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(54) **CLEANING ASSEMBLY, CLEANING DEVICE AND CONTROL METHOD**

(57) A cleaning assembly includes a roller cleaning component (1), including a first cleaning execution element, a driving element (12) and a roller bracket (11), in which the first cleaning execution element is fixedly connected with the roller bracket (11), and the roller cleaning component (1) switches between an edge cleaning mode and an ordinary cleaning mode by driving the first cleaning execution element and the roller bracket (11) via the driving element; a rear cleaning

component (2), including a second cleaning execution element (22),. In a case where the roller cleaning component (1) switches to the edge cleaning mode, the rear cleaning component (2) moves with following the roller bracket (11) and switches to the corner cleaning mode, and in the corner cleaning mode, a cleaning boundary of the second cleaning execution element (22) forms an outermost edge in a straight direction and an outermost edge in the first direction.

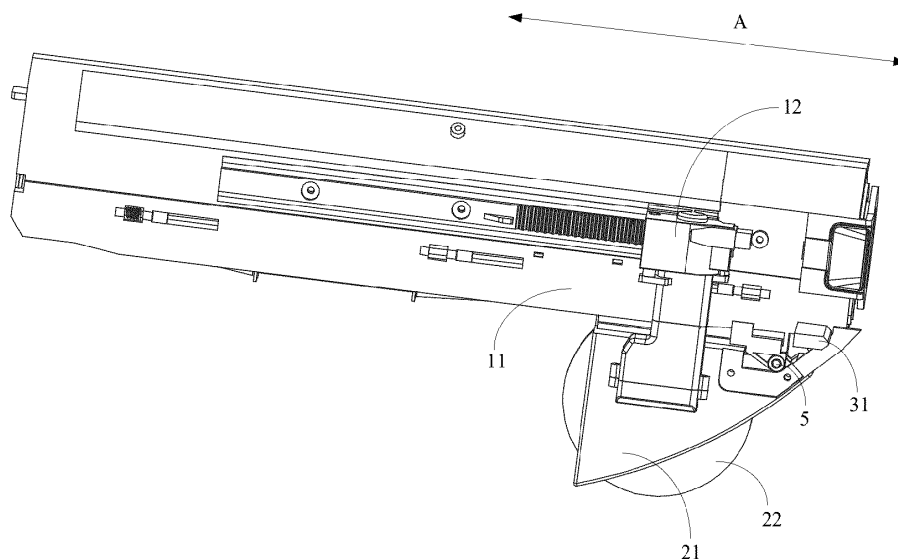


FIG. 1

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## Description

### TECHNICAL FIELD

**[0001]** The invention relates to the field of terminal technologies, in particular to a cleaning assembly, a cleaning device and a control method thereof.

### BACKGROUND

**[0002]** A cleaning robot, such as a robot vacuum cleaner and a robot vacuum and mop cleaner, has become an indispensable part of smart home appliances. However, the existing cleaning robot usually cannot clean an included angle area, which requires a user to clean it manually, or even if the cleaning robot can clean the included angle area, it is required to constantly adjust directions of the cleaning robot to achieve cleaning of the included angle area by twisting, which is complicated to control.

### SUMMARY

**[0003]** According to a first aspect of the invention, a cleaning assembly is provided. The cleaning assembly includes: a roller cleaning component, including a first cleaning execution element, a driving element and a roller bracket, in which, the first cleaning execution element is fixedly connected with the roller bracket, and the roller cleaning component switches between an edge cleaning mode and an ordinary cleaning mode by driving the first cleaning execution element and the roller bracket to perform reciprocating motion in a first direction via the driving element; a rear cleaning component, including a second cleaning execution element, configured with a corner cleaning mode and a retract mode; in which in a case where the roller cleaning component switches to the edge cleaning mode, the rear cleaning component moves following the roller bracket and switches to the corner cleaning mode, and in the corner cleaning mode, a cleaning boundary of the second cleaning execution element forms an outermost edge of an affiliated device in a straight direction and an outermost edge of the affiliated device in the first direction, the first direction is perpendicular to the straight direction.

**[0004]** According to a second aspect of the invention, a cleaning device is provided. The cleaning device includes: a machine body; and the cleaning assembly described in any one of the above embodiments, in which a roller bracket of the cleaning assembly and the machine body are connected in a relatively slidable manner along a first direction, and the first direction is perpendicular to a straight direction of the cleaning device.

**[0005]** According to a third aspect of the invention, a method for controlling a cleaning assembly is provided. The method is applied to the cleaning device described

in any one of the above embodiments, and includes: controlling a rear cleaning component to switch to a corner cleaning mode; controlling the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle; and controlling the cleaning device to execute a straight instruction, to enable a second cleaning execution element to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0006]** According to a fourth aspect of the invention, an apparatus for controlling a cleaning assembly is provided. The apparatus is configured in the cleaning device described in any one of the above embodiments, and includes: a first control module, configured to control a rear cleaning component to switch to a corner cleaning mode; a second control module, configured to control the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle; and a third control module, configured to control the cleaning device to execute a straight instruction, to enable a second cleaning execution element to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0007]** According to a fifth aspect of the invention, a computer-readable storage medium having computer instructions stored thereon is provided. When the instructions are executed by a processor, steps of the method of any one of the above embodiments are implemented.

**[0008]** According to a sixth aspect of the invention, a cleaning device is provided. The cleaning device includes: a processor; and a memory for storing instructions executable by the processor; in which the processor is configured to implement steps of the method of any one of the above embodiments when executing the instructions.

**[0009]** The technical solution provided by the embodiments of the invention includes the following beneficial effects.

**[0010]** As can be seen from the above embodiments, the rear cleaning component of the invention moves following the roller bracket and switches to the corner cleaning mode, thus, mode switching of the rear cleaning component is realized in the mechanical structure, which reduces the number of motor layouts or even removes all the motor layouts, and simplifies the structure. On the other hand, in the corner cleaning mode, since the second cleaning execution element is the outermost edge of the affiliated device, it solves the problem that the second cleaning execution element cannot reach the edge of the included angle area due to blockage of the device, which is beneficial to cleaning the included angle area by simply executing the straight instruction, and has a simple control strategy and a better cleaning effect.

**[0011]** It is understandable that the foregoing general

description and the following detailed descriptions are exemplary and explanatory only and do not limit the invention.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0012]** The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments consistent with the invention and, together with the specification, serve to explain the principles of the invention.

FIG. 1 is a schematic structural diagram of a cleaning assembly according to an example embodiment.

FIG. 2 is a schematic diagram of a part of the cleaning assembly in FIG. 1.

FIG. 3 is a schematic diagram of state switching of a cleaning assembly according to an example embodiment.

FIG. 4 is a schematic structural diagram of a cleaning device according to an example embodiment.

FIG. 5 is a simplified schematic diagram of a cleaning device according to an example embodiment.

FIG. 6 is a schematic structural diagram of another cleaning assembly according to an example embodiment.

FIG. 7 is a schematic diagram of a part of the cleaning assembly in FIG. 6.

FIG. 8 is a schematic diagram of another part of the cleaning assembly in FIG. 6.

FIG. 9 is a schematic diagram of yet another part of the cleaning assembly in FIG. 6.

FIG. 10 is a schematic diagram of a state of the cleaning assembly in FIG. 6.

FIG. 11 is a schematic diagram of a state of a cleaning device according to an example embodiment.

FIG. 12 is a schematic diagram of another state of the cleaning device in FIG. 11.

FIG. 13 is a flowchart of a method for controlling a cleaning device according to an example embodiment.

FIG. 14 is a schematic diagram of a state of a cleaning device according to a first example embodiment.

FIG. 15 is a schematic diagram of a state of the cleaning device according to an example embodiment.

FIG. 16 is a schematic diagram of a third state of the cleaning device according to a second example embodiment.

FIG. 17 is a schematic diagram of a state of the cleaning device according to a fourth example embodiment.

FIG. 18 is a schematic diagram of a state of the cleaning device according to a fifth example embodiment.

FIG. 19 is a schematic diagram of a state of the cleaning device according to a sixth example embodiment.

FIG. 20 is a schematic diagram of a state of the cleaning device according to a seventh example embodiment.

FIG. 21 is a schematic diagram of a state of the cleaning device according to an eighth example embodiment.

FIG. 22 is a schematic diagram of a state of the cleaning device according to a ninth example embodiment.

FIG. 23 is a schematic diagram of a state of the cleaning device according to a tenth example embodiment.

FIG. 24 is a block diagram of an apparatus for controlling the cleaning device according to a first example embodiment.

FIG. 25 is a block diagram of the apparatus for controlling the cleaning device according to a second example embodiment.

FIG. 26 is a block diagram of the apparatus for controlling the cleaning device according to a third example embodiment.

FIG. 27 is a block diagram of the apparatus for controlling the cleaning device according to a fourth example embodiment.

FIG. 28 is a block diagram of the apparatus for controlling the cleaning device according to a fifth example embodiment.

FIG. 29 is a block diagram of the apparatus for controlling the cleaning device according to a sixth example embodiment.

FIG. 30 is a block diagram of the apparatus for controlling the cleaning device according to a seventh example embodiment.

FIG. 31 is a block diagram of a device for controlling a cleaning device according to an example embodiment.

## **DETAILED DESCRIPTION**

**[0013]** Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings. The following description refers to the accompanying drawings in which the same numbers in different drawings represent the same or similar elements unless otherwise represented. The implementations set forth in the following description of the example embodiments do not represent all implementations consistent with the invention. Instead, they are merely examples of apparatuses and methods consistent with aspects related to the invention as recited in the attached claims.

**[0014]** The terms used in the disclosure are only for the purpose of describing specific embodiments, and are not intended to limit the invention. The singular forms of "a" and "the" used in the disclosure and the

attached claims are also intended to include plural forms, unless the context clearly indicates other meanings. It is understandable that the term "and/or" as used herein refers to and includes any or all possible combinations of one or more associated listed items.

**[0015]** It is understandable that although the terms "first", "second" and "third" may be used in the disclosure to describe various types of information, the information should not be limited to these terms. These terms are only used to distinguish the same type of information from each other. For example, without departing from the scope of the invention, the first information may also be referred to as the second information, and similarly, the second information may also be referred to as the first information. Depending on the context, the term "if" as used herein may be interpreted as "when", "upon" or "in response to determining".

**[0016]** FIG. 1 is a schematic structural diagram of a cleaning assembly according to an example embodiment, and FIG. 2 is a schematic diagram of a part of the cleaning assembly in FIG. 1. As illustrated in FIGs. 1 and 2, the cleaning assembly may include a roller cleaning component 1 and a rear cleaning component 2. The rear cleaning component 2 is located at the rear of the roller cleaning component 1. The rear can be defined with reference to a straight direction of a cleaning device in a case where the cleaning assembly is configured to the cleaning device. The roller cleaning component 1 includes a first cleaning execution element (not shown), a roller bracket 11 and a driving element 12. The roller bracket 11 is fixedly connected with the first cleaning execution element. As illustrated in FIG. 3, the driving element 12 is used to drive the first cleaning execution element to perform reciprocating motion in a first direction, e.g., a direction indicated by arrow A, to enable the roller cleaning component 1 to switch between an edge cleaning mode and an ordinary cleaning mode. A case that the roller cleaning component 1 is in the edge cleaning mode is shown by dashed lines, and a case that the roller cleaning component 1 is in the ordinary cleaning mode is shown by solid lines.

**[0017]** The rear cleaning component 2 is configured with a corner cleaning mode and a retract mode. A position of the second cleaning component 22 in the corner cleaning mode is different a position of the second cleaning component 22 in the retract mode. As illustrated in FIG. 3, in a case where the rear cleaning component 2 is in the corner cleaning mode, the roller cleaning component 1 is in the edge cleaning mode. That is, in a case where the roller cleaning component 1 switches to the edge cleaning mode, the rear cleaning component 2 may translate following the roller bracket 11 and rotate relative to roller bracket 11, thereby switching to the corner cleaning mode, until the rear cleaning component 2 is in the corner cleaning mode, and the roller cleaning component 1 is in the edge cleaning mode. It is understood that an included angle

area is often located at an intersection area of two edges. Therefore, with accompanying appearance of the edge cleaning mode and the corner cleaning mode, there is no need for a secondary instruction to control the rear cleaning component 2 to move in the first direction, thus simplifying a control strategy.

**[0018]** The rear cleaning component 2 includes a second cleaning execution element 22. In a case where the rear cleaning component 2 is in the corner cleaning mode, a cleaning boundary of the second cleaning execution element 22 forms an outermost edge in a straight direction of an affiliated device and an outermost edge in the first direction of the affiliated device, and the first direction is perpendicular to the straight direction. For example, as illustrated in FIGs. 4-5, taking the cleaning assembly being configured to a cleaning device, and the cleaning device being a robot vacuum cleaner as an example, the cleaning device includes a machine body 3. The roller cleaning component 1 in the ordinary cleaning mode and the rear cleaning component 2 in the retract mode are both located in a projection range of the machine body 3, that is, within a range covered by the machine body 3. For example, in FIG. 5, the machine body 3 is circular, an arrow C indicates the straight direction of the cleaning device, an arrow B indicates the first direction, and two dashed lines tangent to the circular machine body in FIG. 5 are the outermost edge at a side of the machine body near the second cleaning execution element 22 in the straight direction and the outermost edge at a side of the machine body near the second cleaning execution element 22 in the first direction. As illustrated in FIG. 5, the cleaning boundary of the second cleaning execution element 22 is beyond the outermost edge of the machine body 3 in the straight direction and the outermost edge of the machine body 3 in the first direction, thus, the cleaning boundary of the second cleaning execution element 22 can form the new outermost edge of the affiliated device.

**[0019]** On the basis, subsequently in a case where the cleaning device is controlled to clean the included angle area, on the one hand, the rear cleaning assembly moves following the roller bracket 11 and switches to the corner cleaning mode, thus, mode switching of the rear cleaning component is realized in the mechanical structure, which reduces the number of motor layouts or even removes all the motor layouts, and simplifies the structure. On the other hand, in the corner cleaning mode, since the second cleaning execution element 22 is the outermost edge of the affiliated device, it solves the problem that the second cleaning execution element 22 cannot reach the edge of the included angle area due to blockage of the machine body 3, which is beneficial to cleaning the included angle area by simply executing a straight instruction, and has a simple control strategy and a better cleaning effect.

**[0020]** On the straight direction, the cleaning boundary of the second cleaning execution element 22 is

aligned with a cleaning boundary of the first cleaning execution element, thus, the first cleaning execution element and the second cleaning execution element 22 can clean the same edge, which has a better cleaning effect.

**[0021]** It should be noted that the first cleaning execution element and the second cleaning execution element 22 may include cleaning cloths, cleaning brushes, mopping pads, etc., which is not limited in the invention. In a case where the roller cleaning component 1 switches to the edge cleaning mode, the first cleaning execution element moves close to a wall or edges of other obstacles for edge cleaning. In a case where the roller cleaning component 1 switches to the ordinary cleaning mode, the first cleaning execution element may be relatively located in a central area of the cleaning device, to clean a wide and obstacle-free area. The first direction may be defined with reference to the straight direction of the cleaning device in a case where the cleaning assembly is configured on the cleaning device. For example, the first direction may be perpendicular to the straight direction of the cleaning device. The driving element 12 may include: a motor, a gear and a rack. The motor is connected to the gear and is capable of driving the gear to rotate, and the gear engages with the rack and drives the rack to perform reciprocating motion in the first direction. The rack is fixedly connected with the roller bracket 11, thus, the rack drives the roller bracket 11 to move along with it, which forces the first cleaning execution element to move on the first direction. Certainly, this is only for illustrative purposes, the driving element 12 may adopt other driving modes, for example, may be implemented by using a lead screw structure.

**[0022]** In some embodiments, the rear cleaning component 2 further includes a rear bracket 21 fixedly connected with the second cleaning execution element 22. The rear bracket 21 is rotatably connected with the roller bracket 11, with a rotation axis direction parallel to a height direction of the cleaning assembly, that is, with the rotation axis direction parallel to a height direction of the cleaning device. In a case where the rear cleaning component 2 switches to the corner cleaning mode, the rear cleaning component 2 swings outward relative to the roller bracket 11, and in a case where the rear cleaning component 2 switches to the retract mode, the rear cleaning component 2 retracts inward relative to the roller bracket 11. For example, in FIG. 3, a case that the rear cleaning component 2 is in the retract mode is shown by solid lines, and a case that the rear cleaning component 2 is in the corner cleaning mode is shown by dashed lines. When the rear cleaning component 2 switches from the retract mode to the corner cleaning mode, the rear cleaning component 2 rotates in a counterclockwise manner relative to the roller bracket 11 to swing outward. When the rear cleaning component 2 switches from the corner cleaning mode to the retract mode, the rear cleaning component 2

rotates in a clockwise manner relative to the roller bracket 11 to retract inward. The outward swinging of the rear bracket 21 relative to the roller bracket 11 and movement of the rear bracket 21 as the roller bracket 11 moves may occur simultaneously or may occur one after another in time sequence, which is not limited in the invention.

**[0023]** In some embodiments, movements of the rear cleaning component 2 and the roller cleaning component 1 in the first direction are always synchronous, that is, when the roller cleaning component 1 moves, the rear cleaning component 2 moves along with it. Still taking an example of configuring the cleaning assembly on the robot vacuum cleaner shown in FIG. 4, the machine body 3 includes an anchoring block 31, and the rear cleaning component 2 includes an elastic element 23, one end of the elastic element 23 abuts against the rear bracket 21 and the other end of the elastic element 23 abuts against the roller bracket 11. For example, as illustrated in FIG. 2, the cleaning assembly further includes a rotation shaft 5, the rotation shaft 5 is rotatably connected with the roller bracket 11 and the rear bracket 21. The elastic element 23 may include a torsion spring, and the rotation shaft is passed through the torsion spring. One end of the torsion spring abuts against the roller bracket 11, and the other end of the torsion spring abuts against the rear bracket 21. In a case where the rear cleaning component 2 is in the retract mode, the torsion spring may be twisted, which is beneficial to the subsequent use of potential energy stored in the torsion spring to drive the rear cleaning component 2 to swing outward relative to the roller bracket 11 and switch to the corner cleaning mode. In order to improve aesthetics, the elastic element 23 may be accommodated in the rear bracket 21. Here, the elastic element 23 is taken as a torsion spring as an example for explanation, and the elastic element 23 can also be realized by other types of springs, details are not described here.

**[0024]** In a case where the roller cleaning component 1 switches from the edge cleaning mode to the ordinary cleaning mode, the rear cleaning component 2 moves towards the inside of the machine body 3 along the first direction with following the roller bracket 11, until the rear bracket 21 of the rear cleaning component 2 is in contact with the anchoring block 31 for position limiting. Under a position limiting effect of the anchoring block 31 and translation effect of the roller cleaning component 1, the rear bracket 21 may rotate relative to the roller bracket 11 to retract inward, and the elastic element 23 may be compressed simultaneously to enable the elastic element 23 to switch to a first compressed state. In a case where the roller cleaning component 1 switches from the ordinary cleaning mode to the edge cleaning mode, the rear cleaning component 2 moves towards the outside of the machine body 3 along the first direction with following the roller bracket 11, and the rear bracket 21 is separated from the anchoring

block 31 to release the position limiting effect of the anchoring block 31, and the elastic element 23 releases the potential energy. Through action of the elastic element 23 on the rear bracket 21, the rear bracket 21 rotates relative to the roller bracket 11 to achieve the outward swing, and through further movement along with the roller bracket 11, the rear cleaning component 2 switches to the corner cleaning mode.

**[0025]** Based on the design, through the design of the mechanical structure, the mode switching of the rear cleaning component 2 occurs along with the mode switching of the roller cleaning component 1, without the need to design an additional motor for the mode switching of the rear cleaning component 2, which is beneficial to simplifying the structure and the control strategy. Taking the machine body 3 including the anchoring block 31 as an example, in other embodiments, the anchoring block 31 is in a fixed state when the roller cleaning component 1 performs reciprocating motion in the device. A position where the anchoring block 31 is installed is not limited in the invention.

**[0026]** In other embodiments, as shown in FIGs. 6-10, the roller bracket 11 includes a roller bracket main body 111 and a sliding block 112. The sliding block 112 is slidably connected with the roller bracket main body 111 along the first direction, and the sliding block 112 is rotatably connected with the rear bracket 21. One end of the elastic element 23 abuts against the sliding block 112 and the other end of the elastic element 23 abuts against the rear bracket 21. For relevant implementations of the elastic element 23, reference can be made to the above embodiments without conflict.

**[0027]** The cleaning assembly further includes: a locking component 4, configured with a locked state and an unlocked state. As illustrated in FIG. 11, in a case where the locking component 4 is in the locked state, the locking component 4 may limit movement of the rear bracket 21 relative to the sliding block 112 and enables the roller cleaning component 1 to performs the reciprocating motion along the first direction to switch between the edge cleaning mode and the ordinary cleaning mode. When the roller cleaning component 1 switches between the edge cleaning mode and the ordinary cleaning mode, the sliding block 112 and the roller bracket main body 111 move relatively to each other, without the sliding block 112 and the rear bracket 21 moving along the first direction with following the roller bracket 11, and the rear cleaning component 2 maintains in the retract mode. As illustrated in FIG. 12, in a case where the locking component 4 switches to the unlocked state, the elastic element 23 releases its potential energy, and the rear bracket 21 is forced by the elastic element 23 to swing outward relative to the sliding block 112. Since the locking component 4 is in the unlocked state, the rear bracket 21, the sliding block 112 and the roller bracket main body 111 may synchronously performs the reciprocating motion along the first direction, until the roller cleaning component 1

is in the edge cleaning mode, and the rear cleaning component 2 is in the corner cleaning mode. In a case where the locking component 4 switches to the locked state, the locking component may pull the rear bracket 21 to retract inward relative to the sliding block 112 until the locking component 4 is in the locked state, and the rear cleaning component 2 is in the retract mode.

**[0028]** Based on the design, through state switching of the locking component 4, the roller cleaning component 1 may switch to the edge cleaning mode independently of the rear cleaning component 2, which is beneficial to avoid collision caused by the outward swing of the rear cleaning component 2 during edge cleaning. Moreover, through the state switching of the locking component 4, the roller cleaning component 1 and the rear cleaning component 2 may move in the first direction synchronously, so that the mode switching of the rear cleaning component 2 occurs along with the mode switching of the roller cleaning component 1, without the need to design an additional motor for the mode switching of the rear cleaning component 2, which is beneficial to simplifying the structure and the control strategy.

**[0029]** The locking component 4 includes a transmission element 41 and an extensible element 42. One end of the extensible element 42 is connected with the transmission element 41 and the other end of the extensible element 42 is connected with the rear bracket 21. In a case where the extensible element 42 is tightened to a shortest state through an action of the transmission element 41, the locking component 4 switches to be in the locked state, and the rear cleaning component 2 switches to be in the retract mode. Since the roller cleaning component 1 is in the edge cleaning mode when the rear cleaning component 2 is in the corner cleaning mode, during a process of the locking component 4 switching to be in the locked state, the locking component 4 move along with the translation of the roller bracket 11 in the first direction, the translation of the rear bracket 11 in the first direction, and the rotation of the rear bracket 21 relative to the sliding block 112. The above motions may occur in parallel or sequentially, and the occurrence sequence is not limited in the invention.

**[0030]** The extensible element 42 includes an extension rope 421 and a ball head 422. One end of the extension rope 421 is connected with the transmission element 41, and the other end of the extension rope 421 is connected with the ball head 422. The rear bracket 21 may include a storage recess 211, and the ball head 422 is accommodated in and confined to the storage recess 211. A movable connection between the ball head 422 and the storage recess 211 is beneficial to adapting to an orientation change of the rear bracket 21 when the rear bracket 21 rotates relative to the sliding block 112, and thus preventing the device from being stuck. In order to enhance aesthetics, the rear bracket 21 further includes a rear bracket main body

and a cover 212 connected with the rear bracket main body. The cover 212 is designed to be able to cover the ball head 422 and the storage recess 211. Therefore, in a case where the cover 212 is opened, it is convenient for installation between the ball head 422 and the storage recess 211, and in a case where the cover 212 is closed, it may enhance the aesthetics. The cover 212 and the rear bracket main body can be connected in a rotatable manner, in a slidable manner or in other detachable connection manners, which is not limited in the invention.

**[0031]** In the above embodiments, in order to limit a boundary of inward retracting of the rear cleaning component 2 relative to the roller bracket 11, the roller bracket 11 further includes a first limitation surface 113, and the rear bracket 21 includes a second limitation surface 213. In a case where the rear cleaning component 2 is in the retract mode, the first limitation surface 113 is in contact with the second limitation surface 213 to prevent the rear bracket 21 from retracting inward relative to the roller bracket 11. For example, in a process of the rear cleaning component 2 switching from the corner cleaning mode to the retract mode, when the first limitation surface 113 is in contact with the second limitation surface 213, it indicates that the rear cleaning component 2 is retracted properly and in the retract mode currently, and the first limitation surface 113 and the second limitation surface 213 may also be used to limit an inward retraction boundary of the rear cleaning component 2 relative to the roller bracket 11 when the rear cleaning component 2 rotates inward relative to the roller bracket 11.

**[0032]** Similarly, the roller bracket 11 also includes a third limitation surface 114, and the rear bracket 21 also includes a fourth limitation surface 214. The elastic element 23 acts on the rear bracket 21 to enable the rear bracket 21 to rotate relative to the roller bracket 11 to achieve the outwards swing, until the third limitation surface 114 is in contact with the fourth limitation surface 214 to limit a boundary of the rear bracket 21 swinging outward relative to the roller bracket 11, that is, to prevent the rear cleaning component 2 from excessive swing relative to the roller cleaning component 1, and keep the rear cleaning component 2 in a better position before switching to the corner cleaning mode.

**[0033]** The third limitation surface 114 is perpendicular to the first direction. In a case where the third limitation surface 114 is in contact with the fourth limitation surface 214, the third limitation surface 114 is located on an inner side relative to the fourth limitation surface 214. Therefore, in a case where the roller cleaning component 1 moves outward along the first direction and switches to the edge cleaning mode, the roller cleaning component 1 may act on the fourth limitation surface 214 via the third limitation surface 114, so that the rear cleaning component 2 moves along with the roller cleaning component 1, without the need to arrange additional connections to implement the following

motion of both, which is beneficial to simplifying the structure.

**[0034]** Moreover, in a case where the third limitation surface 114 is in contact with the fourth limitation surface 214 for limiting purposes, the elastic element 23 is in a second compressed state, i.e., an energy accumulation state. With acting a force on the rear bracket 21 by the elastic element 23, it may make the third limitation surface 114 maintain contact with the fourth limitation surface 214 to keep the rear bracket 21 from shaking. An elastic force acted by the elastic element 23 on the rear bracket in the second compressed state is less than an elastic force acted by the elastic element 23 on the rear bracket in the first compressed state. That is, a deformation degree of the elastic element 23 in the first compressed state is greater than a deformation degree of the elastic element 23 in the second compressed state, so as to ensure that the outward swing of the rear cleaning component 2 relative to the roller cleaning component 1 may be implemented by the elastic force of the elastic element 23.

**[0035]** In the above embodiments, an example of the rear cleaning component 2 rotating relative to the roller bracket 11 when switching to the corner cleaning mode or the retract mode is taken for illustration. In other examples, the rear bracket 21 may also be fixedly connected with the roller bracket 11, and the rear cleaning component 2 moves along with the roller bracket 11 in the first direction and switches to the corner cleaning mode or the retract mode. Compared with the solution that the rear cleaning component 2 needs to be retracted inward or swung outward, the structure is simpler.

**[0036]** Based on the technical solution of the invention, a cleaning device is provided. The cleaning device includes a machine body 3 and the cleaning assembly described in any of the above embodiments. The roller bracket 11 and the machine body 3 are connected in a relatively slidably manner along a first direction, for example, a slidable connection is implemented through cooperation of a slide slot and a slide rail, or the roller bracket 11 and the machine body 3 may be connected in the slidably manner indirectly. The first direction is perpendicular to the straight direction of the cleaning device.

**[0037]** Based on the technical solution of the invention, a method for controlling the cleaning assembly is provided. The control method may be applied to the cleaning device provided with the cleaning assembly, or the control method may be applied to an independent component formed by the cleaning assembly itself. As illustrated in FIG. 13, the control method includes the following steps.

**[0038]** At step 101, a rear cleaning component 2 is controlled to switch to a corner cleaning mode.

**[0039]** In some embodiments, as illustrated in the embodiments of FIGs. 1 and 2, a driving element 12 of a roller cleaning component 1 is controlled to switch to

a working state, to drive a roller bracket 11 and a first cleaning execution element of the roller cleaning component 1 to move towards the outside of the cleaning device along the first direction. Meanwhile, since an anchoring block 31 on the machine body 3 is no longer limited a position, the elastic element 23 acts on the rear bracket 21 to enable the rear bracket 21 to rotate relative to the roller bracket 11, that is, enable the rear cleaning component 2 to swing outward relative to the roller bracket 11. The rear bracket 21 is rotatably connected with the roller bracket 11, thus, the rear cleaning component moves towards the outside of the cleaning device along the first direction with following the roller bracket 11 and switches to the corner cleaning mode.

**[0040]** In other embodiments, as illustrated in the embodiments of FIGs. 6-10, a locking component 4 is controlled to switch to an unlocked state. The locking component 4 no longer locks the rear cleaning component 2 tightly, therefore, the elastic member 23 may act on the rear cleaning component 2, to enable the rear cleaning component 2 to swing outward relative to the roller bracket 11. The driving element 12 of the roller cleaning component 1 is controlled to switch to the working state, to drive the roller bracket 11 and the first cleaning execution element of the roller cleaning component 1 to move towards the outside of the cleaning device along the first direction, and the rear cleaning component 2 moves toward the outside of the cleaning device along the first direction with following the roller bracket 11 and switches to the corner cleaning mode. Controlling the locking component 4 to switch to the unlocked state and controlling the driving element 12 to switch to the working state may occur in parallel or sequentially, and a sequence of occurrence is not limited by the invention.

**[0041]** Based on the corner cleaning mode, the locking component 4 may be controlled to switch to the locked state to enable the rear cleaning component 2 to retract inward relative to the roller bracket 11. The driving element 12 of the roller cleaning component 1 is controlled to switch to the working state to drive the roller bracket 11 and the first cleaning execution element of the roller cleaning component 1 to move towards the inside of the cleaning device along the first direction, and the rear cleaning component 2 moves towards the inside of the cleaning device along the first direction with following the roller bracket 11 and switches to the retract mode.

**[0042]** In some embodiments, the rear cleaning component 2 and the roller cleaning component 1 may be fixedly connected to each other, so that after the driving element 12 switches to the working state, the rear cleaning component 2 moves towards the outside of the cleaning device along with the roller cleaning component 1 and switches to the corner cleaning mode.

**[0043]** At step 102, the cleaning device is controlled to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of

an obstacle.

**[0044]** In the embodiment, as illustrated in FIG. 14, a vertical edge is taken as the first edge, a direction indicated by an arrow is a straight direction, a direction along the first edge upward is a forward direction, and a direction along the first edge downward is a backward direction. In a case where the cleaning device detects that an included angle area needs to be cleaned, the cleaning device may be controlled to rotate around the rotation center until the straight direction of the cleaning device is parallel to the first edge. That is, the cleaning device may switch to be in the state shown in FIG. 14, and gets ready to start cleaning the included angle area.

**[0045]** At step 103, the cleaning device is controlled to execute a straight instruction, to enable a second cleaning execution element 22 to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0046]** In the embodiment, as illustrated in FIG. 14, the second cleaning execution element 22 in the corner cleaning mode forms the outermost edge on the left side and the outermost edge on the bottom of the cleaning device in FIG. 14, and the cleaning device is controlled to execute the straight instruction, so that the second cleaning execution element 22 may clean the included angle area formed by the first edge and the second edge of the obstacle.

**[0047]** In some embodiments, as illustrated in FIG. 14, the cleaning device is controlled to execute a backward instruction, and moves from a position shown by the solid lines to a position shown by the dashed lines to complete the cleaning of the included angle area.

**[0048]** In other embodiments, as illustrated in FIG. 14, the cleaning device is controlled to execute a backward instruction towards the second edge, the second edge is perpendicular to the first edge, and then a spacing distance between the second cleaning execution element 22 and the second edge is obtained. In a case where the spacing distance is less than or equal to a predetermined threshold, the cleaning device is controlled to execute the forward instruction. The predetermined threshold may be 2mm, 1mm or 2cm, etc. The spacing distance between the second cleaning execution element 22 and the second edge may be directly obtained by a radar or other ranging sensors, or the spacing distance between the second cleaning execution element 22 and the second edge may be calculated indirectly based on a spacing distance between any other structure on the cleaning device and the second edge, which is not limited in the invention.

**[0049]** In some embodiments, as illustrated in FIG. 15, the cleaning device is controlled to execute the forward instruction, and moves from the position shown by the solid lines to the position shown by the dashed lines to complete the cleaning of the included angle area.

**[0050]** In other embodiments, as illustrated in FIG. 15, the cleaning device is controlled to execute the for-

ward instruction to move away from the second edge, the second edge is perpendicular to the first edge. The cleaning device is controlled to execute a backward instruction after a predetermined duration.

**[0051]** It should be noted that in the solution of controlling the cleaning device to alternately execute the forward instruction and the backward instruction, for an end position during execution of the backward instruction and an end position during execution of the forward instruction, reference can be made to the previous embodiments, and details are not described here.

**[0052]** In the above embodiments, if only the cleaning device is controlled to move forward or backward or alternately move forward and backward, as illustrated in FIGs. 14 and 15, it may not be able to increase a cleaning size of the included angle areas on a direction parallel to the second edge, which may lead to presence of an uncleaned area left during subsequent cleaning by using the first cleaning execution element.

**[0053]** Therefore, in some embodiments, the cleaning device is controlled to rotate around the rotation center alternately in opposite directions, to enable the straight direction of the cleaning device to be parallel to the first edge again, and a first spacing distance between a center of the second cleaning execution element and the first edge to be greater than or less than a second spacing distance between the center of the second cleaning execution element and the first edge during previous execution of the straight instruction. A difference between the first spacing distance and the second spacing distance is less than or equal to a radius of the second cleaning execution element 22, which may avoid an excessive difference between the first spacing distance and the second spacing distance, resulting in the unclean area left between two straight instructions.

**[0054]** For example, taking the cleaning device alternately executing the backward instruction-the forward instruction-the backward instruction as an example, after completing a first execution of the backward instruction, as illustrated in FIG. 16, the cleaning device moves from a position indicated by solid lines to a position indicated by dashed lines in the embodiment of FIG. 16, and reference can be made to the above embodiments for determination of its end positions. Before a first execution of the forward instruction, the cleaning device is controlled to rotate around the rotation center alternately in the opposite directions. For example, in the embodiment in FIG. 17, the cleaning device is controlled to rotate around the rotation center in a clockwise manner, and moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 17, then, as illustrated in FIG. 18, the cleaning device is controlled to rotate around the rotation center in a counterclockwise manner, and moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 18, so that the straight direction of

the cleaning device is parallel to the first edge again, and the spacing distance between the center of the second cleaning execution element and the first edge is increased. With regard to the state shown in FIG. 16, the spacing distance between the center of the second cleaning execution element and the first edge is the second spacing distance. With regard to the state shown in FIG. 18, the spacing distance between the center of the second cleaning execution element and the first edge is the first spacing distance, the first spacing distance is greater than the second spacing. As illustrated in FIG. 19, after the straight direction of the cleaning device is parallel to the first edge again, the cleaning device may execute the backward instruction, and the cleaning device moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 19.

**[0055]** For another example, taking the cleaning device alternately executing the forward instruction, the backward instruction and the forward instruction as an example, as illustrated in FIG. 20, the cleaning device executes the forward instruction and moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 20, and reference can be made to the above embodiments for determination of its end positions. Before a first execution of the backward instruction, the cleaning device may be controlled to rotate around the rotation center alternately in the opposite directions. For example, in the embodiment of FIG. 21, the cleaning device is controlled to rotate around the rotation center in a counterclockwise manner, and moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 21, then, as illustrated in FIG. 22, the cleaning device is controlled to rotate around the rotation center in a clockwise manner, and moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 22, so that the straight direction of the cleaning device is parallel to the first edge again, and the spacing distance between the center of the second cleaning execution element and the first edge is increased. With regard to the state shown in FIG. 20, the spacing distance between the center of the second cleaning execution element and the first edge is the second spacing distance. With regard to the state shown in FIG. 22, the spacing distance between the center of the second cleaning execution element and the first edge is the first spacing distance, the first spacing distance is greater than the second spacing distance. As illustrated in FIG. 23, after the straight direction of the cleaning device is parallel to the first edge again, the cleaning device may execute the backward instruction, and the cleaning device moves from the position indicated by the solid lines to the position indicated by the dashed lines in the embodiment of FIG. 23.

**[0056]** In the above embodiments, examples of

achieving the purpose of making the first spacing distance greater than the second spacing distance before the execution of the backward instruction, and the purpose of making the first spacing distance greater than the second spacing distance before the execution of the forward instruction are taken for illustration. Actually, in other embodiments, it is also possible to control the cleaning device to rotate alternately in the opposite directions with reference to the above embodiments before the execution of other instructions except the first execution of the instruction. The cleaning device rotates alternately in the opposite directions may be a single round of alternation or a plurality of rounds of alternations, which is not limited in the invention.

**[0057]** Step 101 and step 102 may occur in parallel or sequentially, and a sequence of occurrence is not limited in the invention.

**[0058]** According to the above embodiments, the cleaning of the included angle area may be completed by controlling the cleaning device to execute the straight instruction in the technical solution of the invention, which has a simple strategy, and is easy to control.

**[0059]** Corresponding to the above embodiments of the control method, the invention also provides an embodiment of a control apparatus.

**[0060]** FIG. 24 is a block diagram of an apparatus for controlling a cleaning device according to a first example embodiment. As illustrated in FIG. 24, the apparatus includes: a first control module 241, a second control module 242 and a third control module 243.

**[0061]** The first control module 241 is configured to control a rear cleaning component to switch to a corner cleaning mode.

**[0062]** The second control module 242 is configured to control the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle.

**[0063]** The third control module 243 is configured to control the cleaning device to execute a straight instruction, to enable a second cleaning execution element to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0064]** As illustrated in FIG. 25, FIG. 25 is a block diagram of an apparatus for controlling a cleaning device according to a second example embodiment. The embodiment is based on the embodiment of FIG. 24, the third control module 243 includes a first control unit 2431, an obtaining unit 2432 and a second control unit 2433.

**[0065]** The first control unit 2431 is configured to control the cleaning assembly to execute a backward instruction to move towards the second edge, in which the second edge is perpendicular to the first edge.

**[0066]** The obtaining unit 2432 is configured to obtain a spacing distance between the second cleaning execution element and the second edge.

**[0067]** The second control unit 2433 is configured to, in a case where the spacing distance is less than or

equal to a predetermined threshold, control the cleaning device to execute the forward instruction.

**[0068]** As illustrated in FIG. 26, FIG. 26 is a block diagram of an apparatus for controlling a cleaning device according to a third example embodiment. The embodiment is based on the embodiment of FIG. 24, the third control module 243 includes a third control unit 2434 and a fourth control unit 2435.

**[0069]** The third control unit 2434 is configured to control the cleaning device to execute the forward instruction to move away from the second edge, in which the second edge is perpendicular to the first edge.

**[0070]** The fourth control unit 2435 is configured to control the cleaning device to execute a backward instruction after a predetermined duration.

**[0071]** It should be noted that structures of the third control unit 2434 and the fourth control unit 2435 in the apparatus embodiment of FIG. 26 may also be included in the apparatus embodiment of FIG. 25, which is not limited by the invention.

**[0072]** As illustrated in FIG. 27, FIG. 27 is a block diagram of an apparatus for controlling a cleaning device according to a fourth example embodiment. The embodiment is based on the embodiment of FIG. 24, the apparatus also includes a fourth control module 244.

**[0073]** The fourth control module 244 is configured to control the cleaning device to rotate around the rotation center alternately in opposite directions, to enable the straight direction of the cleaning device to be parallel to the first edge again, and a first spacing distance between a center of the second cleaning execution element and the first edge to be greater than a second spacing distance between the center of the second cleaning execution element and the first edge during previous execution of the straight instruction.

**[0074]** It should be noted that a structure of the fourth control module 244 in the apparatus embodiment of FIG. 27 may also be included in the apparatus embodiment of FIG. 25 or FIG. 26, which is not limited by the invention.

**[0075]** In an embodiment of the invention, a difference between the first spacing distance and the second spacing distance is less than or equal to a radius of the second cleaning execution element.

**[0076]** As illustrated in FIG. 28, FIG. 28 is a block diagram of an apparatus for controlling a cleaning device according to a fifth example embodiment. The embodiment is based on the embodiment of FIG. 24, the first control module 241 includes a fifth control unit 2411.

**[0077]** The fifth control unit 2411 is configured to control a driving element of a roller cleaning component to switch to a working state, to enable the rear cleaning component to swing outwards relative to a roller bracket and switch to the corner cleaning mode after moving towards outside of the cleaning device along a first direction with following the roller bracket.

**[0078]** It should be noted that a structure of the fifth control unit 2411 in the apparatus embodiment of FIG. 28 may also be included in any of the apparatus embodiments of FIGs. 25-27, which is not limited by the invention.

**[0079]** As illustrated in FIG. 29, FIG. 29 is a block diagram of an apparatus for controlling a cleaning device according to a sixth example embodiment. The embodiment is based on the embodiment of FIG. 24, the first control module 241 includes a sixth control unit 2412 and a seventh control unit 2413.

**[0080]** The sixth control unit 2412 is configured to control a locking component to switch to an unlocked state, to enable the rear cleaning component to rotate towards outside of a machine body relative to the roller bracket.

**[0081]** The seventh control unit 2413 is configured to control a driving element to switch to a working state, to enable the rear cleaning component to move towards outside of the cleaning device along a first direction with following the roller bracket on and switch to the corner cleaning mode.

**[0082]** It should be noted that structures of the sixth control unit 2412 and the seventh control unit 2413 in the apparatus embodiment of FIG. 28 may also be included in any of the apparatus embodiments of FIGs. 25-27, which is not limited by the invention.

**[0083]** As illustrated in FIG. 30, FIG. 30 is a block diagram of an apparatus for controlling a cleaning device according to a seventh example embodiment. The embodiment is based on the embodiment of FIG. 29, the apparatus also includes a fifth control module 245 and a sixth control module 246.

**[0084]** The fifth control module 245 is configured to control the locking component to switch to a locked state, to enable the rear cleaning component to retract inward relative to the roller bracket.

**[0085]** The sixth control module 246 is configured to control the driving element to switch to the working state, to enable the rear cleaning component to move towards inside of the cleaning device along the first direction with following the roller bracket and switch to a retract mode.

**[0086]** With regard to the apparatus in the above embodiment, the specific way in which each module performs operations has been described in detail in the method embodiments, which will not be described in detail here.

**[0087]** Since the apparatus embodiments basically correspond to the method embodiments, certain contents can refer to the relevant descriptions in the above method embodiments. The apparatus embodiments described above are only schematic, in which the units described as separate components may or may not be physically separated, and the components displayed as units may or may not be physical units, that is, they may be located in one place or distributed to several network units. Some or all of the modules may be se-

lected according to actual needs to achieve the purpose of the disclosed solution. Those skilled in the art can understand and implement the solution without inventive work.

**[0088]** Correspondingly, the invention also provides a control device. The device includes a processor and a memory for storing processor-executable instructions. The processor is configured to: control a rear cleaning component to switch to a corner cleaning mode; control the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle; and control the cleaning device to execute a straight instruction, to enable a second cleaning execution element to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0089]** Correspondingly, the invention also provides a cleaning device. The device includes a memory and one or more programs. The one or more programs are stored in the memory and are configured to be executed by one or more processors to implement the following operations: controlling a rear cleaning component to switch to a corner cleaning mode; controlling the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle; and controlling the cleaning device to execute a straight instruction, to enable a second cleaning execution element to clean an included angle area formed by the first edge and a second edge of the obstacle.

**[0090]** FIG. 31 is a block diagram of a device 3100 for controlling a cleaning device illustrated according to an example embodiment. For example, the device 3100 may be a mobile phone, a computer, a digital broadcasting terminal, a message transceiver device, a game console, a tablet device, a medical device, a fitness device or a personal digital assistant.

**[0091]** As illustrated in FIG. 31, the device 3100 may include one or more of the following components: a processing component 3102, a memory 3104, a power component 3106, a multimedia component 3108, an audio component 3110, an input/output (I/O) interface 3112, a sensor component 3114, and a communication component 3116.

**[0092]** The processing component 3102 typically controls overall operations of the device 3100, such as operations associated with display, telephone calls, data communications, camera operations, and recording operations. The processing component 3102 may include one or more processors 3120 to perform all or part of the steps in the above described method. Moreover, the processing component 3102 may include one or more modules which facilitate the interaction between the processing component 3102 and other components. For example, the processing component 3102 may include a multimedia module to facilitate the interaction between the multimedia component 3108 and the processing component 3102.

**[0093]** The memory 3104 is configured to store various types of data to support the operation of the device 3100. Examples of such data include instructions for any applications or methods operated on the device 3100, contact data, phonebook data, messages, pictures, videos, etc. The memory 3104 may be implemented using any type of volatile or non-volatile memory devices, or a combination thereof, such as a static random-access memory (SRAM), an electrically-erasable programmable read only memory (EEPROM), an erasable programmable read only memory (EPROM), a programmable read only memory (PROM), a read only memory (ROM), a magnetic memory, a flash memory, a magnetic or optical disk.

**[0094]** The power component 3106 provides power to various components of the device 3100. The power component 3106 may include a power management system, one or more power sources, and any other components associated with the generation, management, and distribution of power in the device 3100.

**[0095]** The multimedia component 3108 includes a screen providing an output interface between the device 3100 and the user. In some embodiments, the screen may include a liquid crystal display (LCD) and a touch panel (TP). If the screen includes the TP, the screen may be implemented as a touch screen to receive input signals from the user. The TP includes one or more touch sensors to sense touches, swipes, and gestures on the TP. The touch sensor may not only sense a boundary of a touch or swipe action, but also sense a period of wakeup time and a pressure associated with the touch or swipe action. In some embodiments, the multimedia component 3108 includes a front-facing camera and/or a rear-facing camera. When the device 3100 is in an operating mode, such as a shooting mode or a video mode, the front-facing camera and/or the rear-facing camera can receive external multimedia data. Each front-facing camera and rear-facing camera may be a fixed optical lens system or has focal length and optical zoom capability.

**[0096]** The audio component 3110 is configured to output and/or input audio signals. For example, the audio component 3110 includes a microphone (MIC) configured to receive an external audio signal when the device 3100 is in an operation mode, such as a call mode, a recording mode, and a voice recognition mode. The received audio signal may be further stored in the memory 3104 or transmitted via the communication component 3116. In some embodiments, the audio component 3110 further includes a speaker to output audio signals.

**[0097]** The I/O interface 3112 provides an interface between the processing component 3102 and peripheral interface modules, such as a keyboard, a click wheel, buttons, and the like. The buttons include, but are not limited to, a home button, a volume button, a starting button and a locking button.

**[0098]** The sensor component 3114 includes one or

more sensors to provide status assessments of various aspects of the device 3100. For instance, the sensor component 3114 may detect an open/closed status of the device 3100, relative positioning of components, e.g., the display and the keypad, of the device 3100, a change in position of the device 3100 or a component of the device 3100, a presence or absence of user contact with the device 3100, an orientation or an acceleration/deceleration of the device 3100, and a change in temperature of the device 3100. The sensor component 3114 may include a proximity sensor configured to detect the presence of nearby objects without any physical contact. The sensor component 3114 may also include a light sensor, such as a complementary metal oxide semiconductor (CMOS) or charge-coupled device (CCD) image sensor, for use in imaging applications. In some embodiments, the sensor component 3114 may also include an accelerometer sensor, a gyroscope sensor, a magnetic sensor, a pressure sensor, or a temperature sensor.

**[0099]** The communication component 3116 is configured to facilitate communication, wired or wirelessly, between the device 3100 and other devices. The device 3100 can access a wireless network based on a communication standard, such as wireless fidelity (Wi-Fi), 2G or 3G, 4G LTE, 5G NR or a combination thereof. In an example embodiment, the communication component 3116 receives a broadcast signal or broadcast associated information from an external broadcast management system via a broadcast channel. In an example embodiment, the communication component 3116 further includes a near field communication (NFC) module to facilitate short-range communication. For example, the NFC module may be implemented based on a radio frequency identification (RFID) technology, an infrared data association (IrDA) technology, an ultra-wide band (UWB) technology, a Blue Tooth (BT) technology, and other technologies.

**[0100]** In some example embodiments, the device 3100 may be implemented with one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), controllers, micro-controllers, microprocessors or other electronic components, for performing the above described method.

**[0101]** In some example embodiments, there is also provided a non-transitory computer readable storage medium including instructions, such as the memory 3104, executable by the processor 3120 in the device 3100, for performing the above method. For example, the non-transitory computer-readable storage medium may be a ROM, a random access memory (RAM), a CD-ROM, a magnetic tape, a floppy disc, and an optical data storage device.

**[0102]** Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention dis-

closed here. The scope of the invention is as defined by the claims.

## Claims

### 1. A cleaning assembly, comprising:

a roller cleaning component (1), comprising a first cleaning execution element, a driving element (12) and a roller bracket (11), wherein the first cleaning execution element is fixedly connected with the roller bracket (11), and the roller cleaning component (1) switches between an edge cleaning mode and an ordinary cleaning mode by driving the first cleaning execution element and the roller bracket (11) to perform reciprocating motion in a first direction via the driving element (12);  
 a rear cleaning component (2), comprising a second cleaning execution element (22), configured with a corner cleaning mode and a retract mode;  
 wherein in a case where the roller cleaning component (1) switches to the edge cleaning mode, the rear cleaning component (2) moves with following the roller bracket (11) and switches to the corner cleaning mode, and in the corner cleaning mode, a cleaning boundary of the second cleaning execution element (22) forms an outermost edge of a cleaning device in a straight direction and an outermost edge of the cleaning device in the first direction, the first direction is perpendicular to the straight direction.

2. The cleaning assembly of claim 1, wherein the rear cleaning component (2) further comprises a rear bracket (21) fixedly connected with the second cleaning execution element (22), the rear bracket (21) is rotatably connected with the roller bracket (11) with a rotation axis direction parallel to a height direction of the cleaning assembly, in a case where the rear cleaning component (2) switches to the corner cleaning mode, the rear cleaning component (2) swings outward relative to the roller bracket (11), and in a case where the rear cleaning component (2) switches to the retract mode, the rear cleaning component (2) retracts inward relative to the roller bracket (11).

3. The cleaning assembly of claim 2, wherein the rear cleaning component (2) comprises an elastic element (23), one end of the elastic element (23) abuts against the rear bracket (21) and the other end of the elastic element (23) abuts against the roller bracket (11);

in a case where the roller cleaning component (1) switches to the ordinary cleaning mode, an anchoring block (31) of the cleaning device contacts and limits the rear bracket (21) along the first direction towards an interior of the cleaning device, the rear cleaning component (2) retracts inward relative to the roller cleaning component (1) and switches to the retract mode, and the elastic element (23) switches to a first compressed state; and  
 in a case where the roller cleaning component (1) switches to the edge cleaning mode, the anchoring block (31) is separated from the rear bracket (21), and the elastic element (23) acts on the rear bracket (21) to force the rear bracket (21) to swing outward relative to the roller bracket (11);  
 and optionally, wherein the method further comprises: a rotation shaft (5) rotatably connected with the rear bracket (21) and the roller bracket (11), wherein the elastic element (23) comprises a torsion spring, and the rotation shaft (5) passes through windings of the torsion spring.

4. The cleaning assembly of claim 2 or 3, wherein the roller bracket (11) comprises a roller bracket main body (111) and a sliding block (112), the sliding block (112) is slidably connected with the roller bracket main body (111) along the first direction, and the sliding block (112) is rotatably connected with the rear bracket (21), the rear cleaning component (2) comprises an elastic element (23), one end of the elastic element (23) abuts against the sliding block (112) and the other end of the elastic element (23) abuts against the rear bracket (21); and  
 the cleaning assembly further comprises:

a locking component (4), configured with a locked state and an unlocked state, wherein, in a case where the locking component (4) is in the locked state, the locking component (4) limits movement of the rear bracket (21) relative to the sliding block (112) and keeps the rear cleaning component (2) in the retract mode; and  
 in a case where the locking component (4) switches to the unlocked state, the rear bracket (21) is forced by the elastic element (23) to swing outward relative to the sliding block (112); and  
 in a case where the locking component (4) switches to the locked state, the locking component (4) pulls the rear bracket to retract inward relative to the sliding block (112);  
 and optionally, wherein the method further comprises: a rotation shaft (5) rotatably con-

connected with the rear bracket (21) and the roller bracket (11), wherein the elastic element (23) comprises a torsion spring, and the rotation shaft (5) passes through windings of the torsion spring.

5. The cleaning assembly of claim 4, wherein the locking component (4) comprises an extensible element (42) and a transmission element (41), one end of the extensible element (42) is connected with the transmission element (41), and the other end of the extensible element (42) is connected with the rear bracket (21), in a case where the transmission element (41) tightens the extensible element (42) to a shortest state, the locking component (4) switches to the locked state, and the rear cleaning component (2) switches to the retract mode.

6. The cleaning assembly of claim 5, wherein the extensible element (42) comprises an extension rope (421) and a ball head (422), one end of the extension rope (421) is connected with the transmission element (41), and the other end of the extension rope (421) is connected with the ball head (422); and

the rear bracket (21) comprises a storage recess (211), and the ball head (422) is accommodated in and confined to the storage recess (211);

and optionally, wherein the rear bracket (21) comprises a rear bracket main body and a cover (212) connected with the rear bracket main body, and the cover (212) covers the ball head (422) and the storage recess (211).

7. The cleaning assembly of any one of claims 3 to 6, wherein the roller bracket (11) comprises a first limitation surface, and the rear bracket (21) comprises a second limitation surface, in a case where the rear cleaning component (2) is in the retract mode, the first limitation surface is in contact with the second limitation surface to prevent the rear bracket (21) from retracting inward relative to the roller bracket (11); or

the roller bracket (11) comprises a third limitation surface, the rear bracket (21) comprises a fourth limitation surface, and the elastic element (23) acts on the rear bracket (21) until the fourth limitation surface is in contact with the third limitation surface to limit a boundary of the rear bracket (21) swinging outward relative to the roller bracket (11);

and optionally, wherein the third limitation surface is perpendicular to the first direction, and in a case where the third limitation surface is in

contact with the fourth limitation surface, the third limitation surface is located on an inner side relative to the fourth limitation surface; or in a case where the third limitation surface is in contact with the fourth limitation surface, and the elastic element (23) is in a second compressed state, an elastic force acted by the elastic element (23) on the rear bracket (21) in the second compressed state is less than an elastic force acted by the elastic element (23) on the rear bracket (21) in the first compressed state.

8. The cleaning assembly of claim 1, wherein the rear cleaning component (2) further comprises a rear bracket (21) fixedly connected with the second cleaning execution element (22), the rear bracket (21) is fixedly connected with the roller bracket (11), and the rear cleaning component (2) switches to the corner cleaning mode or the retract mode after moving along the first direction with following the roller bracket (11).
9. The cleaning assembly of any one of claims 1 to 8, wherein in the straight direction, the cleaning boundary of the second cleaning execution element (22) is aligned with a cleaning boundary of the first cleaning execution element.

10. A cleaning device, comprising:

a machine body (3); and  
the cleaning assembly of any one of claims 1 to 9, wherein a roller bracket (11) of the cleaning assembly and the machine body (1) are connected in a relatively slidable manner along a first direction, and the first direction is perpendicular to a straight direction of the cleaning device.

11. A method for controlling a cleaning assembly, comprising:

controlling (101) a rear cleaning component (2) of a cleaning assembly of a cleaning device to switch to a corner cleaning mode;  
controlling (102) the cleaning device to rotate around a rotation center until a straight direction of the cleaning device is parallel to a first edge of an obstacle; and  
controlling (103) the cleaning device to execute a straight instruction, to enable a second cleaning execution element of the cleaning device to clean an included angle area formed by the first edge and a second edge of the obstacle.

12. The method of claim 11, wherein controlling (103)

the cleaning device to execute the straight instruction comprises at least one of:

controlling the cleaning assembly to execute a backward instruction to move towards the second edge, wherein the second edge is perpendicular to the first edge, obtaining a spacing distance between the second cleaning execution element and the second edge, and in a case where the spacing distance is less than or equal to a predetermined threshold, controlling the cleaning device to execute the forward instruction; or  
controlling the cleaning device to execute the forward instruction to move away from the second edge, wherein the second edge is perpendicular to the first edge, and controlling the cleaning device to execute a backward instruction after a predetermined duration.

**13.** The method of claim 11 or 12, further comprising:

controlling the cleaning device to rotate around the rotation center alternately in opposite directions, to enable the straight direction of the cleaning device to be parallel to the first edge again, and a first spacing distance between a center of the second cleaning execution element and the first edge to be greater than a second spacing distance between the center of the second cleaning execution element and the first edge during previous execution of the straight instruction;  
and optionally, wherein a difference between the first spacing distance and the second spacing distance is less than or equal to a radius of the second cleaning execution element.

**14.** The method of any one of claims 11 to 13, wherein controlling (101) the rear cleaning component to switch to the corner cleaning mode comprises at least one of:

controlling a driving element (12) of a roller cleaning component (1) of the cleaning assembly to switch to a working state, to enable the rear cleaning component to swing outwards relative to a roller bracket (11) of the roller cleaning component and switch to the corner cleaning mode after moving towards outside of the cleaning device along a first direction with following the roller bracket;  
controlling a locking component (4) of the cleaning assembly to switch to an unlocked state, to enable the rear cleaning component to rotate towards outside of a machine body of the cleaning device relative to the roller bracket, and controlling a driving element (12) to

switch to a working state, to enable the rear cleaning component to move towards outside of the cleaning device along a first direction with following the roller bracket on and switch to the corner cleaning mode; or  
controlling the locking component to switch to a locked state, to enable the rear cleaning component to retract inward relative to the roller bracket, and controlling the driving element to switch to the working state, to enable the rear cleaning component to move towards inside of the cleaning device along the first direction with following the roller bracket and switch to a retract mode.

**15.** A computer-readable storage medium having computer instructions stored thereon, wherein when the instructions are executed by a processor, steps of the method of any one of claims 11 to 14 are implemented.

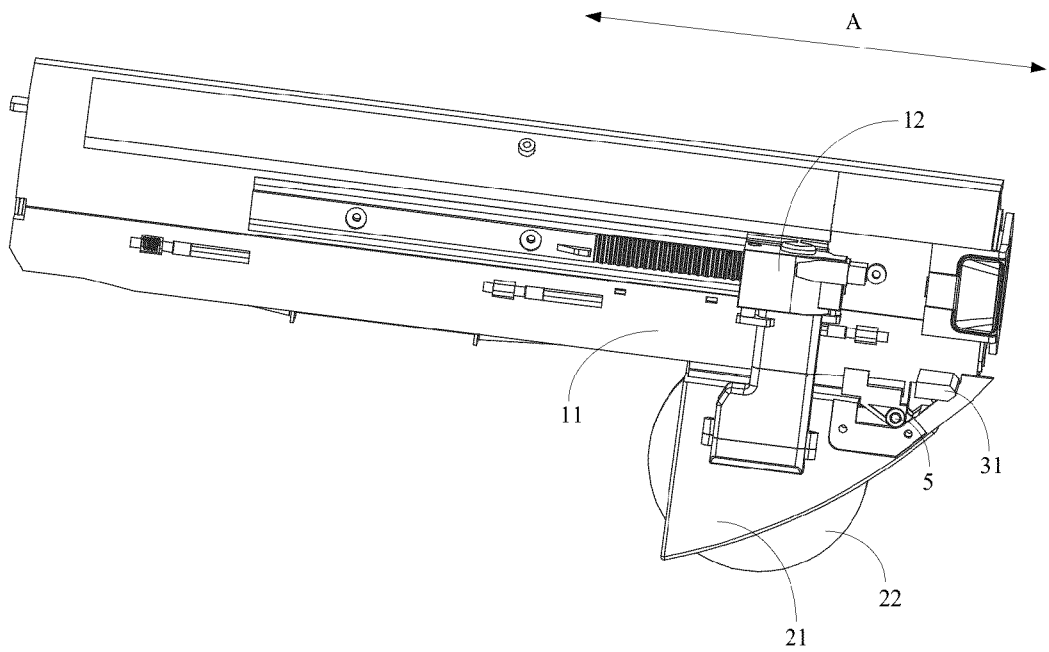


FIG. 1

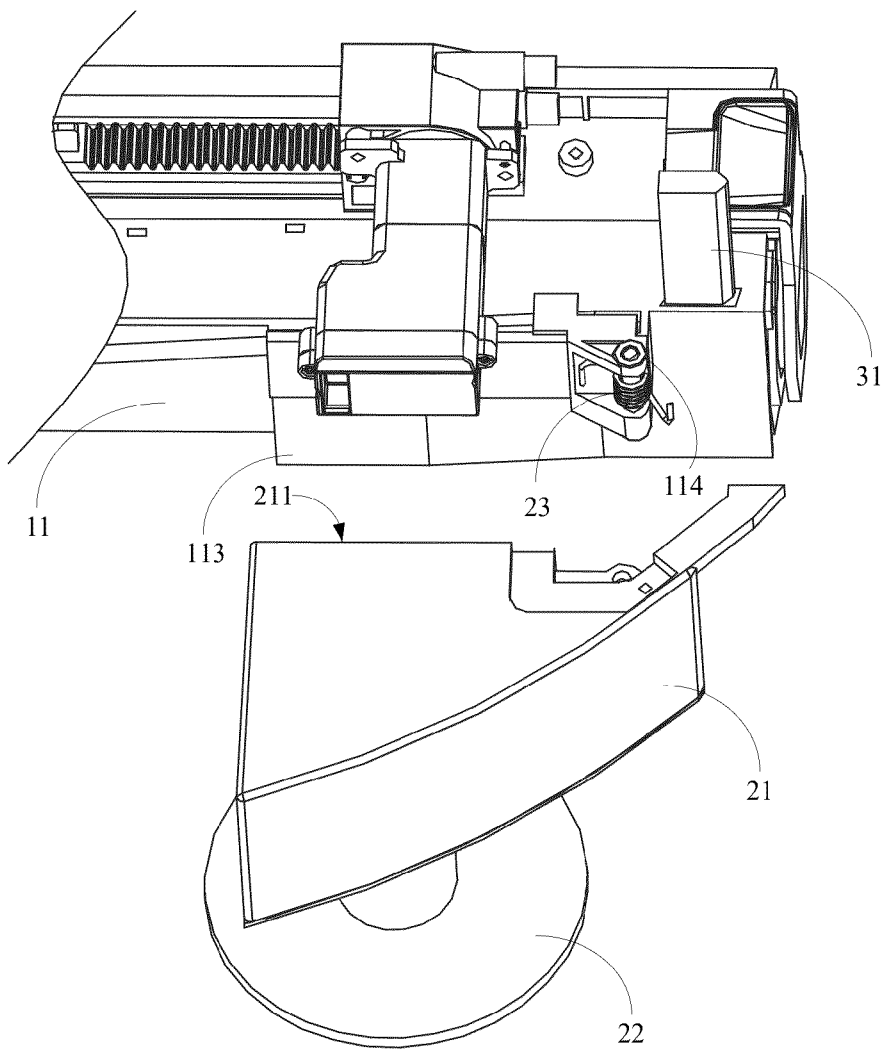


FIG. 2

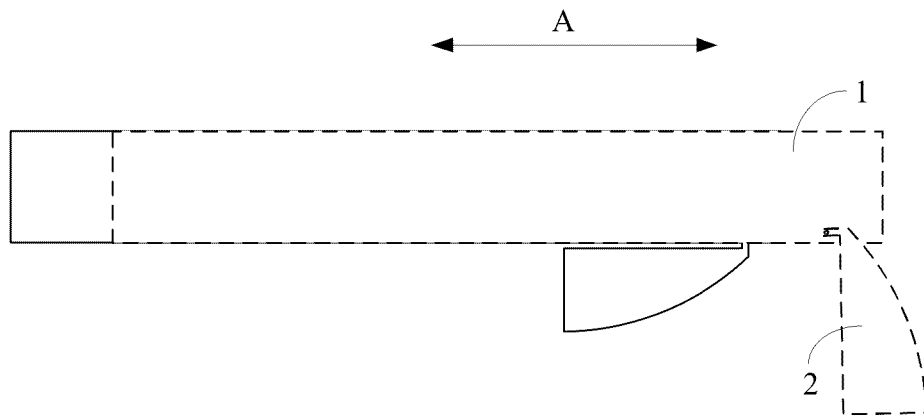


FIG. 3

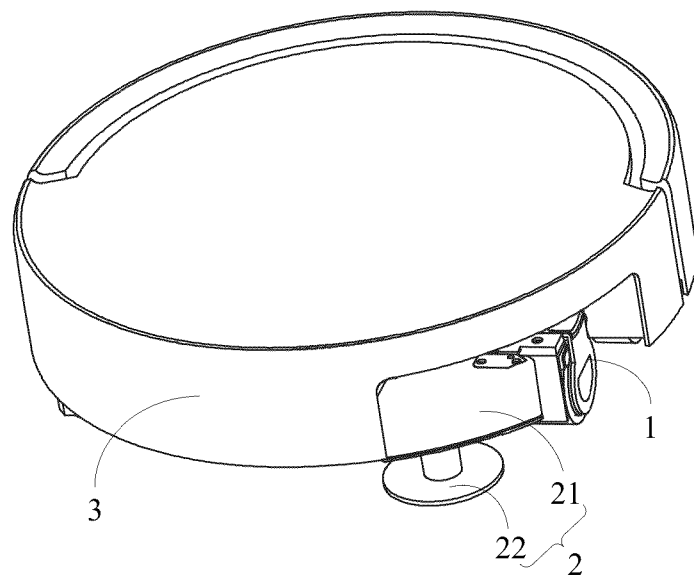


FIG. 4

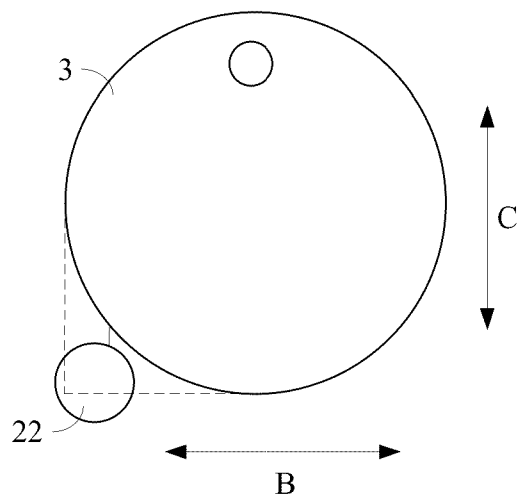


FIG. 5

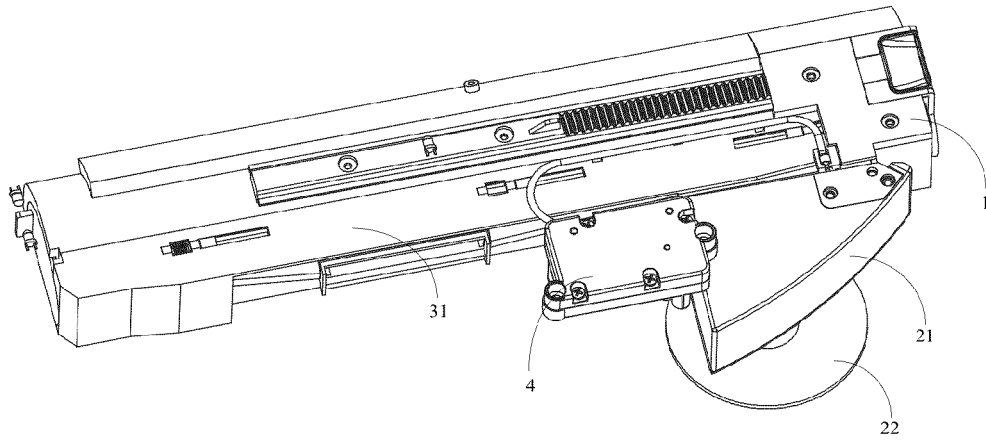


FIG. 6

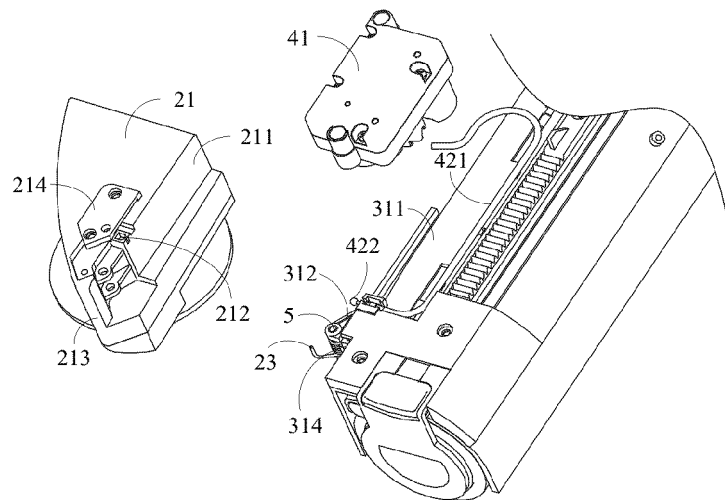


FIG. 7

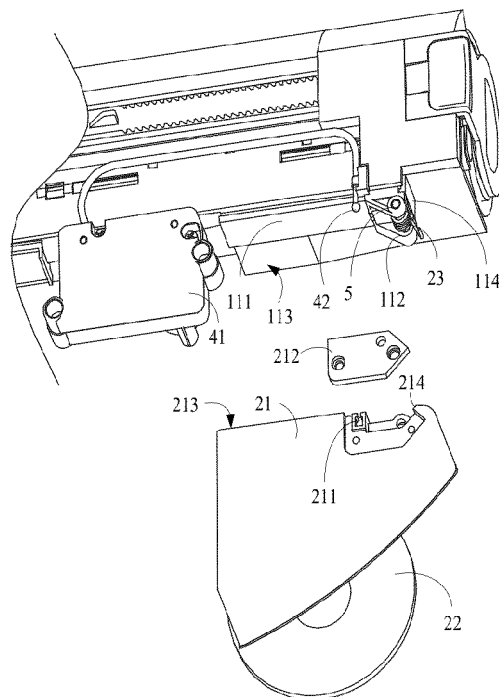


FIG. 8

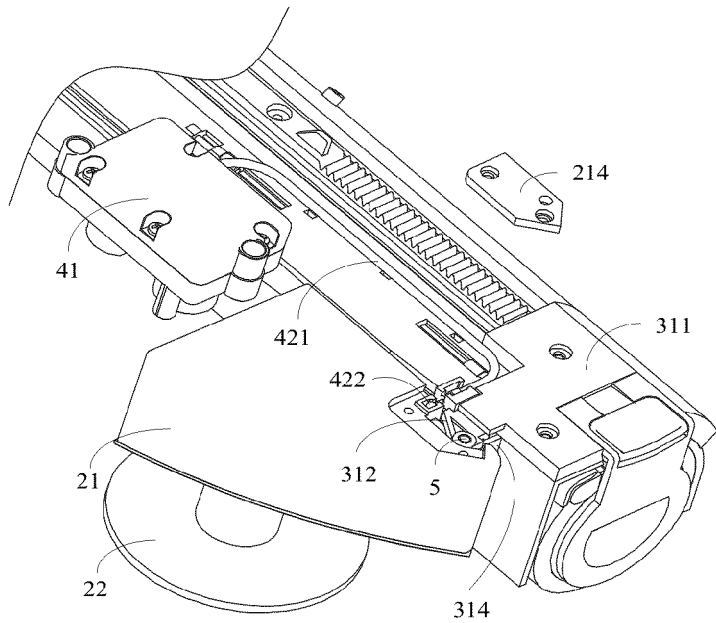


FIG. 9

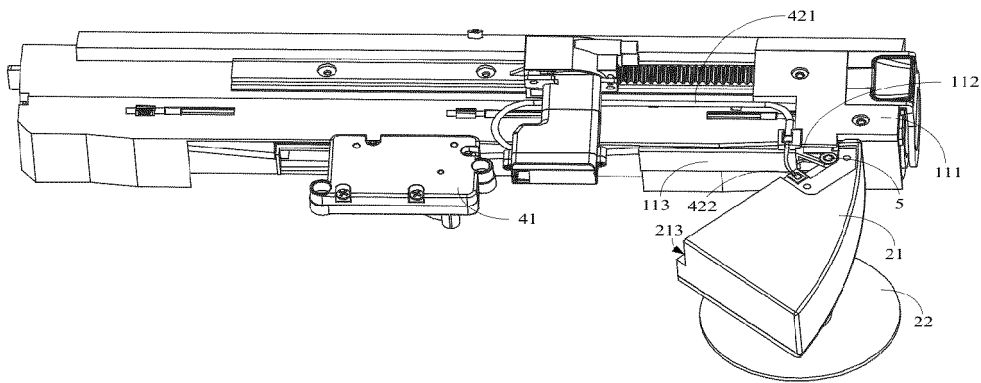


FIG. 10

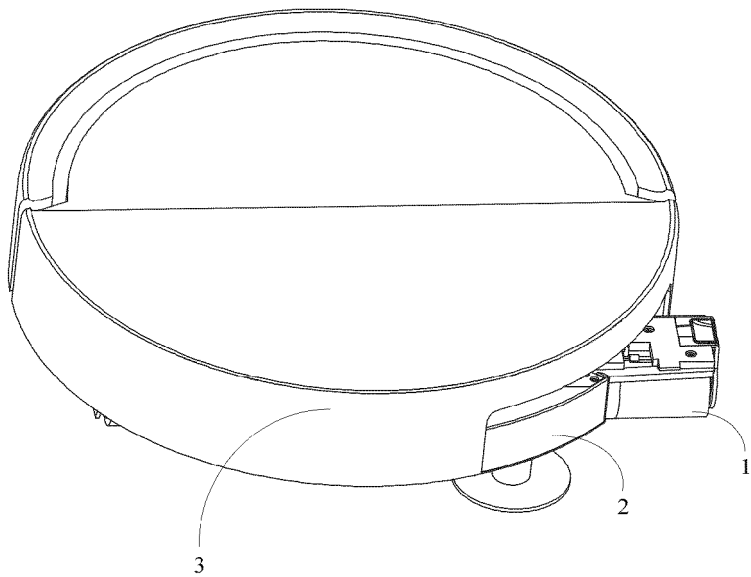


FIG. 11

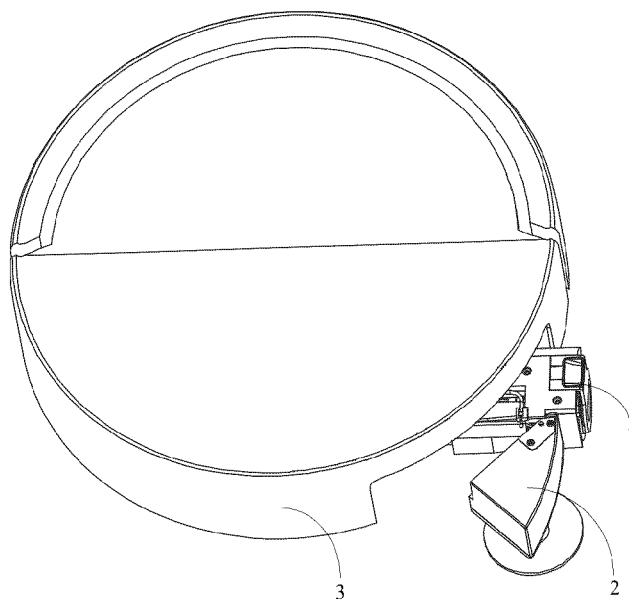


FIG. 12

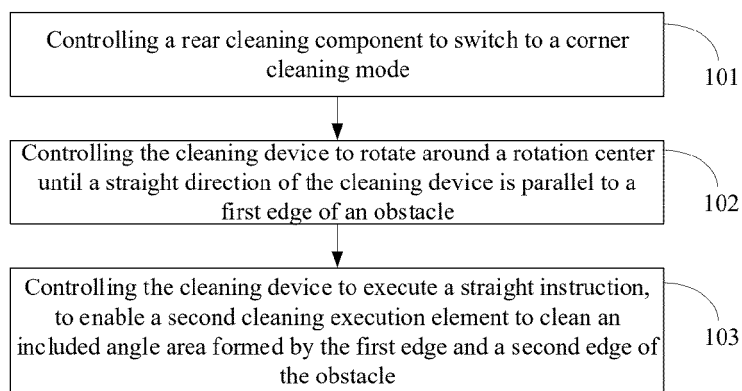


FIG. 13

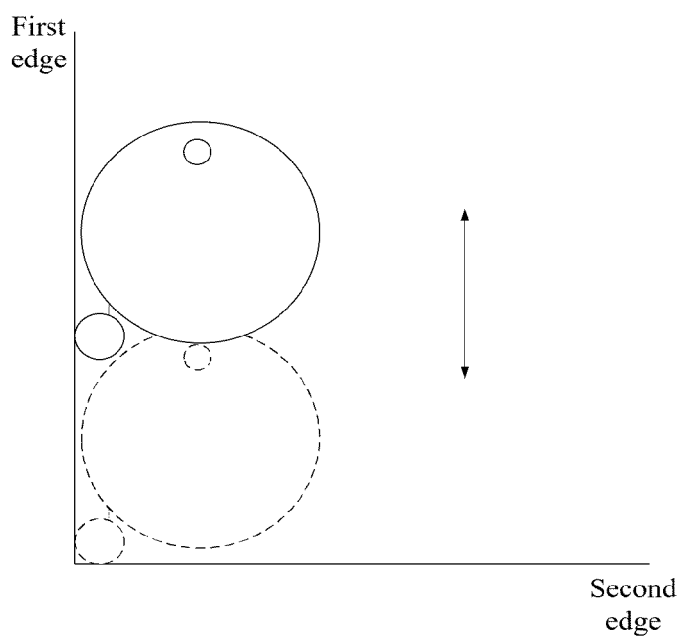


FIG. 14

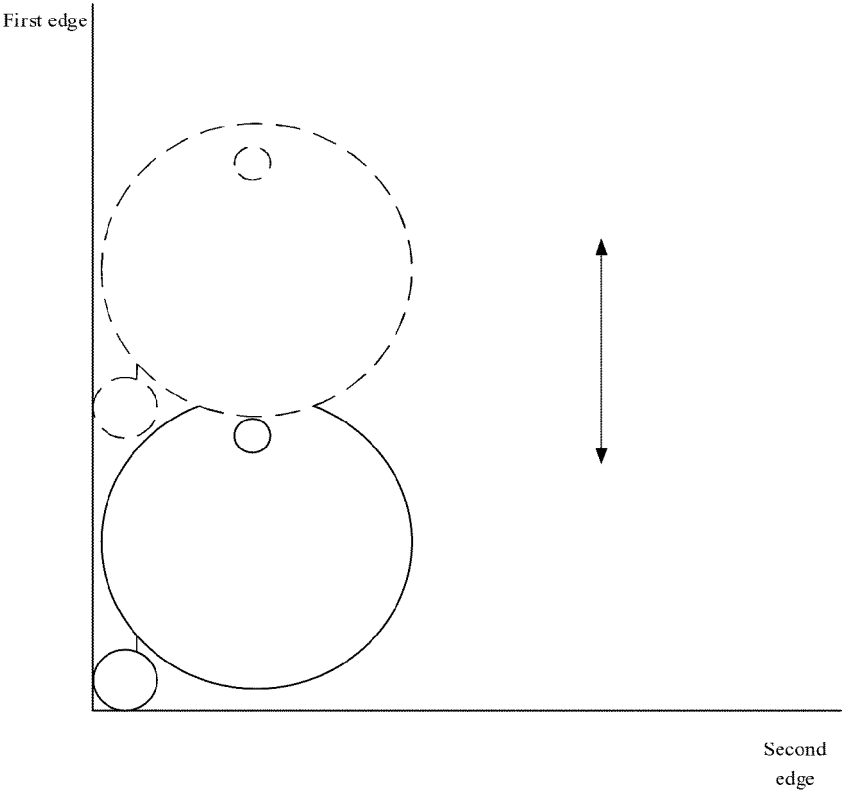


FIG. 15

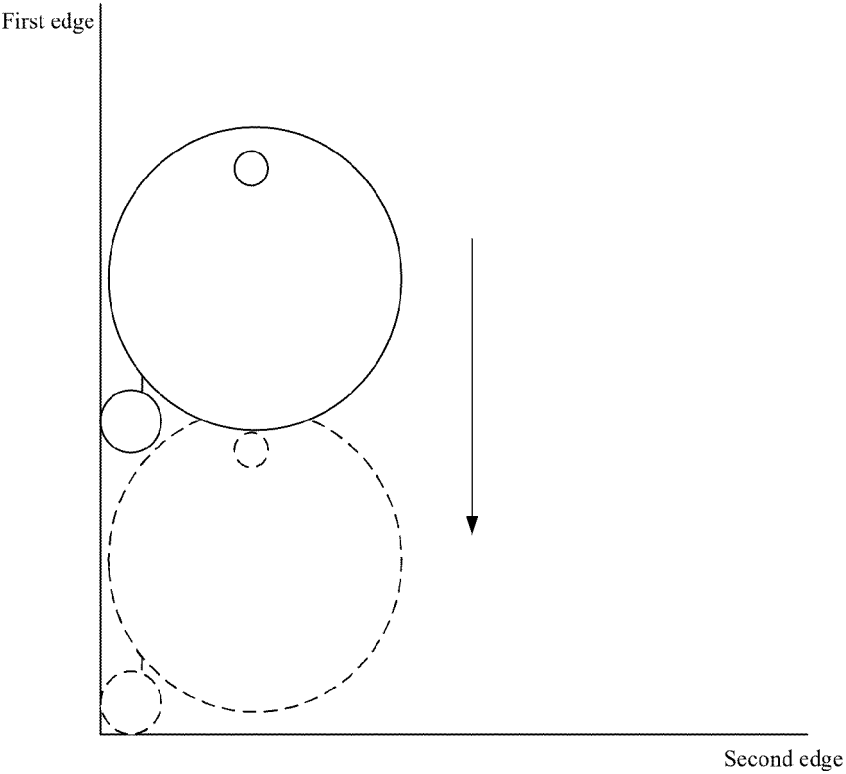


FIG. 16

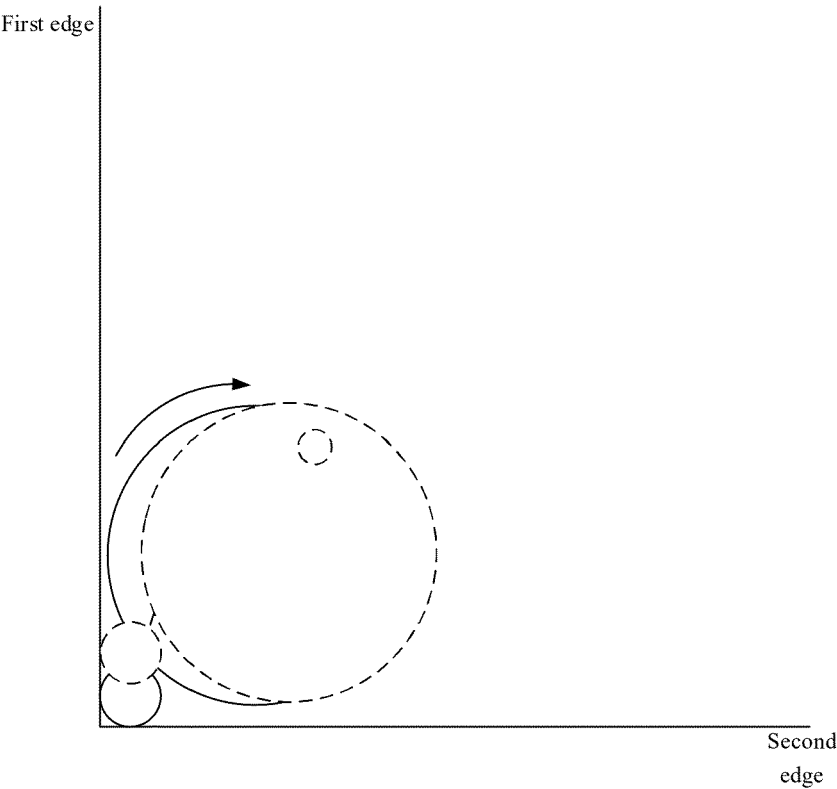


FIG. 17

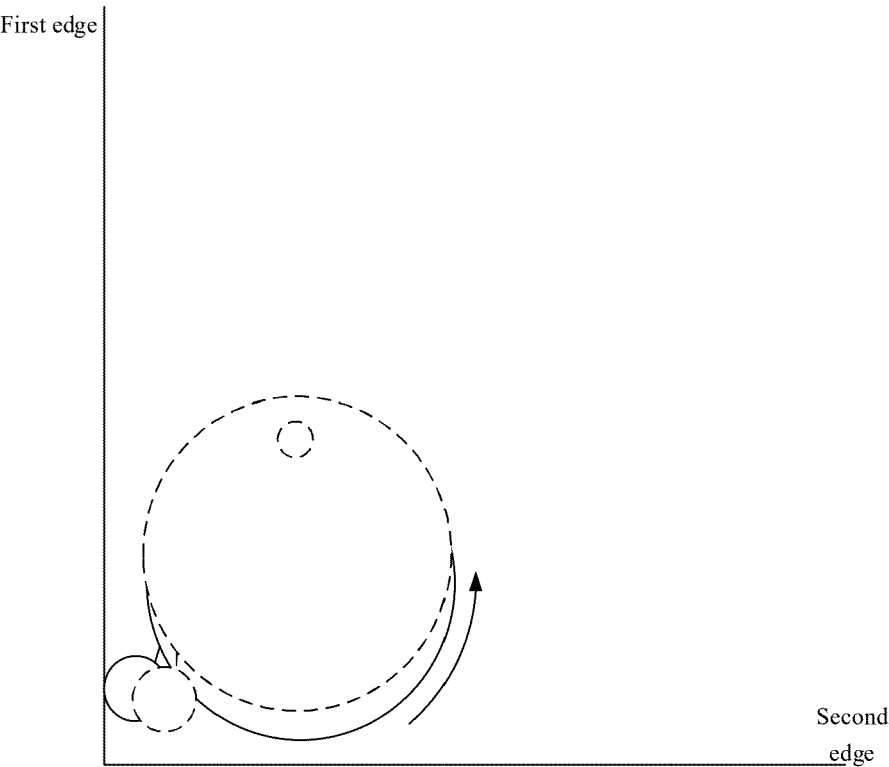


FIG. 18

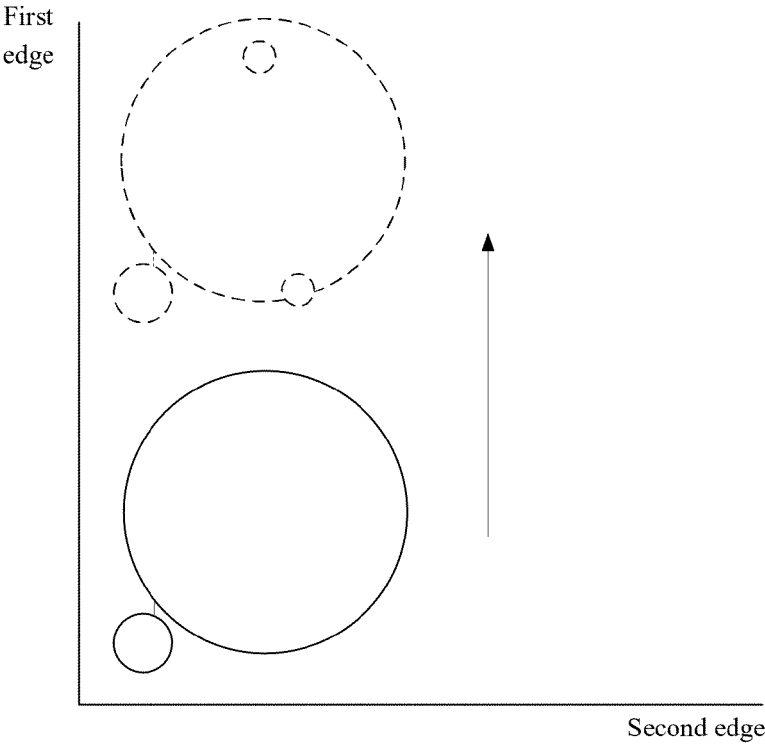


FIG. 19

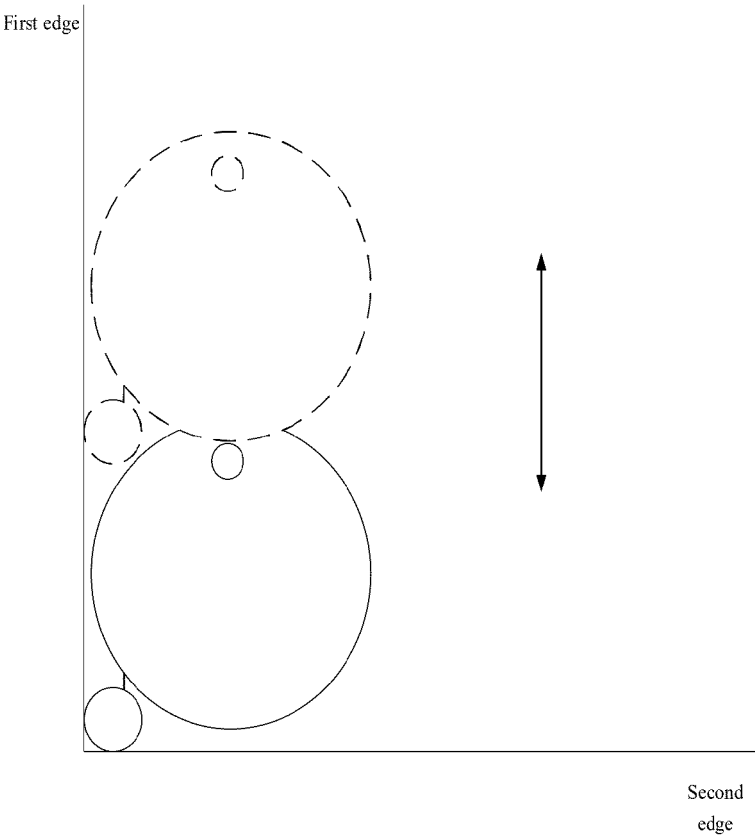


FIG. 20

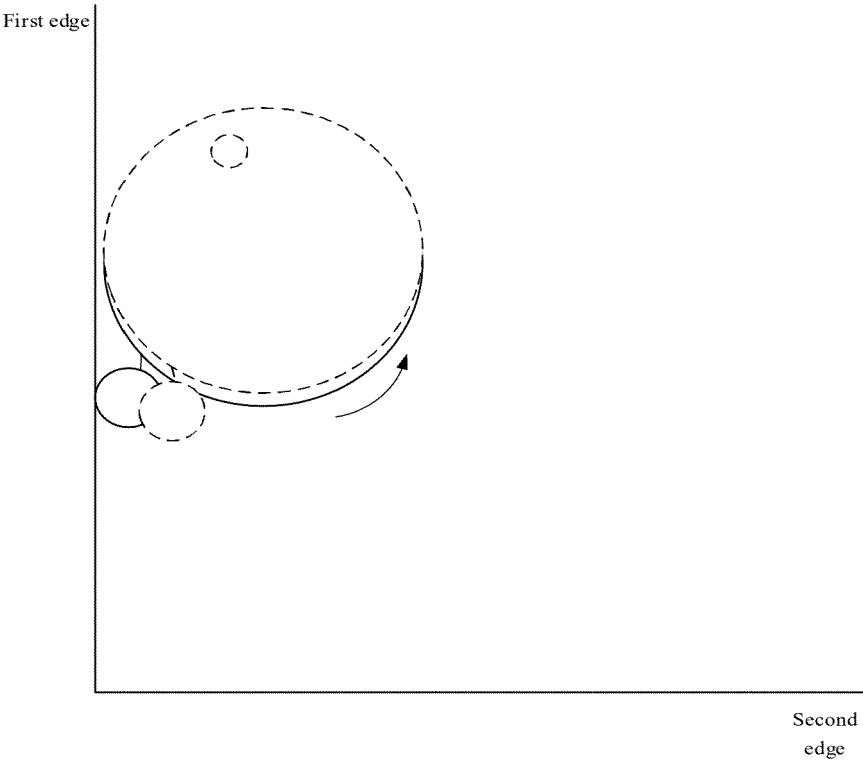


FIG. 21

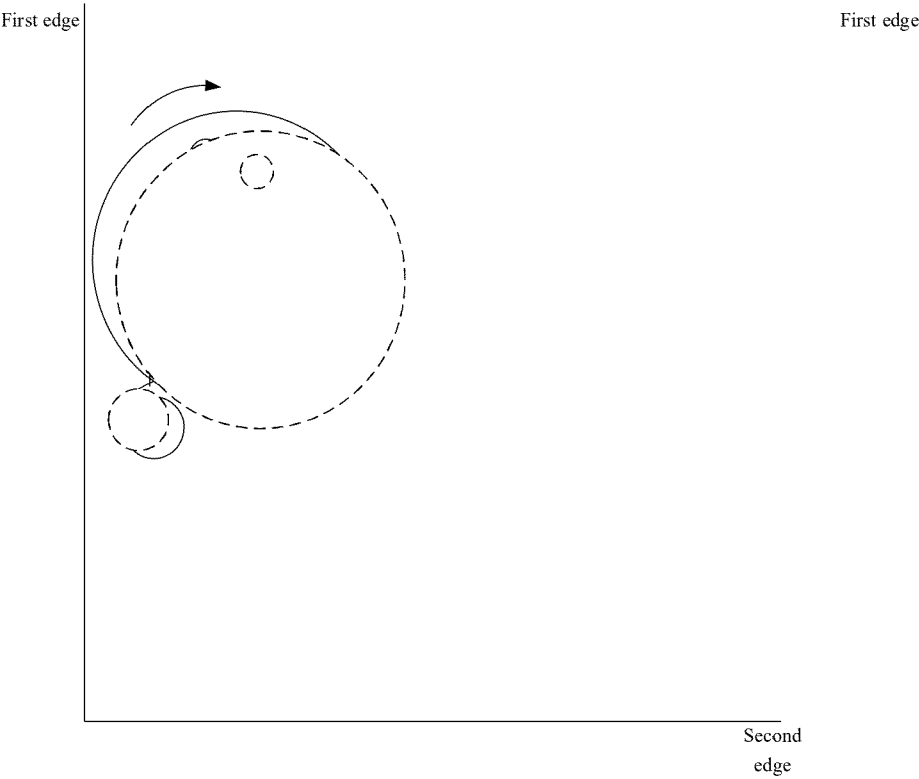


FIG. 22

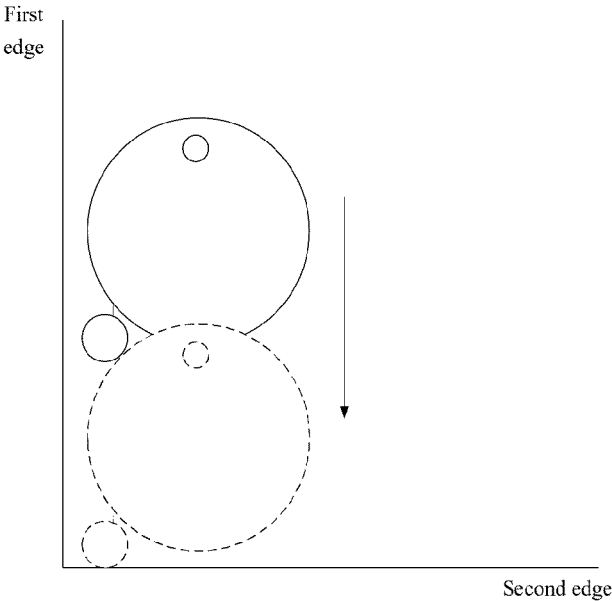


FIG. 23

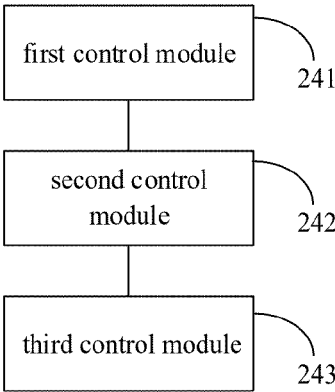


FIG. 24

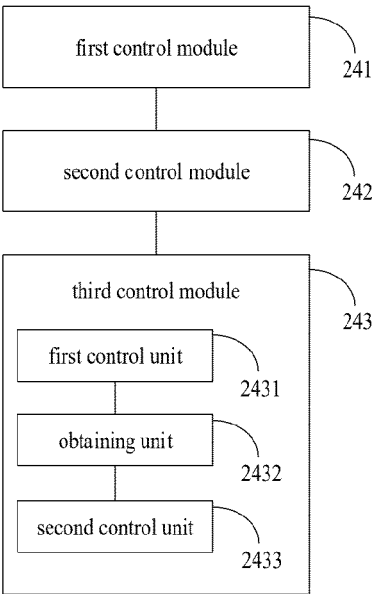


FIG. 25

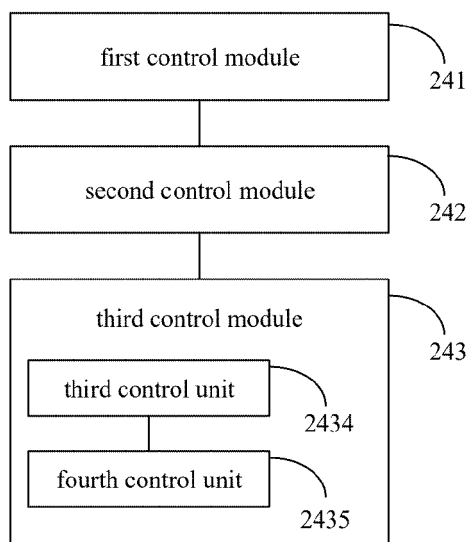


FIG. 26

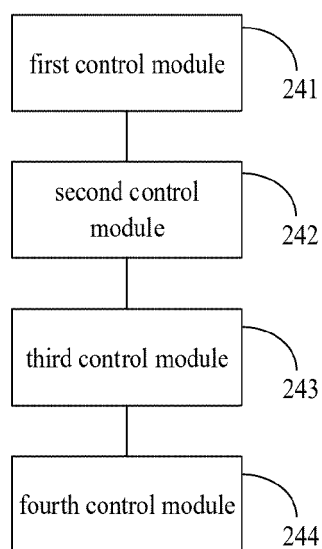


FIG. 27

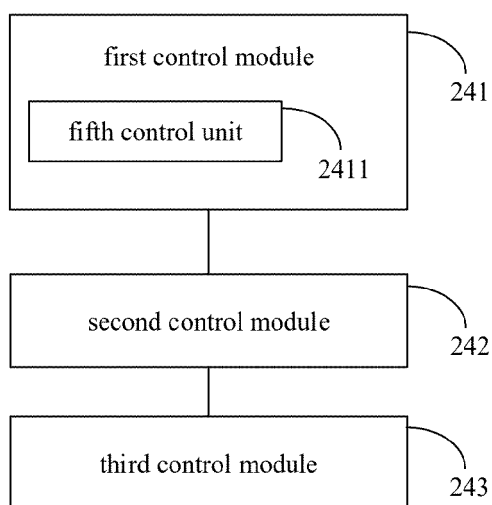


FIG. 28

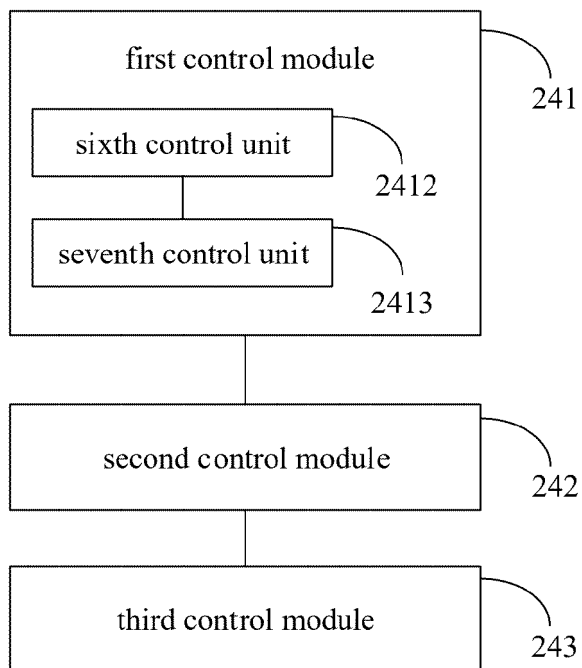


FIG. 29

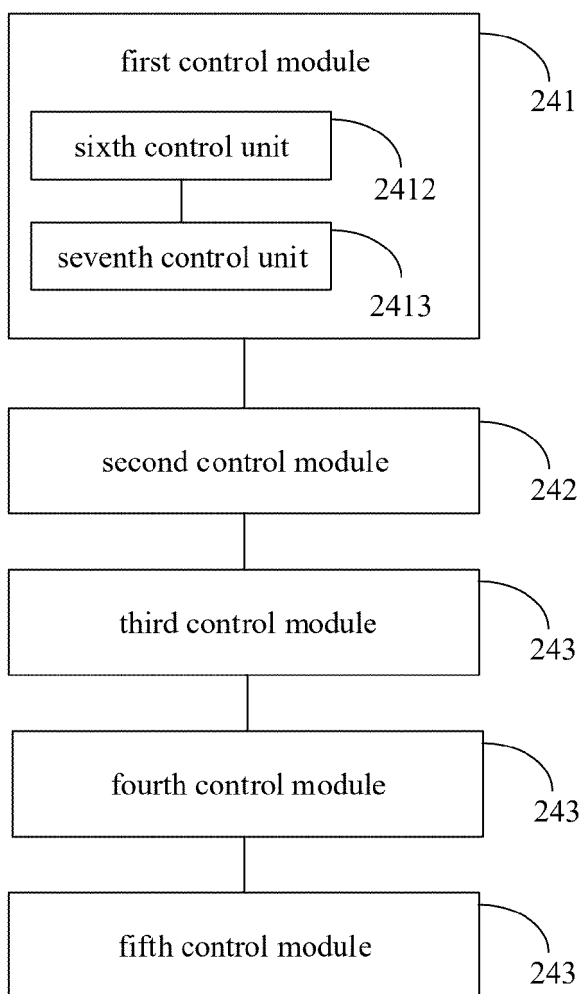


FIG. 30

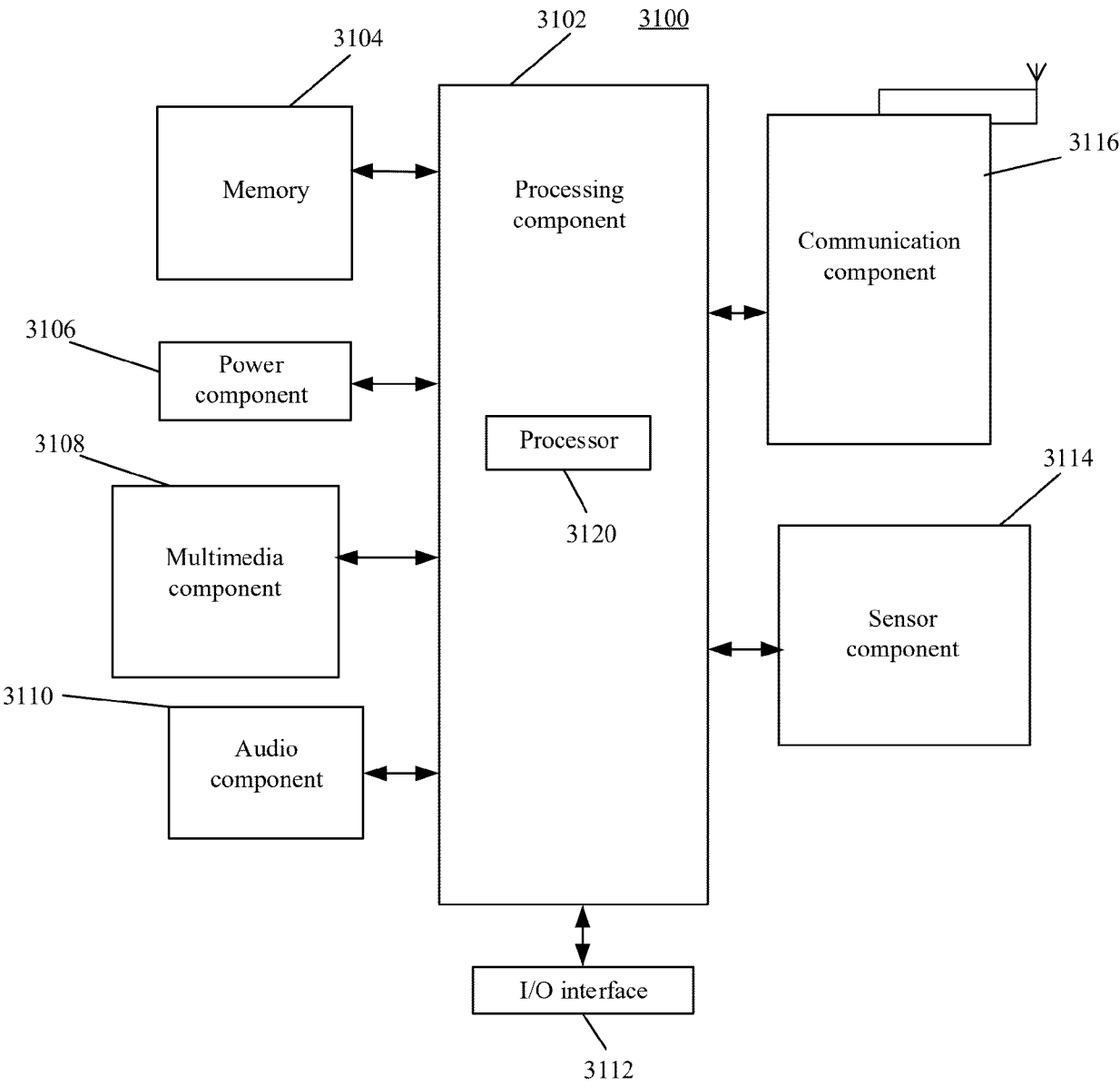


FIG. 31

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