



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.09.2022 Bulletin 2022/39

(51) International Patent Classification (IPC):
A47L 11/40^(2006.01)

(21) Application number: **22164247.3**

(52) Cooperative Patent Classification (CPC):
**A47L 11/283; A47L 11/4038; A47L 11/4055;
A47L 11/4069; A47L 2201/06**

(22) Date of filing: **24.03.2022**

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

• **Yunjing Intelligence (Shenzhen) Co., Ltd.**
Shenzhen 518000 (CN)

(72) Inventors:
• **ZHANG, Junbin**
Shenzhen, 518000 (CN)
• **LIN, Weijing**
Shenzhen, 518000 (CN)
• **LI, Xingyan**
Shenzhen, 518000 (CN)

(30) Priority: **25.03.2021 CN 202110323260**

(71) Applicants:
• **Yunjing Intelligence Technology**
(Dongguan) Co., Ltd.
Dongguan, Guangdong 523000 (CN)

(74) Representative: **Sach, Greg Robert**
Valet Patent Services LLP
Siedlungsstrasse 4a
85253 Erdweg (DE)

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

(57) A cleaning assembly configured for mounting on a main body of a cleaning robot includes a cleaning component, a first connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body, and a second connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body. The first connecting rod, the

cleaning component, the second connecting rod, and the main body cooperatively form a link mechanism to lift or lower the cleaning member by a reciprocating movement of the link mechanism, and a driving device is configured to drive the link mechanism to perform the reciprocating movement. The adaptability of the cleaning robot using the cleaning assembly is improved since the cleaning component can be lifted or lowered.

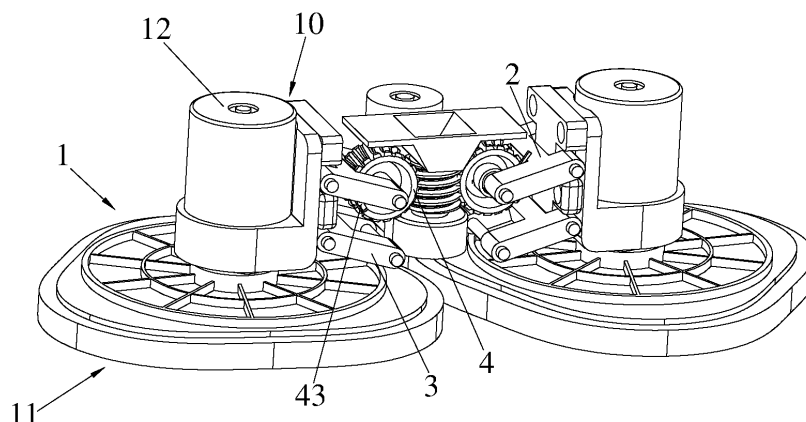


FIG. 2

Description

RELATED APPLICATIONS

- 5 **[0001]** This application claims the priority to Chinese application No. 202110323260.2 filed on March 25, 2021, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

- 10 **[0002]** The present disclosure relates to technical field of cleaning robots, and in particular to a cleaning assembly and a cleaning robot with the same.

BACKGROUND

- 15 **[0003]** With the development of science and technology, more and more cleaning robots are used by peoples. The cleaning robot generally includes a cleaning component which is configured to clean the surface to be cleaned. However, the cleaning component in related technologies cannot be lifted and held in a lift position, as a result, the cleaning robot using the cleaning component is short of adaptability.

20 SUMMARY

[0004] One objective of the present disclosure is to provide a cleaning assembly which can lift or lower a component of a cleaning robot, thereby improving the adaptability of the cleaning robot.

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

- 25 **[0006]** To achieve the above objectives, the present disclosure provides a cleaning assembly configured for mounting on a main body of a cleaning robot, and the cleaning assembly includes:

a cleaning component;

- 30 a first connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body, and a second connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body, allowing the first connecting rod, the cleaning component, the second connecting rod, and the main body to form a link mechanism to lift or lower the cleaning component by a reciprocating movement of the link mechanism; and

a driving device, configured to drive the link mechanism to perform the reciprocating movement.

- 35 **[0007]** In some embodiments, the cleaning component includes a mounting base connected with the first connecting rod and the second connecting rod, and a cleaning member fixedly or rotatably installed on the mounting base.

[0008] In some embodiments, the link mechanism includes a four-bar linkage of a rhomboid.

- 40 **[0009]** In some embodiments, a connection position between the cleaning component and the first connecting rod and a connection position between the cleaning component and the second connecting rod face to each other in a vertical direction, and a connection position between the main body and the first connecting rod and a connection position between the main body and the second connecting rod face to each other in the vertical direction.

- 45 **[0010]** In some embodiments, the cleaning assembly further includes a torque applying device. When the cleaning component encounters an obstacle, the cleaning component is pushed upward to make the link mechanism transform, and transformation of the link mechanism allows the torque applying device to be pushed against by the link mechanism to store elastic potential energy; and the cleaning component falls back down under a release of the elastic potential energy of the torque applying device when the cleaning component is separated from the obstacle.

- 50 **[0011]** In some embodiments, the driving device includes a transmission structure configured to drive the first connecting rod to rotate in a first direction to allow the cleaning component to be lifted upward by the link mechanism; the torque applying device is arranged on the transmission structure and configured to be driven by the transmission structure to push the first connecting rod to rotate in a second direction to allow the cleaning component to fall back down.

- 55 **[0012]** In some embodiments, the transmission structure includes a rotating body on which the torque applying device is arranged; the first connecting rod is rotated in the first direction to lift the cleaning component upward when the rotating body is rotated in a third direction; and the first connecting rod is pushed by the torque applying device to rotate in the second direction to allow the cleaning component to fall back down when the rotating body is rotated in a fourth direction.

[0013] In some embodiments, the torque applying device includes a torsion spring which includes a torsion spring body, and a first torsion arm and a second torsion arm connected to the torsion spring body. The rotating body is provided with a shaft on which the torsion spring body is sleeved, the first torsion arm is engaged with the rotating body, and the

second torsion arm is configured to act on the first connecting rod. When the rotating body is rotated in the fourth direction, the second torsion arm is driven to press the first connecting rod down to allow the first connecting rod to rotate in the second direction; when the cleaning component encounters an obstacle, the second torsion arm is pushed by the first connecting rod due to a transformation of the link mechanism to allow the torsion spring to store elastic potential energy.

[0014] In some embodiments, the rotating body is provided with a protrusion which is configured to push the first connecting rod to rotate in the first direction when the rotating body is rotated in the third direction.

[0015] In some embodiments, the driving device includes a rotating body fixedly connected to the first connecting rod.

[0016] In some embodiments, the cleaning assembly includes two cleaning components which are arranged side by side, and each of the two cleaning components is connected to the main body by the first connecting rod and the second connecting rod;

[0017] the driving device includes a driving motor, a transmission mechanism, a screw rod, a sliding seat, and two gears served as the rotating body; the driving motor is connected to the screw rod through the transmission mechanism to drive the screw rod to rotate, the sliding seat is in threaded connection with the screw rod to be lifted or lowered by the screw rod, two gear racks are arranged on opposite sides of the sliding seat and each gear rack is engaged with a gear, and each of the two gears is configured to drive a corresponding first connecting rod.

[0018] In some embodiments, the cleaning assembly includes two cleaning components which are arranged side by side, and each of the two cleaning components is connected to the main body by the first connecting rod and the second connecting rod;

the driving device includes a driving motor, a transmission mechanism, a worm, and two worm gears served as the rotating body, the driving motor is connected to the worm through the transmission mechanism to drive the worm to rotate, and each of the two worm gears is meshed on a side of opposite two sides of the worm and configured to drive a corresponding first connecting rod.

[0019] The present disclosure further provides a cleaning robot including the above cleaning assembly.

[0020] The present disclosure is provided with a driving device to drive the link mechanism to perform a reciprocating movement, so as to lift or lower the cleaning component. Accordingly, the cleaning robot using the cleaning assembly is adaptability improved since the cleaning component can be lifted or lowered.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The accompanying drawings facilitate an understanding of the various embodiments of the disclosure, wherein:

FIG. 1 is a perspective view of a cleaning assembly according to a first embodiment of the present disclosure;

FIG. 2 is another perspective view of the cleaning assembly of FIG. 1;

FIG. 3 is an exploded view of the cleaning assembly of FIG. 1;

FIG. 4 is a bottom view of the cleaning assembly of FIG. 1;

FIG. 5 is a cross-sectional view along the line A-A in FIG. 4;

FIG. 6 is a perspective view of the cleaning assembly of FIG. 1 with a part of components is hidden;

FIG. 7 is another perspective view of the cleaning assembly of FIG. 1 with a part of components is hidden;

FIG. 8 is a perspective view of a cleaning assembly according to a second embodiment of the present disclosure;

FIG. 9 is a bottom view of the cleaning assembly of FIG. 8;

FIG. 10 is a cross-sectional view along the line B-B in FIG. 9;

FIG. 11 is a cross-sectional view of a cleaning assembly according to a third embodiment of the present disclosure;

FIG. 12 is a perspective view of a cleaning assembly according to a fourth embodiment of the present disclosure; and

FIG. 13 is a perspective view of a cleaning assembly and a main body according to an embodiment of the present disclosure.

Reference signs

1	cleaning component	10	mounting base
101	mounting base body	102	third connecting rod
103	substrate	104	side plate
11	cleaning member	12	rotary drive motor
121	output shaft	2	first connecting rod
21	notch	3	second connecting rod

(continued)

4	rotating body	41	first shaft
42	buckle hole	43	protrusion
5	torsion spring	51	torsion spring body
52	first torsion arm	53	second torsion arm
6	driving motor	7	transmission mechanism
8	worm	81	second shaft
G	cover	G1	shaft hole
a, b, c, d	rotating shaft	4'	rotating body
6'	driving motor	7'	transmission mechanism
8'	screw rod	9'	sliding seat
91'	gear rack	92'	guide rod
G'	cover	G1'	screw hole
G2'	guide rod hole	a'	rotating shaft
T	spring	1'	cleaning component
100	main body		

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0022] 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 embodiment and the attached drawings are described in detail.

[0023] FIGS. 1-7 show a cleaning assembly according to a first embodiment of the present disclosure. The cleaning assembly is mounted on a main body 100 (see FIG. 13) of a cleaning robot, and includes a cleaning component 1, a first connecting rod 2, a second connecting rod 3 and a driving device. Specifically, the cleaning component 1 is configured to clean a surface, both ends of the first connecting rod 2 and both ends of the connecting rods 3 are swingingly connected to the cleaning component 1 and the main body 100, so that the first connecting rod 2, the cleaning component 1, the second connecting rod 3 and the main body 100 form a link mechanism, such as a four-bar linkage, and the four-bar linkage provides a reciprocating movement to lift or lower the cleaning component 1; and the driving device is configured to drive the four-bar linkage to make the reciprocating movement.

[0024] When the driving device drives the four-bar linkage to reciprocate, the position of the main body 100 of the four-bar linkage is relatively fixed. The first connecting rod 2 and the second connecting rod 3 are rotated back and forth around their respective connection positions on the main body 100 of the cleaning robot, and the cleaning component 1 is lifted or lowered with the reciprocating movement of the four-bar linkage. Thus, the cleaning robot of the present disclosure can lift or lower the cleaning component 1 as required, thereby improving the adaptability of the cleaning robot. For example, when the cleaning component 1 is too dirty, the cleaning robot needs to return to the base station to clean the cleaning component 1, the cleaning component 1 may be lifted to avoid secondary pollution to the cleaning component 1, meanwhile to facilitate the rapid travel of the cleaning robot.

[0025] In this embodiment, both ends of the first connecting rod 2 and both ends of the second connecting rod 3 are pivotally connected to the cleaning component 1 and the main body 100 of the cleaning robot, respectively.

[0026] Optionally, the first connecting rod 2 and the second connecting rod 3 may be connected to a same structure of the main body 100 at the same time, or connected to different structures of the main body 100. In an exemplary embodiment, the first connecting rod 2 and the second connecting rod 3 may be connected to the housing of the main body 100.

[0027] In this embodiment, the cleaning component 1 includes a mounting base 10 and a cleaning member 11 mounted on the mounting base 10, and the cleaning component 1 is connected to the first connecting rod 2 and the second connecting rod 3 through the mounting base 10.

[0028] Referring to FIG. 1, specifically, the mounting base 10 includes a mounting base body 101 and a third connecting rod 102. The cleaning member 11 is mounted on the mounting base body 101, the third connecting rod 102 is fixedly connected to the mounting base body 101, and the mounting base 10 is respectively connected to the first connecting rod 2 and the second connecting rod 3 through the third connecting rod 102.

[0029] The cleaning member 11 is rotatably mounted on the mounting base 10, and the cleaning member may also be fixedly mounted on the mounting base 10. In order to rotate the cleaning member 11, a rotary drive motor 12 may be installed on the mounting base 10 and in transmission connection with the cleaning member 11.

[0030] Referring to FIGS. 1 and 5, in an exemplary embodiment, the mounting base body 101 includes a substrate 103 and a side plate 104, the rotary drive motor 12 is mounted on the base body 103, and an output shaft 121 of the rotary drive motor 12 is extended downward from the substrate 103 to be connected with the cleaning member 11. The third connecting rod 102 is installed on the side plate 104.

[0031] Of course, the cleaning member 11 may also be fixedly installed on the mounting base 10, which is not limited in the present disclosure.

[0032] In an exemplary embodiment, the cleaning component 1 is a mopping module, which is not limited however. For example, the cleaning component 1 may also be a sweeping module.

[0033] In short, for the present disclosure, the cleaning component 1 is not limited to any form.

[0034] In this embodiment, the four-bar linkage is a rhomboid four-bar linkage.

[0035] The connection position between the cleaning component 1 and the first connecting rod 2 and the connection position between the cleaning component 1 and the second connecting rod 3 face to each other in the vertical direction, and the connection position between the main body 100 and the first connecting rod 2 and the connection position between the main body 100 and the second connecting rod 3 face to each other in the vertical direction. In such a way, the cleaning component 1 can be lifted or lowered in the vertical direction. Of course, the lifting/lowering direction of the cleaning component 1 is not limited.

[0036] In an exemplary embodiment, the cleaning component 1 is pivoted with the first connecting rod 2 and the second connecting rod 3, respectively; the main body 100 is pivoted with the first connecting rod 2 and the second connecting rod 3, respectively.

[0037] In this embodiment, the cleaning assembly further includes a torque applying device which acts on the first connecting rod 2 and/or the second connecting rod 3. When the cleaning component 1 encounters an obstacle, the cleaning component 1 is pushed upward to make the four-bar linkage transform, such that the torque applying device is pushed against by the four-bar linkage to store elastic potential energy. When the cleaning component 1 is separated from the obstacle, the cleaning component 1 returns downward under the release of the elastic potential energy of the torque applying device. The arrangement of the torque applying device facilitates the self-adaptive floating of the cleaning component 1 when the cleaning robot is cleaning an uneven surface.

[0038] The specific form and arrangement of the "torque applying device" are not limited in the present disclosure.

[0039] The driving device includes a transmission structure which is configured to drive the first connecting rod 2 to rotate in a first direction so that the cleaning component 1 is lifted upward under an action of the four-bar linkage. The torque applying device is arranged on the transmission structure and is configured to push the first connecting rod 2 to rotate in a second direction under the drive of the transmission structure, so as to make the cleaning component 1 to return downward under an action of the four-bar linkage.

[0040] In the present disclosure, the first connecting rod 2 is defined as a connecting rod driven by the driving device, which may be any one of the two connecting rods between the cleaning component 1 and the main body 100 of the cleaning robot. Of course, it does not rule out the possibility that the first connecting rod 2 and the second connecting rod 3 may be simultaneously driven by the driving device. In an exemplary embodiment, the first connecting rod 2 is located above the second connecting rod 3, which is not limited however. The transmission structure may have various embodiments, as long as it can drive the first connecting rod 2 to rotate in the first direction, and drive the torque applying device to push the first connecting rod 2 to rotate in the second direction. Of course, it does not rule out the possibility that the first connecting rod 2 and the second connecting rod 3 may be simultaneously pushed by the torque applying device.

[0041] By arranging the torque applying device on the transmission structure, on the one hand, it is beneficial to achieve the adaptive floating of the cleaning component 1 through the cooperation of the torque applying device and the first connecting rod 2, on the other hand, it facilitates the installation of the torque applying device.

[0042] Of course, the torque applying device in the present disclosure is not limited to being provided on the transmission structure. It's feasible that, the torque applying device only plays a role in facilitating the self-adaptive floating of the cleaning component 1.

[0043] In an exemplary embodiment, the transmission structure includes a rotating body 4 on which the torque applying device is arranged. When the rotating body 4 is rotated in a third direction, the first connecting rod 2 is rotated in the first direction to lift up the cleaning component 1. When the rotating body 4 is rotated in a fourth direction, the second connecting rod 2 is rotated in the second direction under the push of the torque applying device to make the cleaning component 1 to return downward. By arranging the torque applying device on the rotating body 4, it is convenient to drive the torque applying device to push the first connecting rod 2.

[0044] It should be noted that, when the rotating body 4 is rotated in the third direction, the first connecting rod 2 may be configured to be directly driven by the rotating body 4 to rotate in the first direction, which is not limited however. For

example, the transmission structure may include other structures for driving the first connecting rod 2 to rotate in the first direction. In addition, it is not excluded here that the first connecting rod 2 and the second connecting rod 3 may be directly driven by the rotating body 4, and/or directly pushed by the torque applying device in other embodiments.

[0045] In some embodiments, the rotation axis of the first connecting rod 2 and the rotation axis of the rotating body 4 are substantially coincident, which is not limited however.

[0046] The first connecting rod 2 is pivotally connected to the main body 100 of the cleaning robot through a rotating shaft a, and the rotating body 4 is rotatably arranged on the rotating shaft a, for example, the rotating body 4 is in clearance fit with the rotating shaft a.

[0047] Referring to FIGS. 3 and 6, in an exemplary embodiment, the torque applying device includes a torsion spring 5 which includes a torsion spring body 51, a first torsion arm 52 and a second torsion arm 53 which are both connected to the torsion spring body 51. The rotating body 4 is provided with a first shaft 41, and the torsion spring body 51 is sleeved on the first shaft 41. The first torsion arm 52 is engaged on the rotating body 4, and the second torsion arm 53 is configured to act on the first connecting rod 2. When the rotating body 4 is rotated in the fourth direction, the second torsion arm 53 is driven to press the first connecting rod 2 to rotate in the second direction.

[0048] When the cleaning component 1 encounters an obstacle, the second torsion arm 53 is pushed by the first connecting rod 2 due to the transformation of the four-bar linkage, so that the torsion spring 5 stores elastic potential energy. When the cleaning component 1 is free from obstacles, the first connecting rod 2 is pressed by the torsion spring 5 by means of its elastic potential energy to facilitate the downward return of the cleaning component 1. In such a way, the torsion spring 5 can be stably configured on the rotating body 4, and the torsion spring 5 and the first connecting rod 2 can be stably cooperated with one another.

[0049] It should be noted that, it is not excluded here that the torsion spring 5 may be configured to act on both the first connecting rod 2 and the second connecting rod 3.

[0050] In order to stably install the torsion spring 5 on the rotating body 4, the rotating body 4 is provided with a buckle hole 42 for buckling with the first torsion arm 52 of the torsion spring 5.

[0051] Referring to FIG. 7, in an exemplary embodiment, the rotating body 4 is provided with a protrusion 43 which is configured to push the first connecting rod 4 to rotate in the first direction when the rotating body 4 is rotated in the third direction. In such a way, the first connecting rod 2 can be reliably pushed.

[0052] Referring to FIGS. 6 and 7, in an exemplary embodiment, the first connecting rod 2 and the second connecting rod 3 are both plate-shaped. Two ends of the first connecting rod 2 are respectively provided with rotating shafts a and b, and two ends of the second connecting rod 3 are respectively provided with rotating shafts c and d. Two ends of each of the rotating shafts a, b, c, and d are pivotally connected to the main body 100 and the cleaning component 1 respectively. A notch 21 is formed on one end of the first connecting rod 2, and the rotating body 4 is partially located at the notch 21 and is in clearance fit with the rotating shaft a. The two side walls of the rotating body 4 are respectively provided with a protrusion 43. Of course, the location of the protrusion 43 is not limited.

[0053] In an exemplary embodiment, the rotating body 4 is a worm gear. However, the rotating body 4 is not limited to the form of a worm gear. For example, in a second embodiment of the present disclosure, the rotating body 4 is a gear.

[0054] Referring to FIG. 6, in an exemplary embodiment, the cleaning assembly includes two cleaning components 1 arranged side by side, the first connecting rod 2 and the second connecting rod 3 are respectively connected between each cleaning component 1 and the main body 100. The driving device includes a driving motor 6, a transmission mechanism 7, a worm 8, and two worm gears served as the rotating body 4. The driving motor 6 is connected to the worm 8 through the transmission mechanism 7 to drive the worm 8 to rotate, and the two worm gears are respectively meshed on opposite sides of the worm 8 and configured to drive the respective first connecting rod 2. In such a way, the four-bar linkage can be reliably driven to reciprocate.

[0055] Referring to FIGS. 1 and 3. In an exemplary embodiment, a cover G is provided above the two worm gears and the worm 8, a shaft hole G1 is formed on the cover G, and the top of the worm 8 is provided with a second shaft 81 that is in a rotation fit with the shaft hole G1.

[0056] FIGS. 8 to 10 show a cleaning assembly according to a second embodiment of the present disclosure. The main difference between this embodiment and the first embodiment is the driving device.

[0057] In an exemplary embodiment, the cleaning assembly includes two cleaning components 1 arranged side by side, the first connecting rod 2 and the second connecting rod 3 are respectively connected between each cleaning components 1 and the main body 100. The driving device includes a driving motor 6', a transmission mechanism 7', a screw rod 8', a sliding seat 9' and two gears served as the rotating body 4'. The driving motor 6' is connected to the screw rod 8' through the transmission mechanism 7' to drive the screw rod 8' to rotate, the sliding seat 9' is in threaded connection with the screw rod 8' to be lifted or lowered by the screw rod 8'. Two gear racks 91' are formed on opposite sides of the sliding seat 9' to be respectively connected with the two gears, and the two gears are respectively configured to drive the respective first connecting rod 2. In such a way, the four-bar linkage can be reliably driven to reciprocate.

[0058] In an exemplary embodiment, the sliding seat 9' is slidably arranged on a guide rod 92' to ensure the reliable sliding of the sliding seat 9'.

[0059] In this embodiment, the rotating body 4' plays the same role as the rotating body 4 in the first embodiment.

[0060] Referring to FIGS. 8 and 9, in an exemplary embodiment, a cover G' is provided above the two gears and the sliding seat 9', and a screw hole G1' and a guide rod hole G2' are formed on the cover G', the top of the screw rod 8' is arranged in the screw hole G1', and the guide rod 92' is arranged in the guide rod hole G2'.

[0061] FIG. 11 shows a cleaning assembly according to a third embodiment of the present disclosure. The main difference between this embodiment and the first embodiment is that, no torque applying device is configured on the rotating body 4, and the rotating body 4 is fixedly connected to the first connecting rod 2 to drive the first connecting rod 2 to rotate in the first direction and the second direction, so as to cause the four-bar linkage be reciprocated to realize the lifting and lowering of the cleaning component 1'. It is not excluded that the rotating body 4 may be both fixedly connected to the first connecting rod 2 and the second connecting rod 3, respectively.

[0062] The first connecting rod 2 is pivotally connected to the main body 100 of the cleaning robot through a rotating shaft a', and the rotating body 4 is arranged on the rotating shaft a', preferably in the form of a key connection. When the rotating body 4 rotates, the first connecting rod 2 is driven to rotate by the rotating shaft a'.

[0063] In order to further realize the self-adaptive floating cleaning of the cleaning component 1', a spring T is built into the cleaning component 1' in the present embodiment. Of course, other manners may also be utilized to realize the self-adaptive floating cleaning, for example, a torque applying device may be provided to act on the four-bar linkage.

[0064] FIG. 12 shows a cleaning assembly according to a fourth embodiment of the present disclosure.

[0065] The main difference between this embodiment and the second embodiment is that, no torque applying device is provided on the rotating body 4', and the rotating body 4' is fixedly connected to the first connecting rod 2 to drive the first connecting rod 2 to rotate in the first direction and the second direction, so as to cause the four-bar linkage be reciprocated to realize the lifting and lowering of the cleaning component 1'. It is not excluded that the rotating body 4' may be both fixedly connected to the first connecting rod 2 and the second connecting rod 3, respectively.

[0066] The first connecting rod 2 is pivotally connected to the main body 100 of the cleaning robot through a rotating shaft a', and the rotating body 4' is arranged on the rotating shaft a', preferably in the form of a key connection. When the rotating body 4 rotates, the first connecting rod 2 is driven to rotate by the rotating shaft a'.

[0067] In order to further realize the self-adaptive floating cleaning of the cleaning component 1', a spring T is built into the cleaning component 1' in the present embodiment. Of course, other manners may also be utilized to realize the self-adaptive floating cleaning, for example, a torque applying device may be provided to act on the four-bar linkage.

[0068] In addition, the present disclosure also discloses a cleaning robot including the above-mentioned cleaning assembly.

[0069] 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 cleaning assembly, configured for mounting on a main body of a cleaning robot, the cleaning assembly comprising:

a cleaning component;
a first connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body, and a second connecting rod with one end swingingly connected to the cleaning component and the other end swingingly connected to the main body, allowing the first connecting rod, the cleaning component, the second connecting rod, and the main body to form a link mechanism to lift or lower the cleaning component by a reciprocating movement of the link mechanism; and
a driving device, configured to drive the link mechanism to perform the reciprocating movement.

2. The cleaning assembly as claimed in claim 1, wherein the cleaning component comprises a mounting base connected with the first connecting rod and the second connecting rod, and a cleaning member fixedly or rotatably installed on the mounting base.

3. The cleaning assembly as claimed in claim 1, wherein the link mechanism comprises a four-bar linkage of a rhomboid.

4. The cleaning assembly as claimed in claim 1, wherein a connection position between the cleaning component and the first connecting rod and a connection position between the cleaning component and the second connecting rod face to each other in a vertical direction, and a connection position between the main body and the first connecting rod and a connection position between the main body and the second connecting rod face to each other in the

vertical direction.

5. The cleaning assembly as claimed in claim 1, further comprising a torque applying device; wherein,

when the cleaning component encounters an obstacle, the cleaning component is pushed upward to make the link mechanism transform, and transformation of the link mechanism allows the torque applying device to be pushed against by the link mechanism to store elastic potential energy; and the cleaning component falls back down under a release of the elastic potential energy of the torque applying device when the cleaning component is separated from the obstacle.

6. The cleaning assembly as claimed in claim 5, wherein the driving device comprises a transmission structure configured to drive the first connecting rod to rotate in a first direction to allow the cleaning component to be lifted upward by the link mechanism; the torque applying device is arranged on the transmission structure and configured to be driven by the transmission structure to push the first connecting rod to rotate in a second direction to allow the cleaning component to fall back down.

7. The cleaning assembly as claimed in claim 6, wherein the transmission structure comprises a rotating body on which the torque applying device is arranged;

the first connecting rod is rotated in the first direction to lift the cleaning component upward when the rotating body is rotated in a third direction; and the first connecting rod is pushed by the torque applying device to rotate in the second direction to allow the cleaning component to fall back down when the rotating body is rotated in a fourth direction.

8. The cleaning assembly as claimed in claim 7, wherein

the rotating body is provided with a shaft, and the torque applying device comprises a torsion spring comprising:

a torsion spring body sleeved on the shaft, and a first torsion arm connected to the torsion spring body and engaged with the rotating body; and a second torsion arm connected to the torsion spring body and configured to act on the first connecting rod;

the second torsion arm is driven to press the first connecting rod down to allow the first connecting rod to rotate in the second direction when the rotating body is rotated in the fourth direction; and the second torsion arm is pushed by the first connecting rod due to transformation of the link mechanism to allow the torsion spring to store elastic potential energy when the cleaning component encounters an obstacle.

9. The cleaning assembly as claimed in claim 7, wherein the rotating body is provided with a protrusion configured to push the first connecting rod to rotate in the first direction when the rotating body is rotated in the third direction.

10. The cleaning assembly as claimed in claim 1, wherein the driving device comprises a rotating body fixedly connected to the first connecting rod.

11. The cleaning assembly as claimed in any one of claims 7-10, wherein the cleaning assembly comprises two cleaning components which are arranged side by side, and each of the two cleaning components are connected to the main body by the first connecting rod and the second connecting rod; the driving device comprises a driving motor, a transmission mechanism, a screw rod, a sliding seat, and two gears served as the rotating body; the driving motor is connected to the screw rod through the transmission mechanism to drive the screw rod to rotate, the sliding seat is in threaded connection with the screw rod to be lifted or lowered by the screw rod, two gear racks are arranged on opposite sides of the sliding seat and each gear rack is engaged with a gear, and each of the two gears is configured to drive a corresponding first connecting rod.

12. The cleaning assembly as claimed in any one of claims 7-10, wherein the cleaning assembly comprises two cleaning components which are arranged side by side, and each of the two cleaning components is connected to the main body by the first connecting rod and the second connecting rod; the driving device comprises a driving motor, a transmission mechanism, a worm, and two worm gears served as

the rotating body, the driving motor is connected to the worm through the transmission mechanism to drive the worm to rotate, and each of the two worm gears is meshed on a side of opposite two sides of the worm and configured to drive a corresponding first connecting rod.

5 **13.** A cleaning robot, wherein the cleaning robot comprises the cleaning assembly as claimed in any one of claims 1-12.

10

15

20

25

30

35

40

45

50

55

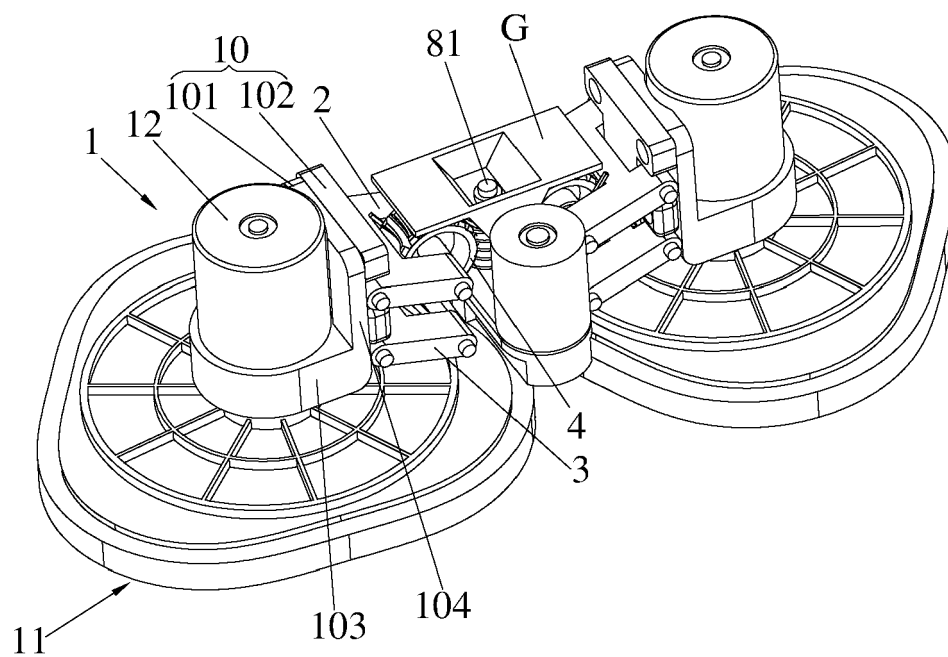


FIG. 1

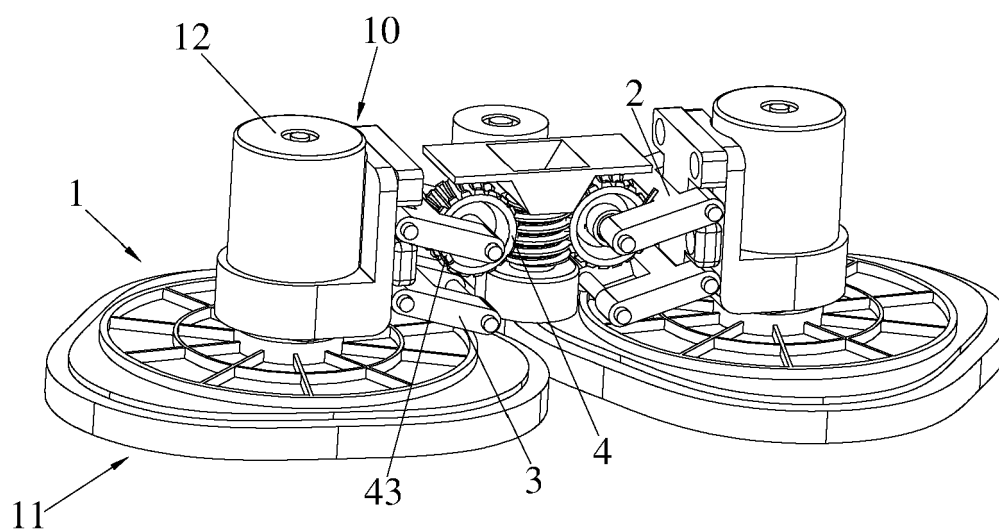


FIG. 2

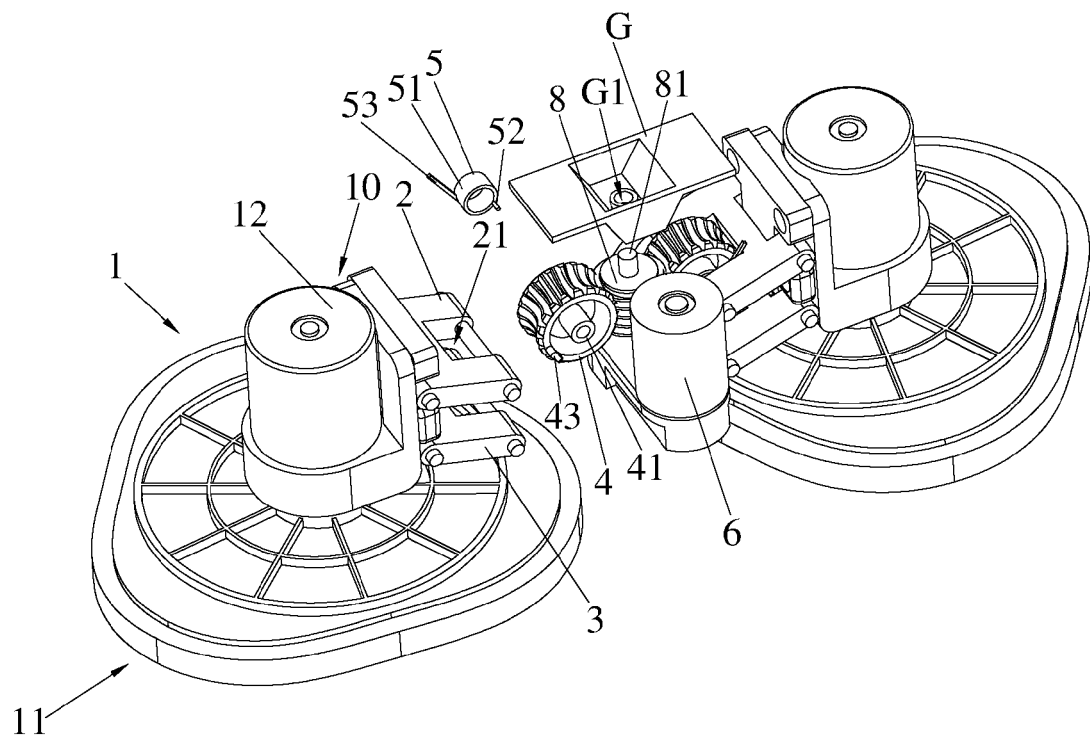


FIG. 3

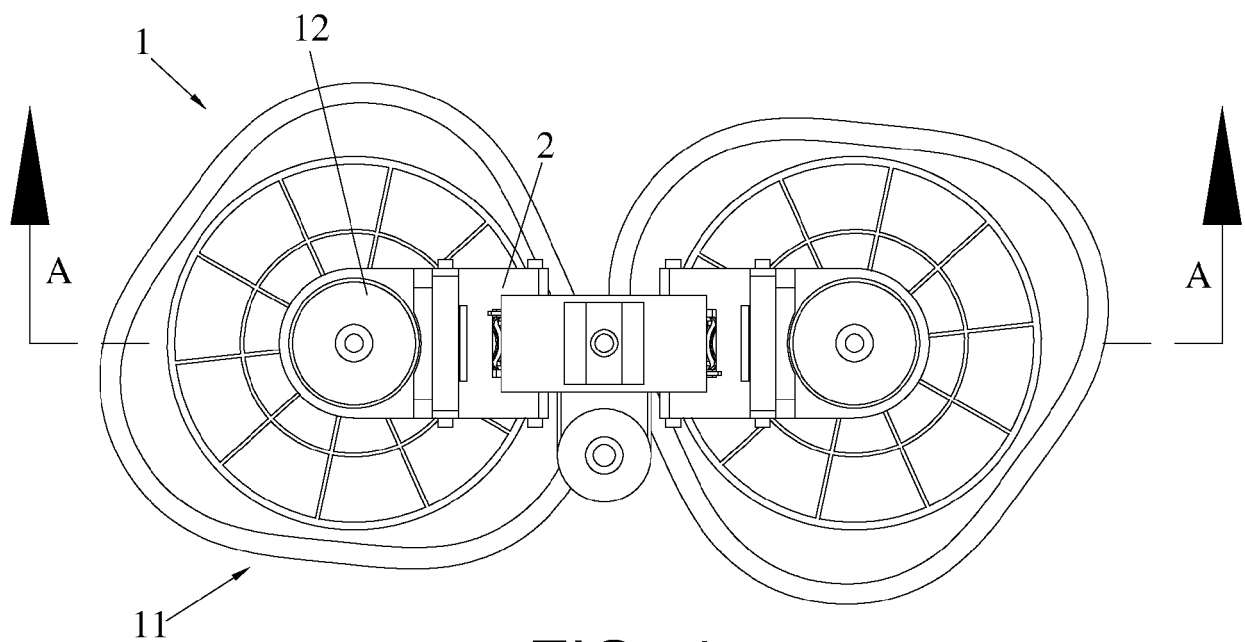


FIG. 4

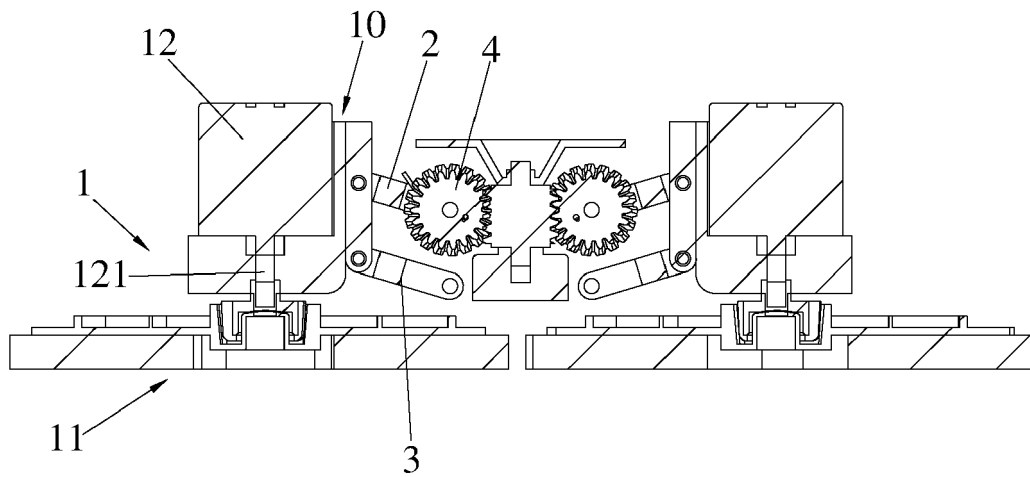


FIG. 5

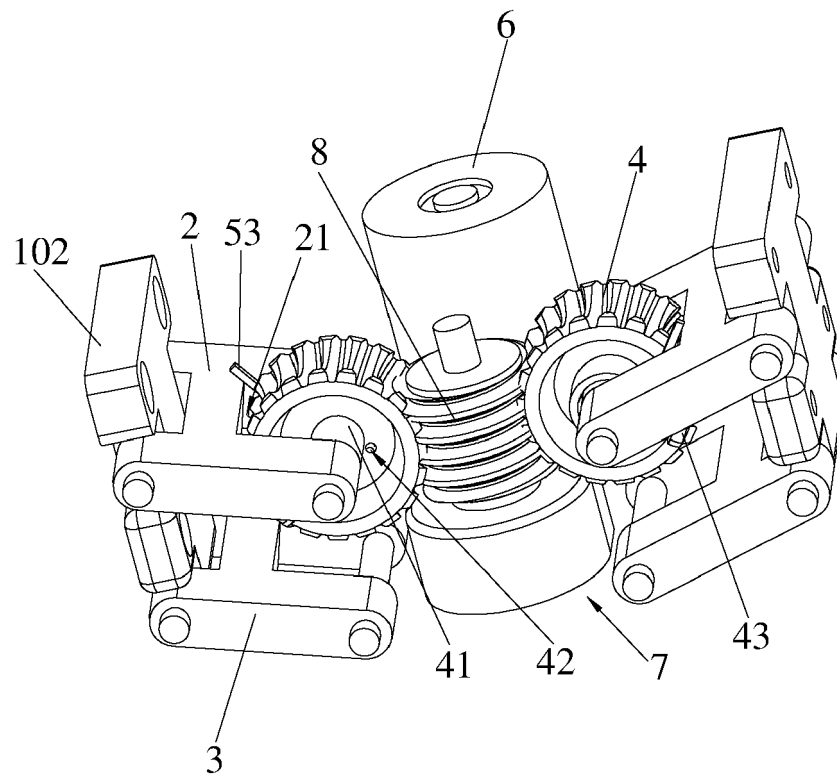


FIG. 6

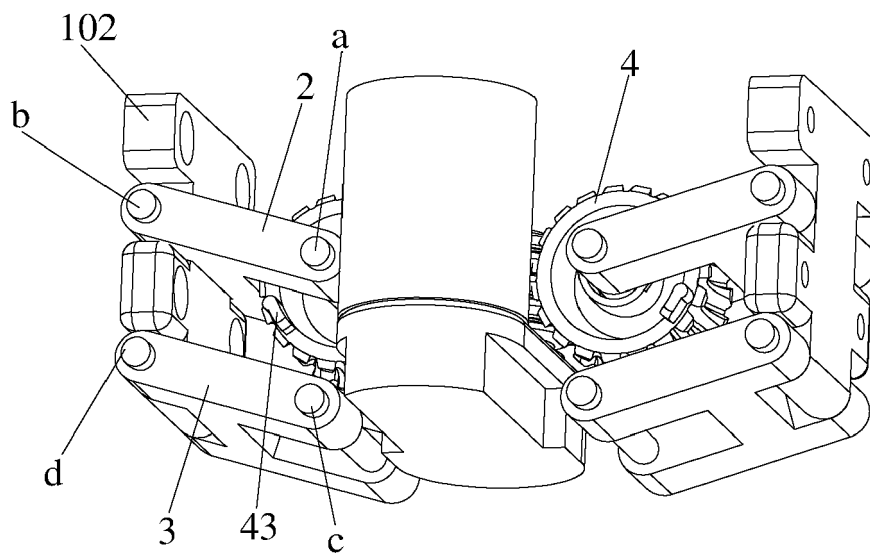


FIG. 7

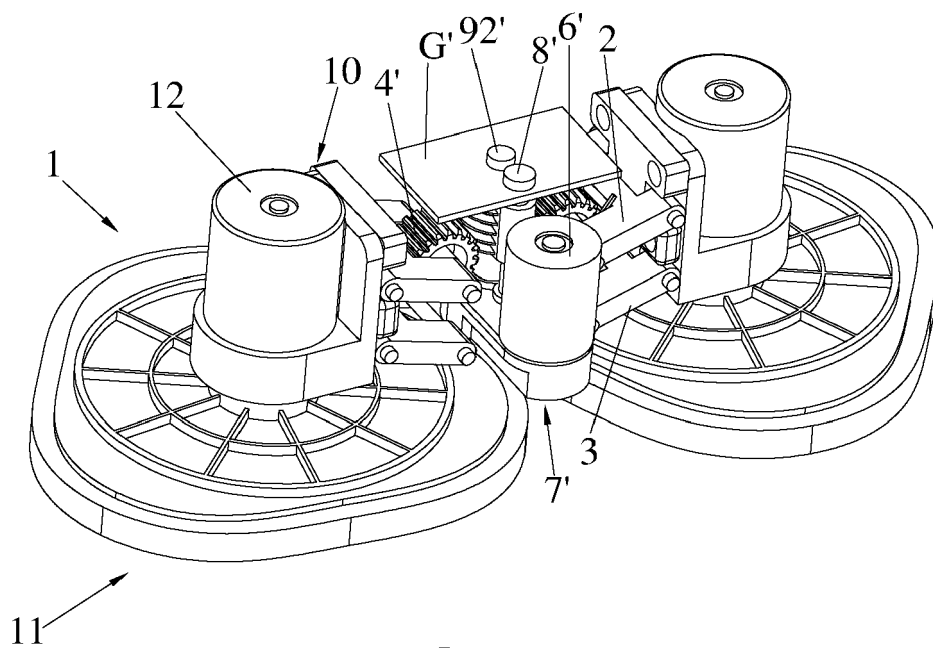


FIG. 8

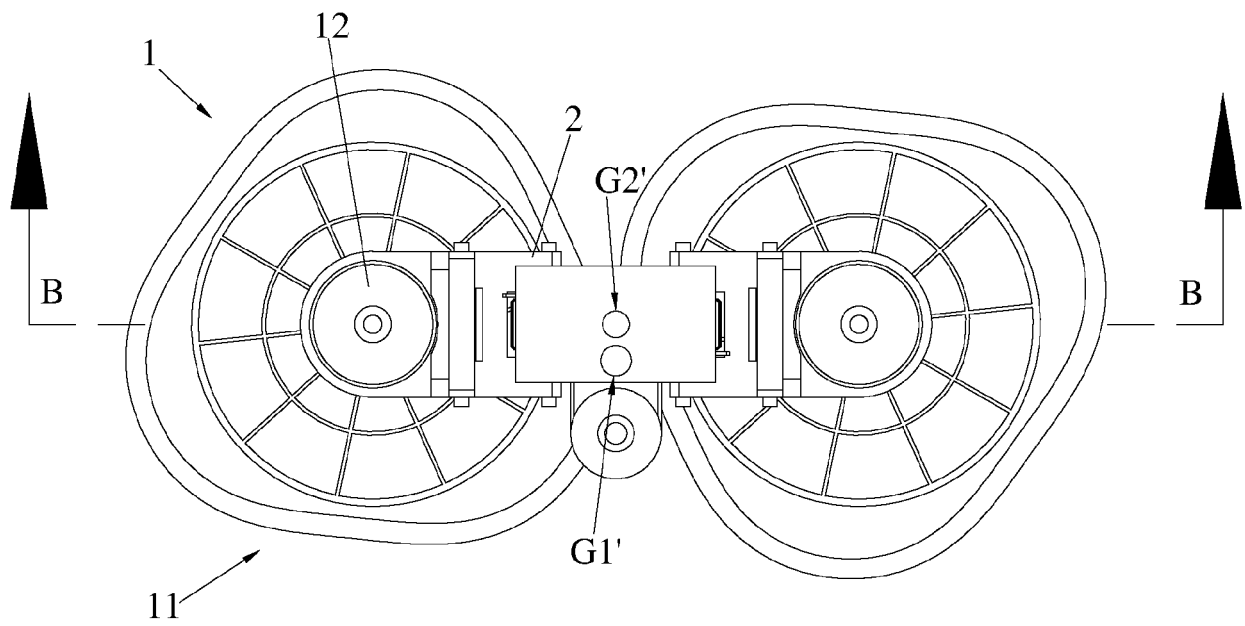


FIG. 9

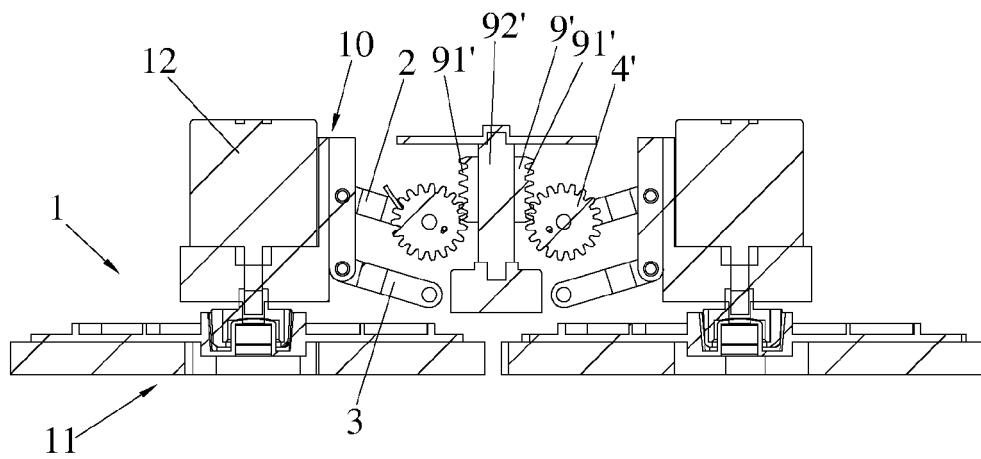


FIG. 10

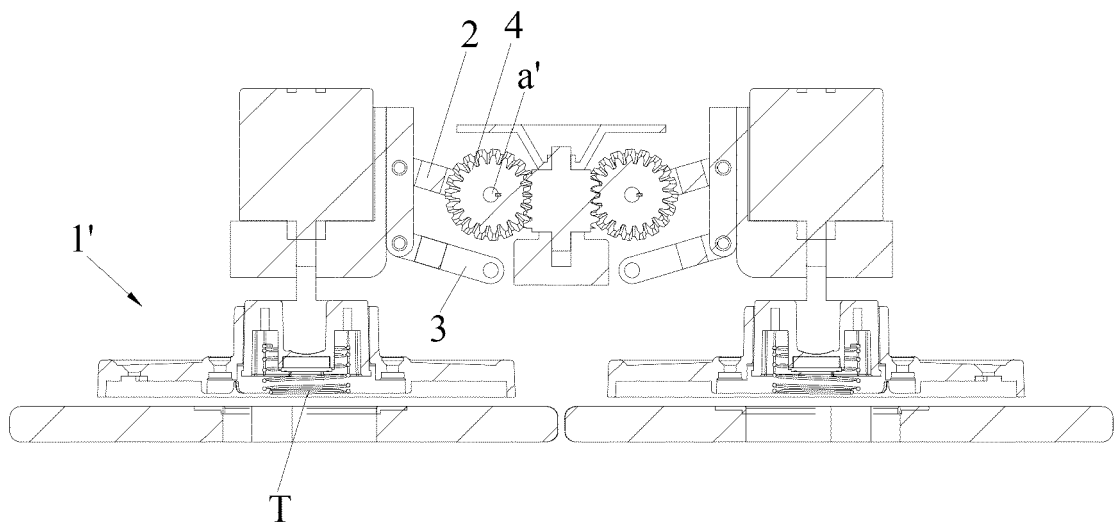


FIG. 11

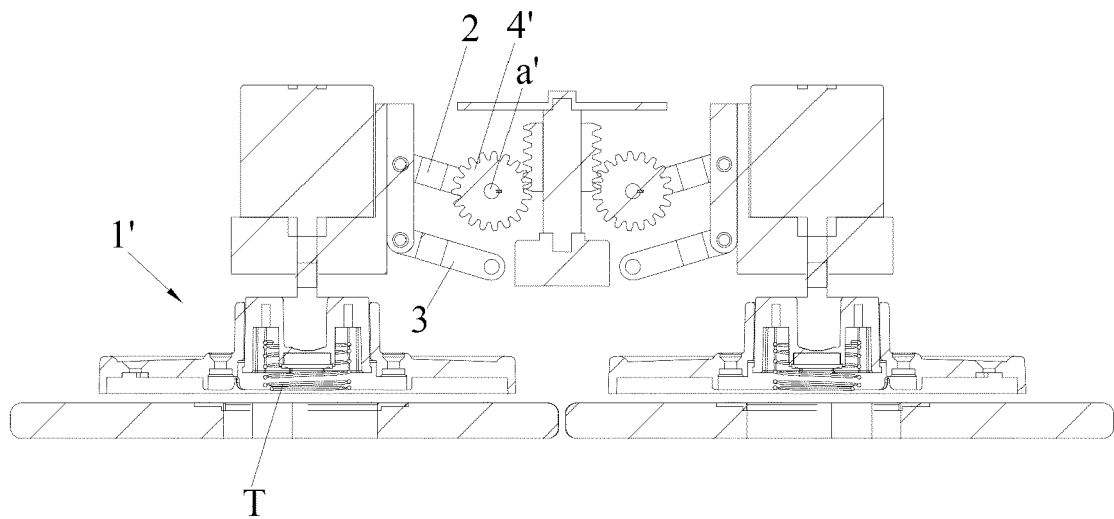


FIG. 12

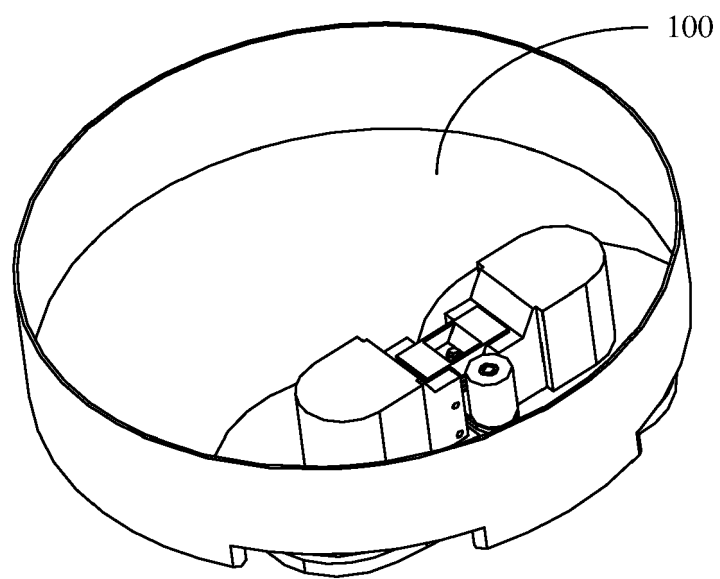


FIG. 13



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 4247

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 110 215 166 A (SUZHOU GAOZHIXIAN AUTOM TECH CO LTD ET AL.) 10 September 2019 (2019-09-10)	1-4, 13	INV. A47L11/40
A	* abstract; figures 1-5 * -----	5-12	
X	CN 112 168 076 A (HRG INT INST RES & INNOVATION) 5 January 2021 (2021-01-05)	1-4, 13	
A	* figures 1-14 * -----	5-12	
X	EP 2 756 787 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 23 July 2014 (2014-07-23)	1, 2, 4, 13	
A	* paragraph [0031] - paragraph [0047]; figures 1-5 *	3, 5-12	
A	EP 3 482 669 A1 (VORWERK CO INTERHOLDING [DE]) 15 May 2019 (2019-05-15)	1-13	
	* paragraph [0027] - paragraph [0028]; figures 1-2b *		
A	WO 2019/233493 A1 (POSITEC POWER TOOLS SUZHOU CO LTD [CN]) 12 December 2019 (2019-12-12)	7	TECHNICAL FIELDS SEARCHED (IPC)
	* paragraph [0086]; figures 5a, 5b * -----		A47L
The present search report has been drawn up for all claims			

1

Place of search	Date of completion of the search	Examiner
Munich	10 August 2022	Masset, Markus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 16 4247

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-08-2022

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 110215166 A	10-09-2019	NONE	
CN 112168076 A	05-01-2021	NONE	
EP 2756787 A1	23-07-2014	AU 2014208026 A1	16-07-2015
		CN 104918529 A	16-09-2015
		CN 110477818 A	22-11-2019
		EP 2756787 A1	23-07-2014
		KR 20140093369 A	28-07-2014
		US 2014196231 A1	17-07-2014
		WO 2014112772 A1	24-07-2014
EP 3482669 A1	15-05-2019	CN 109758050 A	17-05-2019
		DE 102017126414 A1	16-05-2019
		EP 3482669 A1	15-05-2019
		JP 2019088779 A	13-06-2019
		TW 201929762 A	01-08-2019
		US 2019142237 A1	16-05-2019
WO 2019233493 A1	12-12-2019	CN 111565613 A	21-08-2020
		EP 3804599 A1	14-04-2021
		JP 2021526446 A	07-10-2021
		KR 20210018459 A	17-02-2021
		US 2021228050 A1	29-07-2021
		WO 2019233493 A1	12-12-2019

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 202110323260 [0001]