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(54) SELF-MOVING ROBOT SYSTEM

(57) A self-moving robot system is provided, including a dust collection base station and a self-moving robot, where the self-moving robot includes a main machine and a dust containing box, and the dust containing box is detachably mounted on the main machine; the dust collection base station includes a power apparatus, a dust collection apparatus, and a transfer apparatus, where the transfer apparatus can be engaged with the dust containing box and assist separation of the dust containing box from the main machine or assist mounting of the dust containing box on the main machine; the dust collection apparatus is configured to collect debris from the dust containing box; and the power apparatus drives the transfer apparatus and enables the transfer apparatus to move the dust containing box to a dust collection opening of the dust collection apparatus, so as to transfer the debris to the dust collection apparatus. The dust containing box is transferred by the transfer apparatus without using an air pump to suck the debris and the like in the dust containing box with relatively low working noise. During dust collection, there is no need to move the entire self-moving robot with a relatively small system load, and the dust containing box is transferred by the transfer apparatus with relatively low working noise and relatively high use comfort of a user.

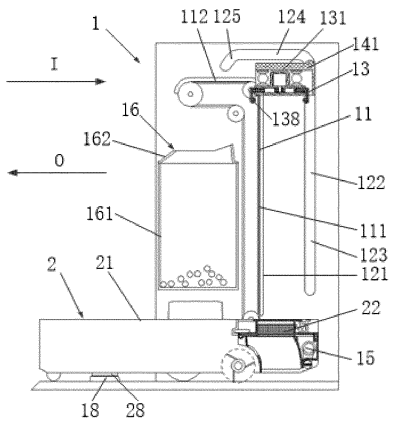

FIG. 1-1

EP 4 162 853 A1

Description

Technical Field

[0001] The present disclosure relates to the field of electromechanical technologies, and in particular, to a self-moving robot system.

Related Art

[0002] A base station of a conventional self-moving robot is mainly configured to charge the self-moving robot, and a user needs to dump and clean a dust containing box of the self-moving robot. In order to reduce a user intervention frequency, a "suction type" dust collection base station is introduced, and an air pump is mounted in the dust collection base station to suck away debris in the dust containing box of the self-moving robot.

[0003] At present, during operation of the "suction type" dust collection base station, there is a common problem of loud noise with a noise level even reaching 75 dB, far exceeding a level of 40 dB to 60 dB for normal people's conversation, which affects the normal conversation of users and makes people feel upset and distracted. The dust collection base station performs a suction operation every time the self-moving robot returns to the base station, and frequent suction with loud noise causes discomfort to the user and damages the hearing nerve.

SUMMARY

[0004] The present disclosure is made in view of the status of the prior art. An objective of the present disclosure is to provide a self-moving robot system. The self-moving robot system has a dust collection base station, and the dust collection base station does not use an air pump to suck debris from a self-moving robot with relatively low working noise and relatively high use comfort of a user.

[0005] A self-moving robot system is provided, including a dust collection base station and a self-moving robot, where the dust collection base station is configured to collect debris of the self-moving robot, and the self-moving robot includes a main machine and a dust containing box, where the dust containing box is detachably mounted on the main machine;

the dust collection base station includes a power apparatus, a dust collection apparatus, and a transfer apparatus, where the transfer apparatus can be engaged with the dust containing box and assist separation of the dust containing box from the main machine or assist mounting of the dust containing box on the main machine; the dust collection apparatus is configured to collect debris from the dust containing box; and the power apparatus drives the transfer apparatus and enables the transfer apparatus to move the dust containing box to a dust collection opening of the dust collection apparatus, so as to transfer the debris to the dust collection apparatus.

[0006] Preferably, the self-moving robot system further includes a first cover opening apparatus, where the first cover opening apparatus can open or close a box cover of the dust containing box, and when the box cover of the dust containing box is opened, the debris in the dust containing box can be transferred to the dust collection apparatus.

[0007] Preferably, the dust collection base station includes an operating position for the self-moving robot to stop, and the dust collection apparatus is located above the operating position.

[0008] Preferably, the power apparatus includes a conveying assembly, where the conveying assembly includes a first conveying portion arranged in a vertical direction and a second conveying portion arranged in a horizontal direction, and the transfer apparatus is connected to the power apparatus to move along with the conveying assembly.

[0009] Preferably, the conveying assembly includes a synchronous belt assembly, the first conveying portion includes a first synchronous belt, and the second conveying portion includes a second synchronous belt.

[0010] Preferably, the self-moving robot system includes a loading and unloading portion, where the loading and unloading portion is configured to operate the dust containing box to be separated from the main machine or be mounted on the main machine.

[0011] Preferably, one of the dust containing box and the main machine includes a lock pin, the other of the dust containing box and the main machine includes a lock slot, and the lock pin can be inserted into or exit from the lock slot; the loading and unloading portion can apply a force to one of the dust containing box and the main machine, so that the lock pin exits from the lock slot, to assist separation of the dust containing box from the main machine; and/or the loading and unloading portion can release the force applied to the lock pin, so that the lock pin is inserted into the lock slot, to assist mounting of the dust containing box on one of the dust containing box and the main machine.

[0012] Preferably, the loading and unloading portion includes a snap-fit, the transfer apparatus includes an electromagnetic switch, a driving spring, and a carrying portion, the snap-fit is connected to the driving spring, the electromagnetic switch drives the snap-fit to push or release the lock pin, and the carrying portion is configured to carry the dust containing box separated from the main machine; or

the loading and unloading portion includes a clamping claw, the transfer apparatus includes a clamping motor and a first gear structure, the clamping claw includes a second rack structure, and the first gear structure driven by the clamping motor meshes with the second rack structure, to drive the clamping claw to clamp or loosen the dust containing box.

[0013] Preferably, the self-moving robot includes an operating portion, where the operating portion can assist separation of the dust containing box from the main ma-

chine or mounting of the dust containing box on the main machine in response to pressing or releasing pressing of a user.

[0014] Preferably, the dust collection base station includes a sealing portion, where the sealing portion can be sealedly connected to the dust containing box and the dust collection opening.

[0015] Preferably, the sealing portion is provided with a large opening end and a small opening end, an aperture of the large opening end is greater than an aperture of the small opening end, the large opening end is configured to be sleeved with the dust collection opening, and the small opening end is configured to connect the dust containing box.

[0016] Preferably, the dust collection base station further includes an auxiliary dust dumping apparatus, where the auxiliary dust dumping apparatus includes a vibration motor and an eccentric assembly, the vibration motor drives the eccentric assembly to vibrate, the auxiliary dust dumping apparatus is arranged on the transfer apparatus and moves along with the transfer apparatus, and the eccentric assembly can be connected to or in contact with the dust containing box, so that when vibrating, the eccentric assembly can drive the dust containing box to vibrate.

[0017] Preferably, the auxiliary dust dumping apparatus includes a damper, where the damper is connected between the vibration motor and the transfer apparatus.

[0018] Preferably, the dust collection base station includes a charging apparatus, where when the self-moving robot stops at the dust collection base station, the charging apparatus is electrically connected to the self-moving robot to charge the self-moving robot.

[0019] Preferably, the dust collection apparatus includes a garbage bin and a foldable cover, where the garbage bin is provided with the dust collection opening, the foldable cover can cover the dust collection opening when being unfolded, and when the transfer apparatus transfers the dust containing box, the dust containing box can push the foldable cover to be folded, so as to expose the dust collection opening.

[0020] Preferably, the first cover opening apparatus includes a cover opening motor and a rotational portion, where the rotational portion is connected to the box cover of the dust containing box, and when the dust containing box is moved to the dust collection opening of the dust collection apparatus, the cover opening motor drives the rotational portion to rotate, so as to open the box cover of the dust containing box; and after the dust containing box completes debris dumping, the cover opening motor drives the rotational portion to rotate, so as to close the box cover of the dust containing box.

[0021] Preferably, the self-moving robot system includes a second cover opening apparatus, where the second cover opening apparatus includes: a driving member, arranged on the loading and unloading portion; and a rotational member, arranged on one side of the dust containing box and being in contact with the box cover of the dust containing box, where the rotational member is configured to rotate between a first position and a second position under the drive of the driving member; when the rotational member is located at the first position, the box cover is closed; and when the rotational member rotates from the first position to the second position, the box cover is opened under the drive of the rotational member.

[0022] The technical solution provided in the present disclosure at least has the following beneficial effects:

In the self-moving robot system, the dust containing box of the self-moving robot can be removed from the main machine, and the dust containing box can be moved to the dust collection opening, so that debris and the like in the dust containing box are collected by the dust collection apparatus, and the debris and the like are uniformly cleaned, to prevent a user from frequently taking out the debris. In addition, during dust collection, there is no need to move the entire self-moving robot with a relatively small system load and a relatively low requirement on a driving capability of a driving apparatus. The dust containing box is transferred by the transfer apparatus without using an air pump to suck the debris and the like in the dust containing box with relatively low working noise and relatively high use comfort of the user.

[0023] The technical solution provided in the present disclosure may further have the following beneficial effects:

When the synchronous belt assembly transfers the transfer apparatus, the dust collection apparatus may be loaded and unloaded, so that the dust containing box can be transferred and the dust collection apparatus can be loaded and unloaded, and a loading and unloading operation and a moving operation may be simultaneously performed on the dust collection apparatus and the dust containing box.

[0024] When the transfer apparatus transfers the dust containing box, the clamping claw bears the entire weight of the dust containing box, and the first gear structure can mesh with the second rack structure to provide a reliable locking force, thereby ensuring that the dust containing box is stably and reliably transferred.

[0025] The damper has a function of shock absorption, to reduce a vibration force transmitted by the vibration motor to the transfer apparatus and enable the vibration force to act on the dust containing box as much as possible.

[0026] When the dust containing box is transferred to the dust collection opening, the auxiliary dust dumping apparatus slaps the dust containing box, to facilitate dumping of debris and the like.

[0027] When the transfer apparatus transfers the dust containing box, the dust collection apparatus is located above the operating position, and the arrangement in the dust collection base station is compact.

[0028] The self-moving robot can be charged synchronously during debris collection and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1-1 is a schematic diagram of a first embodiment of a self-moving robot system according to the present disclosure.

FIG. 1-2 is a top view of a dust collection base station of the self-moving robot system, where a dust collection apparatus is not displayed.

FIG. 1-3a is a schematic diagram when an upper flip cover of a dust containing box of a self-moving robot of the self-moving robot system is opened.

FIG. 1-3b is a schematic diagram when the dust containing box is separated from a main machine of the self-moving robot.

FIG. 1-3c is a schematic diagram when the dust containing box is mounted on the main machine.

FIG. 1-3d is a top view when the dust containing box is mounted on the main machine.

FIG. 1-4 is a schematic diagram of a transfer apparatus of the dust collection base station.

FIG. 1-5 is a schematic diagram of a working step of the self-moving robot system, where that the dust collection apparatus is ready to be mounted is shown.

FIG. 1-6 is a schematic diagram of a working step of the self-moving robot system, where that the self-moving robot enters the dust collection base station is shown.

FIG. 1-7 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus is ready to be engaged with the dust containing box is shown.

FIG. 1-8 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus separates the dust containing box from the main machine is shown.

FIG. 1-9 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus lifts the dust containing box is shown.

FIG. 1-10 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus horizontally transfers the dust containing box is shown.

FIG. 1-11 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus mounts the dust containing box on the dust collection apparatus is shown.

FIG. 1-12 is a schematic diagram of a working step of the self-moving robot system, where that a first cover opening apparatus opens the dust containing box and a slapping structure slaps the dust containing box is shown.

FIG. 1-13 is a schematic diagram of a working step of the self-moving robot system, where that after debris in the dust containing box falls into the dust collection apparatus, a cover opening mechanism closes the dust containing box is shown.

FIG. 1-14 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus transfers the dust containing box to the main machine of the self-moving robot is shown.

FIG. 2-1 is a schematic diagram of a second embodiment of a self-moving robot system according to the present disclosure.

FIG. 2-2 is a top view of the self-moving robot system.

FIG. 2-3 is a schematic diagram of a self-moving robot of the self-moving robot system.

FIG. 2-4 is a schematic diagram of a transfer apparatus of a dust collection base station.

FIG. 2-5a is a schematic diagram when a cover opening mechanism of the self-moving robot system is not engaged with a lower flip cover of a dust containing box.

FIG. 2-5b is a schematic diagram when the cover opening mechanism is engaged with the lower flip cover.

FIG. 2-5c is a schematic diagram when the cover opening mechanism opens the dust containing box.

FIG. 2-6 is a schematic diagram of a working step of the self-moving robot system, where that the dust collection apparatus is ready to be mounted and the self-moving robot enters the base station for charging is shown.

FIG. 2-7 is a schematic diagram of a working step of the self-moving robot system, where that the dust collection apparatus is mounted is shown.

FIG. 2-8 is a schematic diagram of a working step of the self-moving robot system, where that the trans-

fer apparatus separates the dust containing box from a main machine of the self-moving robot is shown.

FIG. 2-9 is a schematic diagram of a working step of the self-moving robot system, where that the main machine of the self-moving robot moves in an exit direction is shown.

FIG. 2-10 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus lifts the dust containing box is shown.

FIG. 2-11 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus horizontally transfers the dust containing box is shown.

FIG. 2-12 is a schematic diagram of a working step of the self-moving robot system, where that the transfer apparatus mounts the dust containing box on the dust collection apparatus is shown.

FIG. 2-13 is a schematic diagram of a working step of the self-moving robot system, where that the cover opening apparatus opens the dust containing box and a slapping structure slaps the dust containing box is shown.

FIG. 3-1 is a schematic diagram when a rotational member is located at a first position according to an embodiment.

FIG. 3-2 is a schematic diagram when a rotational member is located at a second position according to an embodiment.

FIG. 3-3 is a schematic diagram of a working step of a self-moving robot system according to an embodiment, where that a loading and unloading portion clamps a dust containing box is shown.

[0030] Descriptions of numerals in the drawings:

1. Dust collection base station, 11. Synchronous belt, 111. First synchronous belt, 112. Second synchronous belt, 121 and 122. Track. 123. First track section, 124. Second track section, 125. Descending section, 13. Transfer apparatus, 130. Carrying portion, 131. Transfer frame. 135. Electromagnetic switch, 136. Snap-fit, 137. Driving spring, 138. Clamping claw, 139. Rack, 141. Rolling bearing, 15. First cover opening apparatus, 151. Synchronous belt wheel, 152. Tension wheel, 153. Synchronous belt, 154. Pin, 155. Pin slot, 16. Dust collection apparatus, 161. Garbage bin, 162. Transfer cover, 163. Foldable cover, 164. Pressing ring, 165. Garbage bag, 166. Full dust detection apparatus, 17. Auxiliary dust dumping apparatus, 18. Charging apparatus, and 19. Fan;

2. Self-moving robot, 21. Main machine, 22. Dust containing box, 220. Filtering element, 23. Upper flip cover, 24. Lower flip cover, 26. Locking spring, 27. Lock pin, 28. Charging connector, 29. Linkage portion, 20A and 20B. Hook portion, 211. Button, and 212. Transferring mechanism;

3. Debris;

4. Second cover opening apparatus, 41. Driving member, and 42. Rotational member; and

I. Entrance direction, and O. Exit direction.

DETAILED DESCRIPTION

[0031] Exemplary implementations of the present embodiments are described below in detail with reference to the accompanying drawings. It should be understood that these detailed descriptions are merely used for teaching a person skilled in the art to implement the present embodiments, but are not used to exhaust all possible manners of the present embodiments and are not used for limiting the scope of the present embodiments.

[0032] As shown in FIG. 1-1 to FIG. 1-4 and FIG. 2-1 to FIG. 2-3, the present disclosure provides a self-moving robot system, including a self-moving robot 2 (for example, a sweeping robot) and a dust collection base station 1. The self-moving robot 2 includes a main machine 21 and a dust containing box 22. The dust containing box 22 is detachably mounted on the main machine 21, the dust containing box 22 is configured to accommodate debris 3, dust, and the like, and the main machine 21 includes a circuit part of the self-moving robot 2.

[0033] The dust collection base station 1 includes a charging apparatus 18, a power apparatus (not shown), a dust collection apparatus 16, and a transfer apparatus 13. The self-moving robot 2 includes a charging connector 28, and the charging apparatus 18 is configured to electrically connect the charging connector 28, to charge the self-moving robot 2. The charging apparatus 18 may include a metal contact, and the charging connector 28 may include a metal contact matching the metal contact of the charging apparatus 18.

[0034] The transfer apparatus 13 can be engaged with the dust containing box 22 and assist separation of the dust containing box 22 from the main machine 21 or assist mounting of the dust containing box 22 on the main machine 21. For example, a lock pin 27 is driven to exit from a lock slot, so that the dust containing box 22 is separated from the main machine 21, or the dust containing box 22 is loosened, and the lock pin 27 is inserted into the lock slot, so that the dust containing box 22 is mounted on the main machine 21.

[0035] It should be understood that that the transfer

apparatus 13 "assists" the separation of the dust containing box 22 from the main machine 21 includes the following two cases:

First, the dust containing box 22 is disassembled and removed from the main machine 21 by the transfer apparatus 13.

[0036] Second, the dust containing box 22 is actively unloaded by the main machine 21, for example, ejected out from the main machine/pushed out by the main machine, and the transfer apparatus 13 is configured to receive and move the dust containing box 22 separated from the main machine 21.

[0037] The power apparatus is connected to the transfer apparatus 13, so that the transfer apparatus 13 moves according to a predetermined path, to transfer the dust containing box 22 to a dust collection opening of the dust collection apparatus 16. The self-moving robot system includes a first cover opening apparatus 15, where the first cover opening apparatus 15 is mounted on the dust collection base station 1 or the self-moving robot 2. When the dust containing box 22 arrives at the dust collection opening, the first cover opening apparatus 15 opens the dust containing box 22, so that the debris 3 and the like in the dust containing box 22 fall into the dust collection apparatus 16 from the dust collection opening. When the transfer apparatus 13 transfers the dust containing box 22, the charging apparatus 18 may be electrically connected to the main machine 21 of the self-moving robot 2, to charge the self-moving robot 2.

[0038] In the self-moving robot system, the dust containing box 22 of the self-moving robot 2 can be removed from the main machine 21, and the dust containing box 22 can be moved to the dust collection opening 16, so that the debris 3 and the like in the dust containing box 22 are collected by the dust collection apparatus 16, and the debris 3 and the like are uniformly cleaned, to prevent a user from frequently taking out the debris. In addition, in the system, there is no need to move the entire self-moving robot 2 with a relatively small system load and a relatively low requirement on a driving capability of a driving apparatus. The dust containing box 22 is transferred by the transfer apparatus 13 without using an air pump to suck the debris 3 and the like in the dust containing box 22 with relatively low working noise and relatively high use comfort of the user.

[0039] In addition, the self-moving robot 2 can be charged synchronously during debris 3 collection and the like.

[0040] A direction from which the self-moving robot 2 enters the dust collection base station 1 is defined as an entrance direction I, and a direction from which the self-moving robot leaves the dust collection base station 1 is defined as an exit direction O.

[0041] Two specific embodiments of the self-moving robot system are respectively described below.

First embodiment

[0042] As shown in FIG. 1-1 to FIG. 1-4, the power apparatus includes a conveying assembly, where the conveying assembly includes a first conveying portion arranged in a vertical direction and a second conveying portion arranged in a horizontal direction, and the transfer apparatus is connected to the power apparatus to move along with the conveying assembly. The conveying assembly includes a synchronous belt assembly, the first conveying portion includes a first synchronous belt, and the second conveying portion includes a second synchronous belt.

[0043] The power apparatus may include a driving motor (not shown). The driving motor drives the synchronous belt assembly, and the synchronous belt assembly includes a synchronous belt 11 and a roller, where the synchronous belt 11 is mounted on the roller, and the roller is driven by the driving motor to drive the synchronous belt 11. The synchronous belt 11 includes a first synchronous belt 111 arranged in a vertical direction and a second synchronous belt 112 arranged in a horizontal direction.

[0044] In another implementation, the power apparatus may further include another structure such as a gear and rack mechanism, a link mechanism, a steel wire or a chain, or a screw and a screw rod.

[0045] For example, the power apparatus includes a rack assembly and a gear assembly mounted on the transfer apparatus, and the gear assembly meshes with the rack assembly and rotates to drive the transfer apparatus to move.

[0046] The dust collection apparatus 16 may be located beside the first synchronous belt 111 and below the second synchronous belt 112. The transfer apparatus 13 may be connected to the synchronous belt assembly, for example, riveted to the synchronous belt 11 or tightly fixed to the synchronous belt 11 through a bolt, so that the transfer apparatus 13 can follow the synchronous belt assembly to move to the dust collection opening along the first synchronous belt 111 and the second synchronous belt 112. The dust collection base station 1 includes an operating position for the self-moving robot 2 to stop. The charging apparatus 18 may be arranged at the operating position, the dust collection apparatus 16 is arranged higher than the charging apparatus 18 (the operating position), the self-moving robot 2 enters and exits the dust collection base station 1 below the dust collection apparatus 16, and the conveying assembly is located on a lateral upper side of the dust collection apparatus 16. When the transfer apparatus 13 transfers the dust containing box 22, the dust collection apparatus 16 is located above the operating position, so that the structure in the dust collection base station 1 is compact.

[0047] The dust collection base station 1 may further include a sealing portion, where the sealing portion is configured to sealedly connect the dust containing box 22 and the dust collection opening, to avoid leakage of

dust and the like.

[0048] In this embodiment, the sealing portion may include a transfer cover 162, and the dust collection apparatus 16 may include a garbage bin 161 and the transfer cover 162, where the garbage bin 161 is provided with the dust collection opening, and the garbage bin 161 may be used with a garbage bag. The transfer cover 162 is provided with a large opening end and a small opening end, an aperture of the large opening end is greater than an aperture of the small opening end, the large opening end of the transfer cover 162 is sleeved with the dust collection opening, and the small opening end is configured to be aligned with the dust containing box 22. When the dust containing box 22 is moved above the dust collection apparatus 16, a debris dumping opening of the dust containing box 22 can be engaged with the small opening end of the transfer cover 162, so that when the debris 3 and the like are dumped, there is no dust leakage gap between the dust containing box 22 and the garbage bin 161, to avoid dust raising.

[0049] In another embodiment, an air hole may be provided on one side of the garbage bin 161, and a fan is mounted on an outer side wall of the garbage bin 161, so that a space between the garbage bin 161 and the garbage bag may be vacuumized through rotation of the fan, and the garbage bag is placed close to an inner wall of the garbage bin 161 under the action of atmospheric pressure.

[0050] In another embodiment, the dust collection apparatus 16 may further have a garbage bin mounting position but does not include the garbage bin 61, and the user may directly place a household garbage bin at the mounting position or cover the garbage bin mounting position with a garbage bag.

[0051] In another embodiment, the self-moving robot system further includes a transmission mechanism configured to control the dust collection apparatus 16 to move. Optionally, the transmission mechanism includes a transmission belt and a driving motor. Optionally, the transmission belt may drive the dust collection apparatus to respectively move to a garbage bag mounting position outside the dust collection base station 1, an internal mop recycle position, and a dust collection initial position. Optionally, the dust collection initial position may be located between the garbage bag mounting position and the mop recycle position.

[0052] As shown in FIG. 1-13, a full dust detection apparatus 166 such as an infrared sensor, an ultrasonic sensor, or a distance sensor is further mounted on an upper edge of the garbage bin 162. When debris and the like are about to fill up the garbage bin 162, the full dust detection apparatus 166 detects this case and reminds the user to empty the garbage bin.

[0053] The dust collection base station 1 may further include a track 121 closely attached to the synchronous belt 11 and a track 122 spaced apart from the synchronous belt 11, where the tracks 121 and 122 may be approximately parallel to the synchronous belt 11. The transfer apparatus 13 may be limited by the tracks 121 and 122 to move along the tracks 121 and 122 from a head end to a tail end. The tracks 121 and 122 each may include a first track section 123 parallel to a transmission trajectory of the first synchronous belt 111, a second track section 124 parallel to a transmission trajectory of the second synchronous belt 112, and a descending section 125 connected to the second track section 124. The descending section 125 may be inclined relative to a vertical direction and arranged on a tail end of each of the tracks 121 and 122. The transfer apparatus 13 moves in the vertical direction along the first track section 123, moves in the horizontal direction along the second track section 124, and descends along the descending section 125, so that the dust containing box 22 can pass over the transfer cover 162 in height and then descend to be closely attached to the transfer cover 162.

[0054] The transfer apparatus 13 may include a plurality of rolling bearings 141, where the rolling bearings 141 are mounted in the tracks 121 and 122, so that the transfer apparatus 13 is rollably connected to the tracks 121 and 122.

[0055] As shown in FIG. 1-3a to FIG. 1-3d, the self-moving robot 2 may include the first cover opening apparatus 15, and the first cover opening apparatus 15 may be fixedly mounted on the dust containing box 22 of the self-moving robot 2 and is transferred together with the dust containing box 22. The dust containing box 22 includes an upper flip cover 23 and a lower flip cover 24 (a box cover). The upper flip cover 23 is operated manually to open or close the dust containing box 22, and the lower flip cover 24 is operated by a cover opening mechanism to open and close the dust containing box 22. The upper flip cover 23 may be located on an upper surface of the dust containing box 22, and the lower flip cover 24 may be located on a lower surface of the dust containing box 22, to facilitate manual cover opening and automatic cover opening.

[0056] The dust containing box 22 may further be provided with a filtering element 220. When the self-moving robot 2 works, the filtering element 220 filters sucked debris. The filtering element 220 may include a high efficiency particulate air (HEPA) filter, a sponge mat, nonwoven fabric, or the like.

[0057] The first cover opening apparatus 15 includes a cover opening motor and a rotational portion, where the rotational portion may include a synchronous belt wheel 151, a tension wheel 152, and a synchronous belt 153. The synchronous belt wheel 151 may be mounted on an output end of the cover opening motor, the synchronous belt wheel 151 is connected to the tension wheel 152 by the synchronous belt 153, and the cover opening motor drives the rotational portion to rotate, that is, drives the synchronous belt wheel 151 and the tension wheel 152 to rotate and drives the synchronous belt 153 to roll. The cover opening motor may be mounted on the dust containing box 22, and the rotational portion may be mounted on the lower flip cover 24 of the dust con-

taining box 22. The first cover opening apparatus 15 and the dust containing box 22 are fixedly mounted, so that the first cover opening apparatus 15 is reliably connected to the dust containing box 22. When the dust containing box 22 is moved to the dust collection opening of the dust collection apparatus 16, the cover opening motor drives the rotational portion to rotate, so as to open the lower flip cover 24. after the dust containing box 22 completes debris dumping, the cover opening motor drives the rotational portion to rotate, so as to close the lower flip cover 24.

[0058] In another embodiment, the first cover opening apparatus 15 may further include a linkage mechanism arranged inside the dust containing box 22, and after clamping the dust containing box 22, the transfer apparatus 13 opens and closes the lower flip cover 24 by acting on the linkage mechanism.

[0059] As shown in FIG. 1-2, a contact electrode may be arranged at a position where the dust containing box 22 corresponds to the transfer apparatus 13. When the transfer apparatus 13 is engaged with the dust containing box 22, the contact electrode is conducted, so that a power supply of the cover opening motor is turned on, and whether the first cover opening apparatus 15 is opened or not may be controlled as required.

[0060] As shown in FIG. 1-1 and FIG. 1-2, the transfer apparatus 13 includes a power source, a transfer frame 131 and a loading and unloading portion, where the loading and unloading portion is configured to operate the dust containing box 22 to be separated from the main machine 21 or mounted on the main machine 21. The loading and unloading portion may specifically include a clamping claw 138. The transfer frame 131 is mounted on the synchronous belt 11 (the power apparatus), and the power source and the clamping claw 138 are mounted on the transfer frame 131. The power source includes a clamping motor and a gear (a first gear structure), and the clamping claw 138 includes a rack 139 (a second rack structure). The gear driven by the clamping motor meshes with the rack 139, so that the rack 139 drives the clamping claw 138 to clamp or loosen the dust containing box 22.

[0061] In this embodiment, the loading and unloading portion is located on the transfer apparatus 13. In another embodiment, the loading and unloading portion may further be located on the self-moving robot.

[0062] A lock pin 27 and a linkage portion 29 are arranged in the dust containing box 22. When the clamping claw 138 is engaged with the linkage portion 29 and pushes the linkage portion 29 in the horizontal direction, the lock pin 27 can be linked to the linkage portion 29, so as to exit the lock slot. The linkage portion 29 is provided with a locking spring 26 connected to the lock pin 27, and the lock slot is provided on the main machine 21 of the self-moving robot 2. For example, the linkage portion 29 may be located at the downstream of the lock pin 27 in the entrance direction I, and the linkage portion 29 and the lock pin 27 may simultaneously move in two opposite directions in the horizontal direction.

[0063] When the transfer apparatus 13 is engaged with the dust containing box 22, the clamping claw 138 tightly clamps the linkage portion 29 and may push the linkage portion 29 in the exit direction O. When the linkage portion 29 moves, the locking spring 26 is compressed, and the lock pin 27 is linked to the linkage portion 29 and moves in the entrance direction I to exit the lock slot (as shown in FIG. 1-3b). When the transfer apparatus 13 loosens the dust containing box 22, the clamping claw 138 loosens the linkage portion 29, and the lock pin 27 is ejected by an elastic force of the locking spring 26 in the exit direction O, so that the lock pin 27 is inserted into the lock slot (as shown in FIG. 1-3c).

[0064] In an embodiment, as shown in FIG. 3-1 and FIG. 3-2, the self-moving robot system includes a second cover opening apparatus 4, where the second cover opening apparatus 4 includes: a driving member 41, arranged on the loading and unloading portion; and a rotational member 42, arranged on one side of the dust containing box 22 and being in contact with the box cover (that is, the lower flip plate 24) of the dust containing box 22, where the rotational member 42 is configured to rotate between a first position and a second position under the drive of the driving member 41; when the rotational member 42 is located at the first position, the box cover is closed; and when the rotational member 42 rotates from the first position to the second position, the box cover is opened under the drive of the rotational member 42.

[0065] Optionally, still referring to FIG. 3-1 and FIG. 3-2, one end of the rotational member 42 is rotatably connected to the dust containing box 22 by a connecting shaft, and one end of the rotational member away from the connecting shaft is in contact with the box cover under the action of gravity. When the rotational member 42 is located at the first position, the box cover is closed; and when the rotational member 42 rotates around the connecting shaft under the drive of the driving member 41 to the second position, one end of the rotational member 42 away from the connecting shaft pushes the box cover to be opened, so that dust in the dust containing box falls into the dust collection apparatus 16. Optionally, the rotational member 42 is provided with a limiting portion. When the rotational member 42 is located at the first position, there is a space between one end of the box cover away from the rotational member 42 and the limiting portion, and when the rotational member 42 rotates around the connecting shaft under the drive of the driving member 41 to the second position, one end of the box cover away from the rotational member 42 abuts against the limiting portion, and one end of the rotational member 42 away from the connecting shaft abuts against the box cover, so that the rotational member 42 and the box cover limit each other.

[0066] Optionally, as shown in FIG. 3-3, a time sequence process in which the loading and unloading portion clamps and opens the dust containing box is shown. The loading and unloading portion may be provided with

the clamping claw 138, and the driving member 41 may be arranged on one side of an end portion of the clamping claw 138 and independent of the clamping claw 138. First, after the clamping claw 138 tightens inward, clamps the dust containing box 22, and transfers the dust containing box to the dust collection opening (a time sequence 2), the driving member 41 may move to one end of the rotational member 42 close to the connecting shaft under an external force (a time sequence 3), to push the rotational member 42 to rotate. After dust in the dust containing box 22 has been dumped, the external force on the driving member 41 is released, to reset the driving member 41 (a time sequence 4), so that the rotational member 42 is reset, that is, the rotational member 42 rotates from the second position to the first position, and when the rotational member 42 rotates back to the first position, the box cover is closed again.

[0067] As shown in FIG. 1-3d, the self-moving robot 2 includes an operating portion, where the operating portion can assist separation of the dust containing box 22 from the main machine 21 or mounting of the dust containing box on the main machine 21 in response to pressing or releasing pressing of a user. Specifically, when the dust containing box 22 is manually opened, for example, a button 211 (the operating portion) is pressed in a direction of an arrow A, to compress the locking spring 26, the linkage portion 29 moves and drives the lock pin 27 by using a transfer mechanism 212, and the transfer mechanism 212 causes the linkage portion 29 and the lock pin 27 to be close to each other, for example, the linkage portion 29 moves in a direction of an arrow B2, and the lock pin 27 moves in a direction of an arrow Bl, so that the lock pin 27 is retracted and unlocked from the main machine 21.

[0068] The dust containing box 22 is provided with an upwardly open engagement groove, and the main machine 21 is provided an upwardly open opening through which the dust containing box 22 is separated from the main machine 21. The clamping claw 138 can enter the engagement groove and tightly clamp the dust containing box 22, and the clamping claw 138 moves vertically along the first synchronous belt 111 after tightly clamping the dust containing box 22.

[0069] When the transfer apparatus 13 transfers the dust containing box 22, the clamping claw 138 bears the entire weight of the dust containing box 22, and a structure in which the gear meshes with the rack 139 can provide a reliable locking force, thereby ensuring that the dust containing box 22 is stably and reliably transferred.

[0070] The clamping claw 138 can apply a force to the dust containing box 22 to cause the lock pin 27 to exit the lock slot, so as to assist separation of the dust containing box 22 from the main machine 21 and can further release the force applied to the lock pin 27 to cause the lock pin 27 to be inserted into the lock slot, so as to assist mounting of the dust containing box 22 on the main machine 21.

[0071] The dust collection base station 1 may further include an auxiliary dust dumping apparatus 17 (which is shown in FIG. 2-2), where the auxiliary dust dumping apparatus 17 includes a vibration motor and an eccentric block (an eccentric assembly). The vibration motor drives the eccentric block to vibrate, the vibration motor may be mounted on the transfer frame 131 (the auxiliary dust dumping apparatus 17 is mounted on the transfer apparatus 13) and move along with the transfer apparatus 13, and the eccentric block can be connected to the dust containing box 22 or in contact with the dust containing box 22, to drive the dust containing box 22 to vibrate. When the dust containing box 22 is transferred to the dust collection opening, the auxiliary dust dumping apparatus 17 slaps the dust containing box 22, to facilitate dumping of the debris 3 and the like.

[0072] The auxiliary dust dumping apparatus 17 may further include, for example, four shock-absorbing balls (dampers), where the shock-absorbing ball may be connected between the vibration motor and the transfer apparatus 13, for example, connected between the vibration motor and the transfer frame 131. The shock-absorbing ball has a function of shock absorption, to reduce a vibration force transmitted by the vibration motor to the transfer frame 131 and enable the vibration force to act on the dust containing box 22 as much as possible.

[0073] The dust collection base station 1 includes a control system, where the control system is configured to control the driving motor, the clamping motor, the cover opening motor, the vibration motor, and the like.

[0074] A working process of the self-moving robot system, that is, a control method for the self-moving robot system is described below with reference to FIG. 1-5 to FIG. 1-14.

Dust collection apparatus mounting step

[0075] As shown in FIG. 1-5, the dust collection apparatus 16 is mounted, for example, the dust collection apparatus 16 (the garbage bin 161) may be mounted in the entrance direction I.

Robot entrance step

[0076] As shown in FIG. 1-6, the self-moving robot 2 enters the base station, the transfer apparatus 13 descends and closes to the self-moving robot 2, and the charging apparatus 18 is connected to the charging connector 28.

Dust containing box separation step

[0077] As shown in FIG. 1-7, the transfer apparatus 13 continues to close to the self-moving robot 2, and the transfer apparatus 13 is engaged with the dust containing box 22 and assists separation of the dust containing box 22 from the main machine 21, for example, the clamping claw 138 enters the engagement groove and is ready to engage with the dust containing box 22. As shown in FIG.

1-8, the clamping motor drives the clamping claw 138 to tightly clamp the dust containing box 22, the lock pin 27 exits from the lock slot, and the dust containing box 22 is separated from the main machine 21 of the self-moving robot 2.

Transfer step

[0078] The transfer apparatus 13 transfers the dust containing box 22 to the dust collection opening. As shown in FIG. 1-9, the transfer apparatus 13 moves along the first synchronous belt 111 and the first track section 123, to lift the dust containing box 22, and the dust containing box 22 is separated from the main machine 21 in the vertical direction. As shown in FIG. 1-10, the transfer apparatus 13 moves along the second synchronous belt 112 and the second track section 124, to move the dust containing box 22 in the horizontal direction, so that the dust containing box 22 is located above the dust collection apparatus 16. As shown in FIG. 1-11, the transfer apparatus 13 descends along the descending section 125, so that the dust containing box 22 is aligned with the dust collection opening and is sealedly connected to the dust collection opening, that is, the dust containing box 22 is closely connected to the transfer cover 162.

Cover opening step

[0079] As shown in FIG. 1-12, the first cover opening apparatus 15 opens the lower flip cover 24 of the dust containing box 22, for example, the cover opening motor is turned on, the rotational portion rotates, and the lower flip cover 24 of the dust containing box 22 is opened as the rotation of the rotational portion.

Slapping step

[0080] The auxiliary dust dumping apparatus 17 is started, for example, the vibration motor is turned on, to slap the dust containing box 22. As shown in FIG. 1-13, after the debris 3 and the like are dumped, the cover opening motor reversely rotates, the lower flip cover 24 of the dust containing box 2 is closed as the rotation of the rotational portion, and the vibration motor is closed.

Returning step

[0081] As shown in FIG. 1-14, the transfer apparatus 13 descends, the clamping motor drives the clamping claw 138 to loosen the dust containing box 22, the lock pin 27 is inserted into the lock slot, and the dust containing box 22 is mounted on the main machine 21 of the self-moving robot 2.

[0082] Orders of the dust collection apparatus mounting step and the robot entrance step may be exchanged.

Second embodiment

[0083] A structure of a self-moving robot system in the second embodiment is similar to the structure of the self-moving robot system in the first embodiment, and only a difference between the two is described in this part.

[0084] As shown in FIG. 2-1 to FIG. 2-4, the dust collection base station 1 does not include the track 121 closely attached to the synchronous belt 11 but includes only the track 122 spaced apart from the synchronous belt 11.

[0085] The transfer apparatus 13 includes a power source, a transfer frame 131, and a snap-fit 136 (the transfer apparatus does not include the clamping claw 138 in the first embodiment, and the snap-fit 136 is used as the loading and unloading portion of the transfer apparatus 13), the transfer frame 131 is connected to the power apparatus and includes a carrying portion 130, and the power source and the snap-fit 136 are mounted on the transfer frame 131. The power source includes an electromagnetic switch 135 and a driving spring 137 (and the power source does not include the clamping motor and the gear and rack structure in the first embodiment). The snap-fit 136 is connected to the driving spring 137, and the snap-fit 136 can enter the engagement groove of the dust containing box 22 and push the lock pin 27.

[0086] Specifically, the driving spring 137 may be arranged in the vertical direction, the electromagnetic switch 135 may be turned on, so that the snap-fit 136 moves upward to loosen the lock pin 27, the lock pin 27 is inserted into the lock slot, and the dust containing box 22 is mounted on the main machine 21. When the electromagnetic switch 135 is turned off, an elastic force of the driving spring 137 enables the snap-fit 136 to move downward to push the lock pin 27 to exit the lock slot, and the dust containing box 22 is separated from the main machine 21.

[0087] Alternatively, the dust containing box 22 may be unlocked by pressing the operating portion and separated from the main machine 21. After the dust containing box 22 is separated from the main machine 21, the transfer apparatus 13 may transfer the dust containing box 22. The main machine 21 may alternatively leave first after ejecting out the dust containing box 22, and the dust containing box 22 is left in situ and transferred by the transfer apparatus 13.

[0088] As shown in FIG. 2-3, the lock pin 27 may include an upward hook portion 20A configured to be inserted into the lock slot of the main body 21 to be hooked with the main body 21. The lock pin 27 may further include a hook portion 20B that is open upward and downstream in the entrance direction I and is arranged on one side close to the dust collection base station 1. The hook portion 20B is configured to be hooked with the snap-fit 136. On one hand, it is convenient to push the lock pin 27 downward to compress the locking spring 26, so as to release the hooking of the lock pin 27 and the main body 21, and on the other hand, the dust containing box 22 is

prevented from separating from the transfer apparatus 13 in the entrance direction I. The carrying portion 130 supports the dust containing box 22 from the bottom, and the snap-fit 136 hooks the dust containing box 22 at the downstream of the entrance direction I, thereby stably holding the dust containing box 22.

[0089] The main machine 21 is provided with an opening that is open in the horizontal direction. When the transfer apparatus 13 transfers the dust containing box 22, the main machine 21 of the self-moving robot 2 moves in the exit direction O by a small distance, for example, about 5 cm, so as to release blocking on the dust containing box 22 in the vertical direction.

[0090] The carrying portion 130 is disc-shaped and provided with an opening for carrying the dust containing box 22 separated from the main machine 21. When the transfer apparatus 13 lifts the dust containing box 22, the carrying portion 130 can reliably carry the dust containing box 22.

[0091] Two sides of the opening in a thickness direction of the carrying portion 130 are respectively provided with the large opening end and the small opening end. The carrying portion 130 can be used as a sealing portion to seal the dust collection opening and the dust containing box 22, and the carrying portion 130 can cover the dust collection opening.

[0092] As shown in FIG. 2-1, the dust collection apparatus 16 may further include a fan 19, where the fan 19 may be mounted on a side wall of the garbage bin 161. When the garbage bag 165 is replaced, the fan 19 may be started to suck the interior of the garbage bin 161, so that the garbage bag 165 can be attached to the inner wall of the garbage bin 161. The power of the fan 19 is much smaller than the power of an air pump of a conventional suction-type dust collection base station, and the noise is extremely low. The fan 19 is started only when the garbage bag 165 is replaced.

[0093] The dust collection apparatus 16 may further include a pressing ring 164, and a pressing groove may be provided at the dust collection opening of the garbage bin 161, and a mouth of the garbage bag 165 can enter the pressing groove and is pressed by the pressing ring 164, so that the garbage bag 165 is stably fixed.

[0094] The dust collection apparatus 16 may further include a foldable cover 163 (the dust collection apparatus does not include the transfer cover 162 in the first embodiment), where the foldable cover 163 can cover the dust collection opening when being unfolded. When the transfer apparatus 13 transfers the dust containing box 22 to move the dust containing box 22 in the horizontal direction, the dust containing box 22 can simultaneously push the foldable cover 163 to be folded, so as to expose the dust collection opening. When the carrying portion 130 covers the dust collection opening, the foldable cover 163 is folded, and the dust containing box 22 is sealedly connected to the dust collection opening.

[0095] When the debris 3 and the like are not dumped, the foldable cover 163 covers the garbage bin 161 to prevent odor and dust from overflowing.

[0096] As shown in FIG. 2-5a to FIG. 2-5c, the tension wheel 152 of the first cover opening apparatus 15 may be provided with a pin slot 155, a transverse line-shaped pin 154 may be mounted on the lower flip cover 24, and the pin 154 is inserted into the pin slot 155. When the tension wheel 152 rotates, the lower flip cover 24 rotates together to open or close the dust containing box 22. The first cover opening apparatus 15 may be mounted on the transfer apparatus 13. Specifically, the cover opening motor may be mounted on the transfer frame 131, and the pin slot 155 of the tension wheel 152 may be detachably mounted with the pin 154 of the lower flip cover 24. When the dust containing box 22 is engaged with the transfer apparatus 13, the first cover opening apparatus 15 is connected to the lower flip cover 24 of the dust containing box 22, that is, the pin 154 is inserted into the pin slot 155 (as shown in FIG. 2-5b and FIG. 2-5c). When the dust containing box 22 is disengaged from the transfer apparatus 13, the first cover opening apparatus 15 is separated from the lower flip cover 24, that is, the pin 154 leaves the pin slot 155 (as shown in FIG. 2-5a).

[0097] A working process of the self-moving robot system is described below with reference to FIG. 2-6 to FIG. 2-13.

[0098] As shown in FIG. 2-6 and FIG. 2-7, the dust collection apparatus 16 may be mounted in the entrance direction I.

[0099] As shown in FIG. 2-8, the self-moving robot 2 enters the base station, the electromagnetic switch 135 is turned on, the driving spring 137 is compressed, and the charging connector 28 of the self-moving robot 2 is connected to the charging apparatus 18.

[0100] As shown in FIG. 2-9, the transfer apparatus 13 continues to close to the self-moving robot 2, the electromagnetic switch 135 may be turned off, the driving spring 137 drives the snap-fit 136 to reset and move downward, the snap-fit 136 pushes the lock pin 27 downward, the lock pin 27 exits from the lock slot, the dust containing box 22 is separated from the main machine 21 of the self-moving robot 2, and the rotational portion is connected to the dust containing box 22.

[0101] The self-moving robot 2 moves in the exit direction O, to release blocking on the dust containing box 22 in the vertical direction, and the carrying portion 130 carries the dust containing box 22.

[0102] As shown in FIG. 2-10, the transfer apparatus 13 moves along the first synchronous belt 111 and the first track section 123, to lift the dust containing box 22, and the dust containing box 22 is separated from the main machine 21 in the vertical direction.

[0103] As shown in FIG. 2-11, the transfer apparatus 13 moves along the second synchronous belt 112 and the second track section 124, to move the dust containing box 22 to be located above the dust collection apparatus 16 in the horizontal direction.

[0104] As shown in FIG. 2-12, the transfer apparatus 13 descends along the descending section 125, so that

the dust containing box 22 is sealedly connected to the dust collection opening.

[0105] As shown in FIG. 2-13, the cover opening motor is started, the lower flip cover 24 of the dust containing box 2 is opened as the rotation of the rotational portion, and the vibration motor is started to slap the dust containing box 22.

[0106] The control system of the dust collection base station 1 is configured to control the driving motor, the electromagnetic switch 135, the cover opening motor, the vibration motor, the fan 19, and the like.

[0107] In another embodiment, the transfer apparatus 13 may be indirectly connected to the synchronous belt 11 (the power apparatus) by a support, provided that the transfer apparatus 13 moves under the drive of the synchronous belt 11.

[0108] In another embodiment, the dust collection apparatus 16 may further be mounted in the dust collection base station 1 from sides of the entrance direction I and the exit direction O.

[0109] In another embodiment, the descending section 125 may be arranged in the vertical direction.

[0110] It should be understood that the implementations are merely exemplary, and are not intended to limit the present disclosure. A person skilled in the art may make various variations and changes to the foregoing implementations of the present disclosure with the teachings of the present disclosure without departing from the scope of the present disclosure.

Claims

1. A self-moving robot system, comprising a dust collection base station (1) and a self-moving robot (2), wherein the dust collection base station (1) is configured to collect debris of the self-moving robot (2), and the self-moving robot (2) comprises a main machine (21) and a dust containing box (22), wherein the dust containing box (22) is detachably mounted on the main machine (21);
the dust collection base station (1) comprises a power apparatus, a dust collection apparatus (16), and a transfer apparatus (13), wherein the transfer apparatus (13) can be engaged with the dust containing box (22) and assist separation of the dust containing box (22) from the main machine (21) or assist mounting of the dust containing box (22) on the main machine (21); the dust collection apparatus (16) is configured to collect debris from the dust containing box (22); and the power apparatus drives the transfer apparatus (13) and enables the transfer apparatus (13) to move the dust containing box (22) to a dust collection opening of the dust collection apparatus (16), so as to transfer the debris to the dust collection apparatus.

2. The self-moving robot system according to claim 1, further comprising a first cover opening apparatus (15), wherein the first cover opening apparatus (15) can open or close a box cover of the dust containing box (22), and when the box cover of the dust containing box (22) is opened, the debris (3) in the dust containing box (22) can be transferred to the dust collection apparatus.

3. The self-moving robot system according to claim 1, wherein the dust collection base station (1) comprises an operating position for the self-moving robot (2) to stop, and the dust collection apparatus (16) is located above the operating position.

4. The self-moving robot system according to claim 1, wherein the power apparatus comprises a conveying assembly, wherein the conveying assembly comprises a first conveying portion arranged in a vertical direction and a second conveying portion arranged in a horizontal direction, and the transfer apparatus is connected to the power apparatus to move along with the conveying assembly.

5. The self-moving robot system according to claim 4, wherein the conveying assembly comprises a synchronous belt assembly, the first conveying portion comprises a first synchronous belt, and the second conveying portion comprises a second synchronous belt.

6. The self-moving robot system according to claim 1, comprising a loading and unloading portion, wherein the loading and unloading portion is configured to operate the dust containing box (22) to be separated from the main machine (21) or be mounted on the main machine (21).

7. The self-moving robot system according to claim 6, wherein
one of the dust containing box (22) and the main machine (21) comprises a lock pin (27), the other of the dust containing box and the main machine comprises a lock slot, and the lock pin (27) can be inserted into or exit from the lock slot; the loading and unloading portion can apply a force to one of the dust containing box (22) and the main machine (21), so that the lock pin (27) exits from the lock slot, to assist separation of the dust containing box (22) from the main machine (21); and/or the loading and unloading portion can release the force applied to the lock pin (27), so that the lock pin (27) is inserted into the lock slot, to assist mounting of the dust containing box (22) on one of the dust containing box (22) and the main machine (21).

8. The self-moving robot system according to claim 7, wherein the loading and unloading portion comprises a snap-fit (136), the transfer apparatus (13) com-

prises an electromagnetic switch (135), a driving spring (137), and a carrying portion (130), the snap-fit (136) is connected to the driving spring (137), the electromagnetic switch (135) drives the snap-fit (136) to push or release the lock pin (27), and the carrying portion (130) is configured to carry the dust containing box (22) separated from the main machine (21); or

the loading and unloading portion comprises a clamping claw (138), the transfer apparatus (13) comprises a clamping motor and a first gear structure, the clamping claw (138) comprises a second rack structure, and the first gear structure driven by the clamping motor meshes with the second rack structure, to drive the clamping claw (138) to clamp or loosen the dust containing box (22).

9. The self-moving robot system according to claim 1, wherein the self-moving robot (2) comprises an operating portion, wherein the operating portion can assist separation of the dust containing box (22) from the main machine (21) or mounting of the dust containing box on the main machine (21) in response to pressing or releasing pressing of a user.

10. The self-moving robot system according to claim 1, wherein the dust collection base station (1) comprises a sealing portion, wherein the sealing portion can be sealedly connected to the dust containing box (22) and the dust collection opening.

11. The self-moving robot system according to claim 10, wherein

the sealing portion is provided with a large opening end and a small opening end, an aperture of the large opening end is greater than an aperture of the small opening end, the large opening end is configured to be sleeved with the dust collection opening, and the small opening end is configured to connect the dust containing box (22).

12. The self-moving robot system according to claim 1, wherein the dust collection base station (1) further comprises an auxiliary dust dumping apparatus (17), wherein the auxiliary dust dumping apparatus (17) comprises a vibration motor and an eccentric assembly, the vibration motor drives the eccentric assembly to vibrate, the auxiliary dust dumping apparatus (17) is arranged on the transfer apparatus (13) and moves along with the transfer apparatus (13), and the eccentric assembly can be connected to or in contact with the dust containing box (22), so that when vibrating, the eccentric assembly can drive the dust containing box (22) to vibrate.

13. The self-moving robot system according to claim 12, wherein the auxiliary dust dumping apparatus (17) comprises a damper, wherein the damper is connected between the vibration motor and the transfer apparatus (13).

14. The self-moving robot system according to claim 1, wherein the dust collection base station (1) comprises a charging apparatus (18), wherein when the self-moving robot (2) stops at the dust collection base station (1), the charging apparatus (18) is electrically connected to the self-moving robot (2) to charge the self-moving robot (2).

15. The self-moving robot system according to claim 1, wherein the dust collection apparatus (16) comprises a garbage bin (161) and a foldable cover (163), wherein the garbage bin (161) is provided with the dust collection opening, the foldable cover (163) can cover the dust collection opening when being unfolded, and when the transfer apparatus (13) transfers the dust containing box (22), the dust containing box (22) can push the foldable cover (163) to be folded, so as to expose the dust collection opening.

16. The self-moving robot system according to claim 2, wherein the first cover opening apparatus (15) comprises a cover opening motor and a rotational portion, wherein the rotational portion is connected to the box cover of the dust containing box (22), and when the dust containing box (22) is moved to the dust collection opening of the dust collection apparatus (16), the cover opening motor drives the rotational portion to rotate, so as to open the box cover of the dust containing box (22); and after the dust containing box (22) completes debris dumping, the cover opening motor drives the rotational portion to rotate, so as to close the box cover of the dust containing box (22).

17. The self-moving robot system according to claim 6, comprising a second cover opening apparatus (4), wherein the second cover opening apparatus (4) comprises:

a driving member (41), arranged on the loading and unloading portion; and

a rotational member (42), arranged on one side of the dust containing box (22) and being in contact with the box cover of the dust containing box (22), wherein the rotational member (42) is configured to rotate between a first position and a second position under the drive of the driving member (41);

when the rotational member (42) is located at the first position, the box cover is closed; and

when the rotational member (42) rotates from the first position to the second position, the box cover is opened under the drive of the rotational member (42).

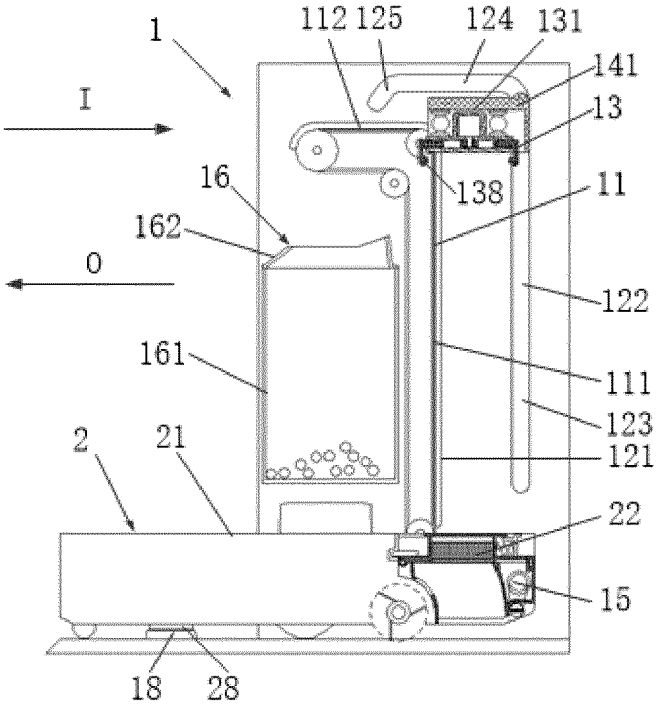
1
112
125
124
131
141
I
13
16
138
11
162
0
122
161
111
123
2
21
121
22
15
18
28

FIG. 1-1

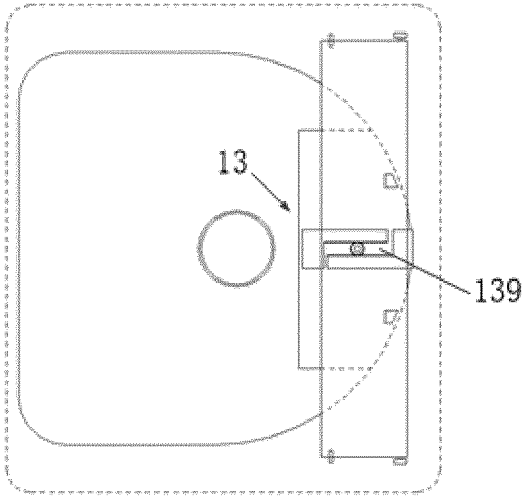
13
139

FIG. 1-2

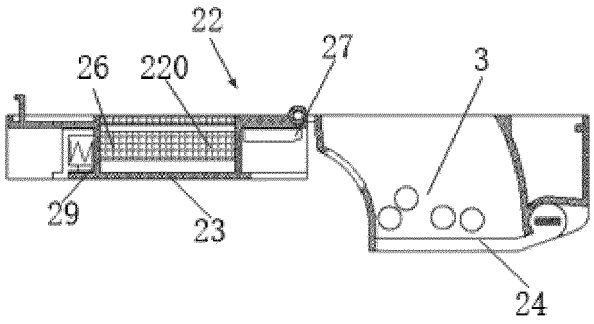

FIG. 1-3a

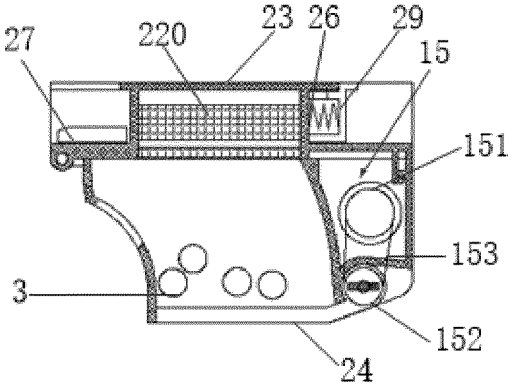

FIG. 1-3b

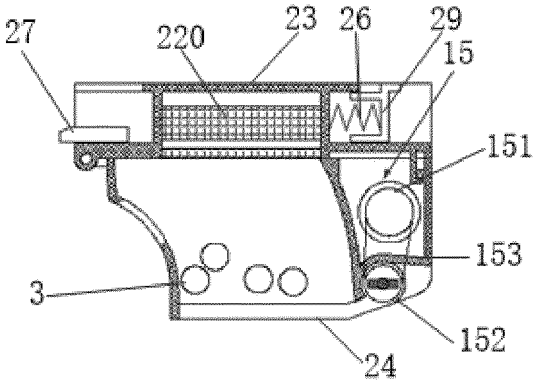

FIG. 1-3c

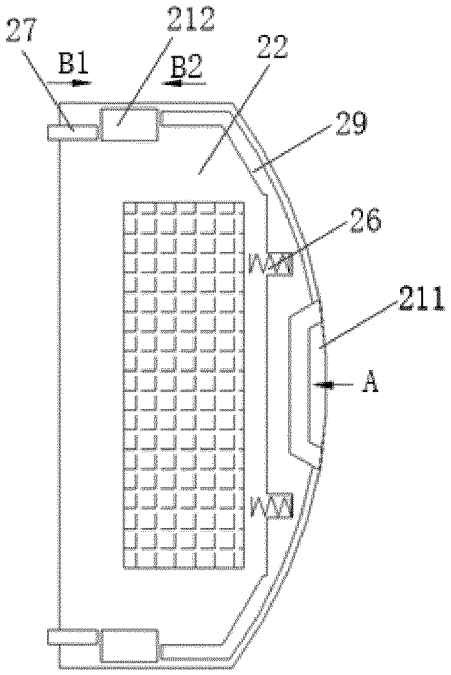

FIG. 1-3d

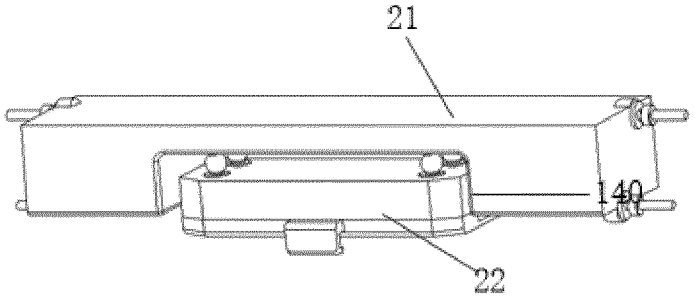

FIG. 1-4

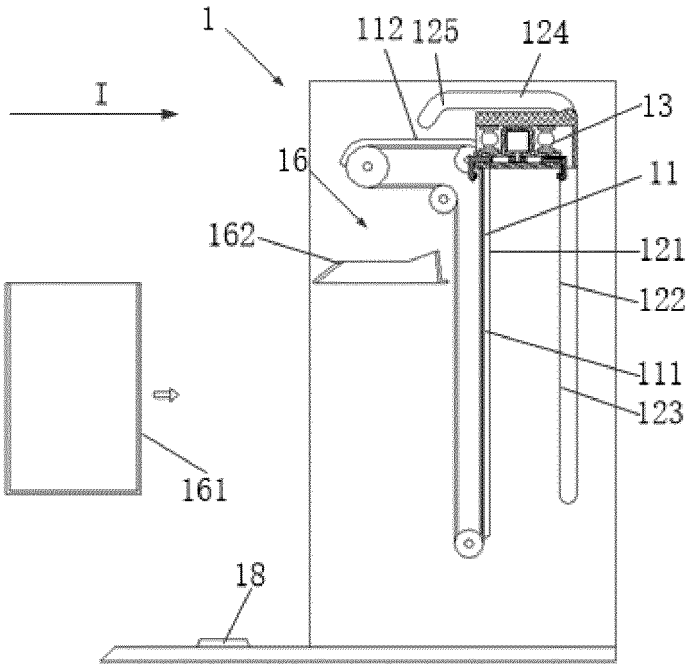
1
112
125
124
I
13
16
11
162
121
122
111
123
161
18

FIG. 1-5

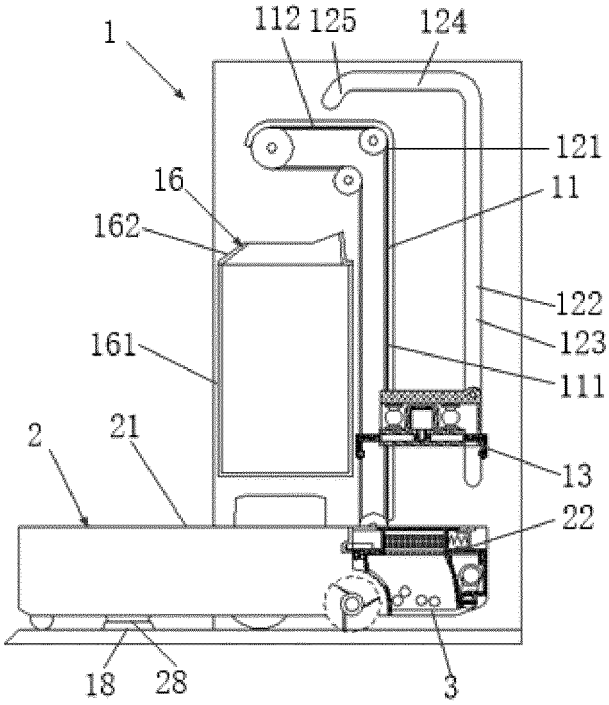
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FIG. 1-6

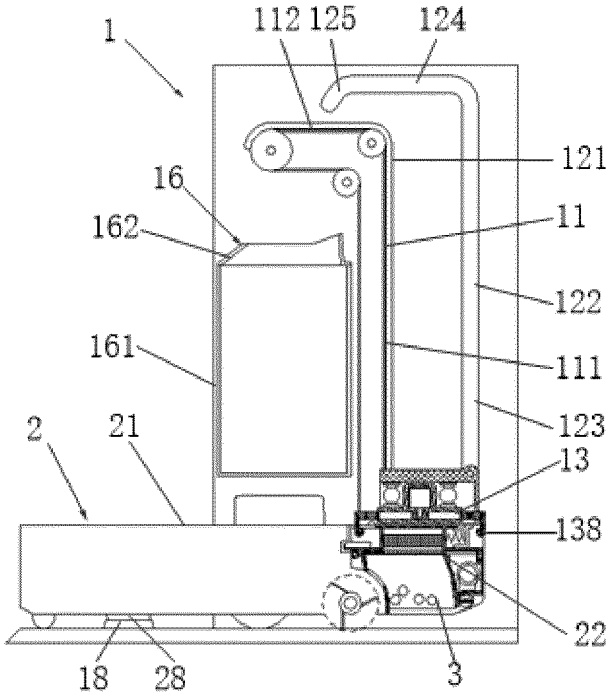
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FIG. 1-7

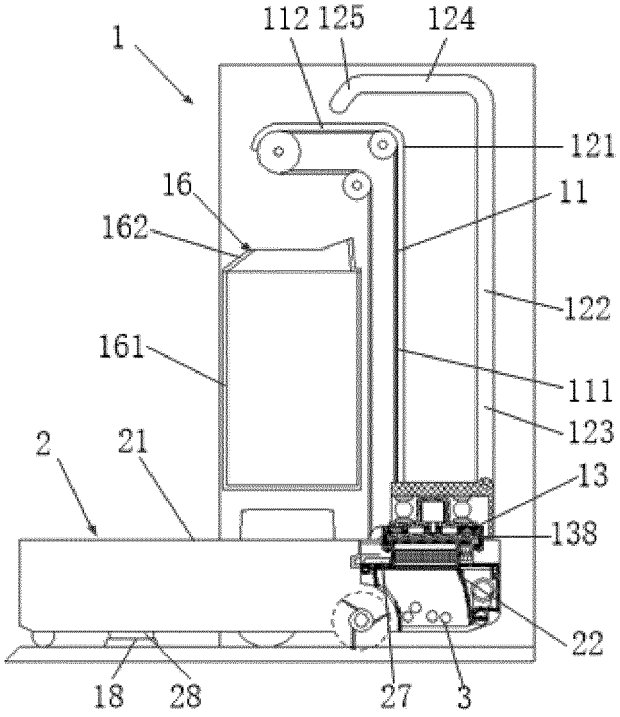
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FIG. 1-8

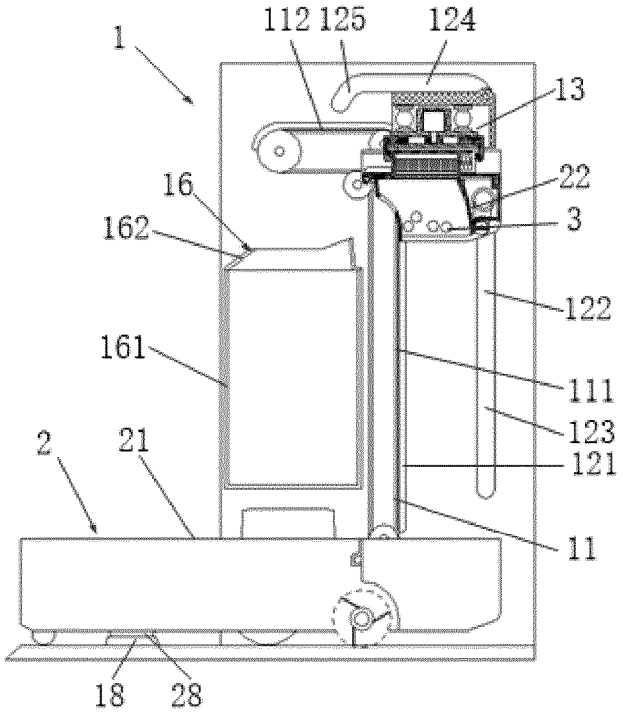

FIG. 1-9

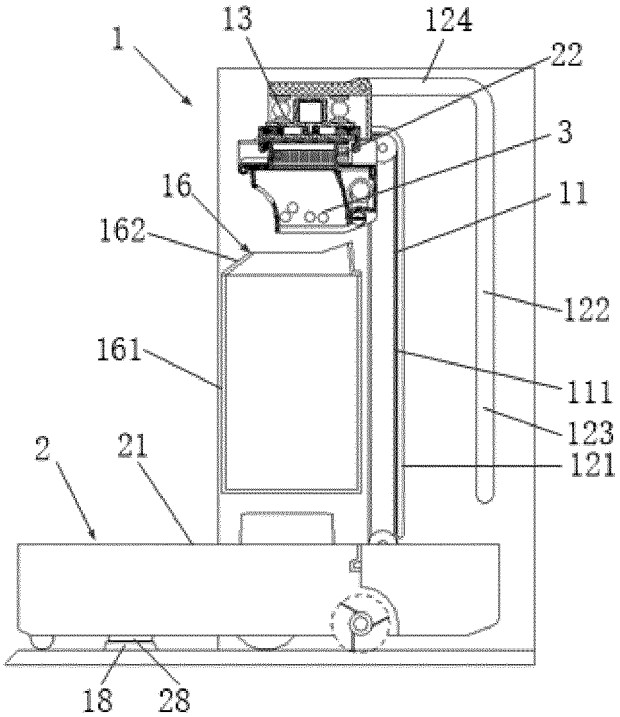

FIG. 1-10

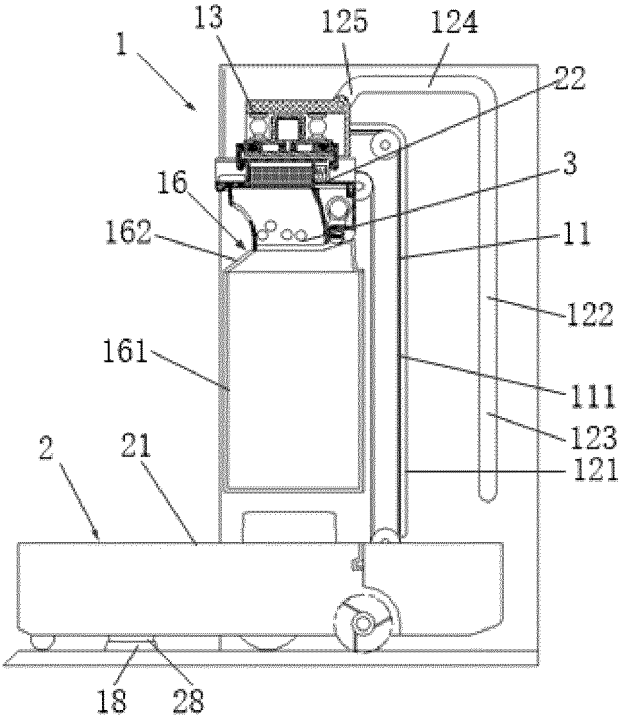

FIG. 1-11

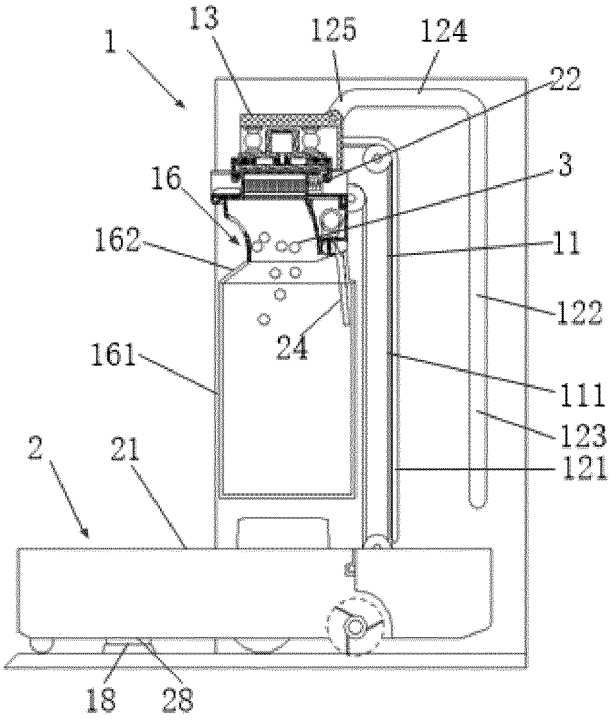

FIG. 1-12

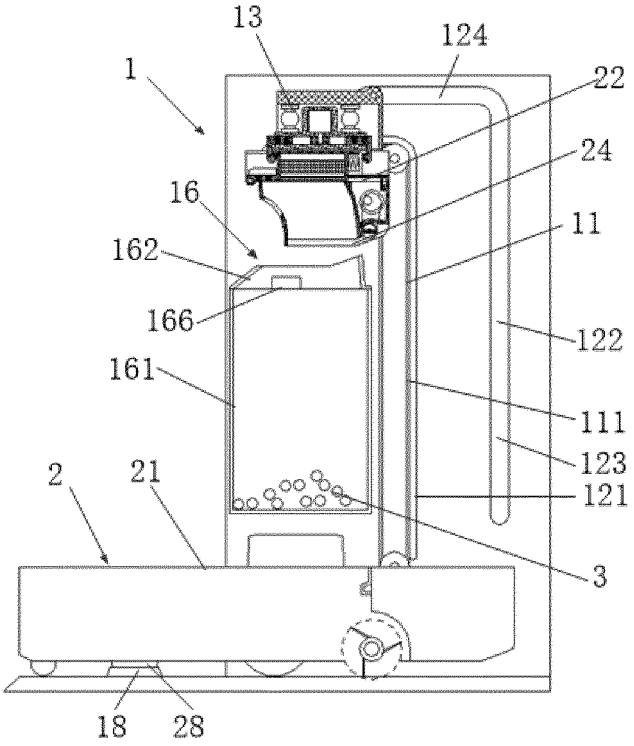

FIG. 1-13

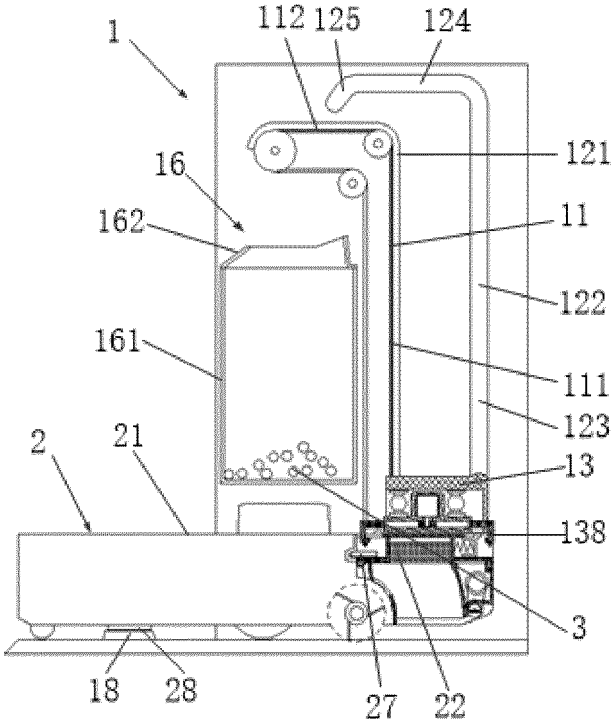

FIG. 1-14

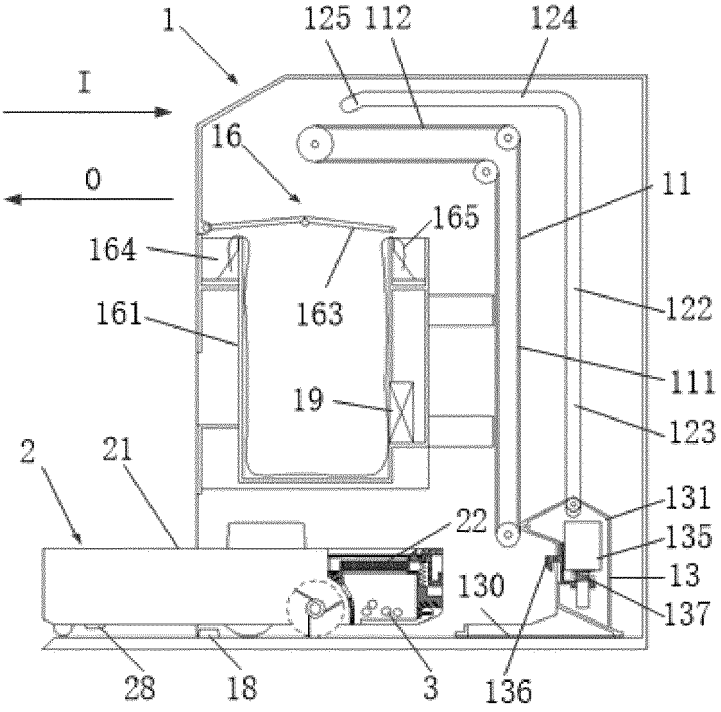
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FIG. 2-1

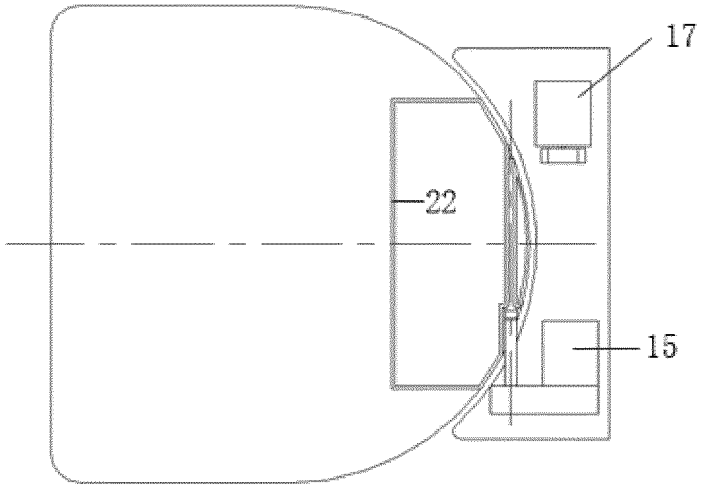
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FIG. 2-2

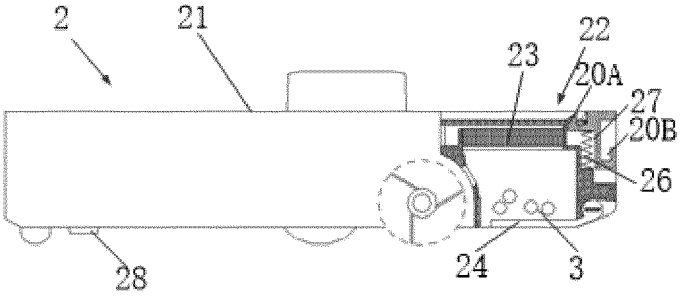

FIG. 2-3

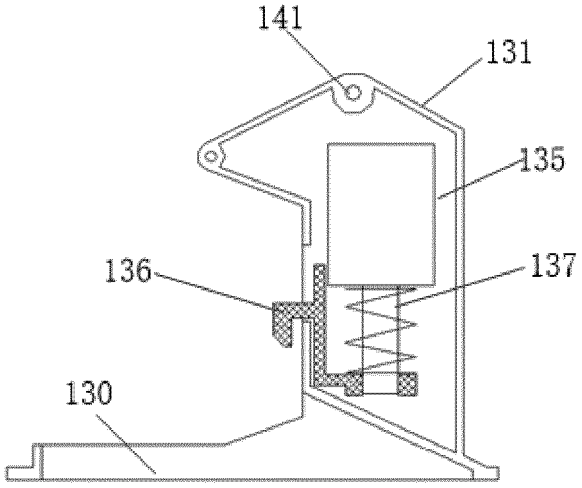

FIG. 2-4

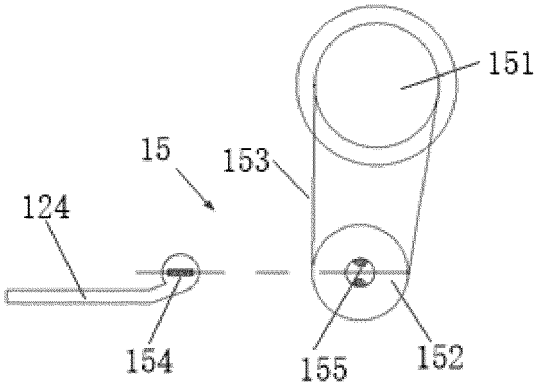

FIG. 2-5a

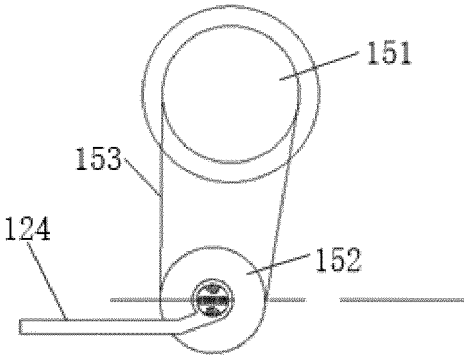

FIG. 2-5b

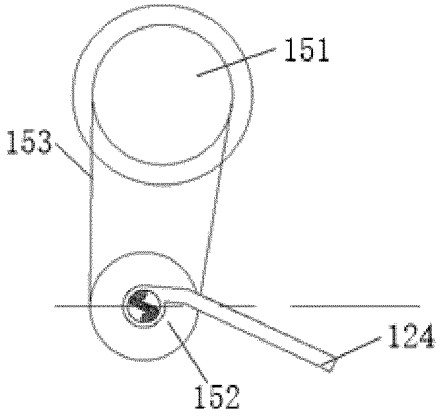

FIG. 2-5c

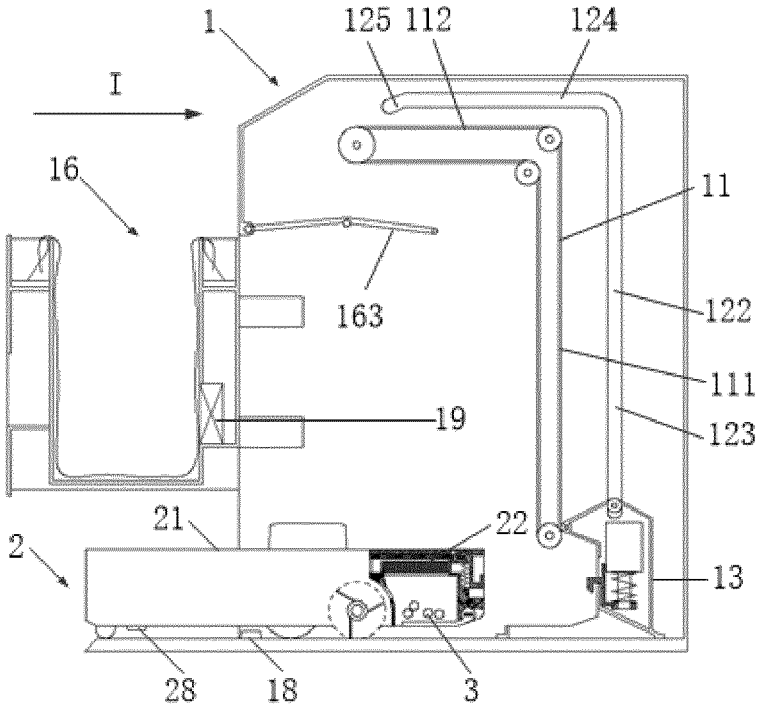
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FIG. 2-6

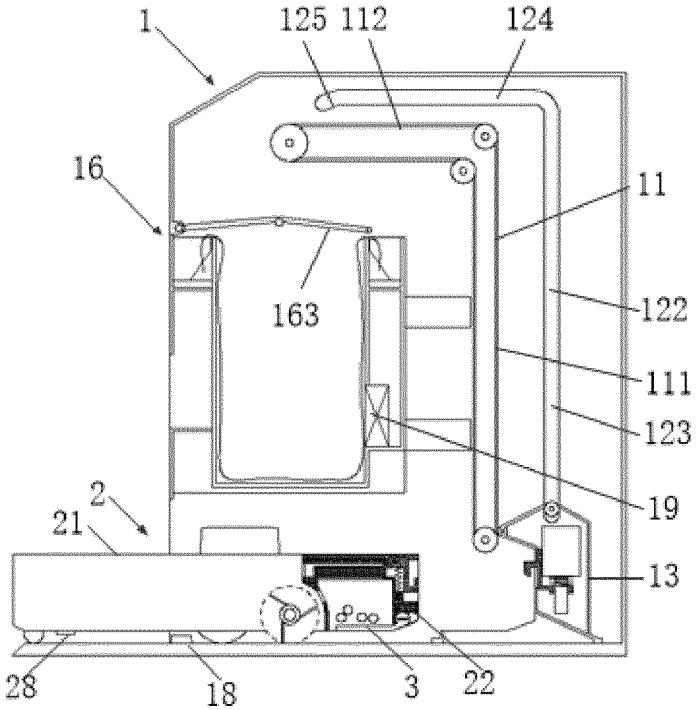
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FIG. 2-7

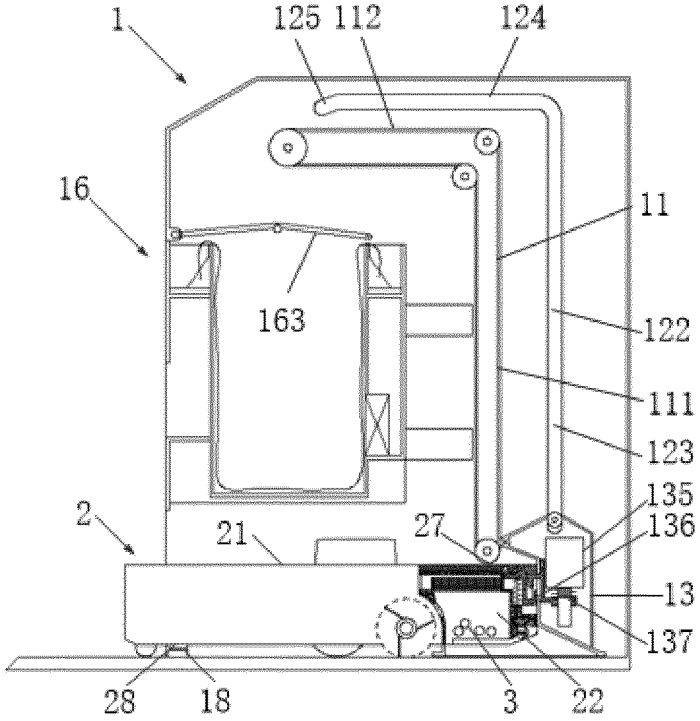
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FIG. 2-8

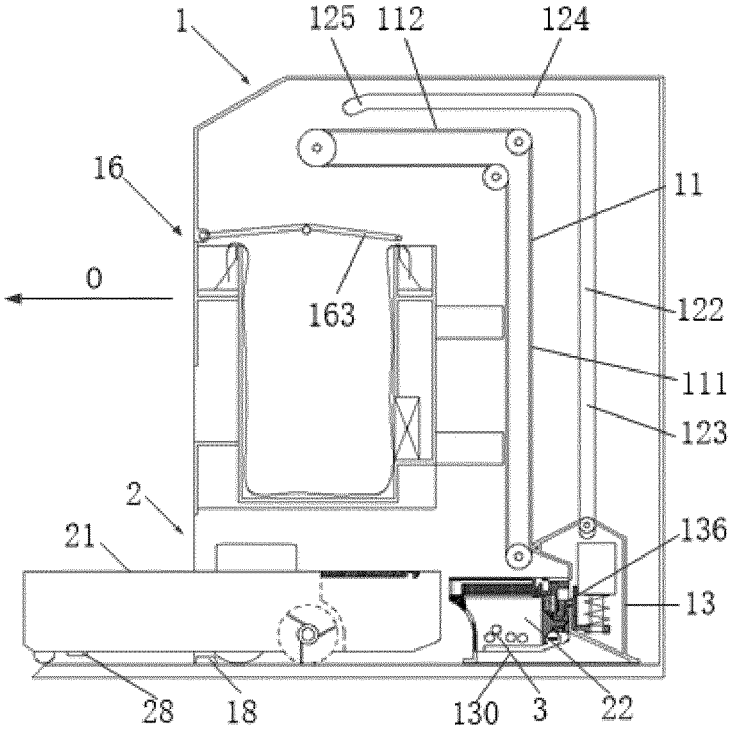
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FIG. 2-9

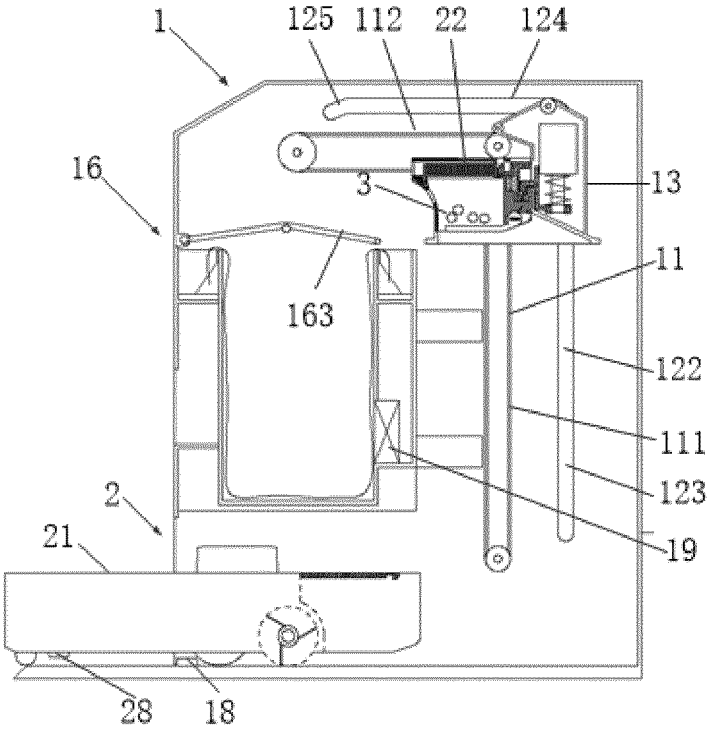


FIG. 2-10

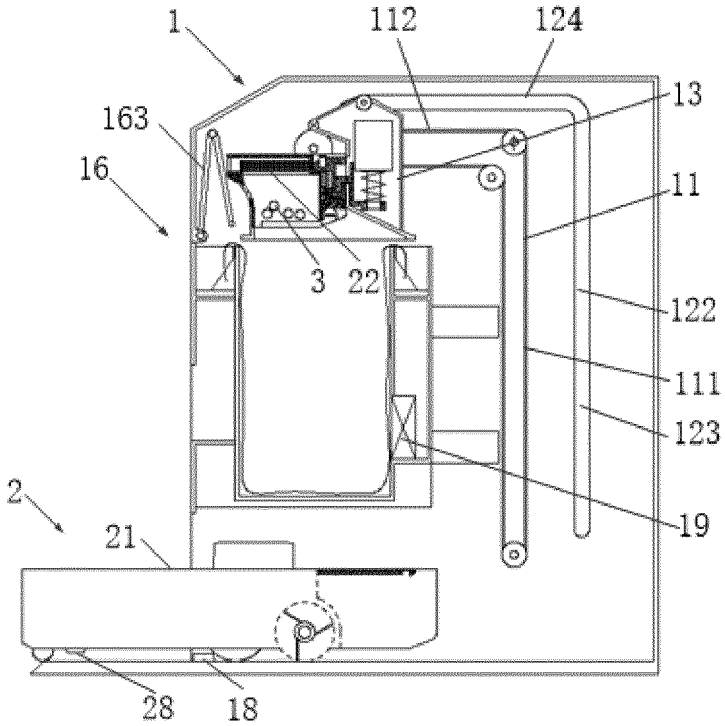


FIG. 2-11

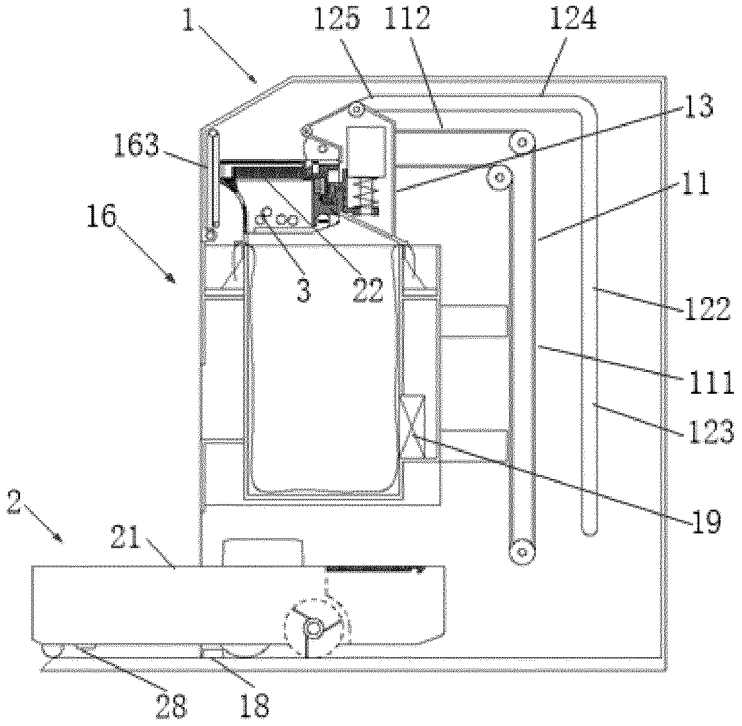


FIG. 2-12

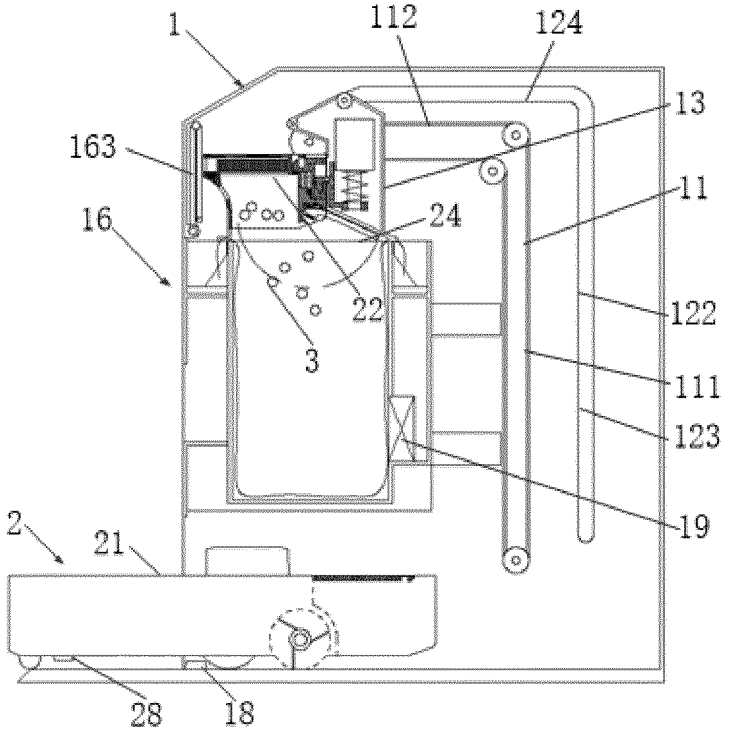


FIG. 2-13

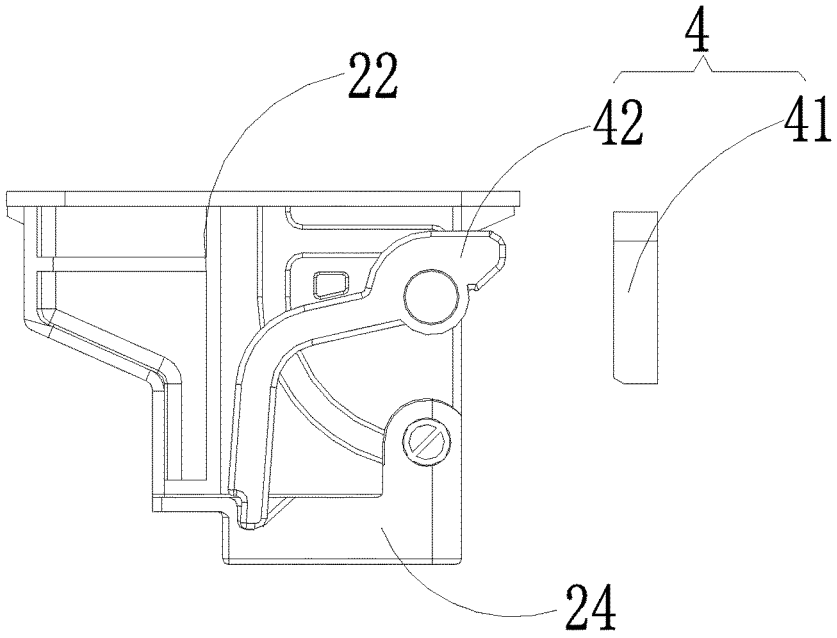


FIG. 3-1

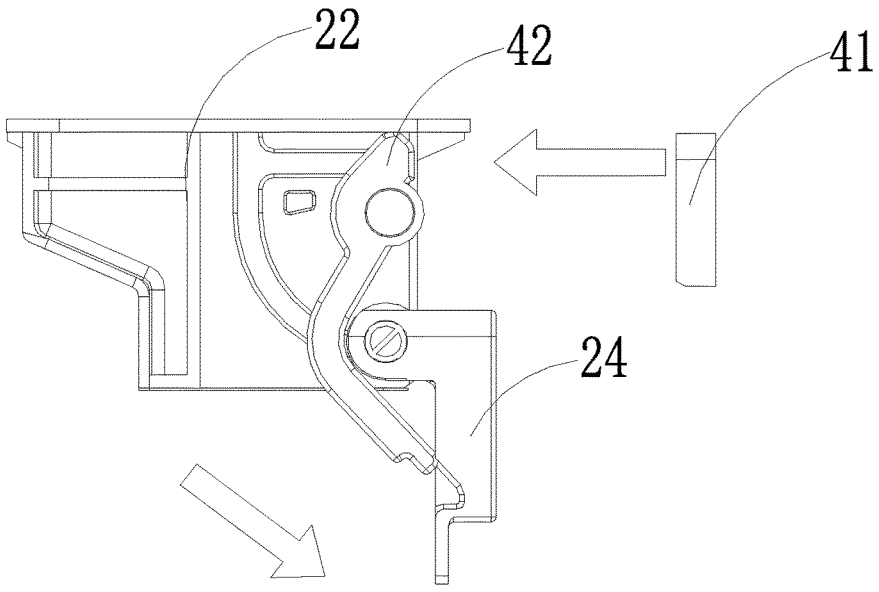
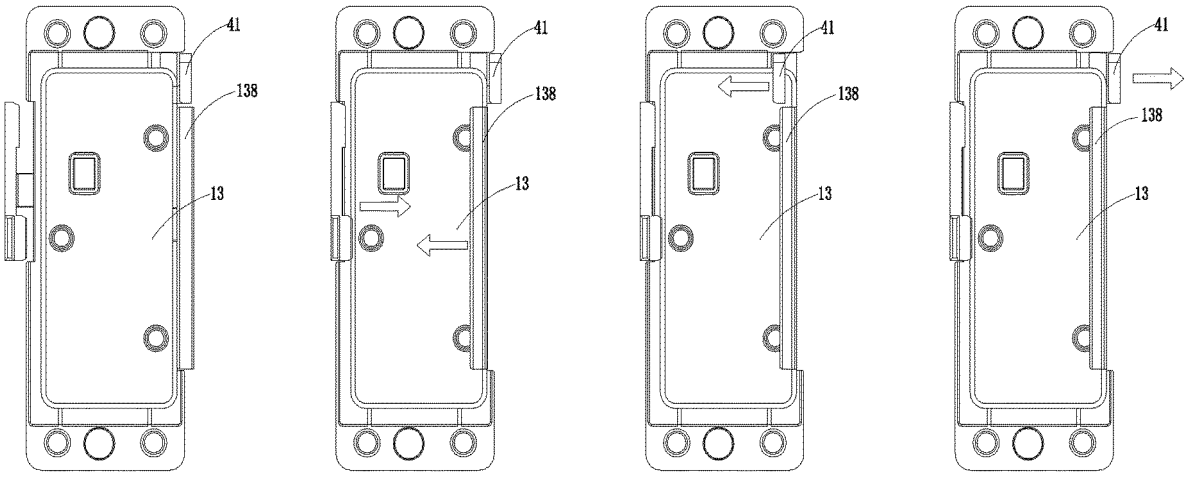


FIG. 3-2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Time sequence 4

FIG. 3-3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/098740

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; B65F

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)

CNABS; CNTXT; VEN; USTXT; WOTXT; EPTXT: 机器人, 尘, 垃圾, 盒, 箱, 袋, 驱动, 集尘, 排出, 排空, 站, 充电, 拆卸, 分离, 收集, 噪音, 噪声, 传送, 转移, 移动, 输送, 抽, 吸, robot, dust, soil, dirt, garbage, container, collect+, discharg+, station, separat+, nosie, convey+, charg+, eject+, mov+, box, driv+, suct+, transfer+, carry+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 111657788 A (VORWERK & CO. INTERHOLDING GMBH) 15 September 2020 (2020-09-15) description, paragraphs [0007]-[0033], and figures 1-6	1-2, 6-11, 15-17
Y	CN 110051283 A (ZHUHAI YIWEI ROBOT TECHNOLOGY CO., LTD.) 26 July 2019 (2019-07-26) description, paragraphs [0006]-[0029], and figures 1-2	1-17
Y	JP H02249801 A (TAKENAKA KOMUTEN CO., LTD. et al.) 05 October 1990 (1990-10-05) description, pages 2-4, and figures 1-2	1-17
Y	JP 2002017638 A (MATSUSHITA ELECTRIC IND CO., LTD.) 22 January 2002 (2002-01-22) description, paragraphs [0008]-[0050], and figures 1-2	12-13
A	CN 107529930 A (IROBOT CORPORATION) 02 January 2018 (2018-01-02) entire document	1-17
A	CN 110325088 A (TOSHIBA HOME APPLIANCES CORPORATION) 11 October 2019 (2019-10-11) entire document	1-17

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 2021	**24 August 2021**
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.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/098740

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 109480713 A (BEIJING XIANGJIE TECHNOLOGY CO., LTD.) 19 March 2019 (2019-03-19) entire document	1-17
A	KR 20100010064 A (SEO HONG TAE) 01 February 2010 (2010-02-01) entire document	1-17
A	US 2013031744 A1 (OTA TETSU) 07 February 2013 (2013-02-07) entire document	1-17

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/098740

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CN	107529930	A	02 January 2018	EP	3313255	B1	17 June 2020
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				EP	3777629	A1	17 February 2021
				US	9924846	B2	27 March 2018
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				EP	3313255	A4	20 February 2019
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KR	20100010064	A	01 February 2010		None		
US	2013031744	A1	07 February 2013	US	9192272	B2	24 November 2015
				JP	6010722	B2	19 October 2016

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