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(54) **ROLLER BRUSH ASSEMBLY AND CLEANING ROBOT**

(57) A roller brush assembly includes a roller brush device, a lifting drive motor, and a lifting transmission assembly. The roller brush device includes a roller brush housing and a roller brush rotatably connected in the roller brush housing, and one side of the roller brush housing is provided with a swing arm. The lifting transmission assembly is connected to the lifting drive motor and driven by the lifting drive motor to drive the swing arm to swing, thereby lifting the roller brush device. Thus, the roller brush device can be lifted and held in a lifted position, thereby improving the adaptability of a cleaning robot having the roller brush assembly.

EP 4 039 154 A1

Description

RELATED APPLICATIONS

[0001] This application claims priority to Chinese Application No. 202110168123.6, filed on February 05, 2021, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of cleaning robots, and in particular to a roller brush assembly and a cleaning robot with the same.

BACKGROUND

[0003] A cleaning robot generally includes a roller brush device and a side brush device. The roller brush device has a roller brush which can be driven by a roller brush drive motor to roll and clean the ground. The side brush device can be driven by a side brush drive motor to rotate around a vertical axis to clean the ground. However, the current roller brush device keeps attaching with the ground during its work progress including the robot returning to clean itself where cleaning is not needed to apply to the ground, which limits the speed of movement of the cleaning robot. Moreover, a height of the roller brush from the ground is fixed, that is, the roller brush cannot change its height for cleaning somewhere with special areas. The side brush device has the same problem as that of the roller brush device.

SUMMARY

[0004] One objective of the present disclosure is to provide a roller brush assembly with the function of lifting and holding the roller brush device in a lifted position when needed to improve the adaptability of the cleaning robot having the roller brush assembly.

[0005] Another objective of the present disclosure is to provide a cleaning robot having the roller brush assembly.

[0006] In some examples, a roller brush assembly comprises a roller brush device, a lifting drive motor, and a lifting transmission assembly. The roller brush device comprises a roller brush housing and a roller brush rotatably connected in the roller brush housing, and one side of the roller brush housing is provided with a swing arm. The lifting transmission assembly is connected to the lifting drive motor and driven by the lifting drive motor to drive the swing arm to swing, allowing the roller brush device to be lifted.

[0007] In some aspects, the roller brush device swings downward and returns by its own gravity.

[0008] In some aspects, the swing arm is configured to swing upward to lift the roller brush device when the roller brush housing encounters an obstacle, and the roller brush device is capable of backswing downward by its own gravity, realizing a self-adaptive floating of the roller brush device.

[0009] In some aspects, the lifting transmission assembly comprises a moving member cooperating with the swing arm and configured to drive the swing arm to drive the roller brush device to swing upward, and a lifting transmission mechanism connected to the lifting drive motor and the moving member to drive the moving member to move.

[0010] In some aspects, the moving member is movable up and down under driving of the lifting drive motor, the moving member comprises a first moving part cooperating with the swing arm, and upward movement of the first moving part allows the swing arm to to drive the roller brush device swinging upward.

[0011] In some aspects, a positioning sensor is provided on the moving member to sense whether the moving member is lifted up in place.

[0012] In some aspects, the lifting drive motor comprises an output shaft vertically arranged and extending upward. The lifting transmission mechanism comprises a screw rod in a thread connection with the moving member, and a gear set comprising a driving gear fixedly connected to the output shaft and a driven gear fixedly connected to the screw rod.

[0013] In some aspects, the swing arm comprises a connecting arm and a contact arm. The connecting arm is disposed on one side of the roller brush housing, the contact arm has a first end of the contact arm connected to the connecting arm and a second end defined with a contact portion. The moving member moves to drive the contact portion towards one side away from the roller brush device, thereby driving the roller brush device to swing upward.

[0014] In some aspects, the roller brush assembly comprises a mounting housing, the moving member is mounted on the mounting housing and movable up and down, a swing groove is defined and penetrated downwardly on a side surface of the mounting housing, the moving member comprises a first moving part extended into the swing groove, the contact arm is swing arranged in the swing groove. The upward movement of the first moving part pushes the contact arm to swing to a side away from the roller brush device, allowing the roller brush device to be lifted; and an inner wall of the swing groove away from the roller brush device limits a swing range of the contact arm.

[0015] In some aspects, the connecting arm is located under and close to the mounting housing, and the mounting housing is configured to limit an upward swing range of the connecting arm.

[0016] In some aspects, a recess is formed at a position of the roller brush housing adjacent to the connecting arm, and the lifting drive motor is arranged correspondingly to the recess.

[0017] In some aspects, the moving member is configured to be movable forward and backward under driving

of the lifting drive motor and the lifting transmission mechanism. The lifting transmission mechanism comprises a screw rod extending forward and backward and a slider in a thread connection to the screw rod, the moving member is slidably sleeved on the screw rod, and an elastic member is disposed between the moving member and the slider. The slider is slid toward the moving member under driving of the lifting drive motor to make the elastic member in a compressed state push the moving member, thereby pushing the swing arm towards one side away from the roller brush device.

[0018] In some aspects, the swing arm comprises a contact portion pushed by the moving member, and the contact portion is located at one side of the moving member away from the slider. The swing arm is pushed by the moving member to swing to contact a contact wall when the lifting drive motor reaches a preset stroke.

[0019] In some aspects, the swing arm is formed with a gap for allowing the screw rod to pass therefrom.

[0020] In some aspects, a limit sliding slot extended forward and backward is defined in the moving member, a limit protrusion is protruded from the slider and toward the moving member, and the limit protrusion is slidably engaged with the limit sliding slot.

[0021] In some aspects, the swing arm is configured to be pivotally connected to a fixing structure inside a cleaning robot.

[0022] In some aspects, the roller brush housing further comprises a pivoting arm, the pivoting arm and the swing arm are located on a same side of the roller brush housing and spaced apart along a length direction of the roller brush housing, a free end of the pivoting arm is configured to be pivotally connected to a fixing structure inside a cleaning robot, and the roller brush device is capable of swinging up and down by the pivoting arm and the swing arm.

[0023] In some examples, a cleaning robot comprises an aforesaid roller brush assembly.

[0024] The roller brush assembly of the present disclosure is provided with a lifting drive motor and a lifting transmission assembly connected with the lifting drive motor, and one side of the roller brush housing is provided with a swing arm. The lifting transmission assembly is driven by the lifting drive motor to drive the swing arm to swing, thereby lifting the roller brush device. Thus, the roller brush device can be lifted and kept in the lifted position to avoid obstructing or affecting the movement of the cleaning robot during no cleaning is performed. Moreover, by adjusting the height of the roller brush device, it is also helpful to clean certain special areas for the cleaning robot and improve the adaptability of the cleaning robot.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The accompanying drawings facilitate an understanding of the various embodiments of this disclosure. In such drawings:

FIG. 1 is a perspective view of a linkage assembly for side brush and roller brush according to an embodiment of the present disclosure;

FIG. 2 is a bottom view of a linkage assembly for side brush and roller brush according to an embodiment of the present disclosure;

FIG. 3 is a cross-sectional view along the line A-A in FIG. 2;

FIG. 4 is a cross-sectional view along the line B-B in FIG. 2;

FIG. 5 is a top view of a linkage assembly for side brush and roller brush according to an embodiment of the present disclosure;

FIG. 6 is a perspective view of the linkage assembly in FIG.1, in which partial structure of the linkage assembly is hidden;

FIG. 7 is a perspective view of the linkage assembly shown in FIG. 6 from a different angle;

FIG. 8 is a rear view of the linkage assembly shown in FIG. 6;

FIG. 9 is a cross-sectional view of the partial structure of FIG.8 along the line C-C;

FIG. 10 is a perspective view of a side brush assembly according to an embodiment of the present disclosure;

FIG. 11 is a perspective view of a side brush assembly and a contact arm according to an embodiment of the present disclosure;

FIG. 12 is a top view of a side brush assembly according to an embodiment of the present disclosure;

FIG. 13 is a cross-sectional view along the line D-D in FIG. 12;

FIG. 14 is a partial view of a roller brush assembly according to another embodiment of the present disclosure; and

FIG. 15 is a perspective view of the roller brush assembly in FIG. 14, in which partial structure of the roller brush assembly is hidden.

DETAILED DESCRIPTION

[0026] In order to explain in detail the technical content, construction features, the purpose and effect achieved by the present disclosure, the following combined with the implementation and the attached drawings are described in detail.

[0027] Note that all orientation words such as "forward", "backward", "up", "down", "top", "bottom", etc. are defined in terms of a base station in normal use, and a direction in which a cleaning robot moves is "front".

[0028] Referring to FIGS. 1 to 13, the present disclosure provides a roller brush device 10 and a side brush device 20, which are parts of a cleaning robot and are configured for cleaning the ground.

[0029] As shown in FIGS. 1 to 5, the cleaning robot is also provided with a lifting drive motor 30 and a lifting transmission assembly connected to the lifting drive motor 30. Specifically, the lifting transmission assembly is

driven by the lifting drive motor 30 to drive the roller brush device 10 and/or the side brush device 20 to lift upward.

[0030] A roller brush assembly, which includes the roller brush device 10, the lifting drive motor 30 and the lifting transmission assembly, is provided. The roller brush device 10 can be lifted by the roller brush assembly and held in a lifted position, so that the cleaning robot will not be obstructed or affected by the roller brush device 10 during the cleaning robot moves but no cleaning is performed. Moreover, certain special areas can be cleaned by adjusting a height of the roller brush device 10, thereby improving the adaptability of the cleaning robot.

[0031] Referring to FIGS. 1 to 9, the roller brush device 10 includes a roller brush housing 11 and a roller brush 12 rotatably connected to the roller brush housing 11, and one side of the roller brush housing 11 is provided with a swing arm 13. The lifting transmission assembly is driven by the lifting drive motor 30 to drive the swing arm 13 to swing, making the roller brush device 10 to be lifted. With the cooperation of the swing arm 13 and the lifting transmission assembly, it is beneficial to drive the rolling brush device 10 to rise upward.

[0032] The roller brush device 10 can automatically backswing downward by its own gravity. Specifically, when the roller brush device 10 needs to return downward, the lifting transmission assembly will make a reverse movement under driving of the lifting drive motor 30. The lifting transmission assembly that makes a reverse movement will not drive the roller brush device 10, thereby releasing or gradually releasing the swing arm 13, so that the roller brush device 10 will automatically swing downward by its own gravity. Of course, it is not limited to this. For example, in other embodiments, the roller brush device 10 may also return downward by the lifting transmission assembly under driving of the lifting drive motor 30.

[0033] In some instances, during the cleaning robot is cleaning, in case the roller brush housing 11 encounters an obstacle, the swing arm 13 will swing upward because of the obstacle to lift the roller brush device 10 upward, and then the roller brush device 10 will fall downward by its own gravity after crossing the obstacle, thereby realizing a self-adaptive floating of the roller brush device 10. The roller brush device 10 of the present disclosure can be driven by the lifting drive motor 30 to lift upward and hold in the lifted position, and can also make a self-adaptive floating in case encountering an uneven ground, so the roller brush device 10 can clean the ground better.

[0034] In some instances, the swing arm 13 is arranged on a front side of the roller brush housing 11.

[0035] The lifting transmission assembly includes a lifting transmission mechanism 40 and a moving member 50. The lifting transmission mechanism 40 is connected to the lifting drive motor 30 and the moving member 50 to drive the moving member 50 to move, thereby driving the swing arm 13 to drive the roller brush device 10 to swing upward.

[0036] The moving member 50 is movable up and down under driving of the lifting drive motor 30. In some instances, the moving member 50 is provided with a first moving part 51 that cooperates with the roller brush device 10, and the first moving part 51 moves up to drive the swing arm 13 to swing the roller brush device 10 upward. In some other embodiments, return of the roller brush device 10 can also be driven by the first moving part 51.

[0037] The movement upward of the first moving part 51 can push the swing arm 13 to swing the roller brush device 10 upward, so, it is not only convenient for driving the roller brush device 10 to rise, but also facilitates falling back and/or self-adaptive floating of the roller brush device 10.

[0038] The swing arm 13 includes a connecting arm 131 and a contact arm 132. Further, the connecting arm 131 is disposed on one side of the roller brush housing 11, a first end of the contact arm 132 is connected to the connecting arm 131, and a second end of the contact arm 132 is formed with a contact portion 1320. Such a structure of the swing arm 13 is beneficial to drive the swing arm 13 by pushing or other methods.

[0039] As shown in FIGS. 1, 3 and 6, when the first moving part 51 moves upward, the contact arm 132 will be pushed to swing toward one side away from the roller brush device 10, thereby driving the roller brush device 10 to swing upward. In an exemplary embodiment, the contact portion 1320 has a contact surface 1321 inclined from bottom to top toward the first moving part 51, so that the first moving part 51 may push the contact arm 132 when the first moving part 51 moves upward.

[0040] In some instances, the first moving part 51 is protruded from the moving member 50 and has a cylindrical shape. But it is not limited to this.

[0041] The contact arm 132 may be fixedly connected to the connecting arm 131, or may be integrated with the connecting arm 131. In addition, the connecting arm 131 may be integrated with the roller brush housing 11, or may be fixedly connected to the roller brush housing 11.

[0042] Specifically, the moving member 50 is mounted on a mounting housing 60 and movable up and down.

[0043] In some instances, a swing groove 61 is defined and penetrated downwardly in a side surface of the mounting housing 60. The first moving part 51 is extended into the swing groove 61, and the contact arm 132 is swing arranged in the swing groove 61. An inner wall of the swing groove 61 away from the roller brush device 10 can limit a swing range of the contact arm 132, as a result, the reliability of swing is improved.

[0044] In some instances, the connecting arm 131 is located under and close to the mounting housing 60 which can limit an upward swing range of the connecting arm 131, thereby further improving the reliability of swing.

[0045] In order to realize a reasonable utilization of space, a recess 111 is formed at a position of the roller brush housing 11 adjacent to the connecting arm 131, and the lifting drive motor 30 is arranged correspondingly to the recess 111, thereby improving the compactness

of the overall structure.

[0046] In some instances, a positioning sensor 52 is provided on the moving member 50 and used to sense whether the moving member 50 is lifted to a specific position, so that it can be accurately and timely to know whether the moving member 50 is lifted into the specific position. Specifically, the mounting housing 60 is provided with an opening 62 that exposes the positioning sensor 52.

[0047] In some instances, the lifting drive motor 30 includes an output shaft 31 vertically arranged and extending upward, and the lifting transmission mechanism 40 includes a gear set 41 and a screw rod 42. Further, the gear set 41 includes a driving gear 411 fixedly connected to the output shaft 31 and a driven gear 412 fixedly connected to the top of the screw rod 42, and the screw rod 42 is in a thread connection with the moving member 50, thereby driving the moving member 50 to move up and down reliably.

[0048] In some instances, the gear set 41 further includes an intermediate gear 413 connected between the driving gear 411 and the driven gear 412, and the gear set 41 is mounted in a gear box 43. Specifically, the gear box 43 is fixed on the top of the mounting housing 60.

[0049] Of course, the lifting drive motor 30 and the lifting transmission mechanism 40 are not limited to the above-mentioned structures.

[0050] Further, the roller brush device 10 includes a roller brush drive motor 14 fixed on the roller brush housing 11. A roller brush transmission mechanism 15 is connected to an output end of the roller brush drive motor 14 to drive the roller brush 12 to rotate.

[0051] In some instances, the roller brush housing 11 is further provided with a dust collection port 112 corresponding to a dust collection box (not shown) of the cleaning robot. Specifically, the dust collection port 112 and the swing arm 13 are located on a same side of the roller brush housing 11, as shown in FIGS. 1 and 7.

[0052] In some instances, the swing arm 13 is configured to be pivotally connected to a fixing structure inside the cleaning robot. When the swing arm 13 is driven, the swing arm 13 can reliably swing around a pivot position. In an exemplary embodiment, the pivot position is set in an area where the contact arm 132 and the connecting arm 131 are connected, so as to facilitate swinging.

[0053] In some embodiments, as shown in FIGS. 1 and 9, the roller brush housing 11 is further provided with a pivoting arm 113. Specifically, the pivoting arm 113 and the swing arm 13 are located on a same side of the roller brush housing 11 and spaced apart along a length direction of the roller brush housing 11. A free end of the pivoting arm 113 is configured to be pivotally connected to the fixing structure inside the cleaning robot, and the roller brush device 10 can swing up and down by a cooperation of the pivoting arm 113 and the swing arm 13. Due to the pivoting arm 113 cooperating with the swing arm 13, it is convenient to swing the roller brush device 10 up and down. Understandably, both the pivoting arm 113 and the swing arm 13 are arranged to ensure the roller brush device 10 to swing up and down more reliably. Of course, this is only a preferred embodiment, and it is not to be limited to this. For example, in other embodiments, two swing arms are arranged on the roller brush housing, and the two swing arms can be respectively provided with a lifting drive motor and a lifting transmission assembly.

[0054] Note that the "fixing structure" in the present disclosure refers to the fact that the structure is in a fixed state during in use.

[0055] In addition, it should be noted that the structure of the lifting transmission assembly and how the roller brush device is driven are not limited to the description disclosed in the specification. For example, the moving member may have other structures. In addition to moving up and down, the moving member can also move forward and backward, which will be described in detail below. The movement of the moving member is not limited as long as the moving member can drive the swing arm. The lifting transmission assembly can take any possible way to drive the swing arm to swing. In addition, in case there is no swing arm on the roller brush housing, the lifting transmission assembly can take other ways to drive the roller brush device upward.

[0056] For the swing arm, its specific form, connection way, and driven way are not limited to the description in the specification. All technical solutions that are provided with a swing arm which can swing upward to lift the roller brush device by a lifting drive motor should fall within the protection scope of the present disclosure.

[0057] Referring to FIGS. 14 to 15, another example of the roller brush assembly is disclosed.

[0058] In this embodiment, a swing arm 13' is provided on one side of a roller brush housing 11'. The lifting transmission assembly includes a lifting transmission mechanism "a" and a moving member "b" cooperating with the swing arm 13'. The moving member b is movable forward and backward under driving of a lifting drive motor "c" and the lifting transmission mechanism a. Specifically, the lifting transmission mechanism a includes a screw rod a1 extending forward and backward and a slider a2 in a thread connection to the screw rod a1. The moving member b is slidably sleeved on the screw rod a1, and an elastic member a3 is disposed between the moving member b and the slider a2. Thus, the slider a2 is slid toward the moving member b under driving of the lifting drive motor c to make the compressed elastic member a3 push the moving member thereby pushing the swing arm 13' towards one side away from the roller brush device 10', thereby swinging the roller brush device 10' upward. With the cooperation of the screw rod a1, the slider a2, the elastic member a3, and the moving member b, the degree of freedom is increased as the roller brush device 10' swings, and problem of structural tolerances is reasonably avoided. And such an arrangement brings a reasonable utilization of inner space of the cleaning robot.

[0059] Specifically, the swing arm 13' includes a con-

tact portion 1320' pushed by the moving member b, and the contact portion 1320' is located at one side of the moving member b away from the slider a2. When the lifting drive motor c reaches a preset stroke, the swing arm 13' is pushed by the moving member b to swing to contact a contact wall d. Due to the elastic member a3, poor contact caused by the tolerance problem of the related structure can be reasonably avoided.

[0060] The contact portion 1320' is formed with a gap 1322' for allowing the screw rod a1 to pass therefrom to cooperate with the moving member b.

[0061] Further, the swing arm 13' includes a connecting arm 131' and a contact arm 132'. The connecting arm 131' is protruding from one side of the roller brush housing 11', a first end of the contact arm 132' is connected to the connecting arm 131', and a second end of the contact arm 132' is defined with a contact portion 1320'. With such a structure, it is convenient to push the swing arm 13.

[0062] In order for the moving member b to move forward and backward reliably, a limit sliding slot b1 extended forward and backward is provided in the moving member b, and the slider a2 is protruded toward the moving member b to form a limit protrusion a21 that is slidably engaged with the limit sliding slot b1. Therefore, the moving member b will not rotate relative to the screw rod a1.

[0063] Specifically, the screw rod a1 is connected to the lifting drive motor c by a gear set a4.

[0064] Specifically, a housing e is provided on the outside of the screw rod a1, the slider a2, and the moving member b, and one end wall of the housing e forms the contact wall d in contact with the swing arm 13'. Of course, the contact wall d is not limited to being formed in this way. For example, in other embodiments, the contact wall d may also be defined on a gear box f outside the gear set a4 at one end of the screw rod a1.

[0065] Referring to FIGS. 10 to 13 again, a side brush assembly includes the side brush device 20, a side brush drive motor 80, and a side brush transmission mechanism 70. Specifically, the side brush device 20 is connected to the side brush drive motor 80 by the side brush transmission mechanism 70, so that during cleaning, the side brush drive motor 80 can drive the side brush device 20 to rotate around a vertical axis thereof.

[0066] The side brush device 20 includes a lifting shaft 22 and a side brush 21 mounted on the lifting shaft 22. Further, the lifting shaft 22 is connected to the side brush transmission mechanism 70, thereby driving the side brush 21 to rotate. The lifting shaft 22 is movable in an axial direction, so that the side brush device 20 can move up and down. In such a way, the side brush device 20 can be lifted to improve the adaptability of the cleaning robot. Furthermore, the side brush device 20 is easy to make self-adaptive floating cleaning and/or be controlled to lift by cooperating with other structures.

[0067] In some instances, the side brush assembly further includes an elastic force applying structure. The elastic force applying structure is configured to provide a downward elastic force to the side brush device 20 so that the side brush 21 can contact with the ground in a floating way. The elastic force applying structure will store elastic potential energy when the side brush device 20 is moved upward, and the side brush device 20 will fall down under actions of the gravity of the side brush device 20 and the release of the elastic potential energy. Thus, the elastic force applying structure can facilitate the side brush 21 to self-adaptive float when the ground to be cleaned is uneven.

[0068] The elastic force applying structure includes a torsion spring N. Of course, it is not limited to the torsion spring N. Any structure that can achieve the above functions should fall within the protection scope of the present disclosure.

[0069] Furthermore, an end cover 90 is mounted on the lifting shaft 22, a bearing 91 is connected between the end cover 90 and the lifting shaft 22, and the end cover 90 is fixed to the lifting shaft 22. In such a way, it is convenient for the lifting shaft 22 to rotate stably.

[0070] In some instances, an engagement groove 221 is defined in the lifting shaft 22. The end cover 90 includes a side wall 92, and the side wall 92 is protruded inwardly to form an engagement portion 93 engaged with the engagement groove 221 for fixing the end cover 90 to the lifting shaft 22.

[0071] The elastic force applying structure is configured to provide the downward elastic force to the end cover 90, and then the elastic force is further transmitted to the side brush 21 by the lifting shaft 22, so that the side brush 21 can be floatingly contacted with the ground. With a cooperation of the elastic force applying structure and the end cover 90, the side brush 21 can be reliably and floatingly contacted with the ground.

[0072] Specifically, the elastic force applying structure takes the torsion spring N, and a torsion arm N1 of the torsion spring N is forced against the end cover 90. Further, a slot 94 is formed at a middle position of a top of the end cover 90, and a free end of the torsion arm N1 is disposed in the slot 94, so that the torsion spring N can be reliably connected with the end cover 90. The side brush assembly further includes a side brush transmission box 71, and the side brush transmission mechanism 70 is disposed in the side brush transmission box 71. The side brush transmission box 71 is provided with a torsion spring bracket 72, and the torsion spring N is mounted on the torsion spring bracket 72.

[0073] In some embodiments, the side brush transmission mechanism 70 includes a side brush driving gear (not shown in the figure) connected to an output end of the side brush drive motor 80, and a side brush driven gear 74 connected to the lifting shaft 22 by a key joint. In such a way, the transmission between different structures is reliable, and the key joint is also helpful to limit a movement range of the lifting shaft 22 in the axial direction of the lifting shaft 22.

[0074] In some embodiments, the side brush assembly may further include the lifting drive motor 30 and the lifting

transmission assembly. The lifting drive motor 30 can drive the lifting transmission assembly to lift the side brush device 20 upward. Specifically, the side brush device 20 can automatically fall back by its own gravity, which may also include a subjected elastic force, and the lifting drive motor 30 and the lifting transmission assembly will not affect a normal operation of the side brush device 20. Of course, maybe, the side brush device 20 can fall back by the lifting transmission assembly, as long as the lifting transmission assembly does not affect the side brush device 20 during normal cleaning.

[0075] In some instances, the lifting transmission assembly may include the lifting transmission mechanism 40 and the moving member 50. The moving member 50 is provided with a second moving part 53 that cooperates with the side brush device 20, and the second moving part 53 moves upward to lift the side brush device 20.

[0076] In an exemplary embodiment, the second moving part 53 cooperates with the end cover 90 (as shown in FIG. 7). The second moving part 53 is arranged to hold up the end cover 90 upward under driving of the lifting drive motor 30 so as to lift the side brush device 20 upward. When the second moving part 53 is driven downward by the lifting drive motor 30, the side brush device 20 automatically resets down. Thus, the side brush device 20 can be reliably driven to lift without affecting the rotation of the side brush device 20.

[0077] It should be noted that the lifting drive motor 30 and the lifting transmission mechanism 40 are not limited to the specific forms described above.

[0078] The side brush described here is used as an example to describe the cleaning member. It should be noted that the side brush 21 in the side brush assembly can also be replaced with other cleaning members, such as a mopping module. Correspondingly, the side brush assembly, the side brush drive motor 80, the side brush transmission mechanism 70, and the side brush device 20 are respectively a cleaning assembly, a cleaning drive motor, a cleaning transmission mechanism, and a cleaning device.

[0079] Referring to FIGS. 1 to 13, a linkage assembly for side brush and roller brush is also provided, which includes the lifting drive motor 30, the lifting transmission assembly, the roller brush device 10, and the side brush device 20. The lifting transmission assembly can simultaneously drive the side brush device 20 and the roller brush device 10 to lift upward under driving of the lifting drive motor 30.

[0080] In the present disclosure, the side brush device 20 and the roller brush device 10 are lifted and held in the lifted position, so that the cleaning robot will not be obstructed or affected by the side brush device 20 and the roller brush device 10 during the cleaning robot moves without performing cleaning. Moreover, by adjusting a height of the side brush device 20 and the roller brush device 10, it is also helpful to clean certain special areas and improve the adaptability of the cleaning robot. In addition, since just one lifting drive motor 30 is employed to drive both the side brush device 20 and the roller brush device 10, it is beneficial to the compactness of the overall structure and the consistency of operation.

[0081] In some instances, the lifting transmission assembly includes the lifting transmission mechanism 40 and the moving member 50 driven by the lifting transmission mechanism 40 to move up and down. The moving member 50 is provided with the first moving part 51 that cooperates with the roller brush device 10 and the second moving part 53 that cooperates with the side brush device 20. The first moving part 51 moves upward to drive the roller brush device 10 upward, and the second moving part 53 moves upward to drive the side brush device 20 upward. Since the moving member 50 can simultaneously drive the roller brush device 10 and the side brush device 20, the overall structure is more compact.

[0082] In some instances, the side brush device 20 may include the side brush 21 and the lifting shaft 22 described above. Since the lifting shaft 22 is connected to the side brush transmission mechanism 70 and movable in the axial direction, it is helpful for the side brush device 20 to move upward by the second moving part 53. Of course, the side brush device is not limited to this. In other embodiments, the lifting transmission assembly may be configured to drive the entire side brush assembly to lift, thereby lifting the side brush device upward.

[0083] The first moving part 51 is disposed on an inner side of the moving member 50, and the second moving part 53 is disposed on an outer side of the moving member 50, thereby facilitating space utilization.

[0084] Further, rotation centers of the swing arm 13 and the side brush device 20 are located on the same side of the roller brush housing 11. As shown in FIG.13, a branch arm 210 of the side brush device 20 is elastic and passes through a bottom of the roller brush 12 when the branch arm 210 rotates, thereby facilitating collection of garbage.

[0085] Understandably, the structures of the side brush and the roller brush linkage assembly are not limited to the specific forms described above.

[0086] While the disclosure has been described in connection with what are presently considered to be the most practical and preferred embodiments, it is to be understood that the disclosure is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangement included within the spirit and scope of the disclosure.

Claims

1. A roller brush assembly, comprising:

a roller brush device, comprising a roller brush housing and a roller brush rotatably connected in the roller brush housing, one side of the roller brush housing being provided with a swing arm;
a lifting drive motor; and

a lifting transmission assembly, connected to the lifting drive motor and driven by the lifting drive motor to drive the swing arm to swing, allowing the roller brush device to be lifted.

2. The roller brush assembly according to claim 1, wherein the roller brush device is capable of backswing downward by its own gravity.

3. The roller brush assembly according to claim 1, wherein the swing arm is configured to swing upward to lift the roller brush device when the roller brush housing encounters an obstacle, and the roller brush device is capable of backswing downward by its own gravity, realizing a self-adaptive floating of the roller brush device.

4. The roller brush assembly according to claim 1, wherein the lifting transmission assembly comprises:

a moving member cooperating with the swing arm and configured to drive the swing arm to drive the roller brush device to swing upward; and
a lifting transmission mechanism connected to the lifting drive motor and the moving member to drive the moving member to move.

5. The roller brush assembly according to claim 4, wherein the moving member is movable up and down under driving of the lifting drive motor, the moving member comprises a first moving part cooperating with the swing arm, and upward movement of the first moving part allows the swing arm to drive the roller brush device to swing upward.

6. The roller brush assembly according to claim 5, wherein,

the lifting drive motor comprises an output shaft vertically arranged and extending upward,
the lifting transmission mechanism comprises:

a screw rod in a thread connection with the moving member; and
a gear set comprising a driving gear fixedly connected to the output shaft and a driven gear fixedly connected to the screw rod.

7. The roller brush assembly according to claim 4, wherein the swing arm comprises:

a connecting arm disposed on one side of the roller brush housing; and
a contact arm having a first end connected to the connecting arm and a second end defined with a contact portion;

wherein the moving member moves to drive the contact portion towards one side away from the roller brush device, driving the roller brush device to swing upward.

8. The roller brush assembly according to claim 7, further comprising a mounting housing, wherein the moving member is mounted on the mounting housing and movable up and down, a swing groove is defined and penetrated downwardly on a side surface of the mounting housing, the moving member comprises a first moving part extended into the swing groove, the contact arm is swing arranged in the swing groove, the upward movement of the first moving part pushes the contact arm to swing to a side away from the roller brush device, allowing the roller brush device to be lifted, and an inner wall of the swing groove away from the roller brush device is configured to limit a swing range of the contact arm.

9. The roller brush assembly according to claim 8, wherein the connecting arm is located under and close to the mounting housing, and the mounting housing is configured to limit an upward swing range of the connecting arm.

10. The roller brush assembly according to claim 4, wherein,

the moving member is configured to be movable forward and backward under driving of the lifting drive motor and the lifting transmission mechanism;
the lifting transmission mechanism comprises:

a screw rod extending forward and backward, the moving member being slidably sleeved on the screw rod; and
a slider in a thread connection to the screw rod, an elastic member is disposed between the moving member and the slider, the slider being slid toward the moving member under driving of the lifting drive motor to make the elastic member in a compressed state push the moving member, thereby pushing the swing arm towards one side away from the roller brush device.

11. The roller brush assembly according to claim 10, wherein the swing arm comprises a contact portion pushed by the moving member, and the contact portion is located at one side of the moving member away from the slider; the swing arm is pushed by the moving member to swing to contact a contact wall when the lifting drive motor reaches a preset stroke.

12. The roller brush assembly according to claim 10, wherein the swing arm is formed with a gap for al-

lowing the screw rod to pass therefrom; and/or a limit sliding slot extended forward and backward is defined in the moving member, a limit protrusion is protruded from the slider and toward the moving member, and the limit protrusion is slidably engaged with the limit sliding slot.

13. The roller brush assembly according to claim 1, wherein the swing arm is configured to be pivotally connected to a fixing structure inside a cleaning robot.

14. The roller brush assembly according to claim 1, wherein the roller brush housing further comprises a pivoting arm, the pivoting arm and the swing arm are located on a same side of the roller brush housing and spaced apart along a length direction of the roller brush housing, a free end of the pivoting arm is configured to be pivotally connected to a fixing structure inside a cleaning robot, and the roller brush device is capable of swinging up and down by the pivoting arm and the swing arm.

15. A cleaning robot, comprising a roller brush assembly which comprises a roller brush device, a lifting drive motor, and a lifting transmission assembly, wherein the roller brush device comprises a roller brush housing and a roller brush rotatably connected in the roller brush housing, one side of the roller brush housing is provided with a swing arm, and the lifting transmission assembly is connected to the lifting drive motor and driven by the lifting drive motor to drive the swing arm to swing to allow the roller brush device to be lifted.

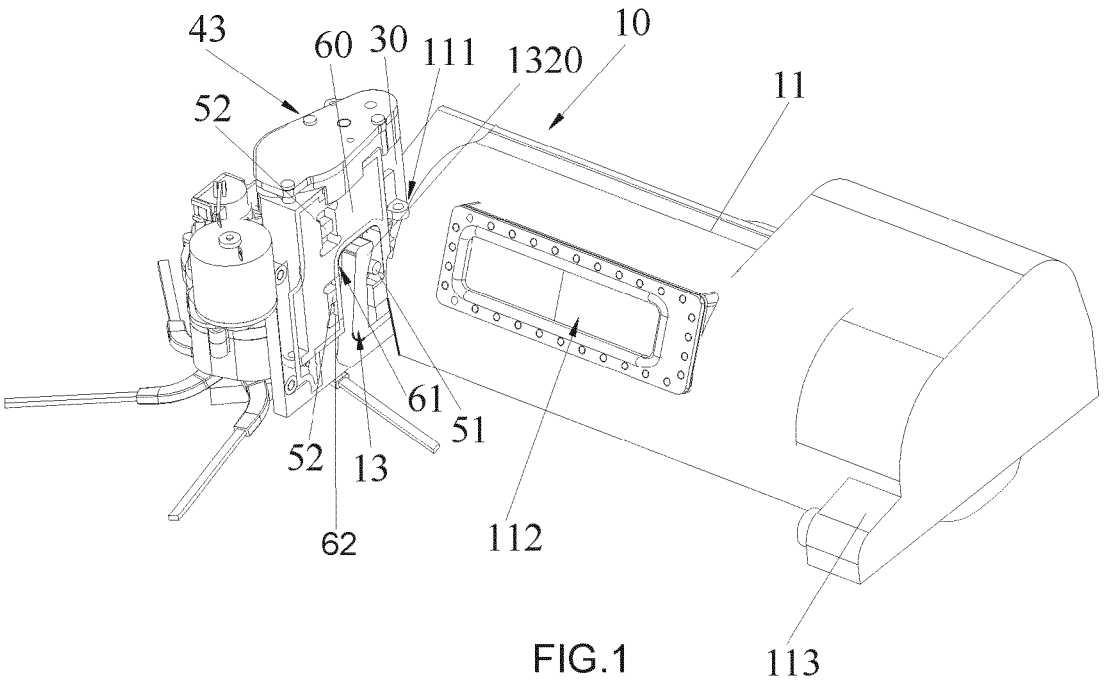

FIG.1

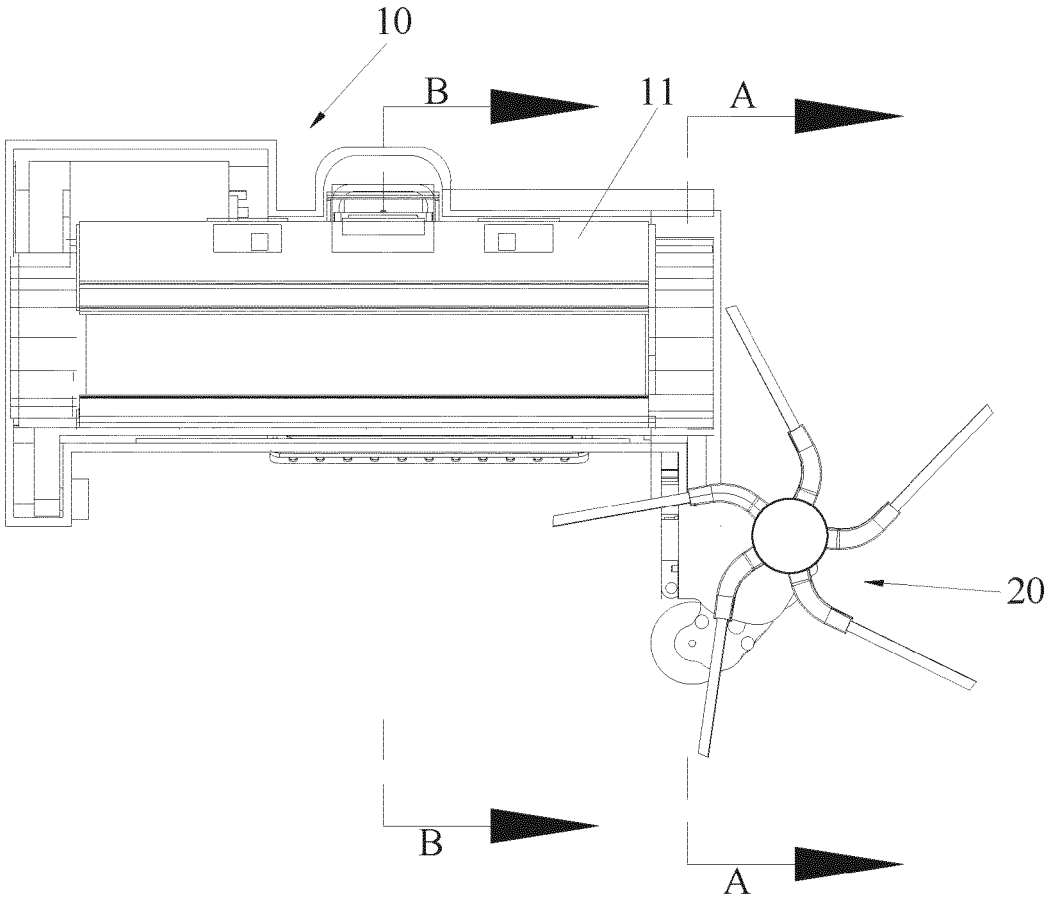

FIG.2

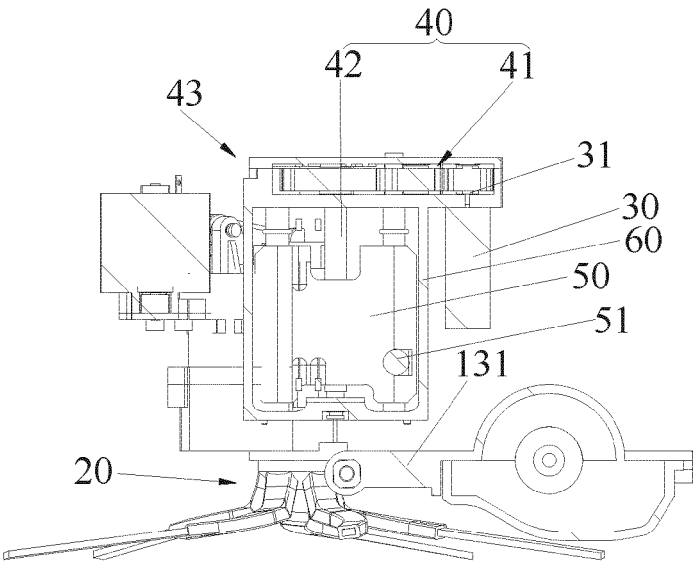
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FIG.3

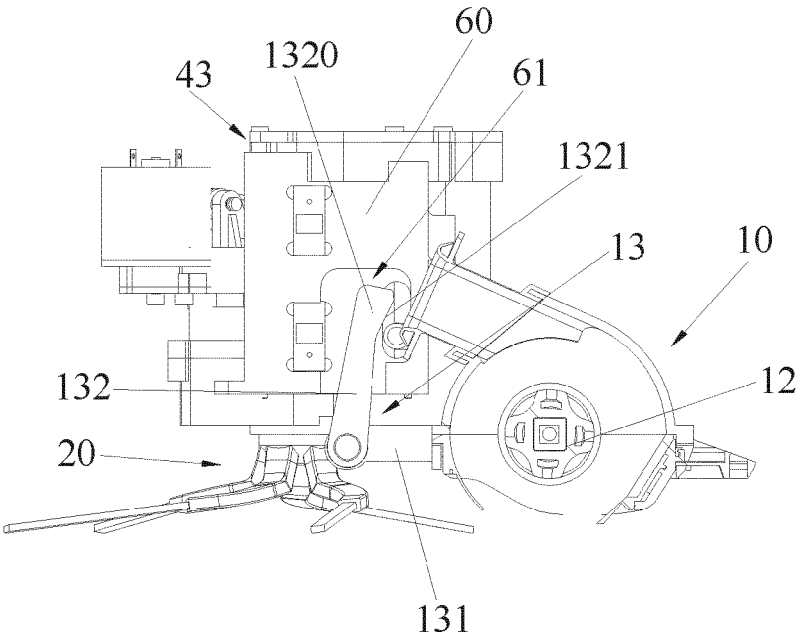
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FIG.4

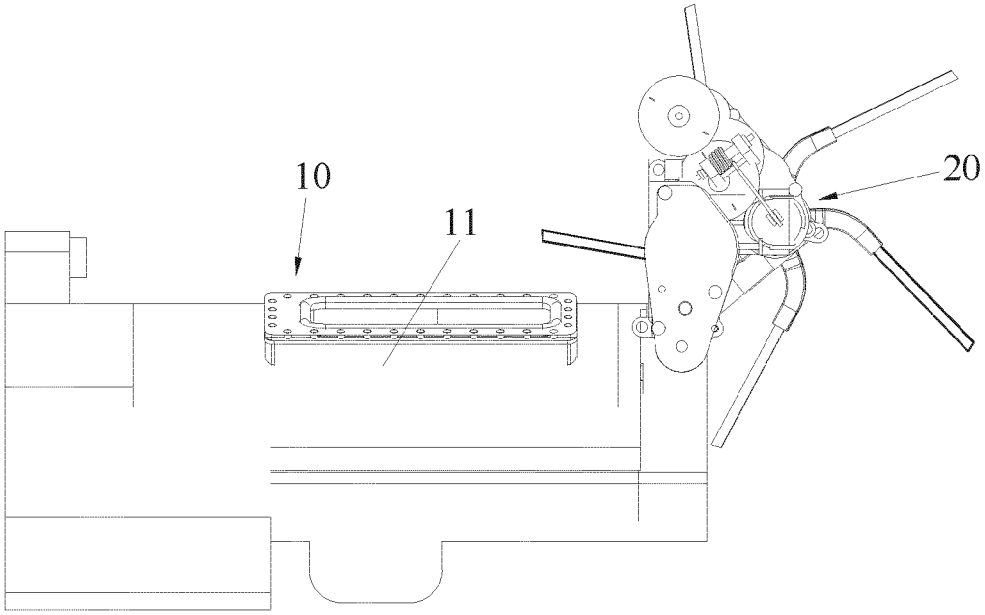

FIG.5

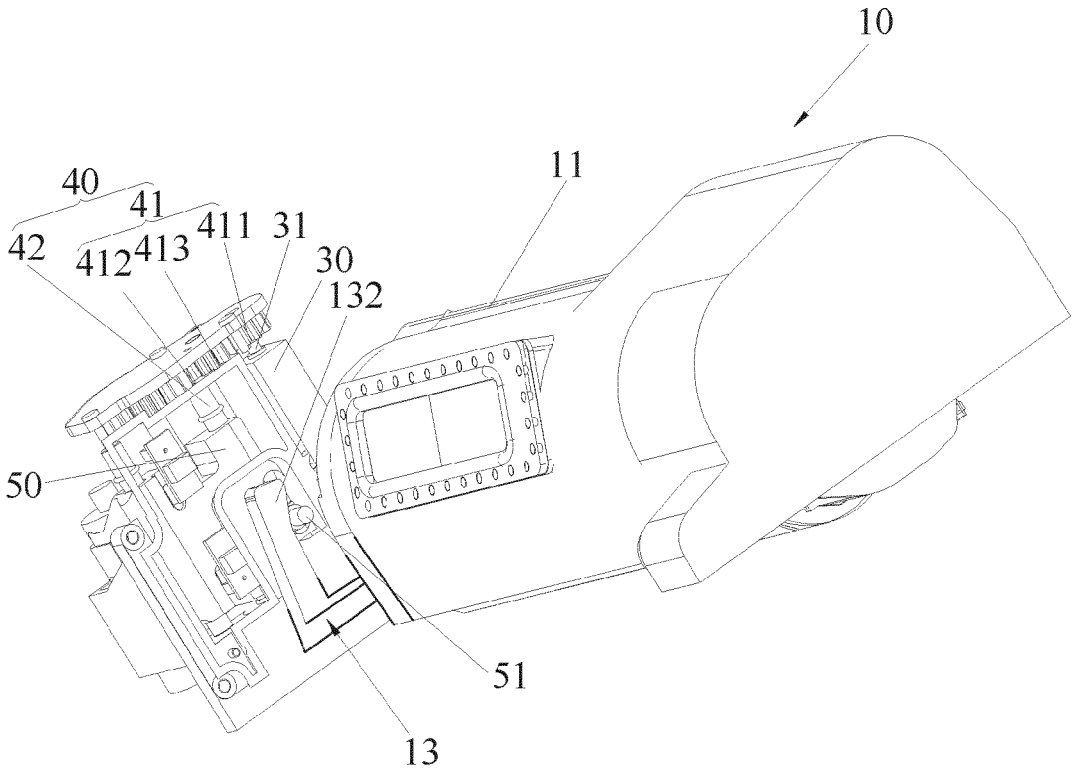

FIG.6

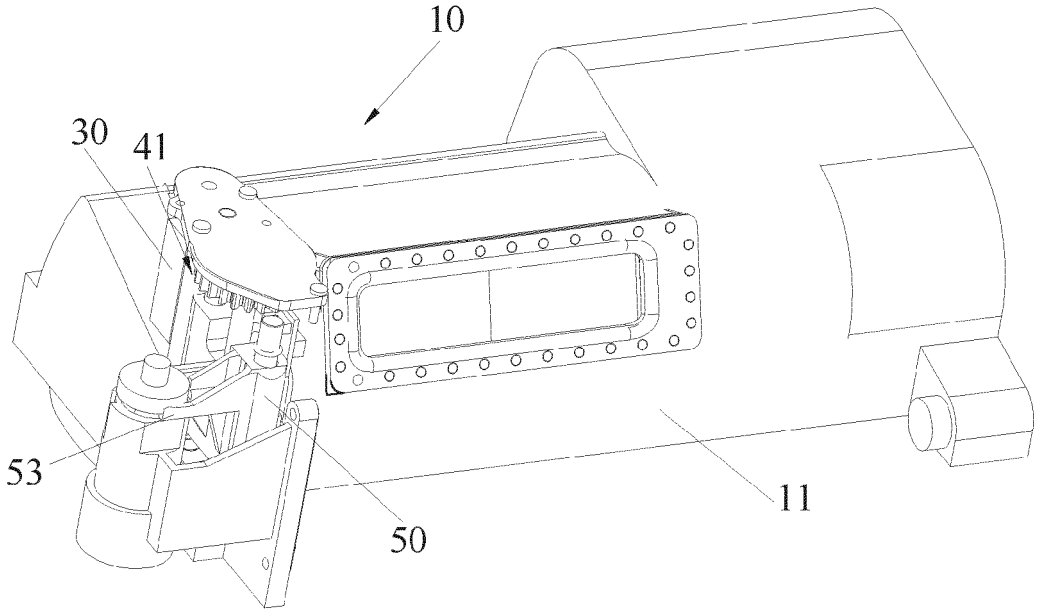

FIG.7

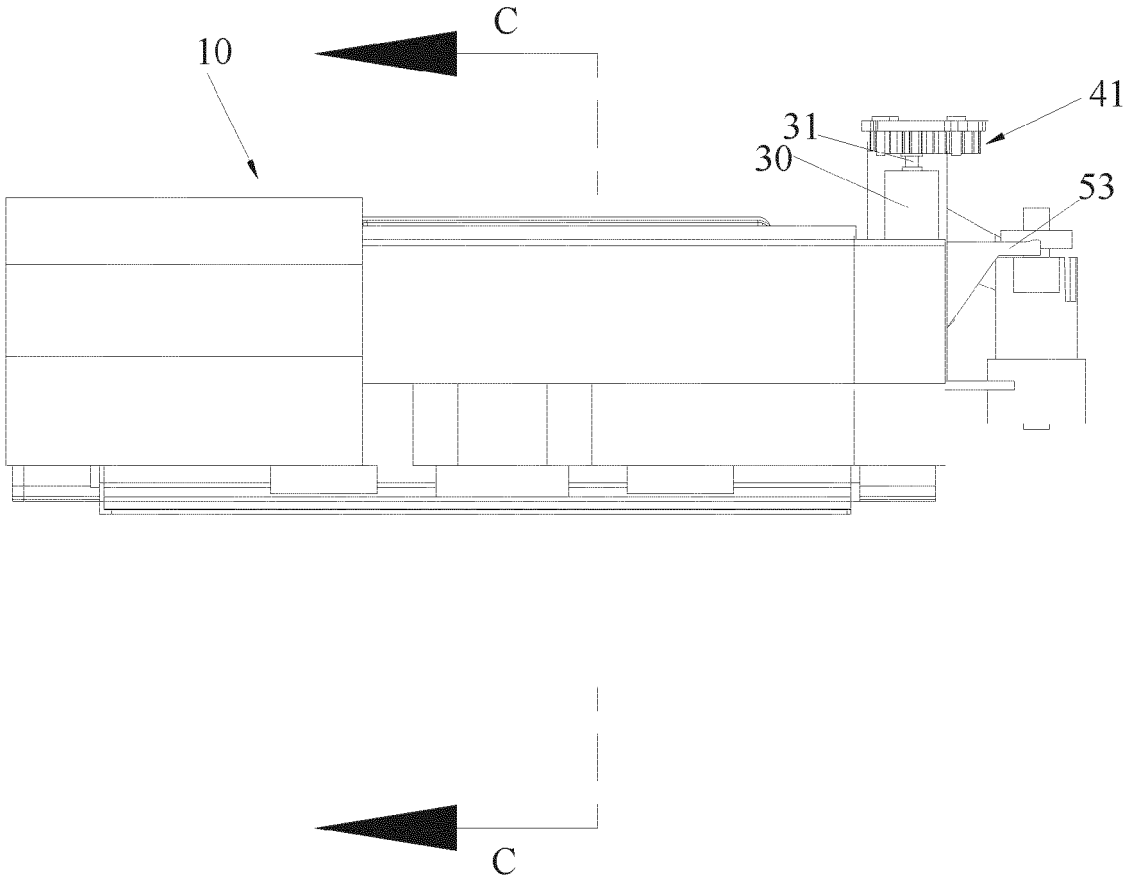

FIG.8

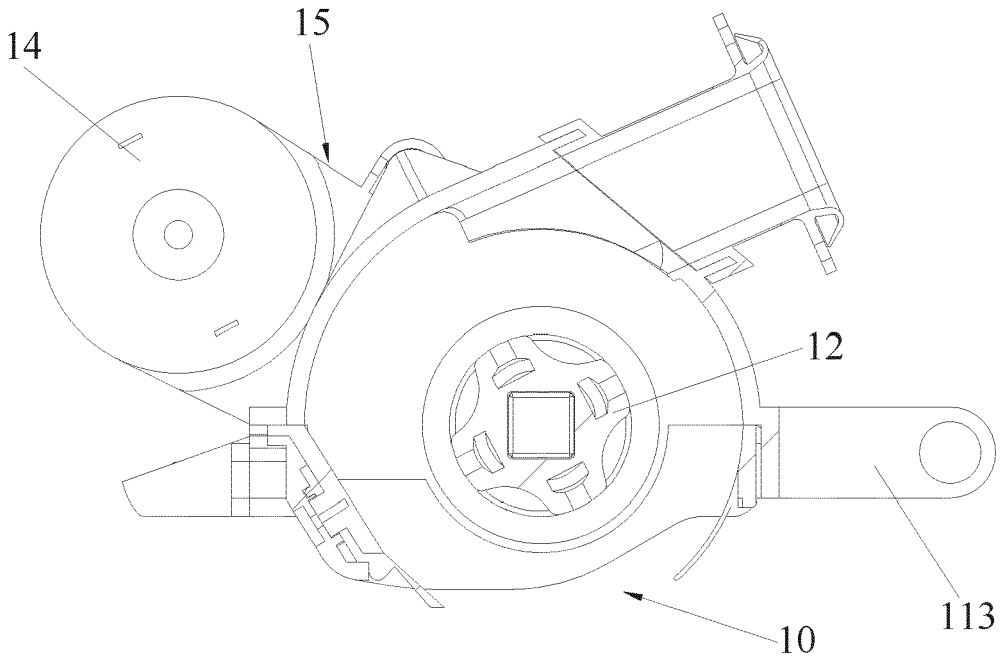

FIG.9

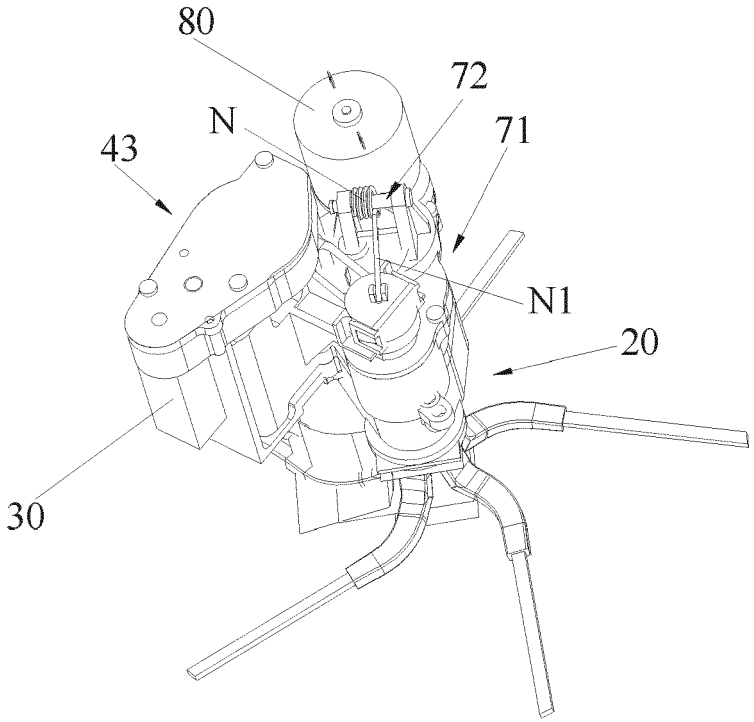

FIG.10

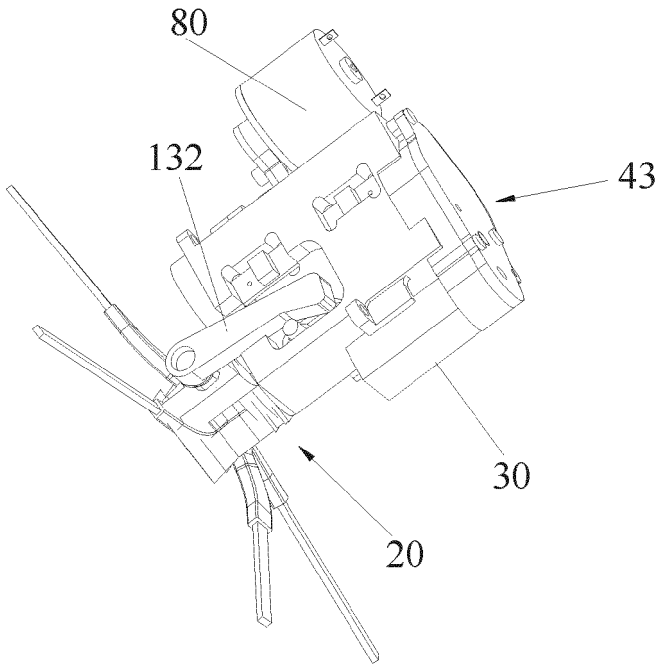

FIG.11

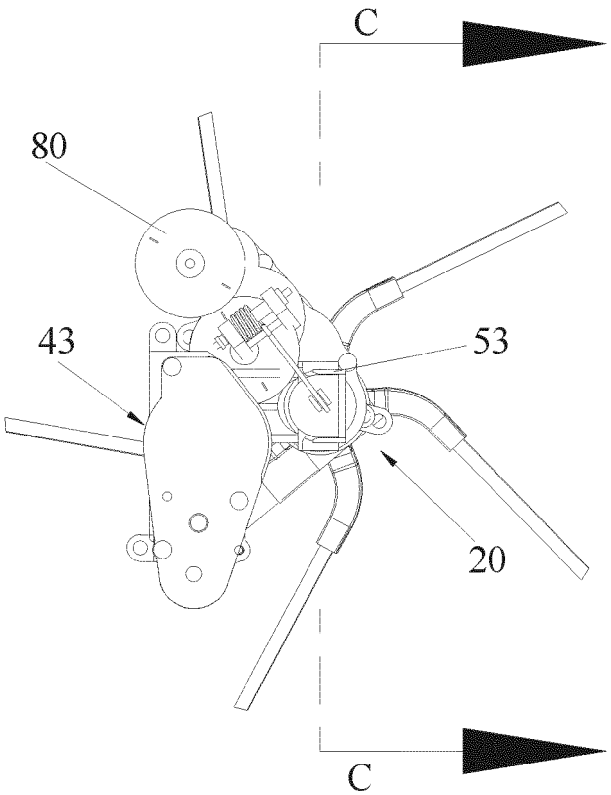

FIG.12

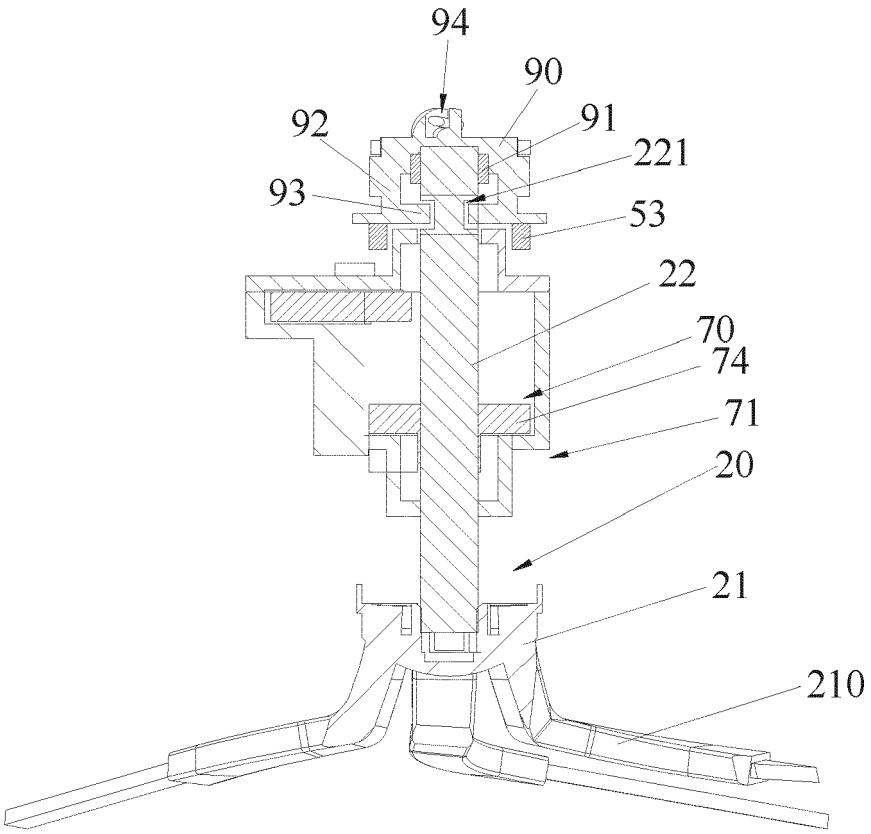

FIG.13

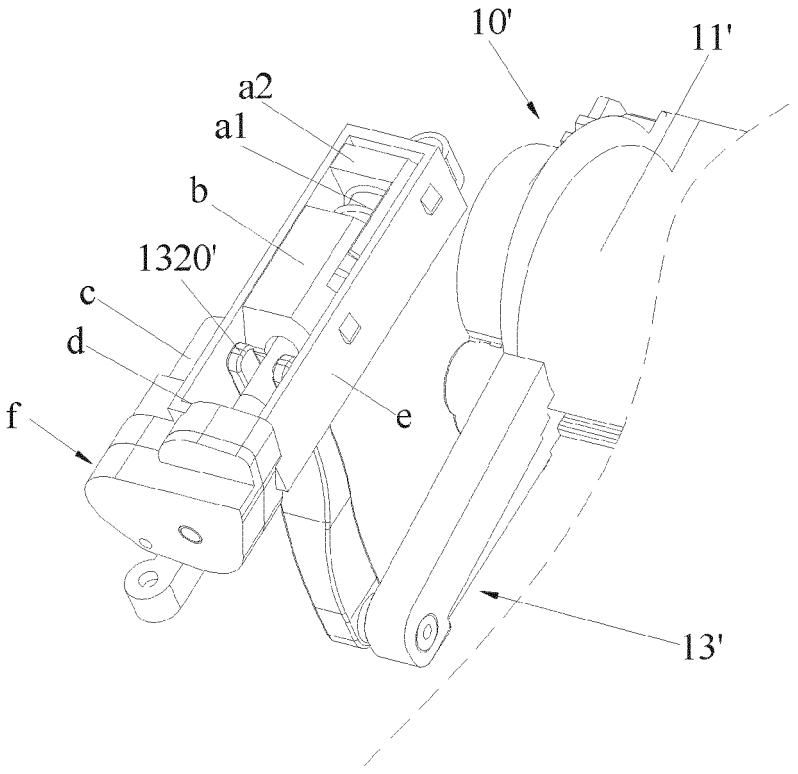
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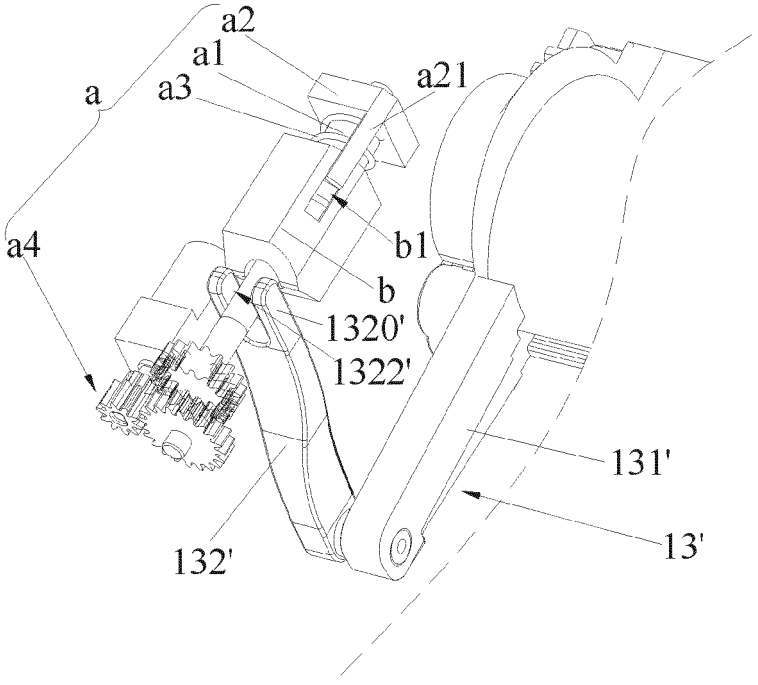
FIG.14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132'

FIG.15

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EUROPEAN SEARCH REPORT

Application Number
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A	* paragraph [0041] - paragraph [0099]; figures 1-9 *	2,3,6, 10-12	
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Place of search	Date of completion of the search	Examiner
Munich	1 June 2022	Hubrich, Klaus

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