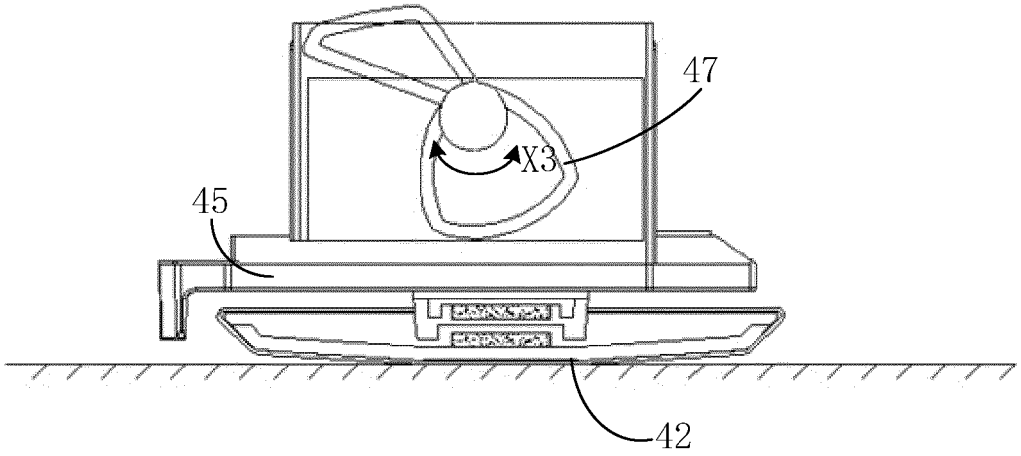

FIG. 10d

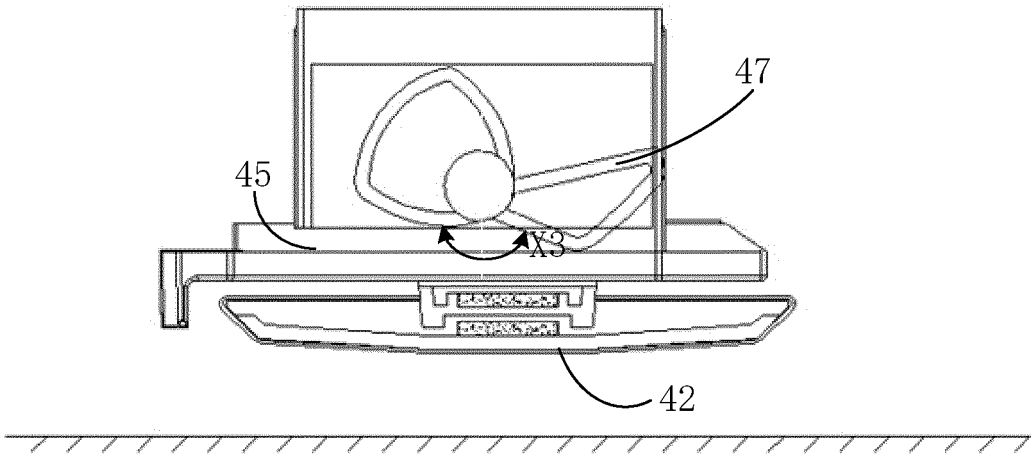

FIG. 10e

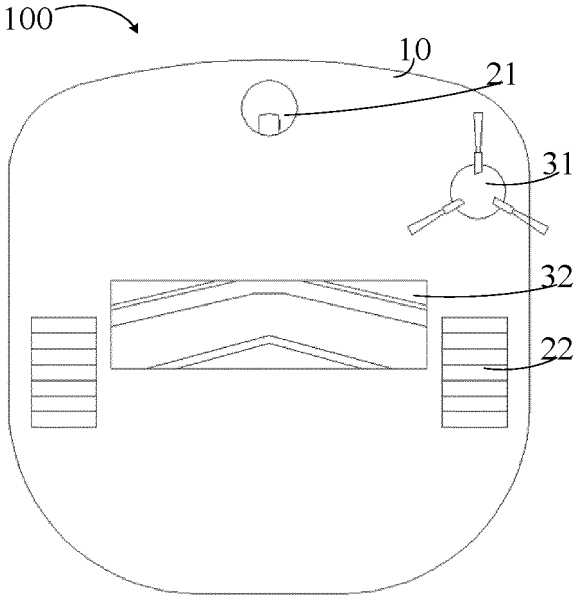

FIG. 11a

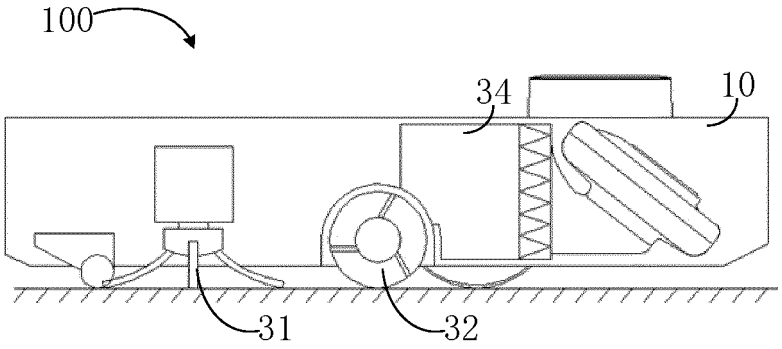

FIG. 11b

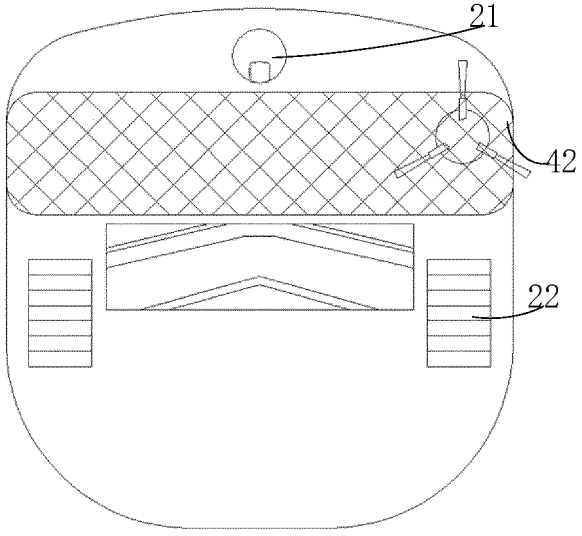

FIG. 11c

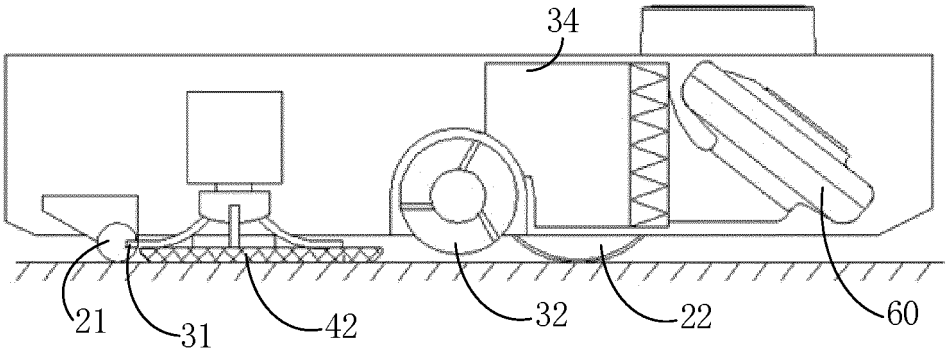

FIG. 11d

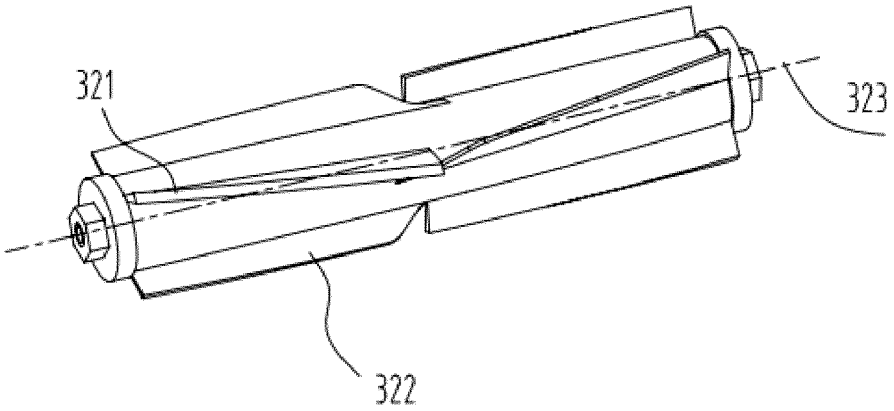

FIG. 12a

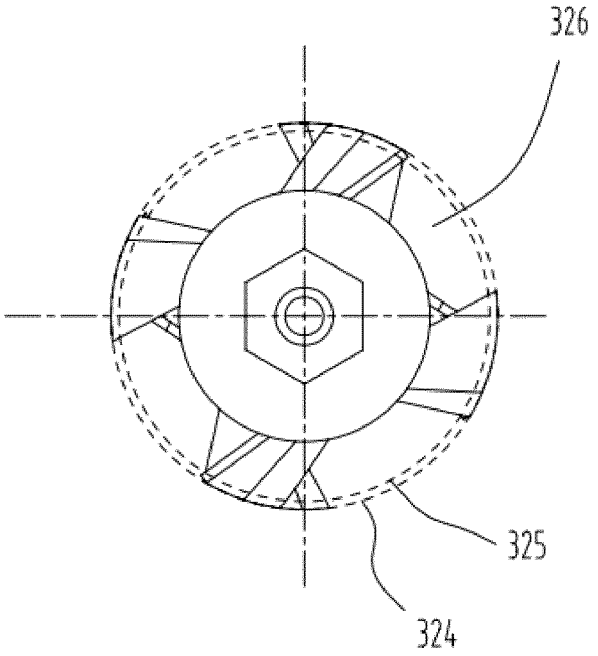

FIG. 12b

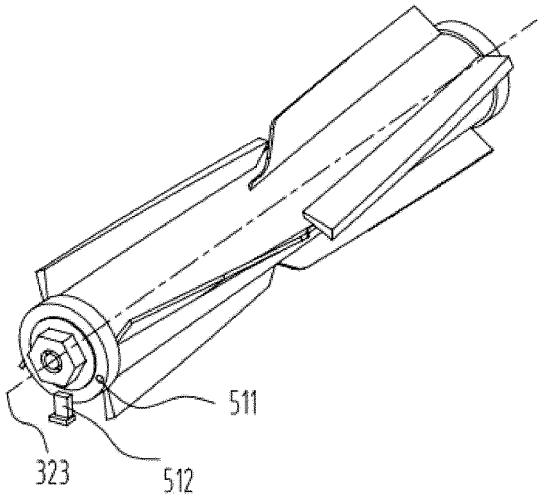

FIG. 12c

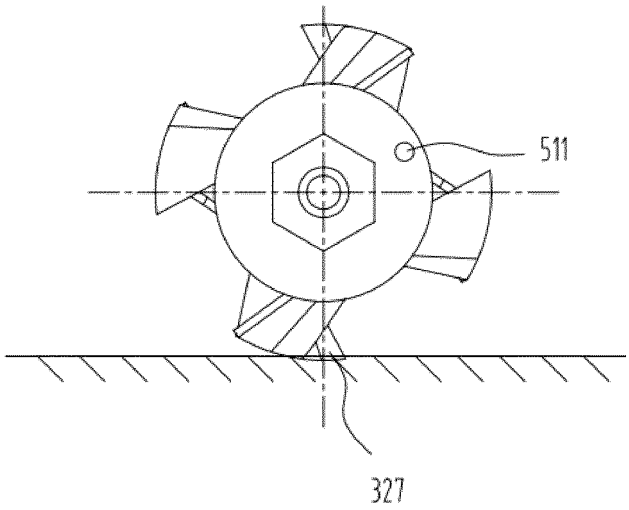

FIG. 12d

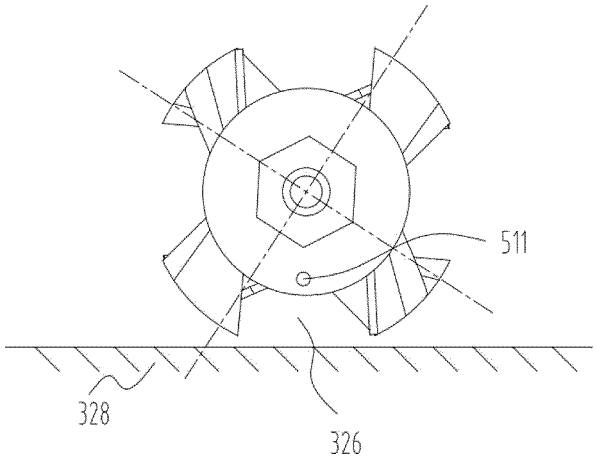

FIG. 12e

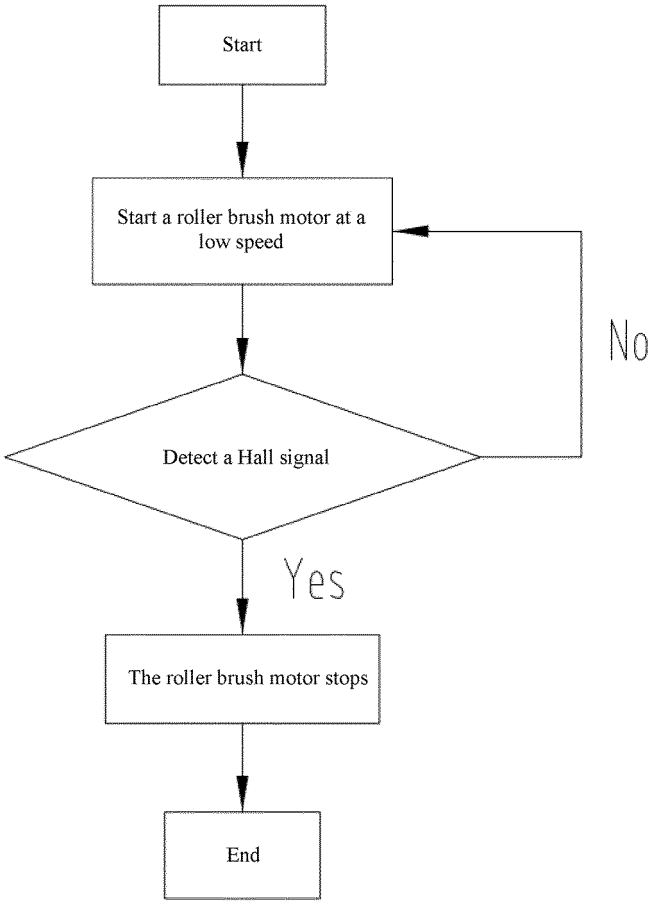

FIG. 12f

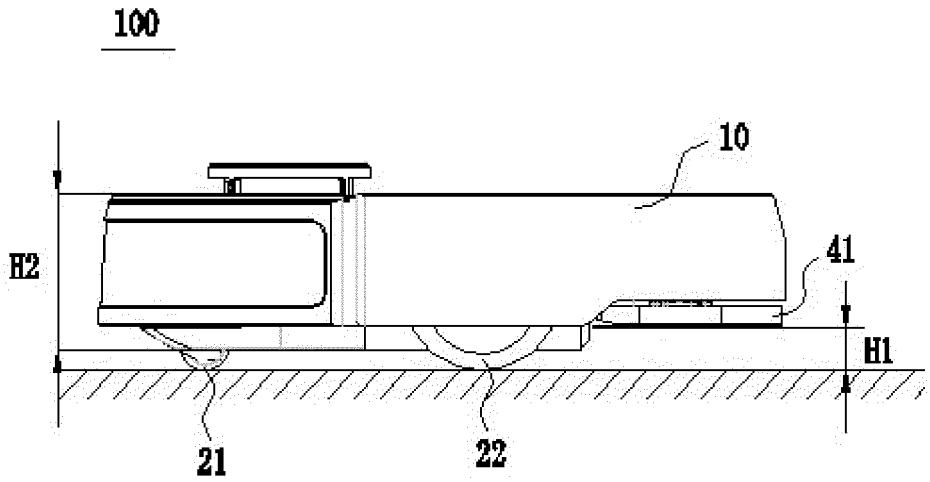

FIG. 13a

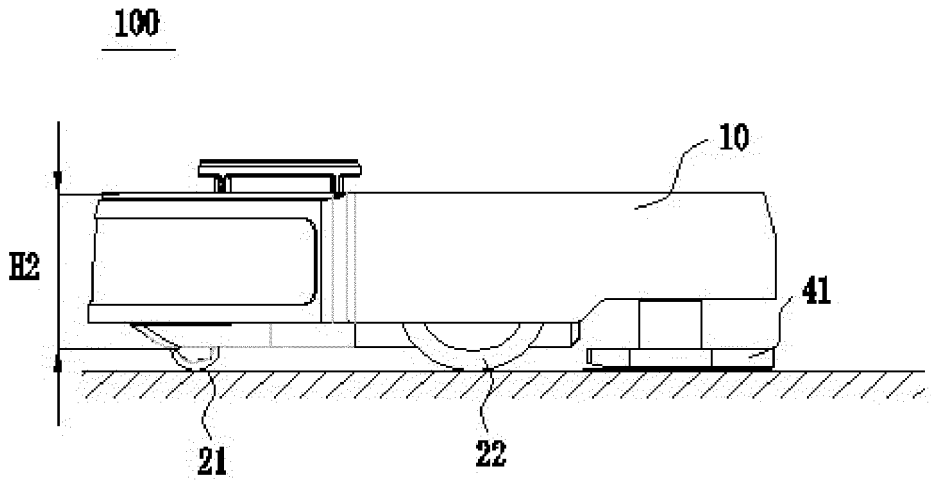

FIG. 13b

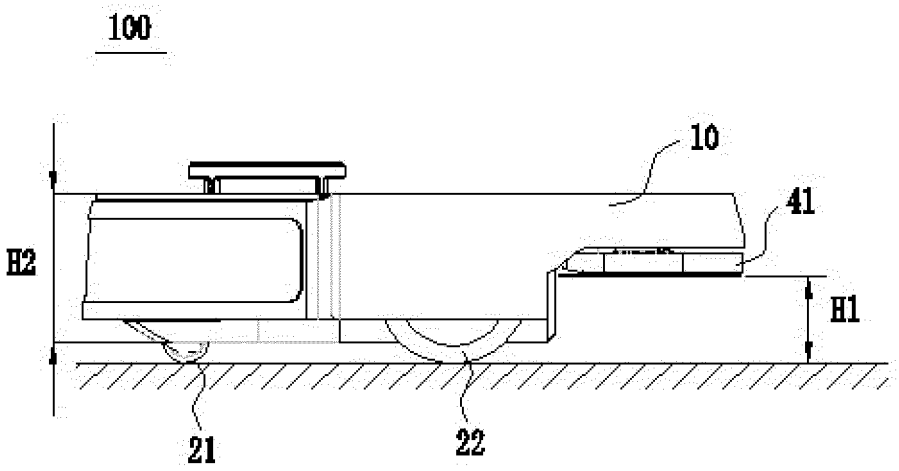

FIG. 14

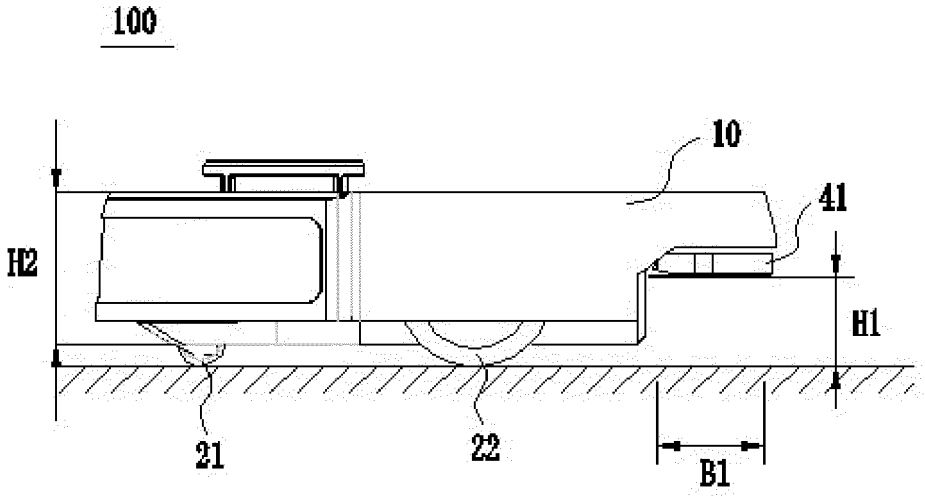

FIG. 15

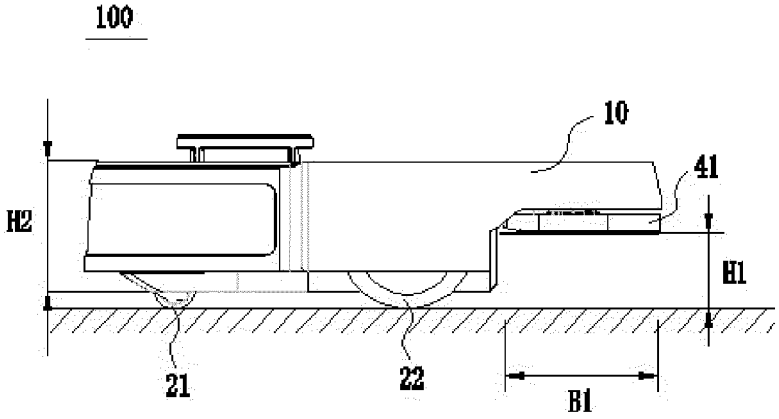

FIG. 16

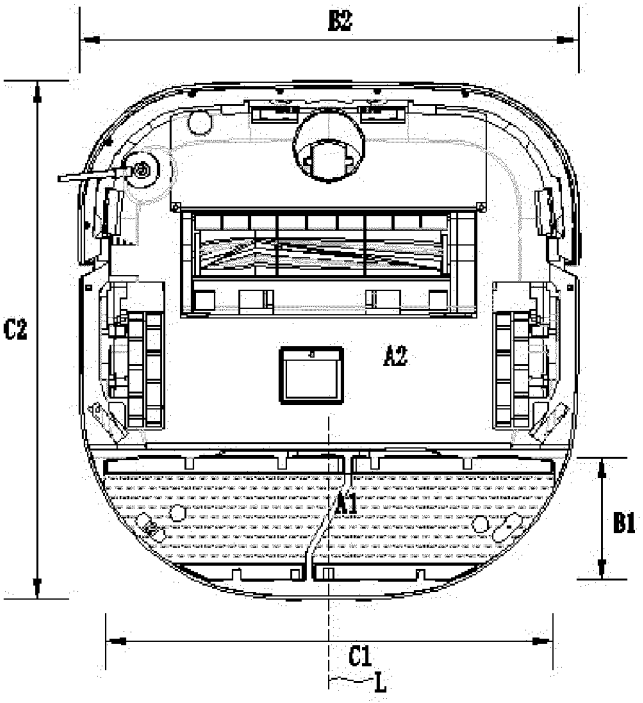

FIG. 17

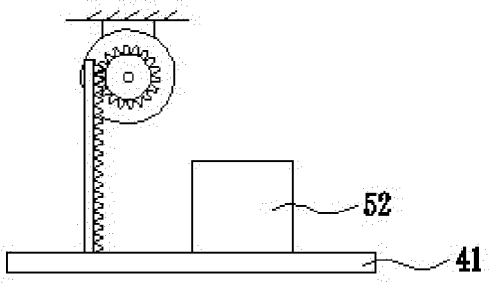

FIG. 18a

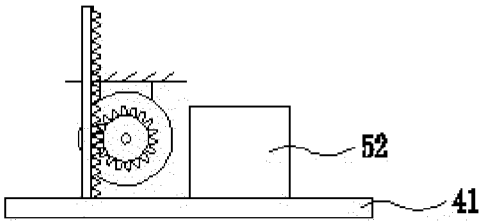

FIG. 18b

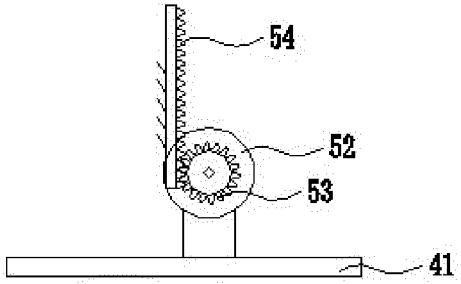

FIG. 19a

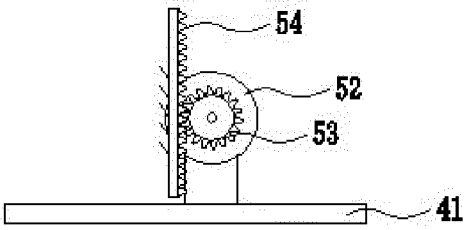

FIG. 19b

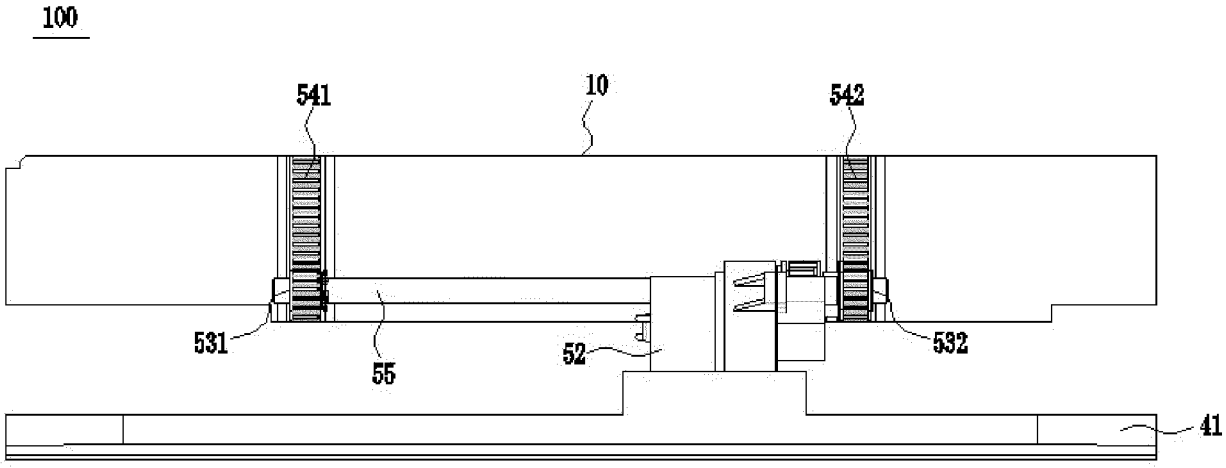

FIG. 20a

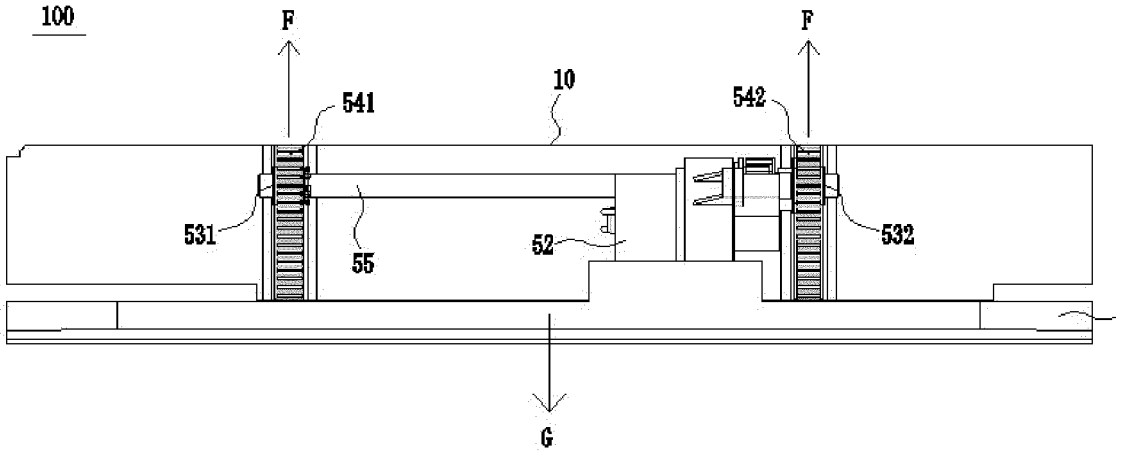

FIG. 20b

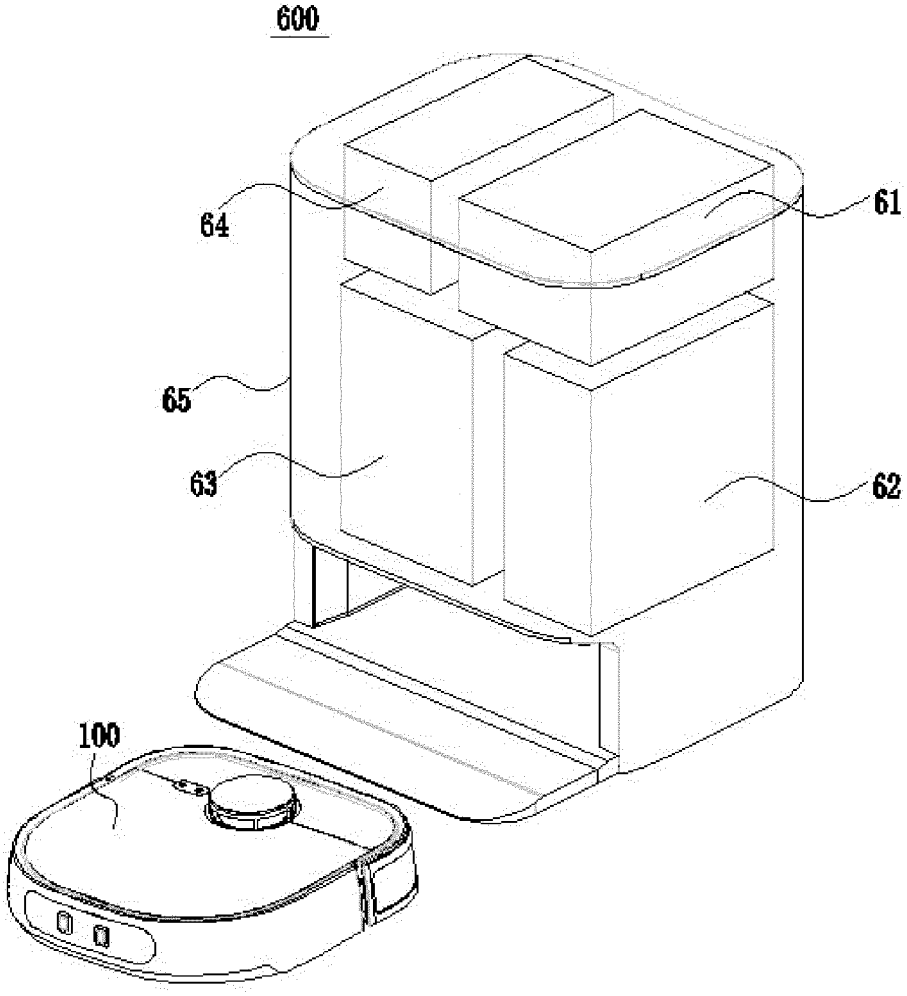

FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/135763

A. CLASSIFICATION OF SUBJECT MATTER

A47L 11/24(2006.01)i; A47L 11/28(2006.01)i; A47L 11/40(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)

A47L; B08B; B25J

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)

CNPAT, CNKI: 扫, 拖地, 擦地, 清洁, 机器人, 基站, 抬升, 升高, 地毯, 毛毯, 避开, 躲避, 接触, 液, 水, 剂, 控制; WPI, EPODOC: wash, clean, sweep, mop, robot, carpet, rug, avoid, contact, raise, lift, hoist, liquid, water, agent, fluid, detergent, control

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 111345746 A (POSITEC POWER TOOLS (SUZHOU) CO., LTD.) 30 June 2020 (2020-06-30) description, paragraphs 0196-0336, and figures 1-75	1-15
Y	CN 111345746 A (POSITEC POWER TOOLS (SUZHOU) CO., LTD.) 30 June 2020 (2020-06-30) description, paragraphs 0196-0336, and figures 1-75	16-39
PY	CN 112043206 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI et al.) 08 December 2020 (2020-12-08) description, paragraphs 0060-0062, and figures 1-5	16-28
PY	CN 113545717 A (ECOVACS ROBOT CO., LTD.) 26 October 2021 (2021-10-26) description, paragraphs 0060-0072, and figures 1-6	29-39
A	CN 110710932 A (SHANGHAI NANMU ROBOT TECHNOLOGY CO., LTD.) 21 January 2020 (2020-01-21) entire document	1-39

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

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2022	**01 March 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/135763

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 106859512 A (SHENZHEN RUANJING TECHNOLOGY CO., LTD.) 20 June 2017 (2017-06-20) entire document	1-39
A	WO 2019174084 A1 (SHENZHEN WATER WORLD CO., LTD.) 19 September 2019 (2019-09-19) entire document	1-39
A	US 2002011813 A1 (KOSELKA, H. et al.) 31 January 2002 (2002-01-31) entire document	1-39

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/135763

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	111345746	A	30 June 2020	KR	20210105907	A	27 August 2021
				WO	2020125760	A1	25 June 2020
				CN	111601534	A	28 August 2020
				WO	2020125489	A1	25 June 2020
				CN	213405910	U	11 June 2021
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CN	112043206	A	08 December 2020		None		
CN	113545717	A	26 October 2021		None		
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				AU	8127601	A	12 November 2001
				WO	0182766	A2	08 November 2001
				WO	0182766	A3	25 April 2002
				WO	0182766	B1	18 July 2002

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202011403195 **[0001]**
- CN 202022876299 **[0001]**
- CN 202110174062 **[0001]**
- CN 202111310212 **[0001]**