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(54) **CLEANING DEVICE**

(57) A cleaning device, comprising a water pumping apparatus (30), a cleaning area (10a) and a work execution mechanism (20). The water pumping apparatus (30) comprises a receiving part (31) and a transitional connecting mechanism (33). An accommodating space (310) and a water outlet (30b) that communicates with the accommodating space (310) are formed in the receiving part (31), and the water outlet (30b) communicates with the cleaning area (10a). The transitional connecting mechanism (33) is in drive connection with the

work execution mechanism (20), and the transitional connecting mechanism (33) may pump water in the accommodating space (310) into the cleaning area (10a) under the drive of the work execution mechanism (20). The cleaning device uses the ready-made work execution mechanism (20) as a power source, and drives a water pumping operation by means of the transitional connecting mechanism (33) without the need for control by means of a control circuit. The apparatus has high structural reliability and low fabrication costs.

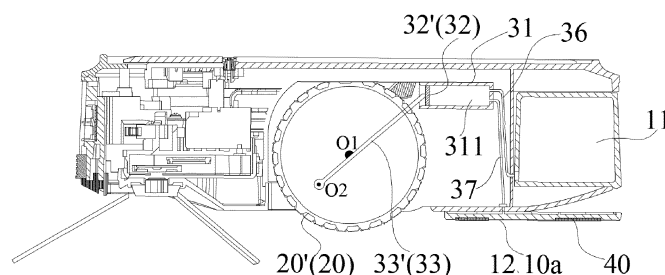


FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese Patent Application No. 201910621671.2, filed on July 10, 2019, the application of which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present application relates to the field of cleaning technology, and in particular to a cleaning device.

BACKGROUND

[0003] A floor cleaning robot is taken as an example. The floor cleaning robot is provided with a water tank and a water pump. A cleaning cloth is installed at the bottom of the floor cleaning robot, a water inlet pipe of the water pump is connected to the water tank, and a drain pipe of the water pump is connected to the cleaning cloth. When the floor cleaning robot mops the floor, water or cleaning agent in the water tank is pumped to the cleaning cloth by means of the water pump, thereby supplying water to the cleaning cloth. The supply amount of water to the cleaning cloth is determined by the displacement and the working time of the water pump.

[0004] As an electronic component, the water pump has relatively low reliability under different temperature and humidity condition, which may reduce the working reliability of the floor cleaning robot and affect user experience.

SUMMARY

[0005] In view of the above, embodiments of the present application desire to provide a cleaning device having high cleaning reliability.

[0006] In order to achieve the above objective, an embodiment of the present application provides a cleaning device, comprising a water pumping device, a cleaning area and an execution mechanism. The water pumping device comprises an accommodating portion and a transitional connecting mechanism. An accommodating space and a water outlet in communication with the accommodating space are formed in the accommodating portion, and the water outlet is also in communication with the cleaning area. The transitional connecting mechanism is connected to the execution mechanism in a manner that the transitional connecting mechanism can be driven by the execution mechanism, and the transitional connecting mechanism may be able to pump water in the accommodating space to the cleaning area under the drive of the execution mechanism.

[0007] In some embodiments, the execution mechanism comprises at least one of a traveling wheel and a

roller brush.

[0008] In some embodiments, the water pumping device comprises a water pumping portion, the transitional connecting mechanism is connected between the execution mechanism and the water pumping portion; the water pumping portion is movably arranged in the accommodating space, the accommodating portion and the water pumping portion jointly define a water reservoir cavity, and the water pumping portion is able to pump water in the water reservoir cavity to the cleaning area.

[0009] In some embodiments, the accommodating portion is cylindrical, the water pumping portion is a piston, and the piston reciprocates linearly in the accommodating portion.

[0010] In some embodiment, the transitional connecting mechanism is a crank, a first end of the crank is connected to a side of the piston facing away from the water reservoir cavity, a second end of the crank is rotatably connected to the execution mechanism, the execution mechanism has a first rotation axis, a second end of the crank has a second rotation axis, the first rotation axis and the second rotation axis are eccentrically arranged with respect to one another, and the execution mechanism drives the piston to reciprocate linearly by means of the crank.

[0011] In some embodiments, the transitional connecting mechanism comprises a cam, a sliding rod and an elastic member, an end of the sliding rod is rotatably connected to the piston, and the elastic member applies a force toward the cam on the sliding rod to press an other end of the sliding rod against a circumferential surface of the cam, the execution mechanism has the first rotation axis, the cam is coaxially and fixedly connected to the execution mechanism, and the execution mechanism drives the piston by means of the cam and the sliding rod to reciprocate linearly.

[0012] In some embodiments, the accommodating portion is in a volute shape, the water pumping portion is a rotor, the rotor rotates in the accommodating portion, and the rotor pumps the water in the water reservoir cavity to the cleaning area during rotation.

[0013] In some embodiments, the execution mechanism has the first rotation axis, the rotor has a third rotation axis, the first rotation axis and the third rotation axis are parallel to but eccentric with respect one another, and the transitional connecting mechanism is able to transmit torque of the execution mechanism to the rotor.

[0014] In some embodiments, the transitional connecting mechanism is a conveyor belt or a gear structure.

[0015] In some embodiments, the cleaning device comprises a water tank, the accommodating portion is formed to be at least a part of the water tank, and the water pumping portion is located inside of the water tank.

[0016] In some embodiments, the cleaning device comprises a water tank, the accommodating portion is located outside the water tank, the accommodating portion is provided with a water inlet that is in communication with the water reservoir cavity, and in communication with

the water tank.

[0017] In some embodiments, the water pumping device comprises a first check valve, and the first check valve is arranged in a waterway between the water inlet and the water tank; and/or the water pumping device comprises a second check valve, and the second check valve is arranged in a waterway between the water outlet and the cleaning area.

[0018] In some embodiments, the accommodating portion is cylindrical in shape, the water pumping portion is a piston, and the piston reciprocates linearly in the accommodating portion, and the piston alternately introduces the water in the water tank into a water supply cavity and pumps the water in the water reservoir cavity into the cleaning area.

[0019] In some embodiments, the water inlet and the water outlet are arranged at an end of the accommodating portion in a sliding direction of the piston.

[0020] In some embodiments, the execution mechanism is a traveling wheel, and the transitional connecting mechanism is connected to a side of the traveling wheel in an axial direction.

[0021] In some embodiments, the transitional connecting mechanism is connected to an axial inner side of the traveling wheel.

[0022] In some embodiments, the cleaning device is a floor cleaning robot or a window cleaning robot.

[0023] The cleaning device of the embodiments of the present application uses the existing execution mechanism as a power source, to allow a water pumping operation by means of the transitional connecting mechanism, that is, the embodiments of the present application use a mechanical manner to drive the water pumping action. The supply amount of water desired by the cleaning area is determined by the action of the execution mechanism and the volume of the accommodating space for storing water, without using a control circuit. Compared with the water pump water supply method in conventional art, the water pumping device of the embodiments of the present application has high structural reliability and practicability, and low fabrication costs, which is conducive to popularization and use.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a partial schematic view of a cleaning device of an embodiment of the present application, in which a first rotation axis is reducible to point O1, and a second rotation axis is reducible to point O2.

FIG. 2 is a schematic view of a water pumping device and a traveling wheel of an embodiment of the present application.

FIG. 3 is a schematic view of a water pumping device and a traveling wheel of another embodiment of the

present application, in which a first rotation axis is reducible to point O1.

Description of Reference Numerals

[0025] Water tank 11; Bracket 12; Cleaning area 10a; Execution mechanism 20; Traveling wheel 20'; Water pumping device 30; Accommodating portion 31; Accommodating space 310; Water reservoir cavity 311; Water inlet 31a; Water outlet 30b; Water pumping portion 32; Piston 32'; Transitional connecting mechanism 33; Crank 33'; Cam 331; Sliding rod 332; Flange structure 3321; Elastic member 333; First check valve 34; Second check valve 35; Water inlet pipe 36; Water outlet pipe 37; Cleaning member 40

DETAILED DESCRIPTION

[0026] It is to be noted that embodiments in the present application and technical features in the embodiments may be combined with each other if there is no conflict. The detailed description in the specific embodiments should be understood as an explanation of the purpose of the present application and should not be regarded as an improper limitation of the present application.

[0027] The embodiments of the present application provide a cleaning device, which may be able to clean items to be cleaned such as floor, glass and the like, and when the cleaning device works, the cleaning device is placed on a surface of the cleaning media.

[0028] The cleaning device may be a floor cleaning robot, a window cleaning robot, or may be a similar type of device, which is not limited herein. In the embodiments of the present application, a floor cleaning robot is taken as an example of the cleaning device.

[0029] Referring to FIG. 1, a cleaning device comprises a water pumping device 30, a cleaning area 10a and an execution mechanism 20. The water pumping device 30 comprises an accommodating portion 31 and a transitional connecting mechanism 33. An accommodating space 310 and a water outlet 30b in communication with the accommodating space 310 are formed in the accommodating portion 31, and the water outlet 30b is in communication with the cleaning area 10a, for example, by means of a water outlet pipe 37. The transitional connecting mechanism 33 is in connection with the execution mechanism 20, and the transitional connecting mechanism 33 may pump water in the accommodating space 310 to the cleaning area 10a under the drive of the execution mechanism 20.

[0030] The cleaning device of the embodiments of the present application uses the existing execution mechanism 20 as a power source, to allow a water pumping operation by means of the transitional connecting mechanism 33. The supply amount of water desired by the cleaning area 10a is determined by the action of the execution mechanism 20 and the volume of the accommodating space 310 for storing water, without using a control

circuit. Compared with the water pump water supply method in conventional art, the water pumping device 30 of the embodiments of the present application has high structural reliability and practicability, and low fabrication costs, which is conducive to popularization and use.

[0031] It should be noted that the execution mechanism 20 refers to an external execution mechanism for realizing the cleaning function of the cleaning device, for example, a traveling wheel 20' or a roller brush. The traveling wheel 20' executes the traveling function of the cleaning device, the cleaning device may realize continuous cleaning work by traveling of the traveling wheel 20'; and the roller brush may allow the cleaning device to wipe and clean the items.

[0032] The cleaning area 10a refers to the area configure to contact the cleaning member 40. The cleaning member 40 may be cleaning cloth, sponge, etc. For example, referring to FIG. 1, the cleaning area 10a may be the bottom of a bracket 12 for installing the cleaning member 40. Before the cleaning device works normally, the cleaning member 40 is installed at the bottom of the bracket 12, the water in the accommodating space 310 is pumped to the cleaning area 10a, and the water pumped to the cleaning area 10a is absorbed by the cleaning member 40. Then, during the traveling process of the cleaning device, the cleaning member 40 wipes and cleans the items to be cleaned.

[0033] It should be noted that the transitional connecting mechanism 33 may pump the water in the accommodating space 310 to the cleaning area 10a by an additional structure, or may pump the water in the accommodating space 310 to the cleaning area 10a without additional structure. For example, the transitional connecting mechanism 33 is driven by the execution mechanism 20 to continuously pump air or other gas to the accommodating space 310 unidirectionally, and the water is the accommodating space 310 is pumped to the cleaning area 10a under air pressure.

[0034] In the embodiments of the present application, the transitional connecting mechanism 33 pumps the water in the accommodating space 310 to the cleaning area 10a by the additional structure. Specifically, the water pumping device 30 comprises a water pumping portion 32 movably arranged in the accommodating space 310. The water pumping portion 32 and the accommodating portion 31 together define a water reservoir cavity 311. The water pumping portion 32 can pump the water in the water reservoir cavity 311 to the cleaning area 10a, that is, the transitional connecting mechanism 33 pumps the water in the accommodating space 310 to the cleaning area 10a by the water pumping portion 32. In the embodiments of the present application, the power is transmitted to the water pumping portion 32 by means of the transitional connecting mechanism 33, and then the Water pumping portion 32 is driven to perform drainage operation. In this way, a greater pressure may be directly applied to the water in the water reservoir cavity 311, and the water in the water reservoir cavity 311 may be reliably

pumped to the cleaning area 10a.

[0035] The specific structure of the accommodating portion 31 is not limited thereto, as long as it can contain a certain volume of water. In some embodiments, the cleaning device comprises a water tank 11, in which a certain volume of water or cleaning liquid is prestored. For ease of description, the embodiments of the present application are described by taking water as an example. The accommodating portion 31 may be at least a part of the structure of the water tank 11. For example, a part of the space in the water tank 11 is isolated to form the accommodating space of the accommodating portion 31, and the prestored water in the water tank 11 enters into the water reservoir cavity 311 through a through-hole with a certain diameter. In another example, the water tank 11 itself is the accommodating portion 31, and the space in the water tank 11 is the above-accommodating space 311.

[0036] In another example, referring to FIG. 1, in the embodiments of the present application, the accommodating portion 31 is located outside the water tank 11, the accommodating portion 31 is provided with a water inlet 31a in communication with the water reservoir cavity 311. The water inlet 31a is in communication with the water tank 11. It should be understood that the accommodating portion 31 may be fixedly connected to the water tank 11, or may be spaced apart from the water tank 11, which is not limited herein. In the embodiments of the present application, the accommodating portion 31 is arranged on the outer side of the water tank 11, so that, on the one hand, the water tank 11 is able to have a large volume in the limited space of the cleaning device and the water storage capacity is improved, on the other hand, relative positions between the water tank 11, the cleaning area 10a and the accommodating portion 31 may be flexibly arranged as long as the water tank, the cleaning area and the accommodating portion are in communication with one another by corresponding pipelines, so that the structural design of the cleaning device can be more flexible, and the structural layout of the cleaning device can be more reasonable and compact.

[0037] In the embodiments of the present application, the execution mechanism 20 is a traveling wheel 20', and the transitional connecting mechanism 33 is connected to the traveling wheel 20'. The rotation of the traveling wheel 20' is associated with the travel distance of the cleaning device, so that the movement amplitude of the water pumping portion 32 is associated with the travel distance of the cleaning device. Specifically, when the cleaning device does not travel, the traveling wheel 20' is stationary, the transitional connecting mechanism 33 remains stationary, and thus the water pumping portion 32 does not move. At this time, the cleaning member 40 does not perform wiping and cleaning work, and the water pumping device 30 does not output water to the cleaning area 10a. When the cleaning device travels a short distance, the rotation amplitude of the traveling wheel 20' is small, and the movement distance of the water pump-

ing portion 32 is also short, so the amount of outputted water pumped by the water pumping device 30 to the cleaning area 10a is also relatively small. In the case that the cleaning device travels a short distance, the supply amount of water desired by the cleaning member 40 is also small, so that the amount of water outputted by the water pumping device 30 to the cleaning member 40 can be better matched with the supply amount of water desired by the cleaning member 40. Similarly, when the cleaning device travels a large distance, the amount of outputted water pumped by the water pumping device 30 to the cleaning area 10a is large, and the supply amount of water desired by the cleaning member 40 is also large.

[0038] In one embodiment, the transitional connecting mechanism 33 is connected to a side of the traveling wheel 20' in its axial direction, which facilitates the connection between the transitional connecting mechanism 33 and the traveling wheel 20. Further, the transitional connecting mechanism 33 is connected to an axial inner side of the traveling wheel 20', so that the transitional connecting mechanism 33 will not be exposed to the outer side of the cleaning device. In the working process of the cleaning device, the transitional connecting mechanism 33 will not interfere with other objects in the external environment. Moreover, the layout of the water pumping device 30 is more reasonable and compact.

[0039] The accommodating portion 31 and the water pumping portion 32 may be in various forms. For example, in one embodiment, the accommodating portion is cylindrical, and correspondingly, the water pumping portion 32 is a piston 32'. In another embodiment, the accommodating portion 31 is volute, and the water pumping portion 32 is a rotor.

[0040] Relative positions of the water tank 11, the execution mechanism 20, the transitional connecting mechanism 33, and the cleaning area 10a may be appropriately changed as required.

[0041] The specific embodiments of the present application will be described below in conjunction with the drawings.

First Embodiment

[0042] Referring to FIG. 1 and FIG. 2, in this embodiment, the accommodating portion 31 is located outside the water tank 11. The accommodating portion 31 is cylindrical, one end of the accommodating portion 31 is a closed end, and the other end is an open end. The water pumping portion 32 is a piston 32', and the piston 32' reciprocates linearly in the accommodating portion 31, and the piston 32' alternately introduces the water in the water tank 11 into the water reservoir cavity 311 and then pumps the water in the water reservoir cavity 311 to the cleaning area 10a. That is to say, at the same time, the operation of introducing the water in the water tank 11 into the water reservoir cavity 311 and the operation of pumping the water in the water reservoir cavity 311 to

the cleaning area 10a cannot be performed simultaneously. Specifically, when the transitional connecting mechanism 33 drives the piston 32' to slide along a first direction (towards left side in FIG. 1), the volume of the water reservoir cavity 311 is increased, resulting in that a negative pressure is formed in the water reservoir cavity 311. The water in the water tank 11 is sucked into the water reservoir cavity 311 under the negative pressure. In this process, a waterway between the water outlet 30b and the cleaning area 10a is in a cut-off state. When the transitional connecting mechanism 33 drives the piston 32' to slide along a second direction (towards right side in FIG. 1), the piston 32' exerts a force onto the water in the water reservoir cavity 311, so that a certain water pressure suffice to pump the water to the cleaning area 10a is generated in the water in the water reservoir cavity 311. In this process, the waterway between the water inlet 31a and the water tank 11 is in a cut-off state.

[0043] In order to facilitate the opening and closing control of the waterway between the water inlet 31a and the water tank 11, and to facilitate the opening and closing control of the waterway between the water outlet 30b and the cleaning area 10a, valves may be arranged in the corresponding waterways so as to open or close them in time. The structure type of the valve is not limited, which may be an electric control valve, a hydraulic control valve and the like.

[0044] In this embodiment, the water pumping device 30 comprises a first check valve 34, the first check valve 34 is a hydraulic control valve, that is, it may be opened and closed without electromagnetic control. The first check valve 34 is arranged in the waterway between the water inlet 31a and the water tank 11. It should be understood that the first check valve 34 can allow water to flow unidirectionally from the side of the water tank 11 to the side of the water inlet 31a, that is, a liquid inlet end of the first check valve 34 is in communication with the water tank 11, and a liquid outlet end of the first check valve 34 is in communication with the water inlet 31a. The first check valve 34 is simple in structure, does not require electric control, and can be automatically opened and closed according to water pressure. For example, when the negative pressure in the water containing chamber 311 is greater than an opening pressure of the first check valve 34, the first check valve 34 is opened, and the water in the water tank 11 enters into the water reservoir cavity 311 through the first check valve 34 under the negative pressure of the water reservoir cavity 311. When a water pressure is generated in the water in the water reservoir cavity 311, the water pressure reversely acts on the first check valve 34, then the first check valve 34 is closed. The water pressure in the water tank 11 is insufficient to open the first check valve 34, and therefore, the first check valve 34 can stably and reliably and automatically stay in a cut-off state.

[0045] The water pumping device 30 comprises a second check valve 35, which is arranged in a waterway between the water outlet 30b and the cleaning area 10a.

The action principle and working process of the second check valve 35 are similar to those of the first check valve 34, and details will not be repeated here.

[0046] It should be understood that a combination of valves may be selected according to requirement. For example, in some embodiments, the above-mentioned second check valve 35 may be arranged in the waterway between the water outlet 30b and the cleaning area 10a, and an electric control valve or hydraulic control valve of other type is arranged in the waterway between the water inlet 31a and the water tank 11. In another embodiment, the above-mentioned first check valve 34 may be arranged in the waterway between the water inlet 31a and the water tank 11, while an electric control valve or electric control valve of other type is arranged in the waterway between the water outlet 30b and the cleaning area 10a.

[0047] The water outlet 30b is taken as an example. If the water outlet 30b is located on a sidewall of the accommodating portion 31, that is, a position at a non-closed end. When the piston 32' moves toward the closed end, if the piston 32' moves to block the water outlet 30b by a periphery of the piston 32', the water in the water reservoir cavity 311 cannot be discharged. Then, if the piston 32' is driven by the transitional connecting mechanism 33 to continue moving toward the closed end, the water in the water reservoir cavity 311 is compressed, the water pressure continues to rise, this may damage the piston 32', the accommodating portion 31, or the above-mentioned valve. Therefore, the device should be designed in such a way that the movement amplitude of the piston 32' cannot reach the water outlet 30b, but this will result in an increase in the size of the accommodating portion 31 in the movement direction of the piston 32' under the same conditions.

[0048] Therefore, in the embodiments of the present application, the water inlet 31a and the water outlet 30b are arranged at the end of the accommodating portion 31 in a sliding direction of the piston 32', that is, arranged at the closed end of the accommodating portion 31, so that the piston 32' can keep moving to a position in contact with the closed end, can make the structure of the accommodating portion 31 more compact under the same conditions, and can also prevent the water in water reservoir cavity 311 from being unduly compressed.

[0049] In the embodiment of the present application, referring to FIG. 2, the transitional connecting mechanism 33 is a crank 33'. Specifically, one end of the crank 33' is connected to one side of the piston 32' facing away from the water reservoir cavity 311, and the other end of the crank 33' is rotatably connected to the execution mechanism 20. The execution mechanism 20 has a first rotation axis (referring to O1 in FIG. 1), that is, the execution mechanism 20 is rotatable about the first rotation axis. The second end of the crank 33' has a second rotation axis (referring to point O2 in FIG. 1), the first rotation axis and the second rotation axis are eccentric with respect to one another, that is, when the crank 33' rotates with the rotation of the execution mechanism 20, it re-

volves around the first rotation axis and rotates about the second rotation axis. The execution mechanism 20 drives the piston 32' by means of the crank 33' to reciprocate linearly, that is to say, the execution mechanism 20, the crank 33' and the piston 32' form a slider-crank structure, and the crank 33' can convert the rotational movement of the execution mechanism 20 into a linear sliding movement of the piston 32'.

[0050] In this embodiment, the execution mechanism 20 is a traveling wheel 20'. It should be understood that the execution mechanism 20 may also be a roller brush or execution mechanism 20 of other type.

Second Embodiment

[0051] Referring to FIG. 3, the difference from the first embodiment is that the transitional connecting mechanism 33 comprises a cam 331, a sliding rod 332 and an elastic member 333. One end of the sliding rod 332 is rotatably connected (for example, hinged) with the piston 32'. The elastic member 333 applies a force toward the cam 331 on the sliding rod 332 to press the other end of the sliding rod 332 against a circumferential surface of the cam 331. The execution mechanism 20 has a first rotation axis, the cam 331 is coaxially and fixedly connected to the execution mechanism 20. That is, the execution mechanism 20 rotates about the first rotation axis, and the cam 331 also rotates about the first rotation axis.

[0052] Since the shape of the circumferential surface of the cam 331 is non-circular, the sliding rod 332 reciprocates linearly under the combined action of the elastic member 333 and the cam 331 when the cam 331 spins about the first rotation axis, thereby driving the piston 32' to reciprocate linearly.

[0053] Specifically, in the embodiment of the present application, the elastic member 333 is a spring mounted around the sliding rod 332. The sliding rod 332 guides the telescopic movement of the spring, to improve the reliability of the spring. One end of the spring abuts against a side of the piston 32' facing away from the water reservoir cavity 311. Further, continuing to refer to FIG. 3, a flange structure 3321 is formed in a circumferential direction of the sliding rod 332, and the other end of the spring abuts against a side of the flange structure 3321 facing the accommodating portion 31, that is, the spring is sandwiched between the flange structure 3321 and the piston 32'.

Third embodiment (not shown)

[0054] The difference from the first embodiment is that, the accommodating portion 31 is in a volute shape, and the water pumping portion 32 is a rotor. The rotor rotates in the accommodating portion 31, and synchronously introduces water in the water tank 11 into the water reservoir cavity 311 and pumps the water in the water reservoir cavity 311 to the cleaning area 10a. That is, while the

rotor is performing the operation process of introducing the water in the water tank 11 into the water reservoir cavity 311, it also performs the operation process of pumping the water in the water reservoir cavity 311 to the cleaning area 10a. The above two operation processes are performed simultaneously.

[0055] In this embodiment, the water inlet 31a and the water outlet 30b are respectively located on opposite sides of the rotor. The rotor divides the accommodating space 310 into a first cavity and a second cavity. The first cavity and the second cavity together form a water reservoir cavity 311. That is to say, the water inlet 31a is in communication with the first cavity, and the water outlet 30b is in communication with the second cavity. When the rotor rotates, the rotor squeezes water in the first cavity into the second cavity, and a negative pressure is generated in the first cavity. The water in the water tank 11 is sucked into the first cavity under the negative pressure, water in the second cavity has a certain water pressure, and the water in the second cavity is pumped to the cleaning area 10a under the water pressure.

[0056] The execution mechanism 20 has a first rotation axis, the rotor has a third rotation axis, the first rotation axis and the third rotation axis are parallel to but eccentric with respect to one another. The transitional connecting mechanism 33 can transmit torque of the execution mechanism 20 to the rotor. That is, the transitional connecting mechanism 33 is a torque transmission structure, for example, the transitional connecting mechanism 33 is a conveyor belt or a gear structure.

[0057] The various embodiments/implementations provided in the present application may be combined with each other without any contradiction.

[0058] The above description is only the preferred embodiments of the present application, and is not intended to limit the present application, and for those skilled in the art, the present application may have various modifications and changes. Any modification, equivalent replacement, improvement, etc. made according to the spirit and principle of the present application shall be regarded as within the protection scope of the present application.

Claims

1. A cleaning device, comprising a cleaning area, an execution mechanism and a water pumping device; wherein the water pumping device comprises:

an accommodating portion, the accommodating portion being provided with an accommodating space, and a water outlet in communication with the accommodating space and in communication with the cleaning area; and
a transitional connecting mechanism, the transitional connecting mechanism being connected to the execution mechanism in a manner that

the transitional connecting mechanism can be driven by the execution mechanism, wherein the transitional connecting mechanism is able to pump water in the accommodating space to the cleaning area under the drive of the execution mechanism.

2. The cleaning device of claim 1, wherein the execution mechanism comprises at least one of a traveling wheel and a roller brush.
3. The cleaning device of claim 1, wherein the water pumping device comprises a water pumping portion, the transitional connecting mechanism is connected between the execution mechanism and the water pumping portion; the water pumping portion is movably arranged in the accommodating space, the accommodating portion and the water pumping portion jointly enclose and define a water reservoir cavity, the water pumping portion is able to pump water in the water reservoir cavity to the cleaning area.
4. The cleaning device of claim 3, wherein the accommodating portion is cylindrical, the water pumping portion is a piston, the piston reciprocates linearly in the accommodating portion.
5. The cleaning device of claim 4, wherein the transitional connecting mechanism is a crank, a first end of the crank is connected to a side of the piston facing away from the water reservoir cavity, a second end of the crank is rotatably connected to the execution mechanism, the execution mechanism has a first rotation axis, the second end of the crank has a second rotation axis, the first rotation axis and the second rotation axis are eccentrically arranged with respect to one another, the execution mechanism drives the piston to reciprocate linearly by means of the crank.
6. The cleaning device of claim 4, wherein the transitional connecting mechanism comprises a cam, a sliding rod and an elastic member, an end of the sliding rod is rotatably connected with the piston, the elastic member applies a force toward the cam on the sliding rod to press an other end of the sliding rod against a circumferential surface of the cam, the execution mechanism has a first rotation axis, the cam is coaxially and fixedly connected to the execution mechanism, the execution mechanism drives the piston to reciprocate linearly by means of the cam and the sliding rod.
7. The cleaning device of claim 3, wherein the accommodating portion is in a volute shape, the water pumping portion is a rotor, the rotor rotates in the accommodating portion, the rotor pumps the water in the water reservoir cavity to the cleaning area during rotation.

8. The cleaning device of claim 7, wherein the execution mechanism has a first rotation axis, the rotor has a third rotation axis, the first rotation axis and the third rotation axis are parallel to but eccentric with respect one another, the transitional connecting mechanism is able to transmit a torque of the execution mechanism to the rotor. 5
9. The cleaning device of claim 8, wherein the transitional connecting mechanism is a conveyor belt or a gear structure. 10
10. The cleaning device of claim 3, wherein the cleaning device comprises a water tank, the accommodating portion is formed to be at least a part of the water tank, the water pumping portion is located inside of the water tank. 15
11. The cleaning device of claim 3, wherein the cleaning device comprises a water tank, the accommodating portion is located outside of the water tank, the accommodating portion is provided with a water inlet that is in communication with the water reservoir cavity and in communication with the water tank. 20
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12. The cleaning device of claim 11, wherein the water pumping device comprises a first check valve, the first check valve is arranged in a waterway between the water inlet and the water tank; and/or the water pumping device comprises a second check valve, the second check valve is arranged in a water way between the water outlet and the cleaning area. 30
13. The cleaning device of claim 11, wherein the accommodating portion is cylindrical, the water pumping portion is a piston, the piston reciprocates linearly in the accommodating portion, the piston alternately introduces the water in the water tank into the water supply cavity and pumps the water in the water reservoir cavity into the cleaning area. 35
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14. The cleaning device of claim 13, wherein the water inlet and the water outlet are arranged at an end of the accommodating portion in a sliding direction of the piston. 45
15. The cleaning device of any one of claims 1 to 14, wherein the execution mechanism is a traveling wheel, the transitional connecting mechanism is connected to a side of the traveling wheel in an axial direction. 50
16. The cleaning device of claim 15, wherein the transitional connecting mechanism is connected to an axial inner side of the traveling wheel. 55
17. The cleaning device of any one of claims 1 to 14, wherein the cleaning device is a floor cleaning robot or a window cleaning robot.

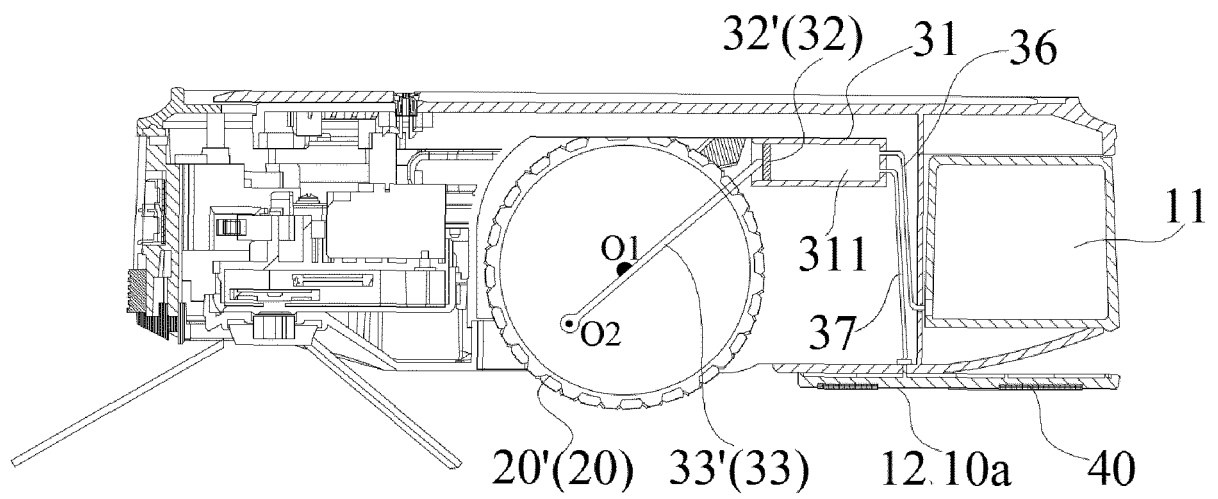


FIG. 1

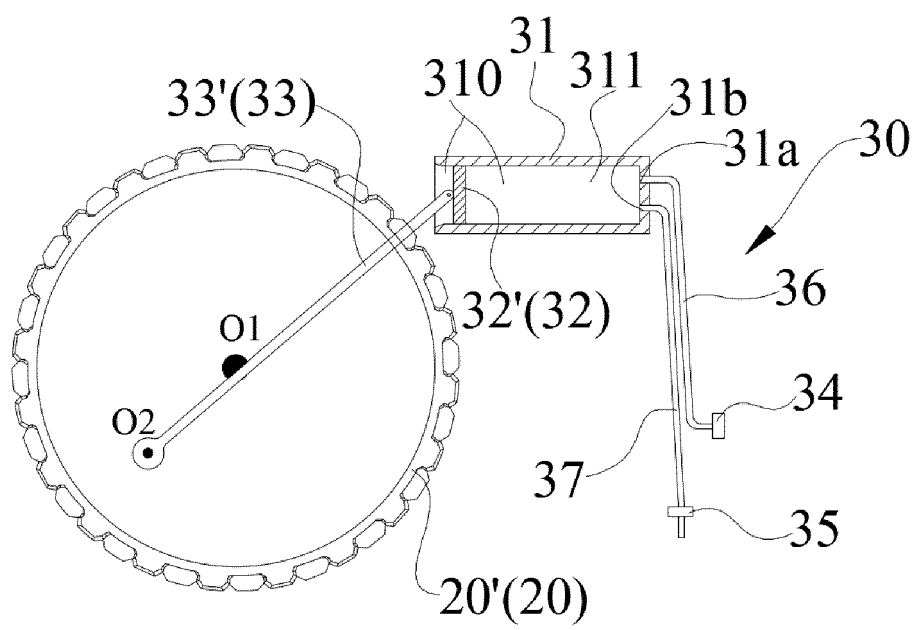


FIG. 2

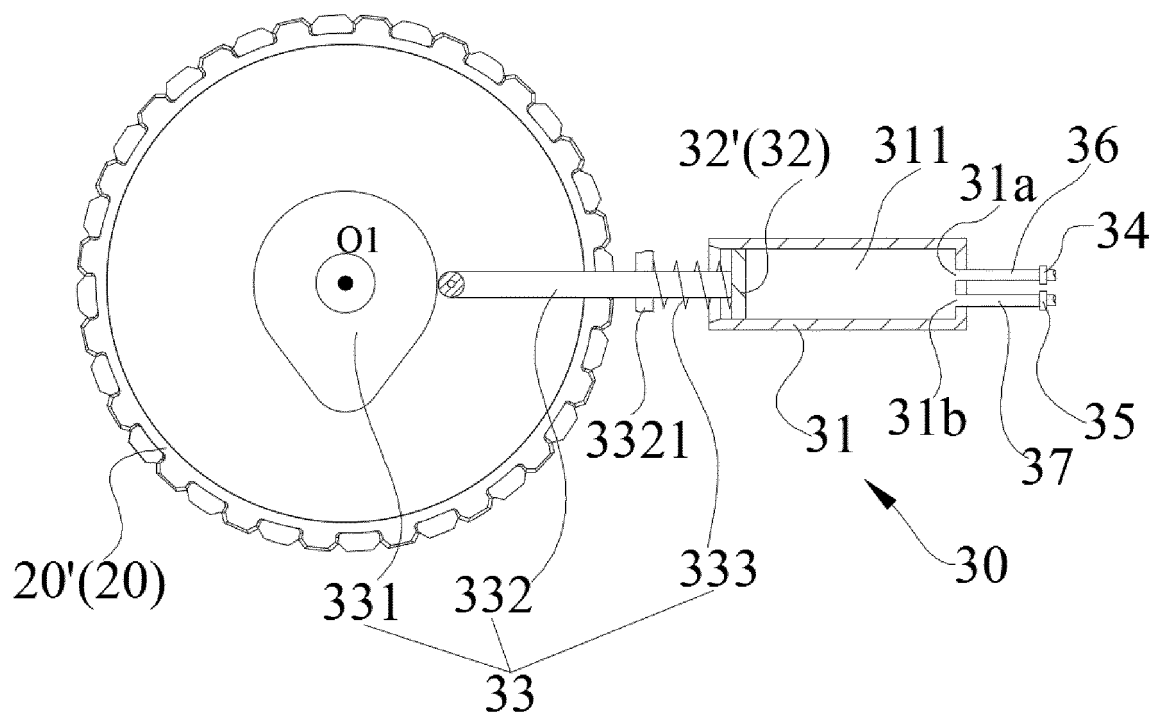


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/083519

5	A. CLASSIFICATION OF SUBJECT MATTER		
	A47L 11/26(2006.01)i; A47L 11/40(2006.01)i; A47L 13/22(2006.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED		
	Minimum documentation searched (classification system followed by classification symbols)		
	A47L		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	CNPAT, CNKI, EPODOC, WPI, 江苏美的清洁电器股份有限公司, 动轮, 滚轮, 轮子, 脚轮, 行走轮, 刷, 泵, 活塞, 柱塞, 连杆, 曲柄, 凸轮, 偏心, 铰接, 水, 液, 单向阀, 往复, roller, wheel, caster, brush, agitator, pump, piston, pluger, rod, lever, cam, eccentric, hinge, pivot, water, liquid, valve, reciprocate		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	X	CN 108433654 A (SUZHOU HAILY ELECTRIC CO., LTD.) 24 August 2018 (2018-08-24) description paragraphs [0021], [0026], figures 1, 8	1-3, 7-12, 15-17
25	Y	CN 108433654 A (SUZHOU HAILY ELECTRIC CO., LTD.) 24 August 2018 (2018-08-24) description paragraphs [0021], [0026], figures 1, 8	4-6, 13-14
	Y	CN 108523769 A (XIE, Feng) 14 September 2018 (2018-09-14) description, paragraphs [0032]-[0034], and figure 1	4-6, 13-14
30	X	CN 102512125 A (CUORI ELECTRICAL APPLIANCE GROUP CO., LTD.) 27 June 2012 (2012-06-27) description paragraphs [0028]-[0029]	1-3, 7-12, 15-17
	X	CN 102379661 A (SUZHOU EUP ELECTRIC CO., LTD.) 21 March 2012 (2012-03-21) description, paragraphs [0014]-[0015], and figures 5-6	1-3, 7-12, 15-17
	A	CN 109483350 A (ZHONG, Langchan) 19 March 2019 (2019-03-19) entire document	1-17
35	A	CN 106361220 A (ECOVACS ROBOT CO., LTD.) 01 February 2017 (2017-02-01) entire document	1-17
40	☒ 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		
45	Date of the actual completion of the international search		Date of mailing of the international search report
	09 June 2020		30 June 2020
50	Name and mailing address of the ISA/CN		Authorized officer
	China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China		
55	Facsimile No. (86-10)62019451		Telephone No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 202018105546 U1 (HIZERO TECHNOLOGIES CO., LTD.) 15 November 2018 (2018-11-15) entire document	1-17

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/083519

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 108433654 A	24 August 2018	None	
CN 108523769 A	14 September 2018	None	
CN 102512125 A	27 June 2012	None	
CN 102379661 A	21 March 2012	CN 102379661 B	17 July 2013
CN 109483350 A	19 March 2019	None	
CN 106361220 A	01 February 2017	None	
DE 202018105546 U1	15 November 2018	GB 2570960 A	14 August 2019
		EP 3524117 A2	14 August 2019
		WO 2019157646 A1	22 August 2019
		US 2019246860 A1	15 August 2019
		JP 2019136485 A	22 August 2019

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201910621671 [0001]