(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 900 602 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
27.10.2021 Bulletin 2021/43

(21) Application number: **19900880.6**

(22) Date of filing: **20.12.2019**

(51) Int Cl.:
A47L 11/24 *(2006.01)* ***A47L 11/40*** *(2006.01)*

(86) International application number:
PCT/CN2019/127044

(87) International publication number:
WO 2020/125758 (25.06.2020 Gazette 2020/26)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **21.12.2018 CN 201811572166**
21.12.2018 CN 201811572174
29.03.2019 CN 201910250300

(71) Applicant: **Positec Power Tools (Suzhou) Co., Ltd**
Suzhou, Jiangsu 215123 (CN)

(72) Inventors:
- **XU, Jianqiang**
  Suzhou, Jiangsu 215123 (CN)
- **XIE, Mingjian**
  Suzhou, Jiangsu 215123 (CN)
- **ZHONG, Hongfeng**
  Suzhou, Jiangsu 215123 (CN)
- **LI, Ji**
  Suzhou, Jiangsu 215123 (CN)
- **WANG, Yujie**
  Suzhou, Jiangsu 215123 (CN)

(74) Representative: **Dentons UK and Middle East LLP**
One Fleet Place
London EC4M 7WS (GB)

(54) CLEANING ROBOT AND CONTROL METHOD

(57) The present invention relates to a cleaning robot and a control method. The cleaning robot may include: a body; a moving mechanism, configured to support the body and driving the cleaning robot to move; a power module, configured to provide a driving force for the cleaning robot to move and work; a mopping module, configured to be mounted on the body and perform predetermined mopping work, where a mop is capable of being mounted on the mopping module; and a control module, configured to be electrically connected to and control the power module, to implement automatic moving and automatic working of the cleaning robot; and further includes a liquid supply device, where the control module can control, based on a current mopping condition, the liquid supply device to convey a liquid to the mopping module. The beneficial effects of the present invention are that the cleaning robot can complete mopping work more efficiently, to reduce burden of a user and improve the degree of automation and the user experience of the cleaning robot. The cleaning robot can intelligently and autonomously control, based on the current mopping condition, the liquid supply device to convey a liquid to a mop, thereby prolonging the service life of a ground material such as a floor in home of the user.

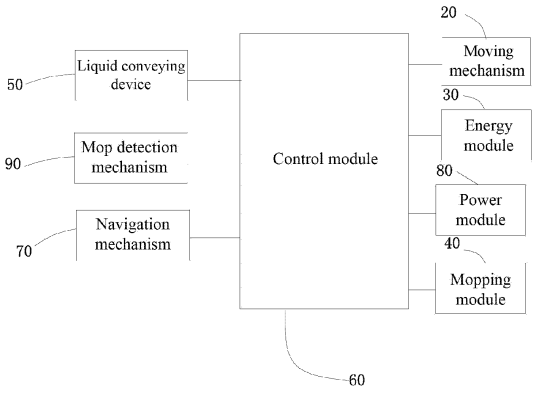

FIG. 3

EP 3 900 602 A1

Description

BACKGROUND

Technical Field

[0001] The present invention relates to a cleaning robot and further relates to a cleaning robot and a control method.

Related Art

[0002] As user requirements are more diversified, there are various types of cleaning robots, and the cleaning robot can wipe a ground, thereby improving the cleanliness of the ground.

[0003] An existing cleaning robot may perform mopping work by using a mop while performing cleaning work. Specifically, the mop is connected to a mopping plate or a machine body, and the ground is cleaned by using the wetted mop. When water is supplied to the mop, a natural water supply method is mostly adopted, that is, water in a water tank naturally flows to the mop at a specific rate to wet the mop. However, when the cleaning robot encounters a condition such as no electricity or stuck, the uninterrupted water supply of the water tank causes damage to the mop due to soaking or accumulation of large amounts of water on the ground to damage a floor due to soaking.

[0004] Therefore, a user needs to personally take care of a robot to help the robot deal with the condition such as no electricity or stuck. Such manual work degrades user experience of in terms of automated operation of the robot.

SUMMARY

[0005] To overcome defects of the prior art, the problem that the present invention needs to resolve is to provide a cleaning robot that can autonomously control conveying of a liquid to a wiping member.

[0006] A technical solution adopted in the present invention to resolve the existing technical problems is: A cleaning robot, configured to move and work in a working region, the cleaning robot comprising:

a body;

a moving mechanism, configured to support the body and driving the cleaning robot to move on a working surface in the working region;

a power module, configured to provide a driving force for the cleaning robot to move and work;

a mopping module, configured to be mounted on the body and perform predetermined mopping work, wherein a wiping member is capable of being mounted on the mopping module; and

a control module, configured to be electrically connected to and control the power module, to implement automatic moving and automatic working of the cleaning robot; and

the cleaning robot further comprising: a liquid supply device electrically connected to the control module, wherein in a wet mopping mode, when a preset condition is met, the control module limits the liquid supply device in conveying a liquid to the mopping module.

[0007] Preferentially, when the cleaning robot is in the wet mopping mode and in a case that it is detected that the cleaning robot is abnormal, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0008] Preferentially, in an abnormal case that it is detected that the cleaning robot is trapped or stuck, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0009] Preferentially, the cleaning robot further comprises a mop detection device electrically connected to the control module, the mop detection device is configured to detect whether the wiping member is mounted on the cleaning robot, and in an abnormal case that the mop detection device detects that the wiping member is not mounted on the cleaning robot, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0010] Preferentially, when the cleaning robot is in the wet mopping mode and in a case that it is detected that the mopping module is at a non-mopping height within a preset period of time, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0011] Preferentially, the cleaning robot further comprises a lifting mechanism, the control module controls the lifting mechanism to lift the mopping module from a first position relative to the working surface during the mopping work to a second position, and when the mopping module is in the wet mopping mode and in a case that it is detected that the mopping module is in a lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module.

[0012] Preferentially, the control module controls a lifting mechanism to lift the mopping module from a first position relative to the working surface to a second position in the following conditions, and the conditions comprise at least one of the following: the cleaning robot returning to a base station for replacing the mopping module, the cleaning robot being in a standby state, and the cleaning robot being trapped or stuck.

[0013] Preferentially, in a case that a non-working surface is detected, the control module controls the lifting

mechanism to lift the mopping module from the first position relative to the working surface to the second position, to control the cleaning robot to cross the non-working surface, and in a case that it is detected that the mopping module is in the lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module.

[0014] Preferentially, after it is detected that the cleaning robot crosses the non-working surface, the control module controls the lifting mechanism to lower the mopping module from the second position relative to the working surface to the first position, and the liquid supply device conveys the liquid to the mopping module.

[0015] Preferentially, when the cleaning robot is in the wet mopping mode and in a case that the cleaning robot is at least replacing the wiping member, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0016] Preferentially, the limiting, by the control module when a preset condition is met, the liquid supply device in conveying a liquid to the mopping module comprises:

controlling, by the control module when the preset condition is met, the liquid supply device to stop conveying the liquid to the mopping module.

[0017] An embodiment of the present invention further provides a control method for a cleaning robot, the cleaning robot comprises a mopping module for performing predetermined mopping work, and the method comprises:

controlling the cleaning robot to enter a wet mopping mode; and

limiting conveying of a liquid to the mopping module when a preset condition is met.

[0018] Preferentially, the limiting conveying of a liquid to the mopping module comprises: stopping conveying the liquid to the mopping module.

[0019] Preferentially, the limiting conveying of a liquid to the mopping module when a preset condition is met comprises:

performing control to convey the liquid to the mopping module when the preset condition is not met.

[0020] Compared with the prior art, the beneficial effects of the present invention are that the cleaning robot can complete mopping work more efficiently, to reduce burden of a user and improve the degree of automation and the user experience of the cleaning robot. When the cleaning robot is in a wet mopping mode and a preset condition is met, a control module can intelligently and autonomously limit a liquid supply device in conveying a liquid to a wiping member, thereby prolonging the service life of a ground material such as a floor in home of the user.

[0021] To overcome defects of the prior art, the problem that the present invention needs to resolve is to provide a cleaning robot that can intelligently switch between working modes to improve the working efficiency and the working effect.

[0022] A technical solution adopted in the present invention to resolve the existing technical problems is: A control method for a cleaning robot, wherein the cleaning robot moves and works in a working region, the cleaning robot comprises a mopping module configured to perform predetermined mopping work and a liquid supply device, a working mode of the cleaning robot comprises dry mopping or wet mopping, the liquid supply device is controlled in the dry mopping mode to be in a closed state, the liquid supply device is controlled in the wet mopping mode to convey a liquid to the mopping module, and the working region comprises at least one preset region; and

the method comprises:

controlling the cleaning robot to perform dry mopping on the preset region; and

controlling the cleaning robot to perform wet mopping on the preset region if it is detected that the cleaning robot completes the dry mopping on the preset region.

[0023] Preferentially, a wiping member is capable of being mounted on the mopping module, and before the performing wet mopping on the preset region, the method further comprises:

controlling the cleaning robot to transfer information that the wiping member is to be replaced to a user, or controlling the cleaning robot to at least replace the wiping member.

[0024] Preferentially, after the cleaning robot completes dry mopping work and wet mopping work on the working region, the control module controls the cleaning robot to transfer information about unloading of the wiping member to a user, or controls the cleaning robot to at least unload the wiping member.

[0025] Preferentially, the working region is divided into at least one preset region in a preset or user-defined manner.

[0026] Preferentially, The method further comprising:

controlling the cleaning robot to perform dry mopping on the working region if it is detected that the cleaning robot completes wet mopping on the working region.

Preferentially, the cleaning robot comprises the liquid supply device configured to convey the liquid to the mopping module, and when the cleaning robot performs wet mopping work, the liquid supply device conveys the liquid to the mopping module according to a preset power and a preset period of time; and

before the performing wet mopping on the working region, the method further comprises:

controlling the cleaning robot to wet a wiping member

in at least one of the following manners, the manners comprising: conveying the liquid to the liquid supply device according to a power greater than the preset power and conveying the liquid to the liquid supply device according to a period of time greater than the preset period of time.

[0027] Preferentially, before the performing wet mopping on the working region, the method further comprises:
controlling the cleaning robot to wet a wiping member in a manner of moving according to a preset path before starting the wet mopping.

[0028] Preferentially, the controlling the cleaning robot to perform wet mopping on the preset region, the method further comprises:
controlling the cleaning robot to move to a starting position of the dry mopping in the preset region, and to start the wet mopping from the starting position.

[0029] An embodiment of the present invention further provides a cleaning robot, the cleaning robot, configured to move and work in a working region, wherein the cleaning robot comprises a mopping module configured to perform predetermined mopping work and a liquid supply device, a working mode of the cleaning robot comprises dry mopping or wet mopping, the liquid supply device is controlled in the dry mopping mode to be in a closed state, the liquid supply device is controlled in the wet mopping mode to convey a liquid to the mopping module, and the working region comprises at least one preset region; and
the cleaning robot further comprises a control module, and the control module controls the cleaning robot to perform dry mopping on the preset region and controls the cleaning robot to perform wet mopping on the preset region if it is detected that the cleaning robot completes the dry mopping on the preset region.

[0030] Preferentially, a wiping member is capable of being mounted on the mopping module, and before the wet mopping is performed on the preset region, the control module controls the cleaning robot to transfer information that the wiping member is to be replaced to a user, or control the cleaning robot to at least replace the wiping member.

[0031] Compared with the prior art, the beneficial effects of the present invention are that the cleaning robot can intelligently switch between a dry mopping working mode and a wet mopping working mode during work, wet mopping work continues automatically after dry mopping is completed in a region without manual switching by a user, thereby saving the time of the user and improving the user experience.

[0032] To overcome defects of the prior art, the problem that the present invention needs to resolve is to provide a cleaning robot that can autonomously control conveying of a liquid to a wiping member.

[0033] A technical solution adopted in the present invention to resolve the existing technical problems is a cleaning robot. The cleaning robot may move and work in a working region, and the cleaning robot may include: a body; a moving mechanism, configured to support the body and driving the cleaning robot to move; a power module, configured to provide a driving force for the cleaning robot to move and work; a mopping module, configured to be mounted on the body and perform predetermined mopping work, where a wiping member is capable of being mounted on the mopping module; and a control module, configured to be electrically connected to and control the power module, to implement automatic moving and automatic working of the cleaning robot; and the cleaning robot may further include a liquid supply device electrically connected to the control module, where the control module can control, based on a current mopping condition, the liquid supply device to convey a liquid to the mopping module.

[0034] Preferentially, when it is detected that the cleaning robot is currently in, but not limited to, at least one of the following mopping conditions, the control module controls the liquid supply device to stop conveying the liquid to the mopping module, and the conditions may include that the cleaning robot is trapped by an obstacle during work, the cleaning robot returns to a base station for replacing the mopping module, the cleaning robot is in a state of replacing the mopping module, and the cleaning robot is in a standby state.

[0035] Preferentially, the cleaning robot may further include a lifting mechanism, the control module can control the lifting mechanism to lift the mopping module from a mopping height of performing mopping work to another height, and when the lifting mechanism is currently in a lifted mopping condition, the control module controls the liquid supply device to stop conveying the liquid to the mopping module.

[0036] Preferentially, the cleaning robot may further include a mop detection device electrically connected to the control module, the mop detection device may be configured to detect whether the wiping member is mounted on the cleaning robot, and when the mop detection device detects a mopping condition that the wiping member is not mounted on the cleaning robot currently, the control module controls the liquid supply device to stop conveying the liquid to the mopping module.

[0037] Preferentially, the cleaning robot may further include a humidity detection device, and the liquid supply device is controlled, based on a current mopping condition detected by the humidity detection device, to convey the liquid to the mopping module.

[0038] Preferentially, the cleaning robot may further include a signal sending device, and the signal sending device sends the mopping condition detected by the humidity detection device to a user.

[0039] Preferentially, the humidity detection device may include a mop humidity sensor, and the control module controls, based on humidity of the wiping member detected by the mop humidity sensor, the liquid supply device to convey the liquid to the mopping module.

[0040] Preferentially, the mop humidity sensor is mounted below the body.

[0041] Preferentially, the humidity detection device may include an environment humidity detection device, and the liquid supply device is controlled, based on environment humidity detected by the environment humidity detection device, to convey the liquid to the mopping module.

[0042] Preferentially, the environment humidity detection device may control, based on environment humidity detected by the cleaning robot in a local and/or remote manner, the liquid supply device to convey the liquid to the mopping module.

[0043] Preferentially, the humidity detection device may include a ground humidity sensor, and the control module controls, based on ground humidity detected by the ground humidity sensor, the liquid supply device to convey the liquid to the mopping module.

[0044] Preferentially, the cleaning robot may further include a ground sensor, the control module controls, based on a ground state currently detected by the ground sensor, the liquid supply device to convey the liquid the mopping module, and the ground state includes a ground material.

[0045] Preferentially, the cleaning robot may further include a navigation mechanism, configured to form a working region map of the cleaning robot, and the control module controls, based on a current mopping condition specified in the working region map, the liquid supply device to convey the liquid to the mopping module.

[0046] Preferentially, the navigation mechanism includes, but is not limited to, at least one of the following: an ultrasonic sensor, an optical sensor, a UWB sensor, and an inertial navigation system.

[0047] Preferentially, the control module may control, based on an instruction from the user, the liquid supply device to convey the liquid to the mopping module.

[0048] Preferentially, the liquid supply device may include a liquid reservoir.

[0049] Preferentially, the liquid supply device may further include a liquid conveying device electrically connected to the control module, the liquid conveying device is connected to the liquid reservoir, and the control module controls, based on the current mopping condition, the liquid conveying device to convey a liquid in the liquid reservoir to the mopping module.

[0050] Preferentially, the cleaning robot may further include a liquid level monitoring device disposed in the liquid reservoir, and the liquid level monitoring device is configured to monitor a liquid level in the liquid reservoir.

[0051] Preferentially, the cleaning robot may further include the signal sending device, and the signal sending device sends a notification message that an amount of liquid in the cleaning robot is insufficient to the user when the liquid level monitoring device finds that the liquid level in the liquid reservoir is lower than a preset threshold.

[0052] Preferentially, the cleaning robot may further include an indication device, configured to indicate whether an amount of liquid in the cleaning robot is sufficient.

[0053] Preferentially, the cleaning robot may further include at least two liquid reservoirs and at least two liquid conveying devices respectively connected to the at least two liquid reservoirs, the control module is configured to control, based on the current mopping condition, the at least two liquid conveying devices to convey liquids in the at least two liquid reservoirs to the mopping module, and types of the liquids stored in the at least two liquid reservoirs are different.

[0054] Preferentially, the cleaning robot further includes valves associated with the at least two liquid conveying devices, the valves are opened and closed under the control of the control module, to control, based on the current mopping condition, the liquid supply device to convey the liquid to the mopping module.

[0055] Preferentially, the cleaning robot may further include the ground sensor, the control module controls, based on the ground state currently detected by the ground sensor, an amount of liquid and a type of the liquid conveyed by each of the at least two liquid reservoirs, and the ground state includes a ground material and/or a ground stain type.

[0056] Preferentially, the cleaning robot may further include the navigation mechanism, configured to form the working region map of the cleaning robot, and the control module controls, based on the current mopping condition specified in the working region map, the amount of liquid and the type of the liquid conveyed by the liquid supply device to the mopping module.

[0057] Preferentially, the cleaning robot may further include an energy module, configured to provide energy for the cleaning robot to move and work.

[0058] Preferentially, the cleaning robot may be a domestic and/or indoor service robot.

[0059] An embodiment of the present invention further provides a control method for a cleaning robot, the method may include: controlling a cleaning robot to enter a working state; determining, based on a current mopping condition, whether a liquid supply device needs to convey a liquid to a mopping module; and controlling the liquid supply device to convey the liquid to the mopping module if the liquid supply device needs to convey the liquid to the mopping module, and the cleaning robot includes the liquid supply device.

[0060] Preferentially, the working state may include dry mopping or wet mopping. Correspondingly, after the controlling a cleaning robot to enter a working state, the method may further include: performing, by the cleaning robot, dry mopping on a working region first, and then performing wet mopping on the working region.

[0061] Compared with the prior art, the beneficial effects of the present invention are that the cleaning robot can complete mopping work more efficiently, to reduce burden of a user and improve the degree of automation and the user experience of the cleaning robot. The cleaning robot can intelligently and autonomously control, based on a current mopping condition, a liquid supply

device to convey a liquid to a wiping member, thereby prolonging the service life of a ground material such as a floor in home of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0062] The foregoing objectives, technical solutions, and beneficial effects of the present invention can be achieved by using the following accompanying drawings:

FIG. 1 is a schematic diagram of a robot cleaning system according to an embodiment of the present invention.

FIG. 2 is a front view of a cleaning robot according to an embodiment of the present invention.

FIG. 3 is a schematic diagram of function modules of a cleaning robot according to an embodiment of the present invention.

FIG. 4 is a structural diagram of only a single liquid reservoir existing in a cleaning robot according to an embodiment of the present invention.

FIG. 5 is a structural diagram of two liquid conveying devices and two liquid reservoirs of a cleaning robot according to an embodiment of the present invention.

FIG. 6 is a structural diagram of a single liquid conveying device and two liquid reservoirs of a cleaning robot according to an embodiment of the present invention.

FIG. 7 is a structural diagram of a liquid supply device of a cleaning robot according to an embodiment of the present invention.

FIG. 8 is a structural diagram of a lifting mechanism according to an embodiment of the present invention.

FIG. 9 to FIG. 12 are schematic diagrams of a scenario of a working process of a cleaning robot.

FIG. 13 to FIG. 16 are schematic diagrams of an application scenario in which a non-working surface is a carpet in a cleaning robot.

FIG. 14 is a structural diagram of a mopping module in a cleaning robot.

DETAILED DESCRIPTION

[0063] Detailed descriptions and technical content of the present invention are described below in cooperation with the accompanying drawings. However, the accompanying drawings only provide reference and description rather than limit the present invention.

[0064] FIG. 1 is a schematic diagram of a robot cleaning system according to the present invention. The robot cleaning system 300 may include a base station 200 and a cleaning robot 100, and the cleaning robot 100 may be a device that can autonomously replace a wiping member. Correspondingly, in addition to charging the cleaning robot 100, the base station 200 for the cleaning robot 100 to return for charging may be further configured for the cleaning robot 100 to replace the wiping member, and a charging function and a wiping member replacement function are combined to form the base station of the cleaning robot, thereby saving a user space. When the cleaning robot 100 needs to return to the base station 200, for example, when it is detected that the wiping member needs to be replaced or the cleaning robot 100 needs to be charged, a program of returning to the base station 200 is started, and the cleaning robot 100 returns to the base station 200 to automatically replace the wiping member and/or automatically charge the cleaning robot 100. In an embodiment of this application, the wiping member may be an item such as a mop or a sponge eraser to wipe a working surface (a ground). It should be noted that to describe this application more clearly, the wiping member is represented by using the mop below.

[0065] The base station 200 includes a bottom plate 207, a supporting plate 206, and an upper plate 205. The upper plate 205 is connected to the bottom plate 207 by the supporting plate 206. A new mop groove 203, an old mop groove 204, and a mop replacement device (not shown in the figure) are disposed on the upper plate 205, the mop replacement device may adopt an elevating mechanism, a swing mechanism, or the like, and projections of the new mop groove 203 and the old mop groove 204 on the bottom plate 207 correspond to a second operation position 202 and a first operation position 201 of the cleaning robot 100 on the bottom plate 207. It may be understood that positions of the new mop groove and the old mop groove are not fixed. For example, in another embodiment, the positions of the new mop groove 203 and the old mop groove 204 may be alternatively interchangeable. The cleaning robot 100 unloads an old mop in the first operation position 201, the mop replacement device of the base station 200 recycles the old mop, and the mop replacement device of the base station 200 releases a new mop, so that the cleaning robot 100 loads the new mop in the second operation position 201.

[0066] In another embodiment of this application, a mop replacement position in the cleaning robot and a position to be returned to for charging may be alternatively set separately. In this case, when the cleaning robot needs to replace a mop, the cleaning robot may return to the mop replacement position to replace the mop; and when the cleaning robot needs to be charged, the cleaning robot may return to the charging position for charging. This is not limited in this application. In this case, the position to be returned to for mop replacement may be

an unfixed position point. In the following description of this application, for ease of description, unless otherwise specified, when that a cleaning robot returns to the base station to replace the mop is described, the position to be returned to may refer to a base station that combines two functions of charging and replacement of the mop, or may refer to a base station that is only configured to replace the mop. Correspondingly, when that the cleaning robot returns for charging is described, the position to be returned to may refer to a base station that combines two functions of charging and replacement of the mop, or may refer to a base station that is only configured to charge the cleaning robot.

[0067] In this embodiment, the cleaning robot may be a domestic and/or indoor service robot.

[0068] As shown in FIG. 2 and FIG. 3, in an embodiment of this application, the cleaning robot 100 may be a mopping robot and include a body 10, a moving mechanism 20, an energy module 30, a mopping module 40, a power module 80, a control module 60, and a navigation mechanism 70. A moving element of the moving mechanism includes a driving wheel 21 for driving the cleaning robot 100 to move. It may be understood that the moving element may be alternatively a track structure. In an embodiment of this application, the cleaning robot 100 may further include a driven wheel (not shown in the figure). The energy module 30 is optionally configured to supply power to the cleaning robot and the cleaning robot optionally charges the energy module 30. The power module 80 may include a motor and a transmission mechanism connected to the motor, the transmission mechanism is connected to the moving mechanism, the motor drives the transmission mechanism to work, and a transmission effect of the transmission mechanism enables the moving mechanism to move. The transmission mechanism may be a worm gear and worm mechanism, a bevel gear mechanism, or the like. The power module 80 may be provided with two sets of motors, one set of motors drives the moving mechanism to move, and the other set of motors drives the mopping module to vibrate at a specific frequency to mop. Alternatively, the power module 80 may be provided with only one set of motor for driving the moving mechanism to move. It may be understood that a quantity of each set of motors is not limited, and may be, for example, one or two. The mopping module 40 may be configured to be mounted on the body to perform predetermined mopping work and a mop can be mounted on the mopping module 40. As shown in a schematic structural diagram of a mopping module in FIG. 17, the mopping module 40 may include a mopping plate 43 and the mop is detachably mounted on the mopping plate. The mopping plate and the mop may be formed integrally, or may be connected in a manner such as a hook-and-loop fastener or a double-sided tape. This is not limited in this application. The navigation mechanism 70 may include, but is not limited to, at least one of the following: an ultrasonic sensor, a radar sensor, an optical sensor (a laser sensor, an infrared sensor, or the like), a UWB sensor, an inertial navigation system, and the like, and is configured to provide environment control data, control the cleaning robot to work, and form a working region map of the cleaning robot.

[0069] In another embodiment of this application, the cleaning robot 100 may be alternatively a sweeping and mopping integrated cleaning device. In this case, the cleaning robot may further include a sweeping module in addition to the mopping module, the sweeping module may include a roller brush and a side brush, which are configured to clean sundries such as dust on a ground, a corner, and the like, the sundries are relatively concentrated at the roller brush by using the side brush for processing, and the dust is collected into a dust-collecting box.

[0070] The control module is, for example, a controller, and may be an embedded digital signal processor (DSP), a microprocessor unit (MPU), an application-specific integrated circuit (ASIC), a programmable logic device (PLD), a system on chip (SOC), a central processing unit (CPU), a field programmable gate array (FPGA), or the like.

[0071] The controller may control, according to a preset program or a received instruction, the cleaning robot to work. Specifically, the controller may control the moving mechanism to move according to a preset moving path in a working region of the cleaning robot. While the moving mechanism drives the cleaning robot to move, the mopping module performs mopping work, to remove garbage such as dust in the working region. Further, when the cleaning robot moves in the preset path and completes the mopping work, the controller may control the cleaning robot to stop the mopping work and control the moving mechanism to move, so that the moving mechanism drives the cleaning robot to leave the working region. A moving path and a stop position of the cleaning robot may be preset in the controller and the controller controls execution of the moving mechanism.

[0072] In this embodiment of this application, the cleaning robot may further include: a liquid supply device electrically connected to the control module. The control module can control, based on a current mopping condition, the liquid supply device to convey a liquid to the mopping module, so that the cleaning robot can autonomously and automatically control a condition of liquid supply of the liquid supply device to a mop. The conveyed liquid may be water, water added with an essential oil, alcohol, or the like. This is not limited in this application. Further, a working mode of the cleaning robot may include a mopping mode such as dry mopping, wet mopping, dry mopping first and then wet mopping, or wet mopping first and then dry mopping, and the user may select a corresponding working mode in an APP of the cleaning robot according to actual needs. In the dry mopping mode, the liquid supply device may be controlled to be in a closed state; and in the wet mopping mode, the liquid supply device may be controlled to convey a liquid to the mopping module.

[0073] FIG. 4 shows a condition in which there is only one liquid reservoir in the cleaning robot. As shown in FIG. 4, the liquid supply device may include a liquid reservoir 51 and a liquid conveying device 50 that is electrically connected to the control module. The liquid conveying device 50 is connected to the liquid reservoir 51. In an embodiment, the control module may control, by using a program, the liquid supply device to convey a liquid to the mopping module, that is, the control module may automatically control, based on a current mopping condition, the liquid conveying device 50 to convey a liquid in the liquid reservoir 51 to the mopping module. In another embodiment, the cleaning robot may further include a valve associated with the liquid conveying device, and the valve is opened and closed under the control of the control module, to control, based on the current mopping condition, the liquid supply device to convey the liquid to the mopping module.

[0074] In an embodiment of this application, the liquid conveying device 50 may be a pump, which may include, but is not limited to, a pump element such as a peristaltic pump, a gear pump, a plunger pump, or a diaphragm pump that can execute a liquid conveying function. The control module controls an amount of liquid conveyed by the liquid reservoir 51 to the mopping module by controlling a rotational speed of an impeller in the pump element. The liquid conveying device 50 is connected to the liquid reservoir 51 by a hose 52, and the liquid in the liquid reservoir 51 can flow to the liquid conveying device 50 by using the hose 52, so that the liquid conveying device 50 may convey the liquid to the mopping module. In an embodiment of this application, the liquid conveying device 50 may directly convey the liquid to the mopping module 40 in a manner shown in FIG. 4, to convey the liquid to the mopping module. In another embodiment of this application, the liquid conveying device 50 may directly spray the liquid onto a ground during work of the cleaning robot, so that the cleaning robot performs wet mopping when moving on the ground onto which the liquid is sprayed, to spray the liquid onto the ground to dissolve stains and mop the ground more cleanly. It should be noted that the above two manners are applicable to all the embodiments of this application to convey the liquid to the mopping module.

[0075] FIG. 7 is a structural diagram of a liquid supply device of a cleaning robot according to an embodiment of the present invention. After flowing out of an outlet pipe 525 of the liquid conveying device 50, a liquid may be first atomized by using an atomizing sheet 526 (three atomizing sheets are used as an example in this application), and then the atomized liquid is conveyed to the mopping module. In another embodiment of this application, after flowing out of the outlet pipe of the liquid conveying device 50, the liquid may first penetrate into a sponge, then is atomized by using the atomizing sheet, and then is conveyed to the mopping module. In another embodiment, alternatively, it is also possible to access the atomizing sheet directly after the liquid reservoir 51 and then transfer it to the mopping module. In the foregoing manner, the liquid in the liquid supply device can be uniformly conveyed to the mopping module, to ensure that the liquid can uniformly cover the mop.

[0076] FIG. 8 is a structural diagram of a lifting mechanism of a mopping module according to this embodiment. In this embodiment, the lifting mechanism of the mopping module can adjust a height of the mopping module 40 relative to a working surface. Specifically, the lifting mechanism of the mopping module includes an elevating mechanism and a fixed plate 11. The elevating mechanism is fixedly connected to the fixed plate 11 and the mopping module 40 is mounted on the fixed plate 11. The elevating mechanism includes an elevating motor 15 and a transmission mechanism. The transmission mechanism includes a gear 16 and screw rod 17 meshed device and an elevating frame 19, and the elevating motor 15 drives the transmission mechanism to drive the mopping module 40 to move upward or downward. Specifically, the elevating frame 19 drives, under the action of the elevating mechanism, the mopping module 40 to move upward or downward relative to the working surface.

[0077] A sliding groove 22 is provided on the elevating frame 19, a corresponding protrusion (not shown in the figure) is disposed on the body, and the mopping module 40 moves upward or downward relative to the body through engagement between the sliding groove 22 and the protrusion. Certainly, it may be understood that the mopping module 40 may alternatively move upward or downward relative to the body through engagement between internal and external threads disposed on the elevating frame and the body. In another embodiment, the lifting mechanism of the mopping module may be alternatively a swing mechanism. The elevating frame 19 drives, under the action of the swing mechanism, the mopping module 40 to swing, to adjust a distance between the mopping module 40 and the working surface. A specific structure is a common structure of an adjusting device, which is not described herein again.

[0078] As shown in FIG. 8, the mopping module 40 is mounted on the fixed plate 11 through magnetic attraction. Specifically, a magnetic element 18 such as a magnet or a magnetic stripe is disposed on the mopping module 40, and is attracted to a magnetic element disposed on the fixed plate 11. Alternatively, a pin hole may be provided on the mopping module 40 and engaged with a corresponding pin column on the fixed plate 11, to mount the mopping module 40 on the fixed plate 11. A protrusion device (not shown in the figure) such as a top column or a convex ball is downwards disposed on the top of the body, and the protrusion device moves relative to the mopping module 40 and is in contact with the mopping module 40, so that the mopping module 40 is separated from the body 11. There are two protrusion devices, and projections of the protrusion devices on the mopping plate fall on two ends of the mopping plate. Certainly, there may be alternatively one or more than two protru-

sion devices.

[0079] The mopping module of the cleaning robot has at least three height positions relative to the working surface under the driving of the lifting mechanism, which are a first position when the cleaning robot performs mopping work, a second position when the cleaning robot moves or crosses an obstacle, and a third position when the cleaning robot unloads a mop 28. The third position is higher than or equal to the second position and the first position is lower than the second position. The requirements of the cleaning robot for mopping the ground, crossing obstacles, and automatically replacing the mop can be achieved by adjusting the position of the mopping module by using the lifting mechanism. Certainly, in addition to the three height states, the cleaning robot may further have a fourth position that is lower than the first position and that is used for mounting a new mop.

[0080] FIG. 9 to FIG. 12 are schematic diagrams of a scenario of a working process of a cleaning robot. A position relationship of the mopping module 40 is described according to the schematic diagram of the scenario. As shown in FIG. 9, when the cleaning robot is in a mopping working state, the lifting mechanism controls the mopping module to be in the first position. In this case, there is a specific pressure between a mop and the ground, and the mop may be in contact with the ground and has a specific amount of interference, to achieve a relatively good cleaning effect. When the cleaning robot encounters an obstacle during mopping, the lifting mechanism controls the mopping module to be in the second position shown in FIG. 10. In this case, the mopping module is automatically lifted, a height of the second position is greater than a height of the working state, but the height cannot be greater than a height of unloading the mop, to prevent the mop and the mopping plate from falling. When the cleaning robot needs to replace the mop during the mopping or the cleaning robot needs to return for charging when an amount of power is lower than a preset threshold during the mopping, the lifting mechanism controls the mopping module to be lifted to the second position shown in FIG. 10, and meanwhile, the cleaning robot may further form position coordinates of the cleaning robot before returning by using the navigation mechanism and label the position coordinates in the working region map. When the mop is replaced, the lifting mechanism controls the mop to be lifted to the third position shown in FIG. 11 to unload the mop, to separate the mopping module from the body, as shown in FIG. 12. An old mop may be unloaded to the first operation position shown in FIG. 1, and the first operation position may be used for unloading the old mop. After the old mop is unloaded, the cleaning robot automatically mounts a new mop, and the cleaning robot may mount the new mop in the second operation position. After the robot enters a corresponding position, the mopping module is attracted to the body through magnetic attraction. Specifically, a magnet is disposed on the mopping module and a magnetic element is disposed on the body. After the new mop is mounted or an amount of power is full, the lifting mechanism controls the mopping module to be lifted to the second position and set off to return to the position of the cleaning robot labeled in the working region map, and when the labeled position is reached, the lifting mechanism controls the mopping module to be adjusted to the first position to continue to mop. When the cleaning robot needs to pause mopping during the mopping, the lifting mechanism controls the mopping module to be lifted to the second position. The lifting mechanism controls the mop to be lifted when the cleaning robot crosses the obstacle, to resolve the defect of a limited cleanable range caused by that the mopping module of the cleaning robot in the prior art only has the second position state when mopping the ground during work and therefore a height of crossing the obstacle is almost 0. The mopping module may control the lifting mechanism to lift the mop to the second position when mopping is paused, to resolve the defect in the prior art that the mopping module only has the second position state when mopping the ground, resulting in that a floor is soaked in the liquid and the floor is damaged. After replacing the mop or being charged, the cleaning robot may further return to a mopping position before the mop is replaced to continue mopping at an interrupted point, to resolve the defect that in the prior art, a mopped region is repeatedly mopped, and a region that is not mopped is missed, and improve the cleaning efficiency of the cleaning robot. In addition, the mop can be replaced automatically, which improves the degree of automation and the user experience of the cleaning robot.

[0081] In an embodiment of this application, when the cleaning robot starts working, it is detected whether the liquid reservoir is mounted on the cleaning robot. When it is detected that the liquid reservoir is not mounted on the cleaning robot, the cleaning robot cannot start working, and the control module controls the cleaning robot to transfer information that the liquid reservoir is not mounted to a user. The information received by the user may be an alarm issued by the robot or a reminder message on the APP. After the liquid reservoir is detected, the cleaning robot starts working.

[0082] When using a mopping robot, the user selects different cleaning modes according to stain conditions on the ground. The cleaning modes are generally divided into a dry mopping mode and a wet mopping mode. The dry mopping mainly deals with stains such as dust and hair, while the wet mopping mainly deals with adhesive stains that are difficult to clean. Due to complex working conditions of the ground in the home, it is often necessary to mix the two modes. In the prior art, when performing cleaning work, the user needs to observe a working condition of the robot on site. When seeing the robot complete wet mopping work or dry mopping work, the user manually enters an instruction to control the robot to start the wet mopping mode or the dry mopping mode again. The manner is relatively complex.

[0083] In an embodiment of this application, a default

working mode of the cleaning robot is: performing dry mopping work first and then performing wet mopping work. That is, when the user starts the cleaning robot to enter the working state, the cleaning robot may first perform dry mopping on a working region, and then perform wet mopping on the working region when it is detected that the dry mopping work is completed. In this way, the defect that when the user performs the wet mopping on the working region without vacuuming the working region, garbage such as hair tends to stick to various places of the working region can be prevented. Further, the cleaning robot can intelligently switch between a dry mopping working mode and a wet mopping working mode during work, wet mopping work is automatically performed after dry mopping is completed in a region, and the user neither needs to observe the working condition of the robot on site nor needs to manually control the robot to start the wet mopping mode according to a condition in which the robot completes the dry mopping, thereby saving the time of the user and improving the user experience in the manner in this embodiment.

[0084] Certainly, in another embodiment, the user may change the default working mode in the APP or man-machine interaction on the body of the cleaning robot according to an actual stain condition on the ground in the home of the user or the requirements of the user. For example, the default working mode is changed to a condition such as only dry mopping, only wet mopping, or wet mopping first and then dry mopping. This is not limited in this application.

[0085] In an embodiment of this application, after building a map, the robot may divide the working region into at least one preset region in a region division manner preset in the APP of the cleaning robot, or the user may divide the working region into at least one preset region according to the requirements of the user. After region division is performed, the robot may first perform dry mopping on one of the at least one preset region according to the working mode of dry mopping first and then wet mopping. After the robot determines, according to a moving path recorded in the map or a moving distance recorded by a sensor carried by the robot, that the robot has completed the dry mopping on the preset region, the robot continues to perform wet mopping on the preset region. After the robot has completed the wet mopping work, the robot may continue to perform the dry mopping work and the wet mopping work similar to the foregoing manner on another preset region according to program setting. Certainly, after building the map and performing the region division, the robot may alternatively first perform the dry mopping on the entire working region, and then perform the wet mopping work on the entire region after determining that the dry mopping work on the entire working region is completed.

[0086] Further, in an embodiment of this application, after it is detected that the wet mopping work is completed, the cleaning robot may be controlled to perform the dry mopping on the working region, so that the user can enter the working region as soon as possible without dirtying the wet working region. If liquids such as coffee and milk are detected on regions when the cleaning robot performs the dry mopping work, the regions may be prevented from being cleaned first. The regions are cleaned after the cleaning robot is subsequently changed to the wet mopping mode, to overcome a defect that other regions are contaminated by these liquids when cleaning is performed by using a dry mop with these liquids attached. Corresponding to the working mode of the cleaning robot, a corresponding quantity of dry mops and a corresponding quantity of wet mops are placed on the base station, or only a dry mop is placed on the base station, and the liquid supply device conveys a liquid to the mopping module to perform wet mopping.

[0087] In an embodiment of this application, before performing wet mopping or dry mopping, the cleaning robot is controlled to transfer information that a mop is to be replaced to the user, or the cleaning robot is controlled to at least replace a mop. After the user receives a reminder message on the robot or the APP that the mop needs to be replaced, the user may choose to manually replace or choose to control the robot to automatically replace the mop or the mopping module, and the mop is detachably mounted on the mopping module. Therefore, only the mop may be replaced during replacement. After completing the dry mopping, the cleaning robot may alternatively automatically return to the base station to replace the mop with a new mop, and after the mop is replaced with the new mop, the wet mopping work is performed. When the mop for dry mopping is used for wet mopping, due to the fact that the mop for dry mopping is often in a dirtied state, if the mop for dry mopping is directly wetted, stains (dust and hair) on the mop for dry mopping are brought onto the ground on which the wet mopping is about to be performed, resulting in secondary contamination of the wetly mopped ground, and the wet mopping cleaning efficiency is reduced. Therefore, the mop is replaced when the robot is controlled to switch between different modes, to ensure that the robot can achieve an optimal cleaning effect when entering a new cleaning mode for working.

[0088] In an embodiment of this application, before performing the wet mopping, the cleaning robot may sufficiently wet the mop by using the following means, so that at a beginning stage of the wet mopping mode, water injected to the mop may be fully spread over the mop within a short period of time, and an area of the wetted mop is increased, thereby improving the cleaning efficiency of the mopping robot at the beginning stage of the wet mopping. When the cleaning robot performs normal wet mopping work, the liquid supply device may convey the liquid to the mopping module according to a preset power and a preset period of time. Therefore, before starting the wet mopping, the cleaning robot may increase a power of conveying the liquid when the liquid supply device works normally, that is, the liquid may be conveyed to the liquid supply device according to a power

greater than the preset power before the wet mopping work is started, and the power is reduced to a power during normal work after the liquid supply device works for a period of time. Similarly, the liquid may be alternatively conveyed to the liquid supply device according to a period of time greater than the preset period of time, and the conveying time is reduced to a conveying time during normal work after the liquid supply device works for a period of time.

[0089] In another embodiment of this application, before starting the wet mopping, the cleaning robot may be alternatively controlled to wet the mop in a manner of moving according to a preset path, for example, the mopping robot is controlled to start to move in a manner such as forward, backward, or turning according to the program, so that the accumulated liquid conveyed onto the mop is completely absorbed by the mop, to perform large-area wetting of the mop. After finishing mounting the mop and moving to a starting position in a state in which the mopping module is lifted, the cleaning robot may move forward and backward in the vicinity of the starting point to wet the mop, and after it is detected that the mop is fully wetted, the cleaning robot may be controlled to move to the starting position of the wet mopping, and to start the wet mopping from the starting position. The cleaning robot fully wets the mop before performing the wet mopping, to overcome the defect that the cleaning effect is relatively poor when the mop is wetted only in the vicinity of a water seepage point.

[0090] In an embodiment of this application, after the cleaning robot completes all mopping work in the working region, the control module may control the cleaning robot to transfer information about unloading of the wiping member to the user, or to at least unload the wiping member. After the cleaning robot completes the mopping work in the working region required to be cleaned by the user, the cleaning robot may be controlled to transfer information about unloading of the mop to the user, or unload the mop, or unload the mopping module; or may transfer information that the mop is to be replaced to the user, or replace the mop, or replace the mopping module. By using the method in this embodiment, it may be ensured that after the entire mopping work is completed, no old mop that has been contaminated exists on the cleaning robot, and the phenomenon of mildewing and stinking due to the fact that the old mop is not cleaned in time is avoided. Further, the unloaded wiping member may be further recycled, thereby preventing the old mop that is unloaded on the ground or the bottom plate of the base station from contaminating the home of the user. Specifically, the information about unloading of the mop may be sent to the user by using a signal sending module, or the user is notified of unloading of the mop by using an indication unit installed on the body, or the cleaning robot may go to the base station to unload the mop autonomously. When the user manually unloads the old mop on the robot, the user may directly remove the old mop, or may mount a new mop on the robot. When the robot is controlled to autonomously unload the mop, the robot may return to the base station to unload the dirty mop. As shown in FIG. 1, the cleaning robot moves to the base station and completes the unloading of the old mop in the first operation position 201, the old mop is recycled to the old mop groove 204 by using the mop replacement device of the base station 300 after the cleaning robot exits the base station, and then the robot directly travels into the base station and stands by, or the cleaning robot may have the new mop mounted and stand by. This is not limited in this application. Subsequently, after mops recycled to the old mop groove 204 reach a specific quantity, the user can collectively process the old mops in the old mop groove.

[0091] In an application scenario, the user controls, in the APP, the robot to work according to a default working mode of" dry mopping first and then wet mopping", and controls the robot to perform dry mopping first and then wet mopping on the working region. After receiving an instruction from the user, the robot may first perform dry mopping work on the working region; and during the dry mopping, the liquid conveying device is controlled to be in a locked and closed state, and after the dry mopping of the entire working region is completed, the robot automatically returns to the base station to replace a mop. After the mop is replaced, the robot is controlled to move to a starting point to start the wet mopping work when the mopping module is in a lifted state, and after the robot moves to the starting point, the mopping module is put down, and a liquid is conveyed by using the liquid conveying device, to implement wet mopping. Before the wet mopping is started, the mop is fully wetted with a liquid by increasing a power of conveying the liquid by using the liquid conveying device and by controlling the robot to advance or draw back in the vicinity of the starting point. After it is detected that the mop is fully wetted with the liquid, the robot returns to the starting point and starts wet mopping, and after the wet mopping work of the entire working region is completed, the robot is controlled to return to the base station to unload the old mop, mount the new mop and stand by.

[0092] In an embodiment of this application, in the wet mopping mode, when it is detected that the cleaning robot is in a preset condition described below, the control module may limit the liquid supply device in conveying the liquid to the mopping module. The problem that in the prior art, when the cleaning robot encounters a condition such as no electricity or stuck, the uninterrupted water supply of a water tank causes damage to the mop due to soaking or accumulation of large amounts of water on the ground to damage the floor due to soaking is resolved, to protect the cleaning robot, protect the floor from being damaged by soaking of the liquid, and ensure a mopping effect. Limiting the liquid supply device in conveying the liquid to the mopping module may be controlling the liquid supply device to stop conveying the liquid to the mopping module or be controlling the liquid supply device to convey less liquid to the mopping module than the case that

the liquid supply device conveys the liquid in the wet mopping mode.

[0093] In an embodiment of this application, when the cleaning robot is in the wet mopping mode and in a case that it is detected that the cleaning robot is abnormal, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0094] In an embodiment of this application, the control module limits the liquid supply device in conveying the liquid to the mopping module in an abnormal case that it is detected that the cleaning robot is trapped or stuck or the controller fails, for example, an abnormal case that the cleaning robot is trapped by an obstacle or a driving wheel falls into a recessed region.

[0095] In another embodiment of this application, the cleaning robot may further include a mop detection device 90 electrically connected to the control module. The mop detection device 90 is configured to detect whether a mop is mounted on the cleaning robot before or during mopping work of the cleaning robot. If the mop is not mounted on the cleaning robot, the control module limits the liquid supply device in conveying the liquid to the mop; and if the mop is mounted on the cleaning robot, the mopping work is started. The mop may be magnetically connected to the mopping plate. Therefore, in this embodiment, the mop detection device 90 may be a Hall sensor.

[0096] In an embodiment of this application, when the cleaning robot is in the wet mopping mode and in a case that it is detected that the mopping module is at a non-mopping height within a preset period of time, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0097] In an embodiment of this application, the cleaning robot further includes a lifting mechanism, and the control module controls the lifting mechanism to lift the mopping module from a first position relative to the working surface during mopping work to a second position. When the mopping module is in the wet mopping mode and in a case that it is detected that the mopping module is in a lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module. The preset period of time may be set autonomously by the user or preset in an APP system. This is not limited in this application.

[0098] Specifically, the control module controls the lifting mechanism to lift the mopping module from the first position relative to the working surface to the second position in the following conditions, and the conditions may include, but not limited to, at least one of the following: the cleaning robot returning to a base station for replacing the mopping module and the cleaning robot being in a standby and mopping-paused state. When the cleaning robot is trapped or stuck in the mopping process, to prevent the mopping module from damaging the floor due to soaking, the lifting mechanism may be controlled to lift the mopping module from the first position relative to the working surface to the second position, and liquid supply is limited.

[0099] In an embodiment of this application, when the cleaning robot detects a non-working surface during work, the control module controls the lifting mechanism to lift the mopping module from the first position relative to the working surface to the second position, to control the cleaning robot to cross the non-working surface. When the cleaning robot crosses the non-working surface and in a case that it is detected that the mopping module is in the lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module. Further, after it is detected that the cleaning robot crosses the non-working surface, the control module controls the lifting mechanism to lower the mopping module from the second position relative to the working surface to the first position, and the liquid supply device conveys the liquid to the mopping module.

[0100] In an application scenario shown in FIG. 13 to FIG. 16 in which the non-working surface is a carpet, when the cleaning robot detects a carpet 35 in the process of mopping in a first position 34 relative to the ground, the control module controls the lifting mechanism to lift the mopping module 40 from the first position 34 relative to the ground to a second position 36, to control the cleaning robot to cross the carpet. When the cleaning robot crosses the carpet, the mopping module 40 is always in a lifted state, and when the cleaning robot crosses the carpet, the liquid supply device stops conveying the liquid to the mopping module, to ensure that a mop is not dirtied by the floor and the carpet is not wetted by the mop. After it is detected that the cleaning robot crosses the carpet, the control module controls the lifting mechanism to lower the mopping module from the second position 36 to the first position 34, and the liquid supply device recovers conveying of the liquid to the mopping module, to ensure that the robot can perform mopping work normally.

[0101] In another embodiment of this application, when the cleaning robot is in the wet mopping mode and when the cleaning robot replaces the mop or the mopping module, the control module limits the liquid supply device in conveying the liquid to the mopping module.

[0102] In another embodiment of this application, when it is detected that the cleaning robot is currently in at least one of the following mopping conditions, for example, the cleaning robot is in a dry mopping mode, the cleaning robot returns to the base station for charging, and the cleaning robot is in a state of charging, because of a condition that all or part of moving elements of the mopping robot leaves the ground when the cleaning robot is picked up by the user or encounters an obstacle and is lifted, or another condition, the control module may control the liquid supply device to stop conveying the liquid to the mopping module.

[0103] In this embodiment of this application, in the wet mopping process, when it is detected that the abnormal condition or the lifted state or a condition that part of the elements leaves the ground is released, for example, an abnormality such as a fault of the controller is repaired,

or the robot returns to the ground, the control module controls the liquid supply device to recover the normal liquid supply to the mopping module.

[0104] In this embodiment, the cleaning robot can control, according to a current mopping condition detected by at least one sensor that is disposed below, the liquid conveyed by the liquid supply device to the mopping module, thereby ensuring a mopping effect.

[0105] In this embodiment of this application, the cleaning robot may further include a humidity detection device, and the liquid supply device is controlled, based on a current mopping condition detected by the humidity detection device, to convey the liquid to the mopping module. The current mopping condition may include, but is not limited to, at least one of the following: mop humidity, ground humidity, environment humidity, and the like. A specific application scenario is described below.

[0106] In an embodiment, the humidity detection device may include a mop humidity sensor, and the control module controls, based on mop humidity detected by the mop humidity sensor, the liquid conveyed by the liquid supply device. Preferentially, the mop humidity sensor such as a capacitive sensor and/or a current sensor may be mounted below the body. The current mopping condition is monitored by using the mop humidity detected by the mop humidity sensor and the mop humidity is sent to the control module. The control module controls, based on the mop humidity detected by the mop humidity sensor, an amount of liquid conveyed by the liquid conveying device. Specifically, when the mop humidity is greater than a preset threshold, the liquid conveying device is controlled to output a liquid at a rate lower than a current liquid output rate. Conversely, when the mop humidity is less than the preset threshold, the liquid conveying device is controlled to output the liquid at a rate higher than the current liquid output rate. The preset threshold may be set by the user according to a current ground condition, and preset thresholds in different regions may be different.

[0107] In another embodiment, the humidity detection device may include an environment humidity detection device, and the liquid conveyed by the liquid supply device may be controlled based on environment humidity detected by the environment humidity detection device. The environment humidity detection device may control, based on the environment humidity detected in a local and/or remote manner, the liquid conveyed by the liquid supply device. The environment humidity detection device may be an air humidity sensor or a humidity measurement instrument mounted on the cleaning robot. The air humidity sensor or the humidity measurement instrument may be mounted at a position at a specific distance from a water source of the cleaning robot, so that a liquid in the cleaning robot is prevented from affecting a measurement result of the environment humidity detection device, and environment humidity of the cleaning robot is detected more accurately, thereby controlling, based on the detected environment humidity, the liquid conveyed by the liquid supply device. The cleaning robot may alternatively detect the environment humidity in a remote manner. In this case, the cleaning robot gets access to a network in a manner such as a cellular manner or Wi-Fi, and the cleaning robot receives a weather condition sent by a server side, and controls, based on the weather condition, the amount of liquid conveyed by the liquid conveying device. When the environment humidity is greater than a preset threshold, the liquid conveying device is controlled to output a liquid at a rate lower than the current liquid output rate. Conversely, when the environment humidity is less than the preset threshold, the liquid conveying device is controlled to output the liquid at a rate higher than the current liquid output rate. The preset threshold may be set by the user according to a current ground condition, and preset thresholds in different regions may be different.

[0108] In another embodiment, the humidity detection device may include a ground humidity sensor such as a visual sensor and/or a radar sensor, and the control module may control, based on ground humidity detected by the ground humidity sensor, the liquid conveyed by the liquid supply device, and may update a humidity value of the region in a mopping APP in real time according to the detected ground humidity. The ground humidity sensor can control, based on the detected ground humidity condition or a degree of dryness, the liquid conveyed by the liquid supply device. Generally, the cleaning robot may perform mopping according to a preset moving path. However, for some regions, when the cleaning robot detects that a ground is relatively dry in the regions, more liquid may be sprayed or a working time of the cleaning robot may be increased, and the cleaning robot stops cleaning the regions when a ground state detected by the ground sensor meets a preset cleaning requirement; or when the cleaning robot detects that a ground is relatively wet in some regions, the liquid conveying device may reduce an amount of conveyed liquid or stop conveying the liquid. For example, when the cleaning robot passes through the same region in a short period of time, the liquid conveying device may be controlled to reduce or stop liquid supply, so that the liquid is prevented from being wasted or wheels are prevented from slipping when the robot moves. In a specific application scenario, after the robot completes the mopping in some regions, when the robot turns and repeatedly moves to some positions in these regions, there are excessive liquids on the ground to cause the robot to slip or waste liquids if the liquid supply continues, so that when it is detected that the robot repeatedly moves in the same region within a short period of time, the liquid conveying device may be controlled to stop liquid supply.

[0109] In an embodiment of this application, the cleaning robot may further include a ground sensor such as a visual sensor and/or a radar sensor, a ground state is detected by using the ground sensor, and the ground state is sent to the control module, so that the control module can control the liquid conveyed by the liquid sup-

ply device. Specifically, the ground state may include a ground material or the like. The ground sensor may detect a material such as a floor or a tile of the working surface. The control module may control, based on the ground state detected by the ground sensor, the amount of liquid conveyed by the liquid conveying device to the mopping module. When the cleaning robot detects that the ground material is a wood floor, a water output amount of the liquid conveying device may be controlled, a water supply amount of a mop is appropriately reduced, and the wood floor may be prevented from being damaged due to an excessive amount of water. In an embodiment, the ground sensor includes a visual sensor, and the control module may determine a material of the working surface according to a ground image obtained by the visual sensor. In another embodiment, the ground sensor may include a radar sensor, and the control module may determine a type of the working surface according to a detection result of the radar sensor.

[0110] In an embodiment, the cleaning robot may further include a signal sending device. The signal sending device may send the current mopping condition (which may include: the mop humidity, the ground humidity, the environment humidity, or the like) detected by the humidity detection device or the ground state detected by the ground sensor to the user. For example, in addition to reading ground humidity in a current region from a display on the body of the cleaning robot, the user may further read the ground humidity in the current region from the mopping APP according to the ground humidity sent by the signal sending device to the user. When the user feels that an amount of liquid may be increased or decreased during mopping, the user may also send a corresponding signal to the cleaning robot, so that the control module can control, based on the instruction sent by the user, the liquid conveyed by the liquid supply device. The liquid supply device in the cleaning robot is intelligently controlled in the above manner to convey the liquid to the mopping module, thereby improving the user experience of the cleaning robot.

[0111] Further, in an embodiment of this application, the cleaning robot may include a navigation mechanism. The user may specify regions in the working region map of the cleaning robot formed by the navigation mechanism and set a liquid condition required by the cleaning robot in each region, so that the control module can control, based on the liquid condition, the liquid reservoir to convey a corresponding liquid in each region, or determine, according to ground humidity in a current region updated by the ground humidity sensor in real time, whether a liquid supply condition of the current region meets a requirement of the user. If the liquid supply condition does not meet the requirement of the user, the liquid is continuously supplied, and if the liquid supply condition meets the requirement of the user, the mopping work on the current region may be stopped. In this embodiment, the navigation mechanism may include, but is not limited to, at least one of the following: an ultrasonic sensor, an optical sensor (which includes an LDS or the like), a UWB sensor, and an inertial navigation system.

[0112] In an embodiment of this application, the cleaning robot may further include a liquid level monitoring device disposed in the liquid reservoir. In an embodiment, when the liquid level monitoring device finds that a liquid level in the liquid reservoir is lower than a preset threshold, a notification message that an amount of liquid in the cleaning robot is insufficient may be sent to the user, and the notification message may include a period of time for which the remaining liquid in the cleaning robot can still be used at a current liquid output rate. When receiving the notification message, the user may choose not to respond, may control the cleaning robot to pause working, or may choose to lower a liquid output rate, or choose to add a liquid to the cleaning robot.

[0113] In another embodiment, the cleaning robot may further include an indication device such as a light emitting indication device (for example, an LED) or a sounding indication device, and the indication device may be configured to indicate whether an amount of liquid in the cleaning robot is sufficient or may be configured to indicate whether the liquid reservoir is mounted on the robot. When the amount of liquid is insufficient, the indication unit may issue a voice message of "Master, The Amount of Water is Insufficient, Please Add Water". A state in which the indication device is when the amount of liquid is not lower than the preset threshold is different from a state in which the indication device is when the amount of liquid is lower than the preset threshold, and the user monitors conditions of the liquid level in the liquid reservoir by observing different states of the indication device. By reminding the user that the amount of liquid is insufficient, the defect that a cleaning effect is worsened due to lack of liquid is prevented, and a mopping effect of the cleaning robot is improved.

[0114] Further, the cleaning robot may further include at least two liquid reservoirs, and the at least two liquid reservoirs are symmetrically disposed on two sides of the body. Different types of liquids are placed into the two liquid reservoirs respectively, and the control module controls liquid conveying devices corresponding to the liquid reservoirs to work synchronously or asynchronously, thereby cleaning different types of stains. Certainly, the cleaning robot may further include more than two liquid reservoirs such as three liquid reservoirs or four liquid reservoirs, and the same type of liquid or different types of liquids may be placed into the different liquid reservoirs according to actual needs. This is not limited in this application.

[0115] The cleaning robot may include a ground sensor such as a visual sensor, a ground state is detected by using the ground sensor, and the ground state is sent to the control module, so that the control module can control an amount of liquid conveyed by each of the two liquid reservoirs and a type of the liquid. The ground state may include a ground material and/or a ground stain type. The ground sensor can control, based on a detected ground

material condition and a condition of whether the ground stain is an oil stain or dust, the amount of liquid conveyed by each of the two liquid reservoirs to the mop. The amount of conveyed liquid may be zero, that is, only one of the liquid reservoirs may be controlled to be used Generally, the cleaning robot may perform mopping according to a preset moving path. However, for some regions, when the cleaning robot detects that a ground is relatively dry in the regions and has more oil stains, more liquid may be sprayed or a working time of the cleaning robot may be increased, and the cleaning robot stops cleaning the regions when a ground state detected by the ground sensor meets a preset cleaning requirement. In this embodiment, the liquids conveyed by the two liquid reservoirs to the mopping module may be respectively controlled, and the cleaning robot stops cleaning the regions when the ground state detected by the ground sensor meets the preset cleaning requirement.

[0116] The cleaning robot may further include a navigation mechanism. The user may specify regions in the working region map of the cleaning robot formed by the navigation mechanism, and set a liquid output amount and a type of liquid required by the cleaning robot in each region, so that the control module can control, based on the liquid output amount and the type of liquid, the liquid conveying device to convey the corresponding amount of liquid and the type of liquid in each region.

[0117] The cleaning robot may further include a signal sending device. The signal sending device may send mop humidity detected by the humidity sensor or a ground state detected by the ground sensor to the user, and the user may read a current mopping condition in a display on the body of the cleaning robot or may read a current mopping condition in the mopping APP. For example, when the user feels that an amount of liquid may be increased or decreased during mopping, the user may also send a corresponding signal to the cleaning robot, so that the control module can control, based on the instruction from the user, the amount of liquid conveyed by the liquid conveying device and the type of liquid. The instruction may be sent by using the mopping APP or may be directly entered by the user on an interaction interface of the cleaning robot. The mopping humidity and the type of mopping liquid of the cleaning robot are intelligently controlled in the above manner, and the user experience of the cleaning robot is improved. Further, the cleaning robot may further include liquid level monitoring devices respectively disposed in the two liquid reservoirs. The liquid level monitoring devices are configured to monitor whether liquid levels in the liquid reservoirs are lower than a preset threshold, and the cleaning robot may also include indication devices that respectively correspond to the two liquid level monitoring devices and that are used for indicating liquid level conditions.

[0118] The following descriptions are made respectively by using specific embodiments of two liquid reservoirs.

[0119] Each of FIG. 5 and FIG. 6 shows a condition that there are two liquid reservoirs. It should be noted that the "first" and "second" in front of various devices in this application are intended to distinguish the two devices as different devices and do not have other special meanings. For example, a first hose and a second hose in the following are both hoses, but are two different hoses. Meanwhile, only two liquid reservoirs are used as an example for description in this application. More than two liquid reservoirs may be alternatively used, and the principle is the same. Details are not described in this application again.

[0120] FIG. 5 shows a condition of two liquid conveying devices and two liquid reservoirs. A first liquid reservoir 511 is connected to a first liquid conveying device 501 by a first hose 521, a second liquid reservoir 512 is connected to a second liquid conveying device 502 by a second hose 522, the first liquid conveying device 501 and the second liquid conveying device 502 are electrically connected to the control module respectively, and the control module may select, based on a current mopping requirement, the first liquid conveying device 501 or the second liquid conveying device 502 to simultaneously or separately convey liquid to a mop, or may select an amount of liquid simultaneously or separately conveyed by the first liquid conveying device 501 or the second liquid conveying device 502 to a mop, thereby ensuring a mopping effect. For example, clean water is stored in the first liquid reservoir 511, a cleaning solution is stored in the second liquid reservoir 512, the control module controls the first liquid conveying device 501 to work when the ground sensor detects that only dust exists on the ground, and the first liquid reservoir 511 conveys the clean water to the first liquid conveying device 501 by using the first hose 521, so that the first liquid conveying device 501 conveys the clean water to the mop, to remove the dust on the ground by using the clean water. When the ground sensor detects that an oil stain further exists on the ground, the control module controls the first liquid conveying device 501 to work and meanwhile also controls the second liquid conveying device 502 to work, that is, the first liquid reservoir 511 conveys the clean water to the first liquid conveying device 501 by using the first hose 521, and meanwhile the second liquid reservoir 512 also conveys the cleaning solution to the second liquid conveying device 502 by using the second hose 522, so that the second liquid conveying device 502 conveys the cleaning solution to the mop. Because a concentration of the cleaning solution is relatively high, a working time of the second liquid conveying device 502 may be controlled to be less than a specific preset threshold. When clean water mixed with the cleaning solution at a suitable concentration has been adjusted is stored in the second liquid reservoir 512, and when the ground sensor detects that the oil stain still exists on the ground, only the second liquid conveying device 502 may be controlled to work, to remove the oil stain on the ground by using the clean water mixed with the cleaning solution at the suitable concentration has been adjusted. When the

humidity detection device detects that mop humidity is greater than a preset threshold, the first liquid reservoir 511 is controlled to output the clean water at a rate lower than a current liquid output rate. When the user labels a region that needs to be cleaned with the cleaning solution for a plurality of times on the map formed for the robot, the cleaning robot repeatedly cleans the region. When the ground sensor detects that there are more oil stains on a region, the cleaning robot may repeatedly clean the region.

[0121] FIG. 6 shows a condition of a single liquid conveying device and two liquid reservoirs. A third liquid reservoir 513 is connected to a third liquid conveying device 503 by a third hose 523, and a fourth liquid reservoir 514 is connected to the third liquid conveying device 503 by a fourth hose 524. In one case, a first valve 531 is mounted only on the fourth hose 524, the first valve 531 is opened and closed under the control of the control module, a liquid in the fourth liquid reservoir 514 is controlled to flow to the third liquid conveying device 503, and the control module selects, based on a current mopping requirement, whether to open the first valve 531. For example, clean water is stored in the third liquid reservoir 513, a cleaning solution is stored in the fourth liquid reservoir 514, the control module controls the third liquid conveying device 503 to work when the ground sensor detects that only dust exists on the ground, and the third liquid reservoir 513 conveys the clean water to the third liquid conveying device 503 by using the third hose 523. When the ground sensor detects that an oil stain further exists on the ground, the control module controls the first valve 531 to be opened, to control the cleaning solution stored in the fourth liquid reservoir 514 to flow to the third liquid conveying device 503, that is, the third liquid reservoir 513 conveys the clean water to the third liquid conveying device 503 by using the third hose 523, and meanwhile the fourth liquid reservoir 514 also conveys the cleaning solution to the third liquid conveying device 503 by using the fourth hose 524, so that the third liquid conveying device 503 conveys the clean water containing the cleaning solution to a mop. Because a concentration of the cleaning solution is relatively high, a working time of the first valve may be controlled to be less than a specific preset threshold, thereby cleaning different types of stains. In another case, the first valve 531 is mounted on the fourth hose 524, and similar to the first valve 531, a second valve (not shown in the figure) is mounted on the third hose 523. The first valve 531 and the second valve are opened and closed under the control of the control module, to control liquids in the fourth liquid reservoir 514 and the third liquid reservoir 513 to flow to the third liquid conveying device 503, and the control module selects, based on a current mopping requirement, whether to open the first valve 531 and the second valve (not shown in the figure). For example, the clean water is stored in the third liquid reservoir 513, and clean water mixed with the cleaning solution at a suitable concentration has been adjusted is stored in the fourth liquid reservoir 514. When the ground sensor detects that only the dust exists on the ground, the control module controls only the second valve (not shown in the figure) to be opened, to control the third liquid conveying device 503 to work, and the third liquid reservoir 513 conveys the clean water to the third liquid conveying device 503 by using the third hose 523, to remove the dust on the ground by using the clean water. When the ground sensor detects that the oil stain further exists on the ground, the control module controls the first valve 531 to be opened, to control the clean water mixed with the cleaning solution at the suitable concentration has been adjusted and that is stored in the fourth liquid reservoir 514 to flow to the third liquid conveying device 503, that is, the fourth liquid reservoir 514 conveys, by using the fourth hose 524, the clean water mixed with the cleaning solution at the suitable concentration has been adjusted to the third liquid conveying device 503, to remove the oil stain on the ground by mopping by using the liquid, thereby cleaning different types of stains.

[0122] The foregoing embodiments only show several implementations of the present invention and are described in detail, but they should not be construed as a limit to the patent scope of the present invention. It should be noted that a person of ordinary skill in the art may further be make several variations and improvements without departing from the concept of the present invention, and these variations and improvements all fall within the protection scope of the present invention. Therefore, the protection scope of the patent of the present invention shall be topic to the appended claims.

Claims

1. A cleaning robot, configured to move and work in a working region, the cleaning robot comprising:

   a body;
   a moving mechanism, configured to support the body and driving the cleaning robot to move on a working surface in the working region;
   a power module, configured to provide a driving force for the cleaning robot to move and work;
   a mopping module, configured to be mounted on the body and perform predetermined mopping work, wherein a wiping member is capable of being mounted on the mopping module; and
   a control module, configured to be electrically connected to and control the power module, to implement automatic moving and automatic working of the cleaning robot; wherein,
   the cleaning robot further comprising: a liquid supply device electrically connected to the control module, wherein in a wet mopping mode, when a preset condition is met, the control module limits the liquid supply device in conveying a liquid to the mopping module.

2. The cleaning robot according to claim 1, wherein when the cleaning robot is in the wet mopping mode and in a case that it is detected that the cleaning robot is abnormal, the control module limits the liquid supply device in conveying the liquid to the mopping module.

3. The cleaning robot according to claim 2, wherein in an abnormal case that it is detected that the cleaning robot is trapped or stuck, the control module limits the liquid supply device in conveying the liquid to the mopping module.

4. The cleaning robot according to claim 2, wherein the cleaning robot further comprises a mop detection device electrically connected to the control module, the mop detection device is configured to detect whether the wiping member is mounted on the cleaning robot, and in an abnormal case that the mop detection device detects that the wiping member is not mounted on the cleaning robot, the control module limits the liquid supply device in conveying the liquid to the mopping module.

5. The cleaning robot according to claim 1, wherein when the cleaning robot is in the wet mopping mode and in a case that it is detected that the mopping module is at a non-mopping height within a preset period of time, the control module limits the liquid supply device in conveying the liquid to the mopping module.

6. The cleaning robot according to claim 5, wherein the cleaning robot further comprises a lifting mechanism, the control module controls the lifting mechanism to lift the mopping module from a first position relative to the working surface during the mopping work to a second position, and when the mopping module is in the wet mopping mode and in a case that it is detected that the mopping module is in a lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module.

7. The cleaning robot according to claim 5, wherein the control module controls a lifting mechanism to lift the mopping module from a first position relative to the working surface to a second position in the following conditions, and the conditions comprise at least one of the following: the cleaning robot returning to a base station for replacing the mopping module, the cleaning robot being in a standby state, and the cleaning robot being trapped or stuck.

8. The cleaning robot according to claim 6, wherein in a case that a non-working surface is detected, the control module controls the lifting mechanism to lift the mopping module from the first position relative to the working surface to the second position, to control the cleaning robot to cross the non-working surface, and in a case that it is detected that the mopping module is in the lifted state within the preset period of time, the liquid supply device is limited in conveying the liquid to the mopping module.

9. The cleaning robot according to claim 8, wherein after it is detected that the cleaning robot crosses the non-working surface, the control module controls the lifting mechanism to lower the mopping module from the second position relative to the working surface to the first position, and the liquid supply device conveys the liquid to the mopping module.

10. The cleaning robot according to claim 1, wherein when the cleaning robot is in the wet mopping mode and in a case that the cleaning robot is at least replacing the wiping member, the control module limits the liquid supply device in conveying the liquid to the mopping module.

11. The cleaning robot according to any one of claims 1 to 10, wherein the limiting, by the control module when a preset condition is met, the liquid supply device in conveying a liquid to the mopping module comprises:
controlling, by the control module when the preset condition is met, the liquid supply device to stop conveying the liquid to the mopping module.

12. A control method for a cleaning robot, wherein a cleaning robot comprises a mopping module for performing predetermined mopping work, and the method comprises:

controlling the cleaning robot to enter a wet mopping mode; and
limiting conveying of a liquid to the mopping module when a preset condition is met.

13. The method according to claim 12, wherein the limiting conveying of a liquid to the mopping module comprises:
stopping conveying the liquid to the mopping module.

14. The method according to claim 12, wherein the limiting conveying of a liquid to the mopping module when a preset condition is met comprises:
performing control to convey the liquid to the mopping module when the preset condition is not met.

15. A control method for a cleaning robot, the cleaning robot moves and works in a working region, wherein the cleaning robot comprises a mopping module configured to perform predetermined mopping work and a liquid supply device, a working mode of the clean-

ing robot comprises dry mopping or wet mopping, the liquid supply device is controlled in the dry mopping mode to be in a closed state, the liquid supply device is controlled in the wet mopping mode to convey a liquid to the mopping module, and the working region comprises at least one preset region; and

the method comprises:
controlling the cleaning robot to perform dry mopping on the preset region; and
controlling the cleaning robot to perform wet mopping on the preset region if it is detected that the cleaning robot completes the dry mopping on the preset region.

16. The method according to claim 15, wherein a wiping member is capable of being mounted on the mopping module, and before the performing wet mopping on the preset region, the method further comprises:
controlling the cleaning robot to transfer information that the wiping member is to be replaced to a user, or controlling the cleaning robot to at least replace the wiping member.

17. The cleaning robot according to claim 15, wherein after the cleaning robot completes dry mopping work and wet mopping work on the working region, the control module controls the cleaning robot to transfer information about unloading of the wiping member to a user, or controls the cleaning robot to at least unload the wiping member.

18. The cleaning robot according to claim 15, wherein the working region is divided into at least one preset region in a preset and/or user-defined manner.

19. The method according to claim 15, wherein the method further comprising:
controlling the cleaning robot to perform dry mopping on the working region if it is detected that the cleaning robot completes wet mopping on the working region.

20. The method according to claim 15, wherein the cleaning robot comprises the liquid supply device configured to convey the liquid to the mopping module, and when the cleaning robot performs wet mopping work, the liquid supply device conveys the liquid to the mopping module according to a preset power and a preset period of time; and
before the performing wet mopping on the working region, the method further comprises:
controlling the cleaning robot to wet a wiping member in at least one of the following manners, the manners comprising: conveying the liquid to the liquid supply device according to a power greater than the preset power and conveying the liquid to the liquid supply device according to a period of time greater than the preset period of time.

21. The method according to claim 15, wherein before the performing wet mopping on the working region, the method further comprises:
controlling the cleaning robot to wet a wiping member in a manner of moving according to a preset path before starting the wet mopping.

22. The method according to claim 21, wherein the controlling the cleaning robot to perform wet mopping on the preset region, the method further comprises:
controlling the cleaning robot to move to a starting position of the dry mopping in the preset region, and to start the wet mopping from the starting position.

23. A cleaning robot, configured to move and work in a working region, wherein the cleaning robot comprises a mopping module configured to perform predetermined mopping work and a liquid supply device, a working mode of the cleaning robot comprises dry mopping or wet mopping, the liquid supply device is controlled in the dry mopping mode to be in a closed state, the liquid supply device is controlled in the wet mopping mode to convey a liquid to the mopping module, and the working region comprises at least one preset region; and
the cleaning robot further comprises a control module, and the control module controls the cleaning robot to perform dry mopping on the preset region and controls the cleaning robot to perform wet mopping on the preset region if it is detected that the cleaning robot completes the dry mopping on the preset region.

24. The cleaning robot according to claim 23, wherein a wiping member is capable of being mounted on the mopping module, and before the wet mopping is performed on the preset region, the control module controls the cleaning robot to transfer information that the wiping member is to be replaced to a user, or control the cleaning robot to at least replace the wiping member.

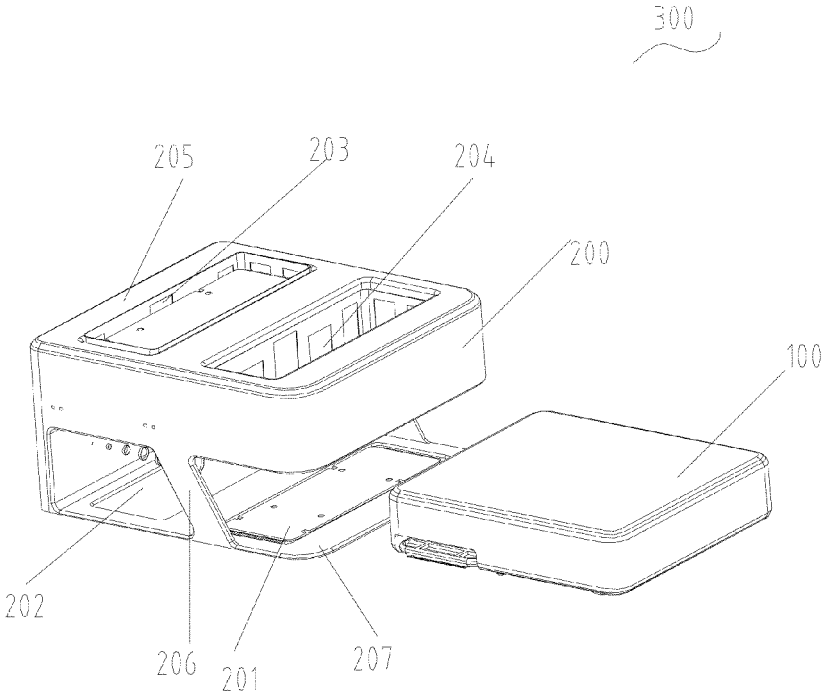

FIG. 1

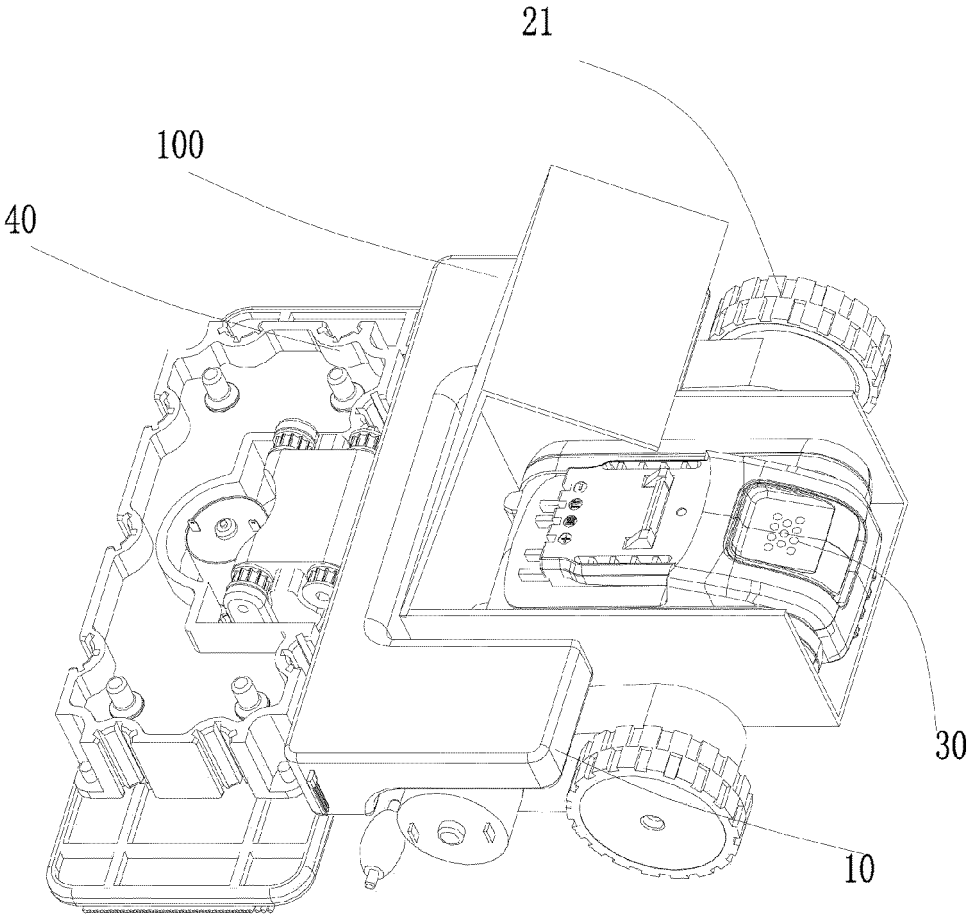

FIG. 2

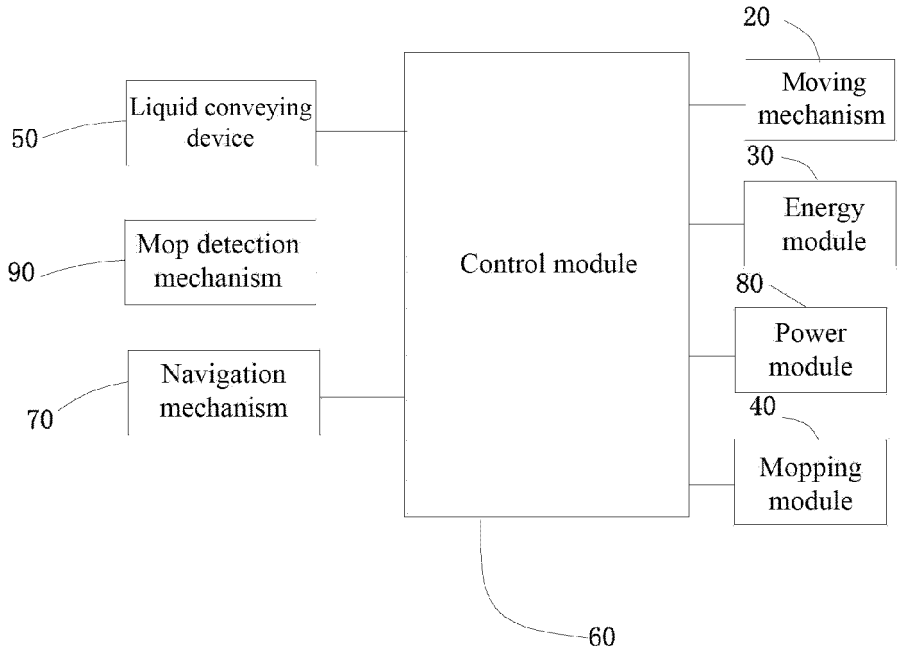
20
Moving mechanism
50
Liquid conveying device
30
Energy module
Control module
90
Mop detection mechanism
80
Power module
70
Navigation mechanism
40
Mopping module
60

FIG. 3

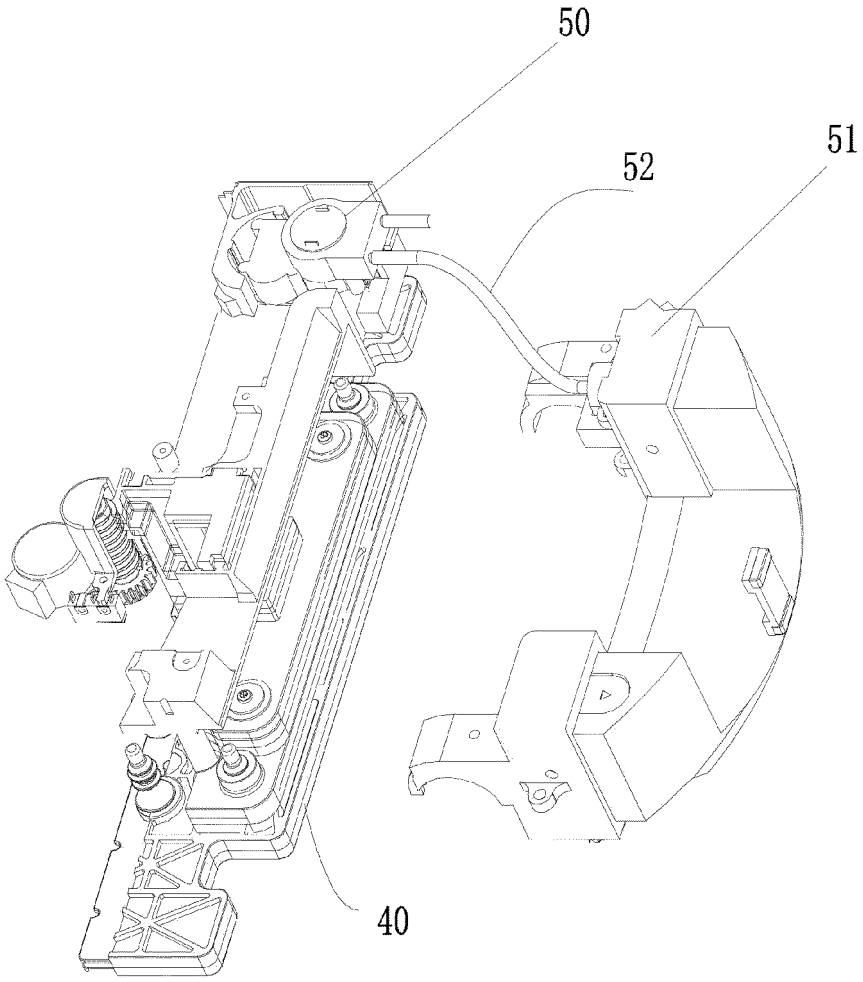

FIG. 4

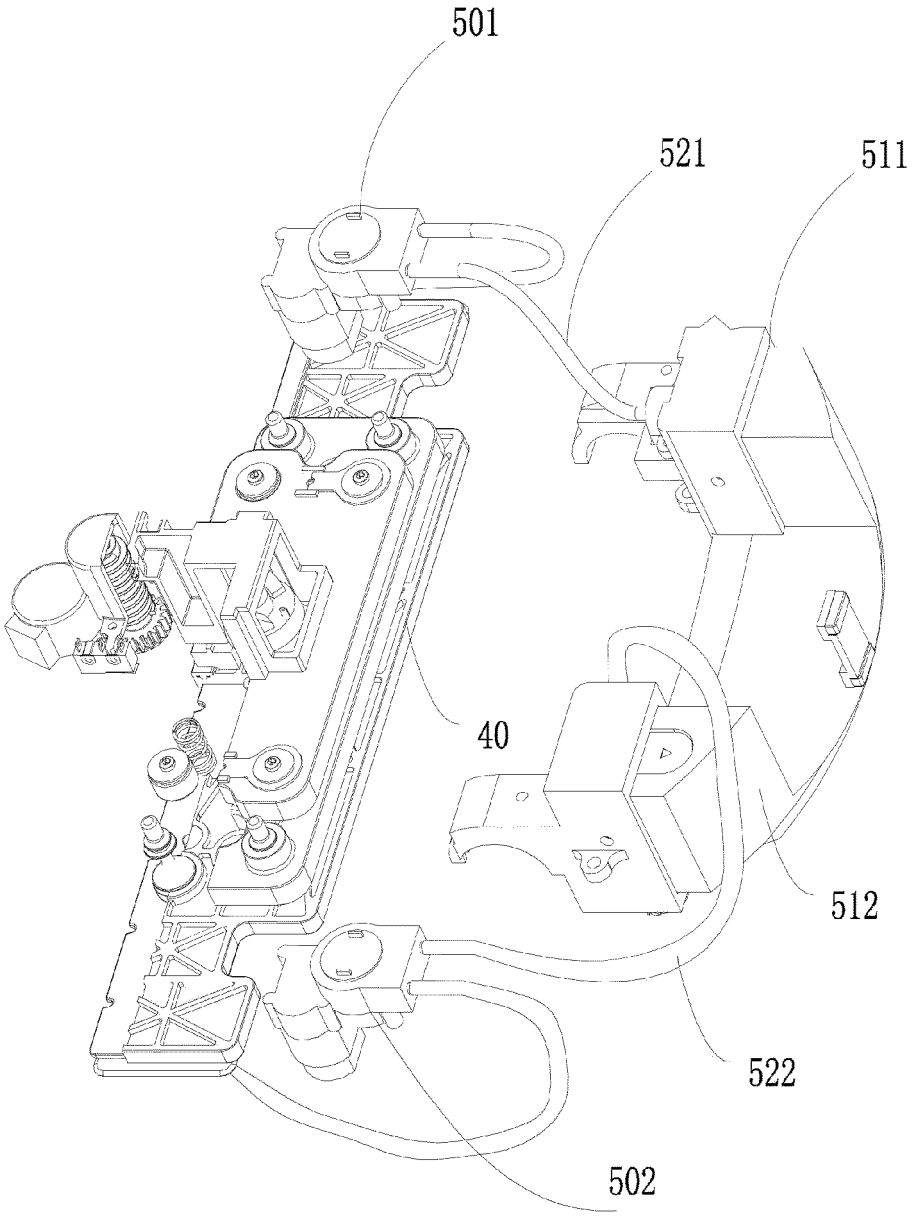

FIG. 5

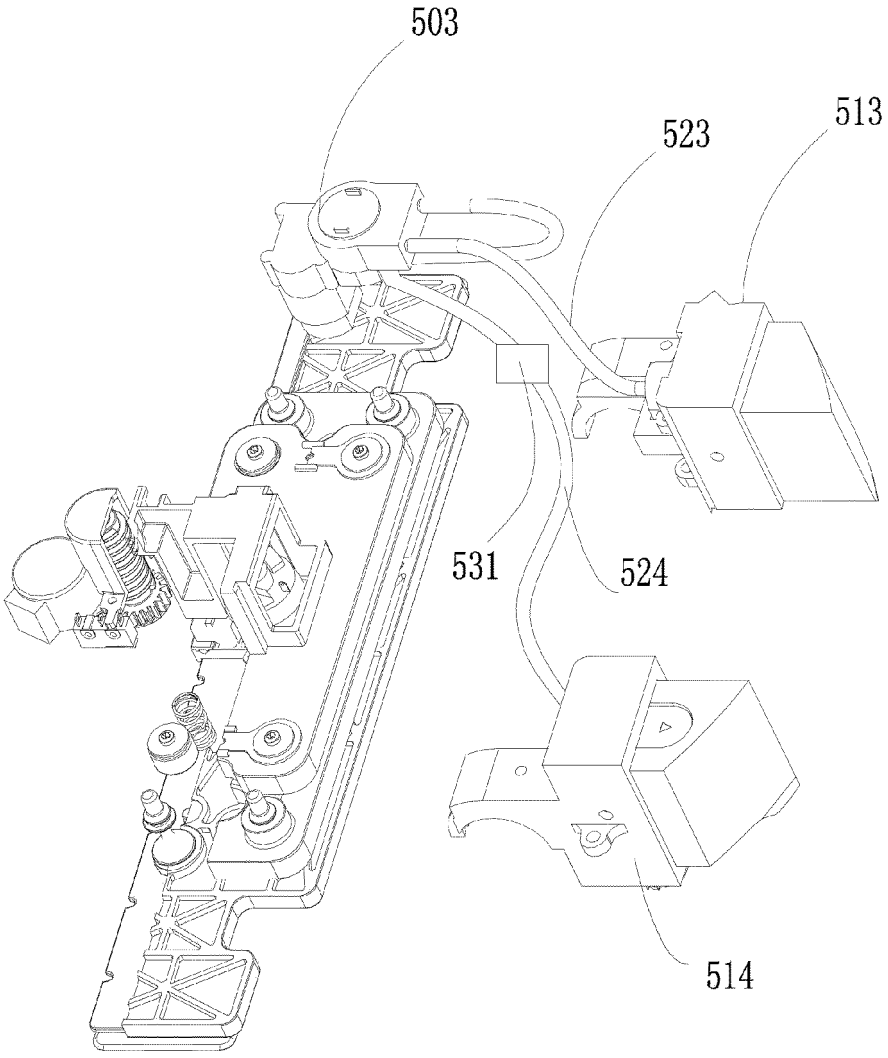

FIG. 6

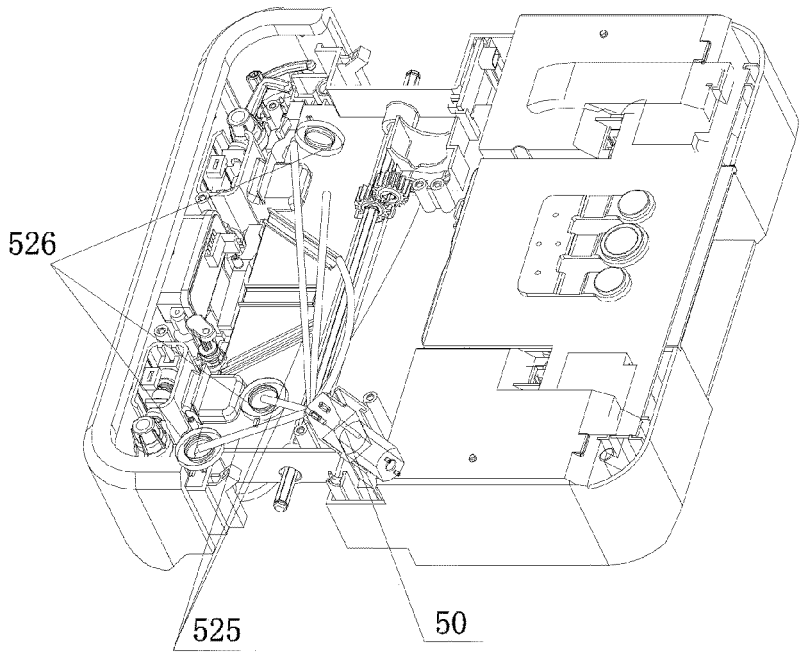

FIG. 7

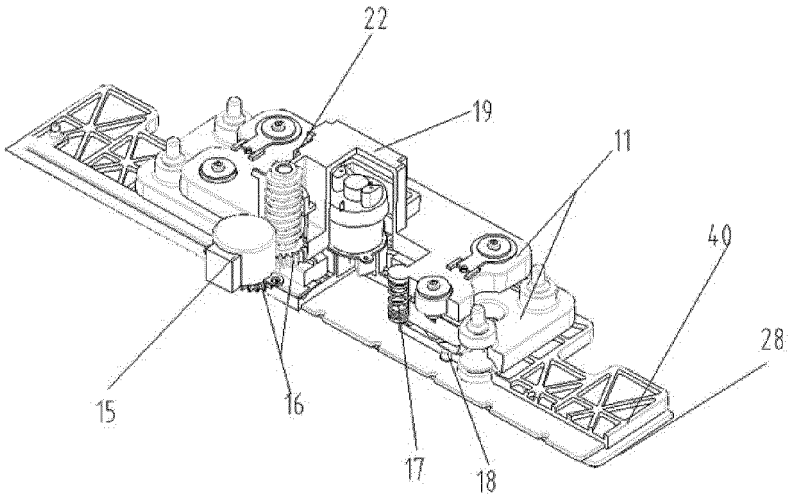

FIG. 8

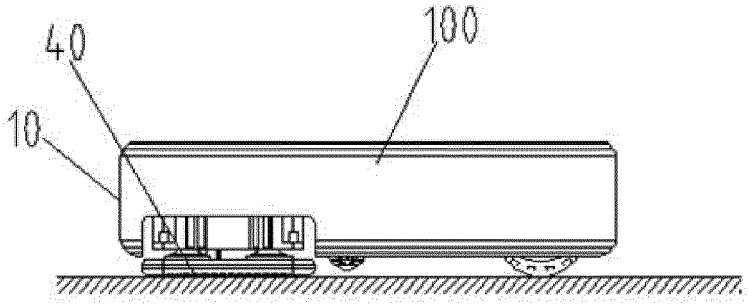

FIG. 9

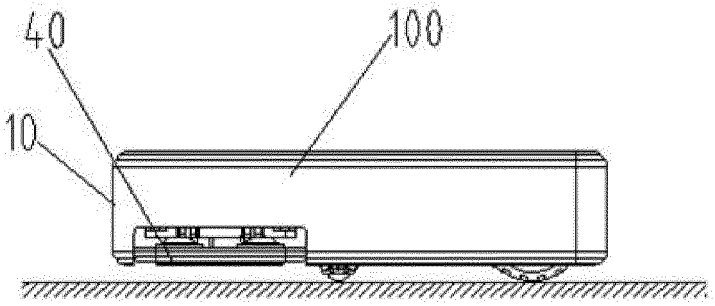

FIG. 10

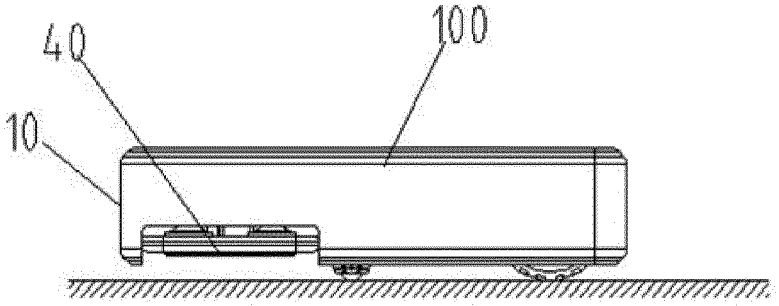

FIG. 11

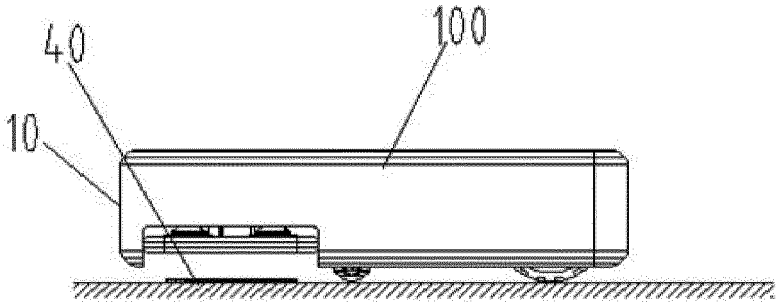

FIG. 12

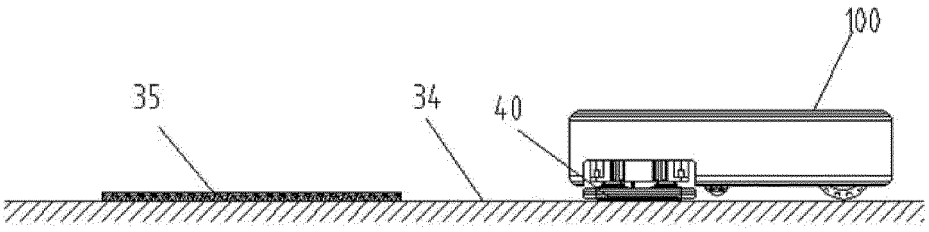

FIG. 13

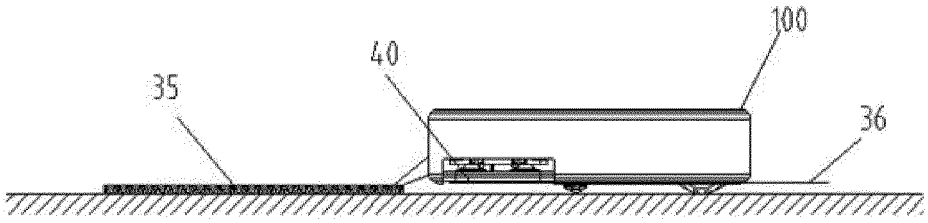

FIG. 14

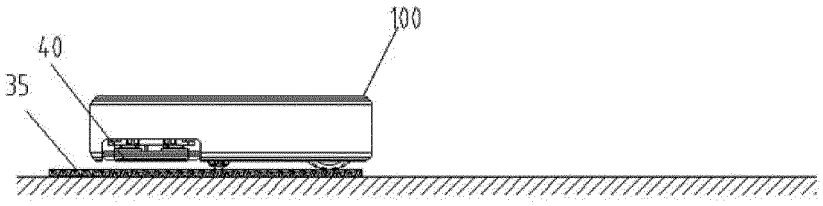

FIG. 15

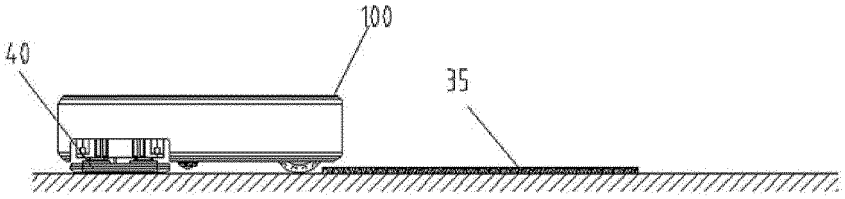

FIG. 16

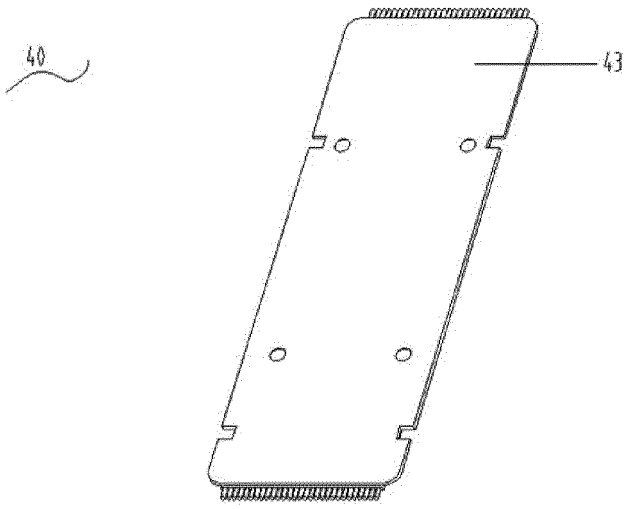

FIG. 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/127044

A. CLASSIFICATION OF SUBJECT MATTER

A47L 11/24(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: 扫地, 拖地, 擦地, 清洁, 机器人, 液, 水, 剂, 限制, 停止, 切断, 断开, 干, 湿, 控制; WPI, EPODOC: wash, clean, sweep, mop, robot, liquid, water, agent, fluid, detergent, restrict, stop, limit, stint, cutoff, disconnect, dry, wet, control

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109077673 A (XIAOGOU ELECTRICAL APPLIANCE INTERNET TECHNOLOGY BEIJING CO., LTD.) 25 December 2018 (2018-12-25) description, paragraphs 0048-86, figures 1-4	1-14
PX	CN 109222769 A (XIAOGOU ELECTRICAL APPLIANCE INTERNET TECHNOLOGY BEIJING CO., LTD.) 18 January 2019 (2019-01-18) description, paragraphs 0035-0075, figures 1-4	1-14
PX	CN 109316131 A (XIAOGOU ELECTRICAL APPLIANCE INTERNET TECHNOLOGY BEIJING CO., LTD.) 12 February 2019 (2019-02-12) description, paragraphs 0041-0089	1-14
X	CN 106335067 A (QINGDAO TAB ROBOT TECH CO., LTD.) 18 January 2017 (2017-01-18) description, paragraphs 0021-0043, figures 1-2	1-14
X	CN 106377206 A (QINGDAO TAB ROBOT TECH CO., LTD.) 08 February 2017 (2017-02-08) description, paragraphs 0021-0042, figures 1-2	1-14
X	JP H0833598 A (FUJI HEAVY IND. LTD.) 06 February 1996 (1996-02-06) description, paragraphs 0012-0044, figures 1-7	1-14

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 February 2020	**19 March 2020**
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**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/127044

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 108742341 A (WUHU JINZHIWANG MECH EQUIPMENT CO LTD) 06 November 2018 (2018-11-06) description, paragraphs 0025-0029, figure 1	15-24
A	JP H0994197 A (FUJITSU GENERAL LTD.) 08 April 1997 (1997-04-08) entire document	1-24
A	WO 2007129976 A1 (SUPERCLEAN SCANDINAVIA AB.) 15 November 2007 (2007-11-15) entire document	1-24

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/127044

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 109077673 A	25 December 2018	None	
CN 109222769 A	18 January 2019	None	
CN 109316131 A	12 February 2019	None	
CN 106335067 A	18 January 2017	None	
CN 106377206 A	08 February 2017	None	
JP H0833598 A	06 February 1996	JP 3516720 B2	05 April 2004
CN 108742341 A	06 November 2018	None	
JP H0994197 A	08 April 1997	None	
WO 2007129976 A1	15 November 2007	SE 529307 C2	26 June 2007
		SE 200601014 A	26 June 2007

Form PCT/ISA/210 (patent family annex) (January 2015)