

POLISHING ROBOT

CROSS-REFERENCE TO RELATED APPLICATION(S)

5 This application claims the priority of Chinese patent application No. 202110806121.5 and titled "POLISHING ROBOT" filed with the China National Intellectual Property Administration (CNIPA) on July 16th, 2021, disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present application relates to the technical field of architectural robots, for example, a polishing robot.

10 BACKGROUND

A polishing robot is suitable for polishing, for example, polishing a poured cement floor, and the related polishing robot has a defect of insufficient processing capability at a corner of a work surface due to a complex structure.

SUMMARY

15 The object of embodiments of the present application is to provide a polishing robot, which is capable of improving the technical problem of insufficient processing capability at a corner of the work surface.

Some embodiments of the present application provide a polishing robot, and the polishing robot may include a chassis and two spindles.

20 The two spindles may be arranged in a Z-axis direction, respectively, the top end of each spindle may be provided with a universal connector rotatable connected to the chassis, and the bottom end of each spindle may be configured to connect a leaf-blade component.

The first reversing mechanism may be connected to the chassis and is configured to drive each spindle to swing around a Y-axis direction, the second reversing mechanism may be connected
25 to the first reversing mechanism and is configured to drive a corresponding spindle to swing around an X-axis direction, and axes of the two spindles may be arranged in the X-axis

direction.

In the above-described implementation process, since the two spindles are arranged in the Z-axis direction, the first reversing mechanism is configured to drive each spindle to swing around the X-axis direction so that the leaf-blade mechanism is inclined with respect to the work surface in the X-axis direction to generate an inclination, and the second reversing mechanism is configured to drive each spindle to swing around the Y-axis direction so that the leaf-blade mechanism is inclined with respect to the work surface in the Y-axis direction to generate an inclination. At the same time, the first reversing mechanism and the second reversing mechanism are integrated together to effectively simplify the structure and reduce the space occupied by the first reversing mechanism and the second reversing mechanism under the chassis.

That is, since the top end of each spindle is provided with the universal connector which is rotatably connected to the chassis in an axial direction of the spindle, the inclination direction and the inclination angle between each leaf-blade component and the work surface, and the rotational speed of the leaf-blade component can be controlled through the cooperation among the two spindles, the first reversing mechanism and the second reversing mechanism, thus different frictional force can be obtained as the driving force for driving translation, steering, and in-situ rotation of the polishing robot, which not only has high operation flexibility, but also can achieve omnidirectional movement during the polishing process of the polishing robot, thereby effectively improving the processing capability of the polishing robot for the work surface corner.

In a possible embodiment, the polishing robot further includes a power mechanism, where the power mechanism may be provided on the chassis, the power mechanism is drivingly connected to the two spindles and drives the two spindles to synchronously rotate in reverse directions around the axes of the two spindles, respectively.

In a possible embodiment, two spindles may be arranged symmetrically along the power mechanism.

In a possible embodiment, the first reversing mechanism and the second reversing mechanism may be located below the chassis.

In a possible embodiment, the first reversing mechanism may include a first swing bracket and a

first inclination driving component.

The first swing bracket may be connected to the chassis and configured to swing around the Y-axis direction, and each of the two spindles is connected to the first swing bracket and is swingable synchronously with the first swing bracket.

- 5 The first inclination driving component may be connected to the first swing bracket to drive the first swing bracket and cause the spindle to swing around the Y-axis direction with respect to the universal connector.

- 10 In the above-described implementation process, each spindle independently swings around the Y-axis direction with respect to the universal connector through the cooperation of the first swing bracket and the first inclination driving component.

In a possible embodiment, the second reversing mechanism may include a second swing bracket and a second inclination driving component.

- 15 The second swing bracket may be connected to the first swing bracket and configured to be able to swing around the X-axis direction, and at least one spindle may rotatably pass through the second swing bracket and is swingable synchronously with the second swing bracket.

The second inclination driving component may be connected to the second swing bracket to drive the second swing bracket and cause the connected spindle to swing around the X-axis direction with respect to the universal connector.

- 20 In the above-described implementation process, the second swing bracket is integrated with the first swing bracket to make the structure more compact, meanwhile, in a case of swinging around the Y-axis direction, the second inclination driving component and the first swinging bracket are integrated, thereby causing the spindles to swing around the Y-axis direction. The above arrangement can also make the second swing bracket independently drive the at least one spindle to swing around the X-axis direction relative to the universal connector.

- 25 In a possible embodiment, the at least one spindle and the second swing bracket are fixed relative to each other in an axial direction and rotatably connected in a circumferential direction.

In the above-described implementation process, the stability between the spindle and the second swing bracket is improved, and the accuracy of the adjustment is ensured.

In a possible embodiment, one of the two spindles which is provided with the first reversing mechanism and the second reversing mechanism swings around the Y-axis direction about the first axis as the axis and swings around the X-axis direction about the second axis as the axis, and the first axis and the second axis intersect in the same plane.

- 5 In the above-described implementation process, the above-described arrangement can make the first axis and the second axis to be in the same horizontal plane at all times during the swing process, and can avoid the decoupling of the movement around the X-axis direction and the movement around the Y-axis direction in the movement process to a certain extent.

- 10 In a possible embodiment, the spindle may be vertically arranged at the intersection point of the first axis and the second axis.

- 15 The arrangement can make the axis of the spindle coincides with the intersection point of the first axis and the second axis at all times during the swing process, further avoiding the decoupling of the degree of freedom of movement in the X-axis direction and in the Y-axis direction during the movement process, not only reducing the difficulty of angle adjustment, but also ensuring the accuracy of angle adjustment.

In a possible embodiment, the first swing bracket may include a first bracket, a second bracket and a third bracket.

- 20 The first bracket may be connected to the chassis, the second bracket is arranged around the spindle and has a gap with the spindle, the second bracket is provided with a first rotation shaft arranged along the Y-axis direction and a second rotation shaft arranged along the X-axis direction, the first rotation shaft is rotatably connected to the first bracket, the third bracket is rotatably connected to the second rotation shaft, and the third bracket is drivingly connected to the first inclination driving component to cause the second bracket to swing around the first rotation shaft.

- 25 In the above-described implementation process, the first rotation shaft and the second rotation shaft are arranged by utilizing the second bracket, the function of the first swing bracket swinging along the first rotation shaft can be achieved and the function of the second swing bracket swinging along the second rotation shaft is also beneficial, the structure is compact, and mutual interference during movement is avoided.

In a possible embodiment, the third bracket includes two fixing members arranged at an interval in the X-axis direction, each of the two spindles is located between the two fixing members, one end of each fixing member is connected to the second swing bracket, and the other end of the fixing member is rotatably connected to the second rotation shaft, so that the second bracket is suspended above the second swing bracket.

In the above-described implementation process, the arrangement structure is compact, the suspension arrangement ensures that the second bracket does not interfere with the second swing bracket when swinging along the first rotation shaft, and the smoothness of swinging adjustment is ensured. Meanwhile, the arrangement of the two fixing members improves the stability of the second swing bracket during swinging.

In a possible embodiment, the first inclination driving mechanism may include a first driving mechanism and a first linkage mechanism.

The first driving mechanism may be located on the side of the second bracket. The first linkage mechanism and the first driving mechanism may be located on the same side of the second bracket, one end of the first linkage mechanism may be connected to a side wall of the third bracket in the X-axis direction, and the other end of the first linkage mechanism is connected to the first driving mechanism, so that a rotational movement of the first driving mechanism is switched into driving force for driving the third bracket and the second bracket is caused to swing around the Y-axis direction.

In the above-described implementation process, the first driving mechanism is arranged on the side of the second bracket, so as to not increase the height of the chassis in the vertical space, and avoid unstable operation caused by an increase of the center of gravity. At the same time, because the swing path of the edge of the second bracket around the first rotation shaft is arcuate in shape during a swing process, the height of the driving force in the upper and lower directions can be adjusted in real time by using the first linkage mechanism to provide the driving force required by swinging, and the structure is simple and the operation is flexible.

In a possible embodiment, the second inclination driving mechanism may include a fixing seat, a second driving mechanism and a second linkage mechanism.

The fixing seat may be connected to the second bracket. The second driving mechanism may be located on the side of the second bracket. The second linkage mechanism and the second

driving mechanism may be located on the same side of the second swing bracket, one end of the second linkage mechanism is connected to a side wall of the second swing bracket in the Y-axis direction, and the other end of the second linkage mechanism is connected to the second driving mechanism, so that a rotational movement of the second driving mechanism is switched into driving force for driving the second swing bracket to swing around the X-axis direction.

In a possible embodiment, the polishing robot further includes wiping plates in one-to-one correspondence with leaf-blade components, and each wiping plate is removably connected to a corresponding leaf-blade component and located at the bottom end of the corresponding leaf-blade component.

In a possible embodiment, the power mechanism may include a first gear, a second gear, a third gear, and a main driving mechanism, the polishing robot may further include a navigation system having a controller, and the controller may be electrically connected to the main driving mechanism, the first driving mechanism, and the second driving mechanism, respectively, to control steering and rotation speeds of the main driving mechanism, the first driving mechanism and the second driving mechanism.

In the above-described implementation process, the second driving mechanism is located at the side of the second swing bracket to reduce the space occupied in the vertical direction, so as to lower the center of gravity, and the fixing seat is connected to the second bracket, so that the second driving mechanism can synchronously move with the first swing bracket, and the effect of driving the second swing bracket to swing around the second axis can be achieved separately.

BRIEF DESCRIPTION OF DRAWINGS

To illustrate solutions in embodiments of the present application more clearly, the accompanying drawings used in description of the embodiments will be briefly described below. Apparently, the subsequent drawings illustrate part of embodiments of the present application, and those of ordinary skill in the art may obtain other accompanying drawings based on the accompanying drawings described below on the premise that no creative work is done.

FIG. 1 is an assembly diagram of a polishing robot;

FIG. 2 is a structure diagram of a power mechanism;

FIG. 3 is an assembly diagram of a leaf-blade structure and a spindle having a bidirectional

degree of freedom;

FIG. 4 is an assembly diagram of a leaf-blade structure and a spindle having a unidirectional degree of freedom;

FIG. 5 is an assembly diagram of a first swing bracket and a second swing bracket;

5 FIG. 6 is a structure diagram of a first inclination driving component;

FIG. 7 is a structure diagram of a second inclination driving component;

FIG. 8 is a view showing inclination directions and force of two spindles when a polishing robot advances;

10 FIG. 9 is a view showing inclination directions and force of two spindles when a polishing robot retreats;

FIG. 10 is a view showing inclination directions and force of two spindles when a polishing robot turns right;

FIG. 11 is a view showing inclination directions and force of two spindles when a polishing robot turns left;

15 FIG. 12 is a view showing inclination directions and force of two spindles when a polishing robot traverses laterally to right;

FIG. 13 is a view showing inclination directions and force of two spindles when a polishing robot traverses laterally to left; and

20 FIG. 14 is a view showing inclination directions and force of two spindles when a polishing robot polishes.

Reference of list

10 polishing robot

100 chassis

	101	collision avoidance bracket
	103	mounting bracket
	110	power mechanism
	111	first gear
5	113	second gear
	114	third gear
	115	main driving mechanism
	117	driving belt
	118	tension member
10	120	spindle
	121	universal connector
	130	leaf-blade component
	133	spatula
	134	connection arm
15	140	wiping plate
	141	clamping portion
	151	first swing bracket
	1511	first bracket
	1513	second bracket
20	1514	first rotation shaft

	1515	second rotation shaft
	1518	fixing member
	153	second swing bracket
	155	first inclination driving component
5	1551	first driving mechanism
	1552	connection member
	1553	first linkage
	1554	second linkage
	1555	third linkage
10	1556	first shaft pin
	1557	second shaft pin
	156	second inclination driving component
	1561	U-shaped fixing plate
	1562	fixing arm
15	1564	second driving mechanism
	1565	fourth connection rod
	1566	fifth connection rod
	1567	sixth connection rod
	1568	third shaft pin
20	1569	fourth shaft pin

DETAILED DESCRIPTION

To illustrate the object, technical solution and advantages of the present application more clearly, the technical solution of the present application will be described clearly and completely in conjunction with drawings. Apparently, the embodiments described below are part, not all, of
5 embodiments of the present application. Generally, the components of this embodiment of the present application described and illustrated in the drawings herein may be arranged and designed through various configurations.

Therefore, the following detailed description of the embodiments of the present application and shown in the drawings is not intended to limit the scope of the present application, but merely
10 illustrates the selected embodiments of the present application. Based on the embodiments described herein, all other embodiments obtained by those skilled in the art without creative work are within the scope of the present application.

It is to be noted that similar reference numerals and letters indicate similar items in subsequent drawings. Therefore, once some item is defined in one drawing, the item needs no more
15 definition and explanation in the subsequent drawings.

In the description of the present application, it is to be noted that the orientational or positional relationships indicated by terms "above", "below", "left", "right", "inside", "outside" and the like are based on the orientational or positional relationships illustrated in the drawings or the orientational or positional relationship that products of the present application are usually used
20 in. These orientations or position relations are intended only to facilitate and simplify description of the present application, and not to indicate or imply that a device or element referred to must have such specific orientations or must be configured or operated in such specific orientations. Thus, these orientations or position relations are not to be construed as limiting the present application. Moreover, the terms "first", "second" and "third" are merely for
25 distinguishing the description and are not to be construed as indicating or implying relative importance.

In the description of the present application, it is to be noted that unless otherwise expressly specified and limited, the term "configured", "mounted" or "connected" is to be construed in a broad sense, for example, as securely connected, detachably connected or internally connected;
30 or directly connected or indirectly connected through an intermediary. For those of ordinary skill in the art, specific meanings of the preceding terms in the present application may be

construed according to specific circumstances.

An embodiment of the present application provides a polishing robot 10 having an X-axis direction, a Y-axis direction and a Z-axis direction. Hereinafter, the left-right direction is represented in the X-axis direction, the front-back direction is represented in the Y-axis direction, and the top-bottom direction is represented in the Z-axis direction, where the X-axis direction, the Y-axis direction and the Z-axis direction are perpendicular to each other.

Referring to FIG. 1, the polishing robot 10 includes a chassis 100, a power mechanism 110, two spindles 120 and two groups of leaf-blade components 130.

The chassis 100 may be provided with a collision avoidance bracket 101 along the outer circumference of the chassis 100 for collision avoidance to protect the polishing robot 10.

Referring to FIGS. 1 and 2, the power mechanism 110 is disposed on the chassis, for example, the power mechanism 110 is located on the upper surface of the chassis 100. The power mechanism 110 is drivingly connected to the two spindles 120, respectively, and the power mechanism 110 drives the two spindles 120 to rotate synchronously in reverse directions around the axes of the spindles 120.

As shown in FIG. 2, the power mechanism 110 includes a first gear 111, a second gear 113, a third gear 114 and a main driving mechanism 115.

The upper surface of the chassis 100 is provided with a mounting bracket 103 in which the first gear 111, the second gear 113, and the third gear 114 are rotatably mounted, the first gear 111, the second gear 113 and the third gear 114 are located substantially in the same horizontal plane, where the first gear 111 is drivingly connected to one of the two spindles 120, the second gear 113 is drivingly connected to the other one of the two spindles 120, and the second gear 113 meshes with the first gear 111. The third gear 114 meshes with the second gear 113, the main driving mechanism 115 is provided on the mounting bracket 103 and is drivingly connected to the third gear 114 for driving the third gear 114 to rotate and causing the two spindles 120 to rotate synchronously in reverse directions, for example, one spindle 120 rotates clockwise and the other spindle 120 rotates counterclockwise.

In order to avoid the problem of different rotational speeds of the two spindles 120 due to different tension degrees of the driving belts 117, optionally, the power mechanism 110 further

includes a tension member 118 corresponding to each spindle 120, each tension member 118 is fixed to the chassis 100 and is configured to adjust the tension force of the corresponding driving belt 117, specifically, the tension member 118 is an idler fixed to the chassis 100 and configured to compress the driving belt 117.

- 5 The two spindles are arranged in the Z-axis direction, respectively, and the axes of the two spindles 120 are arranged in the X-axis direction, that is, the two spindles 120 are arranged at an interval on the chassis 100 in the X-axis direction, namely, the plane formed by the two spindles 120 are parallel to or coincides with the XZ plane. Moreover, the two spindles 120 are arranged symmetrically along the power mechanism 110 to stabilize the rotation of the two spindles 120.
- 10 Each spindle 120 has the top end and the bottom end opposite to each other, where the bottom end of the spindle 120 is configured to connect the leaf-blade component 130, the top end of the spindle 120 is provided with a universal connector 121 connected to the chassis 100, for example, the universal connector 121 is a universal coupling, the universal connector 121 is rotatably connected to the chassis 100 in such a manner that the universal connector 121 can
- 15 rotate along the axis of the universal connector 121, so as to achieve rotation of the spindle 120 around the axis of the spindle 120 itself and swing of the spindle 120 around the X-axis direction and the Y-axis direction in synchronization with the universal connector 121 relative to the chassis 100.

- Each of the two spindles 120 is provided with a first reversing mechanism, at least one of the
- 20 two spindles 120 is provided with a second reversing mechanism, and both the first reversing mechanism and the second reversing mechanism are located below the chassis 100.

- Referring to FIGS. 1, 3 and 4, in this embodiment, one of the two spindles 120 (shown in FIG. 3) which is located at the left end of the chassis 100 is provided with the second reversing mechanism and has a bidirectional degree of freedom (swinging around the X-axis direction and
- 25 around the Y-axis direction, respectively), and the other spindle 120 (shown in FIG. 4) is not provided with the second reversing mechanism and has only a unidirectional degree of freedom of swinging around the Y-axis direction.

- Hereinafter, only the spindle 120 having the bidirectional degree of freedom will be described as an example, and the structure of the spindle 120 having the unidirectional degree of freedom
- 30 will not be described in detail.

The first reversing mechanism is connected to the chassis 100 for driving each of the two spindles 120 to swing around the Y-axis direction, and the second reversing mechanism is connected to the first reversing mechanism for driving the one spindle 120 to swing around the X-axis direction.

- 5 Referring to FIGS. 3 and 5, the first reversing mechanism includes a first swing bracket 151 and a first inclination driving component 155.

10 The first swing bracket 151 is connected to the chassis 100 and is configured to swing around the Y-axis direction, and the spindle 120 is connected to the first swing bracket 151 and is swingable synchronously with the first swing bracket 151. The first inclination driving component 155 is connected to the first swing bracket 151 to drive the first swing bracket 151 and cause the spindle 120 to swing around the Y-axis direction with respect to the universal connector.

The second reversing mechanism includes a second swing bracket 153 and a second inclination driving component 156.

- 15 The second swing bracket 153 is connected to the first swing bracket 151 and is configured to be able to swing around the X-axis direction, and the spindle 120 rotatably passes through the second swing bracket 153 and is swingable synchronously with the second swing bracket 153, that is, the first swing bracket 151 is connected to the spindle 120 through the second swing bracket 153. The second inclination driving component 156 is connected to the second swing
20 bracket 153 to drive the second swing bracket 153 and cause the spindle 120 to swing around the Y-axis direction with respect to the universal connector.

Since the spindle 120 rotatably passes through the second swing bracket 153, the two spindles 120 may rotate and swing independently or simultaneously.

- 25 The spindle 120 having the bidirectional degree of freedom (that is, the spindle 120 provided with the first reversing mechanism and the second reversing mechanism) swings around the Y-axis direction about the first axis as an axis and swings around the X-axis direction about the second axis as the axis.

The first axis and the second axis may have a certain height difference in the Z-axis direction, but under the above conditions, the swing of the spindle 120 around the X-axis direction and the

swing of the spindle 120 around the Y-axis direction may produce certain interference, that is, the swing around the X-axis direction and the movement in the Y-axis direction may be decoupled.

Therefore, in this embodiment, the first axis and the second axis intersect and are located in the same plane, thereby effectively avoiding movement decoupling caused by the height difference between the first axis and the second axis.

In some optional embodiment, the spindle 120 may also be offset from the intersection point of the first axis and the second axis, at this time, a problem of the movement decoupling of the X-axis direction and the Y-axis direction exists in the swing process, at the same time, compared with this embodiment, when the same swing angle is acquired, the spindle 120 must be capable of generating a certain displacement or stretch with respect to the second swing bracket 153 in the Z-axis direction, that is, the spindle 120 and the second swing bracket 153 can only be connected in a slidable manner in the axial direction and in a rotatable manner in the circumferential direction. However, even if the spindle 120 is arranged in this manner, the problem of the movement decoupling cannot be avoided.

In this embodiment, the spindle 120 is vertically arranged at the intersection point of the first axis and the second axis, thereby ensuring that the spindle 120 always coincides with the intersection point of the first axis and the second axis during the movement. It should be noted that for the spindle 120 on each side of the polishing robot 10, the spindle 120 coincides with the Z-axis, the first axis coincides with the Y-axis, and the second axis coincides with the X-axis, thereby avoiding the movement decoupling of each spindle 120 in the X-axis direction and in the Y-axis direction. The operation is simple, and the inclination angle of the leaf-blade component 130 can be accurately adjusted.

At this time, the spindle 120 and the second swing bracket 153 may be relatively fixed in the axial direction or may not be limited, which does not affect the movement coupling in the X-axis direction and in the Y-axis direction.

In this embodiment, the spindle 120 and the second swing bracket 153 are fixed relative to each other in the axial direction and rotatably connected in the circumferential direction. The swing stability can be improved by fixing the spindle 120 and the second swing bracket 153.

As shown in FIG. 5, the first swing bracket 151 includes first brackets 1511, a second bracket

1513 and a third bracket.

The first brackets 1511 are connected to the chassis 100. The number of first brackets 1511 is two and the two first brackets 1511 are arranged at an interval in the Y-axis direction. On the one hand, the arrangement of the two first brackets 1511 can improve stability, and on the other hand, the arrangement at the interval can avoid interference of the swing of the spindle 120 while accommodating the spindle 120 between the two first brackets 1511.

The second bracket 1513 is arranged around the spindle 120 and has a gap with the spindle 120, for example, the second bracket 1513 is annular or square. The second bracket 1513 is provided with a first rotation shaft 1514 arranged along the Y-axis direction and a second rotation shaft 1515 arranged along the X-axis direction, the axis of the first rotation shaft 1514 is the first axis, and the axis of the second rotation shaft 1515 is the second axis. The first rotation 1514, the second rotation 1515 and the second bracket 1513 may be integrally formed.

The first rotation shaft 1514 is rotatably connected to the first brackets 1511. For example, each first bracket 1511 is provided with a bearing matched with the first rotation shaft 1514, and the second bracket 1513 can rotate around the first rotation shaft 1514 by mating between the bearing and the first rotation shaft 1514.

The third bracket is rotatably connected to the second rotation shaft 1515, and the third bracket is drivingly connected to the first inclination driving component 155 to drive the second bracket 1513 to swing about the first rotation shaft 1514.

Optionally, the third bracket includes two fixing members 1518 arranged at an interval in the X-axis direction, the spindle 120 is located between the two fixing members 1518, one end of each fixing member 1518 is connected to the second swing bracket 153, and the other end of each fixing member 1518 is provided with a bearing mating with the second rotation shaft 1515, so that an end of the fixing member 1518 facing away from the second swing bracket 153 is rotatably connected to the second rotation shaft 1515, and at the same time, the second bracket 1513 is suspended above the second swing bracket 153.

The second swing bracket 153 is, for example, in the shape of a plate.

The first inclination driving component 155 is connected to the first swing bracket 151 to drive the first swing bracket 151 and cause the spindle 120 to swing around the Y-axis direction with

respect to the universal connector 121.

As shown in FIGS. 3 and 6, the first inclination driving mechanism 155 includes a first driving mechanism 1551 and a first linkage mechanism.

5 The first driving mechanism 1551 is located on the side of the second bracket 1513, the side is a side facing away from the second bracket 1513 in the X-axis direction or the Y-axis direction, and the first driving mechanism 1551 is connected to the chassis 100 via a connection member 1552.

10 The first linkage mechanism and the first driving mechanism 1551 are located on the same side of the second bracket 1513, one end of the first linkage mechanism is connected to a side wall of the third bracket in the X-axis direction, and the other end of the first linkage mechanism is connected to the first driving mechanism 1551, so as to switch a rotational movement of the first driving mechanism 1551 into driving force for driving the third bracket and causing the second bracket 1513 to swing around the first rotation shaft 1514.

15 As shown in FIG. 6, the first linkage mechanism is, for example, a three linkage mechanism, and includes a first linkage 1553, a second linkage 1554 and a third linkage 1555. The first linkage 1553 is connected to the first driving mechanism 1551, one end of the second linkage 1554 is hinged with one end of the first linkage 1553 facing away from the first driving mechanism 1551 via a first shaft pin 1556, and the other end of the second linkage 1554 is hinged with one end of the third linkage 1555 via a second shaft pin 1557. The second shaft pin 1557 and the first shaft pin 1556 are arranged in parallel and both in the Y-axis direction. One end of the third linkage 1555 facing away from the second linkage 1554 is fixedly connected to a side wall of the second bracket 1513 in the X-axis direction.

25 As shown in FIGS. 3 and 7, the second inclination driving component 156 is connected to the second swing bracket 153 to drive the second swing bracket 153 and cause the spindle 120 to swing around the X-axis direction with respect to the universal connector 121.

The second inclination driving mechanism 156 includes a fixing seat, a second driving mechanism 1564 and a second linkage mechanism.

The fixing seat is connected to the second bracket 1513.

To ensure the stability of installation, optionally, the fixing seat includes, for example, a

U-shaped fixing plate 1561 and a fixing arm 1562 which are connected to each other. The fixing arm 1562 extends along the Y-axis direction, an opening of the U-shaped fixing plate 1561 faces away from the fixing arm 1562, the U-shaped fixing plate 1561 is connected to the two ends of the second bracket 1513 in the X-axis direction, and an end of the U-shaped fixing plate 1561 facing away from the opening of the U-shaped fixing plate 1561 is disposed outside the first bracket 1511 with a gap.

The second driving mechanism 1564 is located on the side of the second swing bracket 153. The second driving mechanism 1564 is connected to the fixing seat.

The second linkage mechanism and the second driving mechanism 1564 are located on the same side of the second swing bracket 153, one end of the second linkage mechanism is connected to a side wall of the second swing bracket 153 in the Y-axis direction, and the other end of the second linkage mechanism is connected to the second driving mechanism 1564 to switch a rotational movement of the second driving mechanism 1564 into driving force for driving the second swing bracket 153 around the second axis.

The second linkage mechanism is, for example, also a three linkage mechanism, and includes a fourth linkage 1565, a fifth linkage 1566 and a sixth linkage 1567. The fourth linkage 1565 is connected to the second driving mechanism 1564, one end of the fifth linkage 1566 is hinged with the end of the fourth linkage 1565 facing away from the second driving mechanism 1564 via a third shaft pin 1568, and the other end of the fifth linkage 1566 is hinged with one end of the sixth linkage 1567 via a fourth shaft pin 1569. The third shaft pin 1568 and the fourth shaft pin 1569 are arranged in the X-axis direction. One end of the sixth linkage 1567 facing away from the fifth linkage 1566 is fixedly connected to a side wall of the second swing bracket 153 in the Y-axis direction.

Under the above arrangement conditions, when the leaf-blade components 130 are required to swing around the Y-axis direction, any one end of the leaf-blade components 130 in the X-axis direction is caused to be in contact with the ground, the other end of the leaf-blade components 130 is separated from the ground, the first linkage mechanism may be powered by turning on the first driving mechanism 1551, and the first linkage mechanism drives the third bracket to swing around the first rotation shaft 1514. The third bracket is connected to the second swing bracket 153, so that the second swing bracket 153 and the second inclination driving component 156 provided on the second bracket 1513 can be driven to swing synchronously around the first rotation shaft 1514, and based on the universal connector 121, the swinging second swing

bracket 153 can drive the spindle 120 to swing synchronously and in the same direction with respect to the chassis, thereby causing the leaf-blade components 130 to incline relative to the ground in the X-axis direction.

When the leaf-blade components 130 are required to swing around the X-axis direction, any one end of the leaf-blade components 130 in the Y-axis direction is caused to be in contact with the ground, and the other end of the leaf-blade components 130 is separated from the ground. The second linkage mechanism may be powered by turning on the second driving mechanism 1564. Since the second swing bracket 153 is fixedly connected to the third bracket 1518 and the third bracket 1518 is hinged with the second rotation shaft 1515, at this time, the second linkage mechanism can drive the second swing bracket 153 to swing around the second rotation shaft 1515, and the swinging second swing bracket 153 can drive the spindle 120 to swing synchronously in the same direction, thereby causing the leaf-blade components 130 to incline relative to the ground in the Y-axis direction.

It is to be noted that the main driving mechanism 115, the first driving mechanism 1551 and the second driving mechanism 1564 may all be direct current servo motors connected to a right-angle reducer, the chassis 100 may be provided with batteries for supplying power to the main driving mechanism 115, the first driving mechanism 1551 and the second driving mechanism 1564, respectively, and these batteries may be lithium batteries to provide sufficient endurance.

The number of leaf-blade mechanisms is two, the two leaf-blade mechanisms correspond to the two spindles 120 respectively, and each leaf-blade mechanism is connected to the bottom end of the corresponding spindle 120, so that the swing of the two spindles 120 drives the change of the inclination angles and the inclination directions of the two leaf-blade mechanisms relative to the ground.

Referring to FIGS. 1 and 3, each leaf-blade mechanism includes a central shaft connected to a corresponding spindle 120, and a plurality of spatulas 133 arranged at intervals along the circumferential direction of the central shaft, each spatula 133 is provided with a connection arm 134, and each spatula 133 may be fixedly connected to the spindle 120 via the connection arm 134. At this time, the inclination angle of each spatula 133 cannot be adjusted, or each spatula 133 may be connected to the central shaft in such a manner that each spatula 133 can rotate around the axial direction of the connection arm 134 to adjust the inclination angle of the spatula 133 according to actual requirements, which may be referred to the related art in detail

and is not limited herein.

Optionally, the polishing robot 10 further includes wiping plates 140 in one-to-one correspondence with the leaf-blade components 130, and each wiping plate 140 is removably connected to a corresponding leaf-blade component 130 and located at the bottom end of the
5 corresponding leaf-blade component 130.

The removable connection is, for example, a clamp, a screw fastening, etc. In this embodiment, each wiping plate 140 is provided with a clamping portion 141, such as a clamping plate, and the clamping portion 141 and the upper surface of each wiping plate 140 together form a bayonet for matching with the edge of each spatula 133, that is, the wiping plate 140 is clamped
10 at the bottom end of the leaf-blade component 130. By being compatible with the wiping plates 140, the playing window period of the polishing robot 10 can be prolonged, and the polishing and pulp-raising effect can be improved at the same time, thereby achieving the trowelling function of the wiping plates 140 and the polishing function of the spatulas 133. Specifically, for example, each wiping plate 140 is connected to one spatula 133 firstly, with the arrangement of
15 the wiping plates 140, the contact area between the polishing robot 10 and the work surface is increased, and the pressure is reduced. At this time, the polishing robot 10 can effectively trowel the ground. When subsequent polishing is needed, the wiping plates 140 can be removed, so that the spatulas 133 directly contact the work surface and the pressure of the polishing robot 10 on the work surface is increased, and the polishing effect is good.

Optionally, the polishing robot 10 further includes a navigation system (not shown), where the navigation system is provided with a controller, the controller is electrically connected to the main driving mechanism 115, the first driving mechanism 1551 and the second driving mechanism 1564, respectively, so that the polishing robot 10 can move along a preset path by controlling the steering and rotation speeds of the main driving mechanism 115, the first driving
20 mechanism 1551 and the second driving mechanism 1564, and the processing capability at the corn of the work surface can be effectively improved.
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In the actual use process of the polishing robot 10 provided in this embodiment, the inclination directions and force of the two spindles 120 are shown in FIGS. 8 to 14, respectively. In FIGS. 8 to 14, the left side is a diagram showing the inclination directions of the two spindles 120, respectively, and the right side is a force diagram corresponding to the two leaf-blade components, where a small circle in each leaf-blade component represents the point of force between each leaf-blade component 130 and the work surface, and driving force F action on
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each leaf-blade component is marked. In FIGS. 11 to 13, since the leaf-blade component 130 corresponding to the spindle 120 and having the unidirectional degree of freedom is kept horizontal, the entire leaf-blade component 130 corresponding to the spindle 120 is uniformly forced, and there is no driving force F for driving the polishing robot 10 to move or rotate.

5 Similarly, FIG. 14 can be obtained.

As shown in FIGS. 1 and 8, when the polishing robot 10 needs to advance, the two spindles 120 are driven in a splayed distribution in the X-axis direction by utilizing the two first reversing mechanisms so that only opposite inner ends of the two leaf-blade components 130 in the X-axis direction are respectively brought into contact with the ground. At this time, the driving
10 force for the polishing robot 10 to move forward in the Y-axis direction is generated by controlling the two leaf-blade components 130 to rotate in the reverse directions.

As shown in FIGS. 1 and 9, when the polishing robot 10 needs to retreat, the two spindles 120 are driven in an inverted splayed distribution in the X-axis direction by utilizing the two first reversing mechanisms so that only opposite outer ends of the two leaf-blade components 130
15 which are in the X-axis direction and face away from each other are respectively brought into contact with the ground. At this time, the driving force for retreating the polishing robot 10 in the Y-axis direction is generated by controlling the two leaf-blade components 130 to rotate in the reverse directions.

As shown in FIGS. 1 and 10, when the polishing robot 10 needs to turn right, the two spindles
20 120 are driven to swing by utilizing the two first reversing mechanisms so that the right end of each leaf-blade component 130 in the X-axis direction 130 is respectively brought into contact with the ground, and the left end of each leaf-blade component 130 is separated from the ground. At this time, since the two leaf-blade components 130 rotate in the reverse directions, and the arm of force and the moment of the center of gravity are different, the driving force for turning
25 the polishing robot 10 to right is generated.

As shown in FIGS. 1 and 11, when the polishing robot 10 needs to turn left, the operation different from turning right is only that the left end of each left-blade component 130 in the X-axis direction is driven to contact with the ground by utilizing the two first reversing mechanisms, and the right end is separated from the ground.

30 As shown in FIGS. 1 and 12, when the polishing robot 10 needs to traverse laterally to right, the leaf-blade component 130 corresponding to the spindle 120 having the unidirectional degree of

freedom remains horizontal, for the spindle having the bidirectional degree of freedom, the rear end of the corresponding leaf-blade component 130 is driven to contact with the ground by the second reversing mechanism provided on the spindle 120, and the front end is separated from the ground. At this time, since the two leaf-blade components 130 rotate in reverse directions,
5 the driving force for traversing the polishing robot 10 laterally to right is generated.

As shown in FIGS. 1 and 13, when the polishing robot 10 needs to traverse laterally to left, the leaf-blade component 130 corresponding to the spindle 120 having the unidirectional degree of freedom remains horizontal, for the spindle having the bidirectional degree of freedom, the front end of the corresponding leaf-blade component 130 is driven to contact with the ground by the
10 second reversing mechanism provided on the spindle, and the rear end is separated from the ground. At this time, since the two leaf-blade components 130 rotate in the reverse directions, the driving force for traversing the polishing robot 10 laterally to left is generated.

Referring to FIG. 14, when the polishing robot does not need to move, and only one of the trowelling operation or the polishing operation is needed, the first reversing mechanism and the
15 second reversing mechanism do not operate, so that the two leaf-blade components 130 are horizontally arranged and fully contact with the ground, and at the same time, the two leaf-blade components 130 rotate in the reverse directions.

To sum up, in the polishing robot provided by the present application, the first reversing mechanism and the second reversing mechanism are integrated together, thus effectively
20 simplifying the structure and reducing the space occupied by the first reversing mechanism and the second reversing mechanism under the chassis. The driving force for driving the polishing robot to translate, turn and rotate in situ is obtained by controlling the inclination direction and inclination angle of each leaf-blade component and the work surface, and the rotation speed of each leaf-blade component, the operation flexibility is high, the polishing robot can achieve the
25 omnidirectional movement in the polishing process, and the processing capability at the corn of the work surface is effectively improved.

The above are only preferred embodiments of the present application and are not intended to limit the present application, and for those skilled in the art, the present application may have various modifications and variations. Any modifications, equivalent substitutions,
30 improvements and the like made within the spirit and principle of the present application should fall within the scope of the present application.

INDUSTRIAL APPLICABILITY

- The present application provides a polishing robot. The polishing robot includes a chassis and two spindles. The top end of each spindle is provided with a universal connector connected to the chassis, the universal connector is rotatably connected to the chassis along the axis direction, the bottom end of each spindle is used for connecting a leaf-blade component, each spindle is respectively provided with a first reversing mechanism, and at least one of the two spindles is provided with a second reversing mechanism. The first reversing mechanism is connected to the chassis and is configured to drive each spindle to swing around a Y-axis direction, the second reversing mechanism is connected to the first reversing mechanism and is configured to drive a corresponding spindle to swing around an X-axis direction, and axes of the two spindles are arranged in the X-axis direction. The above arrangement can drive the polishing robot to translate, turn and rotate in situ, the operation flexibility is high, the polishing robot can achieve the omnidirectional movement in the polishing process, and the processing capability at the corn of the work surface is effectively improved.
- Furthermore, it can be understood that the polishing robot of the present application is reproducible and can be used in a variety of industrial applications. For example, the polishing robot of the present application can be used in the technical field of architectural robots.

CLAIMS

1. A polishing robot, comprising:

a chassis; and

two spindles, wherein the two spindles are arranged in a Z-axis direction, a top end of each of the two spindles is provided with a universal connector connected to the chassis, the universal connector is rotatably connected to the chassis in such a manner as to be rotatable along an axis of the universal connector, a bottom end of each of the two spindles is configured to connect a leaf-blade component, each of the two spindles is provided with a first reversing mechanism, respectively, and at least one of the two spindles is provided with a second reversing mechanism;

wherein the first reversing mechanism is connected to the chassis and is configured to drive each of the two spindles to swing around a Y-axis direction, the second reversing mechanism is connected to the first reversing mechanism and is configured to drive a corresponding spindle of the two spindles to swing around an X-axis direction, and axes of the two spindles are arranged in the X-axis direction.

2. The polishing robot according to claim 1, further comprising a power mechanism, wherein the power mechanism is provided on the chassis, the power mechanism is drivingly connected to the two spindles and drives the two spindles to synchronously rotate in reverse directions around the axes of the two spindles, respectively.

3. The polishing robot according to claim 1 or 2, wherein the two spindles are symmetrically arranged along the power mechanism.

4. The polishing robot according to any one of claims 1 to 3, wherein the first reversing mechanism and the second reversing mechanism are both located below the chassis.

5. The polishing robot according to any one of claims 1 to 4, wherein the first reversing mechanism comprises a first swing bracket and a first inclination driving component;

the first swing bracket is connected to the chassis and is configured to swing around the Y-axis direction, and each of the two spindles is connected to the first swing bracket and is swingable synchronously with the first swing bracket; and

the first inclination driving component is connected to the first swing bracket to drive the first swing bracket and cause the each of the two spindles to swing around the Y-axis direction with respect to the universal connector.

6. The polishing robot according to claim 5, wherein the second reversing mechanism comprises a second swing bracket and a second inclination driving component;

the second swing bracket is connected to the first swing bracket and is configured to swing around the X-axis direction, and the at least one of the two spindles rotatably passes through the second swing bracket and is swingable synchronously with the second swing bracket; and

the second inclination driving component is connected to the second swing bracket to drive the second swing bracket and cause the at least one of the two spindles to swing around the X-axis direction with respect to the universal connector.

7. The polishing robot according to claim 6, wherein the at least one of the two spindles and the second swing bracket are fixed relative to each other in an axial direction to be rotatably connected in a circumferential direction.

8. The polishing robot according to any one of claims 1 to 7, wherein the at least one of the two spindles provided with the first reversing mechanism and the second reversing mechanism swings around the Y-axis direction about a first axis as an axis and swings around the X-axis direction about a second axis as the axis, and the first axis and the second axis intersect in a same plane.

9. The polishing robot according to claim 8, wherein the at least one of the two spindles is vertically disposed at an intersection point of the first axis and the second axis.

10. The polishing robot according to any one of claims 6 to 9, wherein the first swing bracket comprises:

a first bracket, which is connected to the chassis;

a second bracket, which is arranged around each of the two spindles and has a gap with the each of the two spindles, wherein the second bracket is provided with a first rotation shaft arranged along the Y-axis direction and a second rotation shaft arranged along the X-axis direction, and the first rotation shaft is rotatably connected to the first bracket; and

a third bracket, which is rotatably connected to the second rotation shaft, wherein the third bracket is drivingly connected to the first inclination driving component to cause the second bracket to swing around the first rotation shaft.

11. The polishing robot according to claim 10, wherein the third bracket comprises two fixing members arranged at an interval in the X-axis direction, each of the two spindles is located between the two fixing members, one end of each fixing member of the two fixing members is

connected to the second swing bracket, and another end of the each fixing member is rotatably connected to the second rotation shaft so that the second bracket is suspended above the second swing bracket.

5 12. The polishing robot according to claim 10 or 11, wherein the first inclination driving component comprises:

a first driving mechanism, which is located on a side of the second bracket; and

10 a first linkage mechanism, wherein the first linkage mechanism and the first driving mechanism are located on a same side where the second bracket is located, one end of the first linkage mechanism is connected to a side wall of the third bracket in the X-axis direction, and another end of the first linkage mechanism is connected to the first driving mechanism to switch a rotational movement of the first driving mechanism into driving force for driving the third bracket and causing the second bracket to swing around the Y-axis direction.

13. The polishing robot according to claims 10 to 12, wherein the second inclination driving component comprises:

15 a fixing seat, which is connected to the second bracket;

a second driving mechanism, which is located on a side of the second swing bracket and connected to the fixing seat; and

20 a second linkage mechanism, wherein the second linkage mechanism and the second driving mechanism are located on a same side of the second swing bracket, one end of the second linkage mechanism is connected to a side wall of the second swing bracket in the Y-axis direction, and another end of the second linkage mechanism is connected to the second driving mechanism to switch a rotational movement of the second driving mechanism into driving force for driving the second swing bracket to swing around the X-axis direction.

25 14. The polishing robot according to any one of claims 1 to 13, further comprising wiping plates in one-to-one correspondence with leaf-blade components, wherein each of the wiping plates is removably connected to a corresponding leaf-blade component and located at a bottom end of the corresponding leaf-blade component.

30 15. The polishing robot according to claim 13 or 14, wherein the power mechanism comprises a first gear, a second gear, a third gear, and a main driving mechanism, the polishing robot further comprises a navigation system having a controller, and the controller is electrically connected to the main driving mechanism, the first driving mechanism and the second driving mechanism, respectively, to control steering and rotation speeds of the main driving mechanism, the first

driving mechanism and the second driving mechanism.