(19) LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

(11) N° de publication : **LU508564**

(12) **BREVET D'INVENTION** **B1**

(21) N° de dépôt: LU508564

(51) Int. Cl.:
H02S 40/10

(22) Date de dépôt: 28/09/2023

(30) Priorité:
15/08/2023 CN 202311027056.1

(43) Date de mise à disposition du public: 17/02/2025

(47) Date de délivrance: 17/02/2025

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(54) **AUTOMATIC CLEANING AUXILIARY DEVICE FOR PHOTOVOLTAIC PANELS.**

(57) The present invention belongs to the technical field of photovoltaic power generation equipment, particularly involving an automatic cleaning auxiliary device for photovoltaic panels. By providing a tilted first support component on the support frame and photovoltaic panel component, as well as movable components and diamond-shaped components capable of lifting and deforming, the cleaning robot, after cleaning one photovoltaic panel component, transitions to another photovoltaic panel component on a different support frame through the first support component, movable component, and diamond-shaped component for cleaning. The tilted arrangement of the first support component on the support frame and photovoltaic panel component forms a slope-like structure, enabling the cleaning robot to cross different photovoltaic panels and move across various photovoltaic panel components. The use of liftable movable components and deformable diamond-shaped components prevents the cleaning robot from being unable to clean sloped surfaces formed by the slope-like structure and facilitates the adjustment of the slope angle for better passage of the cleaning robot.

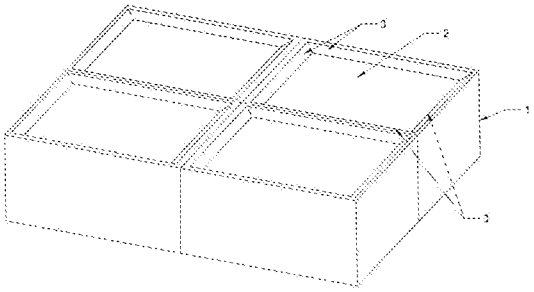

FIG.1

AUTOMATIC CLEANING AUXILIARY DEVICE FOR PHOTOVOLTAIC PANELS

Technical Field

The present invention belongs to the technical field of photovoltaic power generation equipment, particularly relating to an automatic cleaning auxiliary device for photovoltaic panels.

Background Technology

Currently, photovoltaic power generation has become a significant aspect of new energy projects. As the core component of photovoltaic power generation, the energy conversion rate of photovoltaic panels directly affects the efficiency of solar power generation, making dust management on the panel surface particularly important. Traditional cleaning of photovoltaic panels mainly relies on manual cleaning or water spray cleaning using water trucks. This method is labor-intensive, inefficient, and prolonged water droplets on the panels may form convex lens effects that concentrate light, generating localized high temperatures, which can damage the panels, affect power generation, and lead to economic loss. Therefore, photovoltaic cleaning robots have seen widespread use. These robots offer high automation in cleaning, featuring automatic correction, self-check, anti-fall, and strong wind protection functions. They support mobile or cloud-based control, providing convenience and efficiency. Additionally, they employ advanced follower systems to automatically travel along and clean photovoltaic modules. Cleaning schedules can be set according to different regions and seasons, and the robot can autonomously return to a standby position after completing the cleaning task without causing shading on the photovoltaic modules. However, after cleaning one photovoltaic panel, these robots cannot autonomously move to the next panel and require manual transport or assistance to access another panel, indicating the shortcomings of existing photovoltaic cleaning robots.

Summary of the Invention

The objective of this invention is to provide an auxiliary device for automatic cleaning of photovoltaic panels to address the technical issue where photovoltaic cleaning robots cannot automatically transfer to other panels.

To solve the aforementioned technical issue, the specific technical solution of the present invention is as follows:

In some embodiments of this application, an automatic cleaning auxiliary device for photovoltaic panels is provided, which features a fixed structure, including:

A support frame, which is arranged in a matrix layout with adjacent support frames connected via connectors and installation areas provided on the support frame;

Photovoltaic panel components, which are installed in the installation areas of the support frame and are fixedly connected to it;

A first support component, located on the side of the photovoltaic panel component and fixedly connected to both the support frame and the photovoltaic panel component;

The first support component is arranged in an inclined manner;

By providing an inclined first support component on the support frame and photovoltaic panel component, the cleaning robot can enter another photovoltaic panel component on a different support frame for cleaning after finishing the current panel.

In some embodiments of this application, the auxiliary device has a liftable structure, comprising:

A support frame, arranged in a matrix layout with adjacent support frames connected via connectors. The support frame has an installation area and an open-top mounting cavity;

An arc-shaped groove is provided on one side of the mounting cavity;

A first chute located at the bottom of the mounting cavity;

A movable component, with one end hinged to the support frame and the other end slidingly connected to the arc-shaped groove;

Photovoltaic panel components, which are installed in the installation areas of

the support frame and are fixedly connected to it;

A first driving component, located at the bottom of the mounting cavity and fixedly connected to it, with its telescoping end equipped with a first connecting component;

The first connecting component is equipped with several second connecting components, which are fixedly connected to it;

A second support component, fixedly connected to the second connecting components, with a top arc-shaped slideway and a flat slideway. One end of the arc-shaped slideway connects to the flat slideway, and a first limiting component is located at the other end of the arc-shaped slideway, while a second limiting component is located at the end of the flat slideway away from the arc-shaped slideway;

A third support component, located at the bottom of both the first connecting component and the second support component, fixedly connected to both, and slidingly connected to the first chute;

A fourth support component, positioned on the side wall of the mounting cavity below the arc-shaped groove and fixedly connected to the side wall of the mounting cavity, which also has a through-hole;

A sliding component, with one end hinged to the movable component and the other end equipped with a pulley component, passing through the through-hole of the fourth support component;

The pulley component is slidingly connected to the top of the second support component.

In some embodiments of this application, the first driving component is one of either a telescopic cylinder or a lead screw telescopic device.

In some embodiments of this application, the pulley component is rotatably connected to the fourth support component and is made of a flexible, wear-resistant material.

In some embodiments of this application, the auxiliary device is an integrated liftable structure, comprising:

A support frame, arranged in a matrix layout, with a spliced mounting slot

provided between adjacent support frames;

A second chute symmetrically arranged on both sides of the mounting slot and located on the support frame;

A positioning component symmetrically arranged on both sides of the mounting slot and located on the support frame on the opposite side of the second chute, with a third chute provided inside;

A diamond-shaped component, with a plate-like structure on all four sides, and hinged connections between the sides, forming first, second, third, and fourth connecting ends between adjacent sides;

A sliding rod component symmetrically arranged on both the first and second connecting ends, with one end connected to these ends and the other end slidingly connected to the second chute;

A slider component located within the third chute, slidingly connected to the third chute, and connected to the third connecting end of the diamond-shaped component;

A second driving component located at the bottom of the mounting slot, with its telescoping end connected to the fourth connecting end of the diamond-shaped component.

In some embodiments of this application, the diamond-shaped component is a combined structure, comprising:

A first movable plate component with several protruding elements on both sides, and rotating holes on the protruding elements;

A second movable plate component with several protruding elements on both sides, and rotating holes on the protruding elements;

A third movable plate component with several protruding elements on both sides, and rotating holes on the protruding elements;

A fourth movable plate component with several protruding elements on both sides, and rotating holes on the protruding elements;

The protruding elements on one side of the first movable plate component interlock with the protruding elements on one side of the second movable plate component, while the protruding elements on its other side interlock with those on

one side of the third movable plate component;

The protruding elements on one side of the fourth movable plate component interlock with the protruding elements on the other side of the third movable plate component, while the protruding elements on its other side interlock with those on the other side of the second movable plate component;

A first rotating shaft component passes through the rotating holes on the connected sides of the first and third movable plate components, and the rotating holes on the connected sides of the second and fourth movable plate components, with a sliding rod component provided on it;

The sliding rod component is hinged to the first rotating shaft component;

A second rotating shaft component passes through the rotating holes on the connected sides of the first and second movable plate components, with both ends connected to the slider component;

A third rotating shaft component passes through the rotating holes on the connected sides of the third and fourth movable plate components and is connected to the telescoping end of the second driving component.

In some embodiments of this application, the slider component is a combined structure, comprising:

A fixed block component located within the third chute of the positioning component, slidingly connected to the third chute;

A fixed column component located on the fixed block component, fixedly connected to it, and rotatably connected to the second rotating shaft component.

Compared with the existing technology, the beneficial effects of the present invention lie in the inclined arrangement of the first support component on the support frame, and the inclusion of liftable and deformable movable and diamond-shaped components. These form a slope structure, which facilitates the cleaning robot's ability to cross between different photovoltaic panels, allowing the robot to move across various panel components. By employing liftable movable components and deformable diamond-shaped components, the slope structure formed does not prevent the cleaning robot from cleaning the slope surface. Additionally, it allows for

adjustment of the slope angle, making it easier for the cleaning robot to pass through.

Description of the Drawings

By reading the following detailed description of preferred embodiments, various other advantages and benefits will become apparent to those skilled in the art. The drawings are merely for illustrating the preferred embodiments and are not considered as limiting the invention. Throughout the drawings, the same reference symbols indicate the same components. The drawings include:

FIG.1: A schematic diagram of the overall structure provided in Embodiment 1 of the present invention;

FIG.2: A schematic diagram of the internal structure provided in Embodiment 1 of the present invention;

FIG.3: A schematic diagram of the overall structure provided in Embodiment 2 of the present invention;

FIG.4: A schematic diagram of the internal structure provided in Embodiment 2 of the present invention;

FIG.5: A schematic diagram of the overall structure provided in Embodiment 3 of the present invention;

FIG.6: A schematic diagram of the internal structure provided in Embodiment 3 of the present invention;

FIG.7: A schematic diagram of the structure of the diamond-shaped component provided in Embodiment 3 of the present invention;

FIG.8: A front view schematic diagram of the first movable plate component provided in Embodiment 3 of the present invention;

FIG.9: A side view schematic diagram of the first movable plate component provided in Embodiment 3 of the present invention;

FIG.10: A schematic diagram of the structure of the first rotating shaft component provided in Embodiment 3 of the present invention;

FIG.11: A perspective schematic diagram of the second rotating shaft component provided in Embodiment 3 of the present invention;

FIG.12: A front view schematic diagram of the second rotating shaft component provided in Embodiment 3 of the present invention;

FIG.13: A cross-sectional schematic diagram taken along line A-A in FIG. 12.

Detailed Embodiments

Below, the specific embodiments of the present invention are further described in detail in conjunction with the accompanying drawings and examples. The following embodiments are used to illustrate the invention but do not limit the scope of the invention.

In the description of this application, it should be understood that the terms "center," "upper," "lower," "front," "back," "left," "right," "vertical," "horizontal," "top," "bottom," "inside," "outside," and other positional or orientation indicators are based on the positional or orientation relationships shown in the drawings, and are merely for convenience in describing this application and simplifying the description. They do not indicate or imply that the devices or elements being referred to must have specific orientations or configurations and must be operated in specific orientations. Therefore, they should not be construed as limitations on this application.

The terms "first" and "second" are only used for descriptive purposes and should not be understood as indicating relative importance or implicitly specifying the quantity of the technical features referred to. Therefore, features defined as "first" and "second" may explicitly or implicitly include one or more such features. In this application, unless otherwise specified, "multiple" means two or more.

In the description of this application, it should be noted that, unless otherwise clearly specified and defined, the terms "installation," "connected," and "connection" should be understood in a broad sense. For example, it may be a fixed connection, a detachable connection, or an integral connection; it may be a mechanical connection or an electrical connection; it may be a direct connection or an indirect connection through an intermediary; it may be an internal connection between two elements. For those skilled in the art, the specific meaning of these terms in this application can be understood according to the specific circumstances.

To better understand the objectives, structure, and functionality of the present invention, a more detailed description of the invention is provided below in conjunction with the drawings.

Referring to FIGS. 1-2, according to some embodiments of this application, the auxiliary device is a fixed structure, including:

A support frame 1, which provides support and installation positions for photovoltaic panel components 2 and other components. The support frame 1 is arranged in a matrix layout, with adjacent support frames connected by bolts, welding, or other means. An installation area is provided on the support frame 1.

Photovoltaic panel components 2 are installed in the installation area of the support frame 1 and are fixedly connected to the support frame 1.

A first support component 3 is an inclined plate structure, provided on the side of the photovoltaic panel component 2, and is fixedly connected to both the support frame 1 and the photovoltaic panel component 2. In other words, the photovoltaic panel component 2 is a rectangular plate structure with first support components 3 located on all four sides.

It is worth mentioning that the first support component 3 is detachably mounted between the support frame 1 and the photovoltaic panel component 2 and can be fixed in place by bolts, adhesives, welding, riveting, or other means to maintain the position of the first support component 3 relative to the photovoltaic panel component 2 and the support frame 1.

The first support component 3 may be a photovoltaic panel or a slide rail.

The technical effect produced by the above solution in this embodiment is:

By providing an inclined first support component 3 on the support frame 1 and the photovoltaic panel component 2, the cleaning robot, after finishing cleaning one photovoltaic panel component 2, can move to another photovoltaic panel component 2 on a different support frame 1 for cleaning. The fixed first support component 3 allows the cleaning robot to cross different photovoltaic panel components 2 and clean various panels while reducing production costs. However, the cleaning device cannot clean the inclined first support component 3 during the cleaning process, resulting in

incomplete cleaning.

Embodiment 2

Referring to FIGS. 3-4, in this embodiment, the auxiliary device is a liftable structure, including:

A support frame 1 arranged in a matrix layout, with adjacent support frames connected via connectors. The support frame 1 includes an installation area and an open-top mounting cavity 101; an arc-shaped groove 102 is provided on one side of the mounting cavity 101.

A first chute 103 is located at the bottom of the mounting cavity 101.

A movable component 4, which has a plate-like structure, is hinged at one end to the support frame 1 and slidingly connected to the arc-shaped groove 102 at the other end. The movable component 4 can rotate on the support frame 1, and as it rotates, it slides along the arc-shaped groove 102. It is worth noting that during the rotation, the movable component 4 does not detach from the arc-shaped groove 102.

It is also worth mentioning that the movable component 4 may use photovoltaic panels as an integral structure, allowing the cleaning robot to pass while increasing the photovoltaic panel area to improve power generation efficiency. Alternatively, it can use slide rails as the integral structure.

Photovoltaic panel components 2 are installed in the installation area of the support frame 1 and are fixedly connected to the support frame 1.

A first driving component 401, which is a structure with an extendable output end, may be a telescopic cylinder or a mechanical telescopic device. The first driving component 401 is located at the bottom of the mounting cavity 101 and is fixedly connected to it. The telescoping end is equipped with a first connecting component 402, which is a crossbar structure. The first connecting component 402 has several second connecting components 403, which are rod-like structures and are fixed to the first connecting component 402 by welding, riveting, or adhesives to maintain the relative position.

A second support component 404, which has an irregular block structure, is fixedly connected to the second connecting components 403. The top of the second

support component 404 includes an arc-shaped slideway 4041 and a flat slideway 4042. One end of the arc-shaped slideway 4041 connects to the flat slideway 4042, and a first limiting component 4043 is located at the other end of the arc-shaped slideway 4041. A second limiting component 4044 is located at the end of the flat slideway 4042 farthest from the arc-shaped slideway 4041. Both limiting components are block-like structures.

A third support component 405, which is a rod-like structure, is provided at the bottom of both the first connecting component 402 and the second support component 404. It is fixedly connected to both components and slides along the first chute 103, providing support for the first connecting component 402 and the second support component 404. When the telescoping end of the first driving component 401 extends or contracts, the first connecting component 402 and the second support component 404 extend or contract accordingly, and the third support component 405 moves within the first chute 103.

A fourth support component 406, which is a plate-like structure, is located on the side wall of the mounting cavity 101 below the arc-shaped groove 102 and is fixedly connected to it. A through-hole is also provided in the fourth support component 406.

A sliding component 407, which is a rod-like structure, has one end hinged to the movable component 4, and the other end is equipped with a pulley component 408. The sliding component 407 passes through the through-hole of the fourth support component 406 and connects with the top of the second support component 404.

It is worth noting that the pulley component 408 is made of flexible, wear-resistant materials such as rubber or composite fiberboard. The connection between the pulley component 408 and the sliding component 407 can be fixed or rotatable.

When the connection is fixed, the pulley component 408 does not rotate as the second support component 404 moves. Instead, it enters the flat slideway 4042 along the arc-shaped slideway 4041, raising the sliding component 407 for vertical movement.

When the connection is rotatable, the pulley component 408 rotates with the movement of the second support component 404 and moves into the flat slideway

4042 along the arc-shaped slideway 4041, raising the sliding component 407 for vertical movement.

The technical effect produced by the above solution in this embodiment is:

The first driving component 401 extends and contracts, causing the first connecting component 402 to move laterally, which in turn drives the second support component 404 to move laterally. Simultaneously, the third support component 405 slides within the first chute 103. The pulley component 408 slides within the arc-shaped slideway 4041 of the second support component 404 and enters the flat slideway 4042, where it is restricted by the second limiting component 4044 to prevent it from falling out of the flat slideway 4042. Meanwhile, the pulley component 408 moves vertically, and the sliding component 407 moves through the through-hole of the fourth support component 406, causing vertical displacement. This raises the end of the movable component 4 that is away from its hinged connection to the support frame 1, allowing it to slide within the arc-shaped groove 102. The hinged end of the movable component 4 rotates relative to the support frame 1, forming an inclined slope structure to facilitate the cleaning robot's passage. After the cleaning robot passes, the first driving component 401 retracts, driving the first connecting component 402 in the opposite direction, resetting the second support component 404. The pulley component 408 re-enters the arc-shaped slideway 4041 from the flat slideway 4042 and is restricted by the first limiting component 4043 to prevent it from falling out. Simultaneously, the sliding component 407 descends, driving the movable component 4 to reset, aligning it with the same plane as the photovoltaic panel component 2 to facilitate the cleaning robot's cleaning process. By using a liftable mechanism to adjust the angle of the movable component 4, operation is simplified, and the robot is enabled to cross different photovoltaic panel components 2 while cleaning the slope structure, improving the overall cleaning effect.

Embodiment 3

Referring to FIGS. 5-13, in this embodiment, the auxiliary device is an integrated liftable structure, including:

A support frame 1, wherein the support components are arranged in a matrix

layout, with a spliced mounting slot 104 provided between adjacent support frames 1. In other words, the edge of the support frame 1 is designed with an L-shaped groove structure, forming an inverted U-shaped slot when two support frames 1 are combined.

A second chute 105, symmetrically arranged on both sides of the mounting slot 104, is provided on the support frame 1. The number of second chutes 105 ranges from 2 to 5.

A positioning component 5, which is a plate-like structure, is symmetrically arranged on both sides of the mounting slot 104, located on the support frame 1 but on the opposite side of the second chute 105. A third chute 501, which is an open slot structure, is also provided on it.

A diamond-shaped component 6, having a plate-like structure on all four sides, with hinged connections between adjacent sides forming a first connecting end 6011, second connecting end 6012, third connecting end 6013, and fourth connecting end 6014.

The diamond-shaped component 6 is a combined structure, comprising:

First movable plate component 601, with several protruding elements on both sides, and rotating holes on these protrusions.

Second movable plate component 602, also having protruding elements with rotating holes on both sides.

Third movable plate component 603, with similar protrusions and rotating holes.

Fourth movable plate component 604, identical in structure to the other plate components with protrusions and rotating holes.

In other words, the first 601, second 602, third 603, and fourth 604 movable plate components have the same structure, and their connections allow for rotation between each plate.

The protruding elements on one side of the first movable plate component 601 interlock with those on one side of the second movable plate component 602, while the protrusions on the other side interlock with those on one side of the third movable plate component 603. The connecting point between the first and second movable plate components 601 and 602 forms the third connecting end 6013, and the

connection between the first and third plate components 601 and 603 forms the first connecting end 6011.

Similarly, the protruding elements on one side of the fourth movable plate component 604 interlock with those on the other side of the third movable plate component 603, while the protruding elements on its other side interlock with those on the other side of the second movable plate component 602. The connection between the fourth and third movable plate components 604 and 603 forms the fourth connecting end 6014, while the connection between the fourth and second plate components 604 and 602 forms the second connecting end 6012.

A first rotating shaft component 605 passes through the rotating holes of the connected sides of the first 601 and third 603 movable plate components, and the connected sides of the second 602 and fourth 604 movable plate components. The shaft also has a sliding rod component 8, which is hinged at one end to the first rotating shaft component 605 and slidingly connected at the other end to the second chute 105. Thus, the first rotating shaft component 605 is located at the first connecting end 6011 and the second connecting end 6012, allowing the first 601, second 602, third 603, and fourth 604 movable plate components to rotate around it.

A second rotating shaft component 606, which is a cylindrical structure with open ends, passes through the rotating holes of the connected sides of the first 601 and second 602 movable plate components. Both ends of this component are connected to a slider component 502, meaning that the second rotating shaft component 606 is located at the second connecting end 6012, allowing the first 601 and second 602 movable plate components to rotate around it.

A third rotating shaft component 607, having a circular rod structure, passes through the rotating holes of the connected sides of the third 603 and fourth 604 movable plate components, and it is connected to the telescoping end of the second driving component 7. Thus, the third rotating shaft component 607 is located at the fourth connecting end 6014, enabling the third 603 and fourth 604 movable plate components to rotate around it.

A sliding rod component 8, which is rod-like, is symmetrically arranged at the first

connecting end 6011 and the second connecting end 6012. One end is hinged to the first rotating shaft component 605, and the other end is slidingly connected to the second chute 105.

A slider component 502, located within the third chute 501, is slidingly connected to it and rotatably connected to both ends of the second rotating shaft component 606.

The slider component 502 is a combined structure, comprising:

A fixed block component 5021, which is located within the third chute 501 of the positioning component 5 and is slidingly connected to it.

A fixed column component 5022, which is mounted on the fixed block component 5021, fixedly connected to it, and rotatably connected to the second rotating shaft component 606.

A second driving component 7, having an extendable output end, may be a telescopic cylinder or mechanical telescopic device. The second driving component 7 is located at the bottom of the mounting slot 104 and is connected to the third rotating shaft component 607 of the diamond-shaped component 6.

The technical effect produced by the above solution in this embodiment is:

When the second driving component 7 extends, it causes rotation between the third 603 and fourth 604 movable plate components, thereby increasing the angle between them. Simultaneously, the angle between the first 601 and second 602 movable plate components also increases. The sliding rod component 8 on the first rotating shaft component 605 moves within the second chute 105, and the slider component 502 on the second rotating shaft component 606 moves vertically downward within the third chute 501 of the positioning component 5. At this point, the first 601 and second 602 movable plate components align with the photovoltaic panel components 2, enabling the cleaning robot to cross over different photovoltaic panel areas and clean the first 601 and second 602 movable plate components. Once the cleaning robot has passed, the second driving component 7 retracts, reducing the angle between the third 603 and fourth 604 movable plate components, as well as between the first 601 and second 602 movable plate components. Meanwhile, the angles between the first 601 and third 603, and between the second 602 and fourth

604 movable plate components, increase. The sliding rod component 8 moves outward from the second chute 105, and the slider component 502 moves upward within the third chute 501, thereby separating different photovoltaic panel components 2. By using the deformable diamond-shaped component 6 as a partition between two support frames 1, the cleaning robot can pass through via deformation and clean the first 601 and second 602 movable plate components through deformation, forming a partition that not only optimizes the overall structure but also provides better flexibility compared to Embodiment 2.

Each embodiment in this specification is described in a progressive manner, focusing on the differences between each embodiment and the other embodiments. Similar or identical aspects between embodiments are cross-referenced. The disclosed devices correspond to the methods in their respective embodiments, and the relevant details can be found in the description of the method portion.

The above description of the disclosed embodiments enables professionals in the field to implement or use the present invention. Various modifications to these embodiments will be apparent to professionals in the field. The general principles defined herein can be applied to other embodiments without departing from the spirit or scope of the invention. Therefore, the invention is not limited to the embodiments presented herein, but should be understood to cover the broadest scope consistent with the principles and novel features disclosed.

CLAIMS

1. An automatic cleaning auxiliary device for photovoltaic panels, wherein the auxiliary device has a fixed structure, comprising:

A support frame, arranged in a matrix layout, with adjacent support frames connected via connectors, and installation areas provided on the support frame;

Photovoltaic panel components, which are installed in the installation areas of the support frame and are fixedly connected to the support frame;

A first support component, which is located on the side of the photovoltaic panel component and is fixedly connected to both the support frame and the photovoltaic panel component;

The first support component is arranged in an inclined manner;

By providing an inclined first support component on the support frame and photovoltaic panel component, the cleaning robot, after cleaning one photovoltaic panel component, enters another photovoltaic panel component on a different support frame through the first support component for cleaning.

2. The automatic cleaning auxiliary device for photovoltaic panels according to claim 1, wherein the auxiliary device has a liftable structure, comprising:

A support frame, arranged in a matrix layout, with adjacent support frames connected via connectors, an installation area provided on the support frame, and a mounting cavity with an open top provided on the support frame;

An arc-shaped groove provided on one side of the mounting cavity;

A first chute located at the bottom of the mounting cavity;

A movable component, with one end hinged to the support frame and the other end slidingly connected to the arc-shaped groove;

Photovoltaic panel components installed in the installation area of the support frame and fixedly connected to the support frame;

A first driving component, which is located at the bottom of the mounting cavity and is fixedly connected to it, with its telescoping end provided with a first connecting

component;

The first connecting component is equipped with several second connecting components, which are fixedly connected to it;

A second support component, fixedly connected to the second connecting components, with a top arc-shaped slideway and a flat slideway, one end of the arc-shaped slideway connecting to the flat slideway, a first limiting component located at the other end of the arc-shaped slideway, and a second limiting component located at the end of the flat slideway away from the arc-shaped slideway;

A third support component, located at the bottom of both the first connecting component and the second support component, fixedly connected to both, and slidingly connected to the first chute;

A fourth support component, positioned on the side wall of the mounting cavity below the arc-shaped groove, fixedly connected to the side wall of the mounting cavity, and provided with a through hole;

A sliding component, with one end hinged to the movable component and the other end equipped with a pulley component, passing through the through hole of the fourth support component;

The pulley component is slidingly connected to the top of the second support component.

3. The automatic cleaning auxiliary device for photovoltaic panels according to claim 2, wherein the first driving component is one of either a telescopic cylinder or a lead screw telescopic device.

4. The automatic cleaning auxiliary device for photovoltaic panels according to claim 3, wherein the pulley component is rotatably connected to the fourth support component and made of a flexible, wear-resistant material.

5. The automatic cleaning auxiliary device for photovoltaic panels according to claim 1, wherein the auxiliary device is an integrated liftable structure, comprising:

A support frame, arranged in a matrix layout, with a spliced mounting slot provided between adjacent support frames;

A second chute, symmetrically arranged on both sides of the mounting slot and located on the support frame;

A positioning component, symmetrically arranged on both sides of the mounting slot and located on the support frame on the opposite side of the second chute, with a third chute provided inside;

A diamond-shaped component, having a plate-like structure on all four sides, with hinged connections between its sides, forming first, second, third, and fourth connecting ends between adjacent sides;

A sliding rod component, symmetrically arranged on both the first and second connecting ends, with one end connected to these ends and the other end slidingly connected to the second chute;

A slider component located within the third chute, slidingly connected to the third chute and connected to the third connecting end of the diamond-shaped component;

A second driving component located at the bottom of the mounting slot, with its telescoping end connected to the fourth connecting end of the diamond-shaped component.

6. The automatic cleaning auxiliary device for photovoltaic panels according to claim 5, wherein the diamond-shaped component is a combined structure, comprising:

A first movable plate component, with several protruding elements on both sides, and rotating holes on the protruding elements;

A second movable plate component, with several protruding elements on both sides, and rotating holes on the protruding elements;

A third movable plate component, with several protruding elements on both sides, and rotating holes on the protruding elements;

A fourth movable plate component, with several protruding elements on both sides, and rotating holes on the protruding elements;

The protruding elements on one side of the first movable plate component

interlock with the protruding elements on one side of the second movable plate component, while the protruding elements on its other side interlock with those on one side of the third movable plate component;

The protruding elements on one side of the fourth movable plate component interlock with the protruding elements on the other side of the third movable plate component, while the protruding elements on its other side interlock with those on the other side of the second movable plate component;

A first rotating shaft component, passing through the rotating holes on the connected sides of the first and third movable plate components, and the rotating holes on the connected sides of the second and fourth movable plate components, with a sliding rod component provided on it;

The sliding rod component is hinged to the first rotating shaft component;

A second rotating shaft component, passing through the rotating holes on the connected sides of the first and second movable plate components; both ends of the second rotating shaft component are connected to the slider component;

A third rotating shaft component, passing through the rotating holes on the connected sides of the third and fourth movable plate components, and connected to the telescoping end of the second driving component.

7. The automatic cleaning auxiliary device for photovoltaic panels according to claim 6, wherein the slider component is a combined structure, comprising:

A fixed block component, located within the third chute of the positioning component and slidingly connected to the third chute;

A fixed column component, located on the fixed block component and fixedly connected to it, with a rotating connection to the second rotating shaft component.

REVENDICATIONS

1. Dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques, dans lequel le dispositif auxiliaire comporte une structure fixe, comprenant :

Un cadre de support, agencé en une disposition matricielle, les cadres de support adjacents étant reliés par des connecteurs, et des zones d'installation étant prévues sur le cadre de support ;

Des composants de panneaux photovoltaïques, qui sont installés dans les zones d'installation du cadre de support et sont fixés de manière permanente audit cadre ;

Un premier composant de support, situé sur le côté du composant de panneau photovoltaïque et relié de manière fixe au cadre de support ainsi qu'au composant de panneau photovoltaïque ;

Le premier composant de support est agencé de manière inclinée ;

En prévoyant un premier composant de support incliné sur le cadre de support et le composant de panneau photovoltaïque, le robot de nettoyage, après avoir nettoyé un composant de panneau photovoltaïque, pénètre dans un autre composant de panneau photovoltaïque sur un cadre de support différent à travers le premier composant de support pour le nettoyer.

2. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 1, dans lequel le dispositif auxiliaire a une structure relevable, comprenant :

Un cadre de support, agencé en une disposition matricielle, les cadres de support adjacents étant reliés par des connecteurs, une zone d'installation étant pré

vue sur le cadre de support, et une cavité de montage à sommet ouvert étant pré vue sur le cadre de support ;

Une rainure en arc de cercle prévue sur un côté de la cavité de montage ;

Une première rainure de coulissement située au fond de la cavité de montage ;

Un composant mobile, avec une extrémité articulée au cadre de support et l'autre extrémité reliée de manière coulissante à la rainure en arc de cercle ;

Des composants de panneaux photovoltaïques installés dans la zone d'installation du cadre de support et fixés de manière permanente audit cadre ;

Un premier composant de commande, situé au fond de la cavité de montage et fixé à celle-ci, avec son extrémité télescopique munie d'un premier composant de connexion ;

Le premier composant de connexion est équipé de plusieurs seconds composants de connexion qui lui sont fixés de manière permanente ;

Un second composant de support, relié de manière fixe aux seconds composants de connexion, avec une glissière supérieure en forme d'arc et une glissière plate, une extrémité de la glissière en arc se connectant à la glissière plate, un premier composant de limitation situé à l'autre extrémité de la glissière en arc, et un second composant de limitation situé à l'extrémité de la glissière plate opposée à la glissière en arc ;

Un troisième composant de support, situé au fond du premier composant de connexion et du second composant de support, relié de manière fixe à ces deux composants et relié de manière coulissante à la première rainure de coulissement ;

Un quatrième composant de support, positionné sur la paroi latérale de la cavit

é de montage sous la rainure en arc, fixé de manière permanente à la paroi latérale de la cavité de montage, et muni d'un trou traversant ;

Un composant coulissant, avec une extrémité articulée au composant mobile et l'autre extrémité équipée d'un composant à poulie, traversant le trou traversant du quatrième composant de support ;

Le composant à poulie est relié de manière coulissante à la partie supérieure du second composant de support.

3. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 2, dans lequel le premier composant de commande est soit un cylindre télescopique, soit un dispositif de vis à tête télescopique.

4. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 3, dans lequel le composant à poulie est relié de manière rotative au quatrième composant de support et est fabriqué dans un matériau flexible et résistant à l'usure.

5. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 1, dans lequel le dispositif auxiliaire est une structure relevable intégrée, comprenant :

Un cadre de support, agencé en une disposition matricielle, avec une fente de montage en plusieurs parties prévue entre les cadres de support adjacents ;

Une seconde rainure de coulissement, agencée de manière symétrique des deux côtés de la fente de montage et située sur le cadre de support ;

Un composant de positionnement, agencé de manière symétrique des deux côtés de la fente de montage et situé sur le cadre de support du côté opposé à la seconde rainure de coulissement, avec une troisième rainure de coulissement à l'intérieur ;

Un composant en losange, ayant une structure en forme de plaque sur ses quatre côtés, avec des connexions articulées entre ses côtés, formant des première, seconde, troisième et quatrième extrémités de connexion entre les côtés adjacents ;

Un composant de tige coulissante, agencé de manière symétrique sur les première et seconde extrémités de connexion, avec une extrémité reliée à ces extrémités et l'autre extrémité reliée de manière coulissante à la seconde rainure de coulissement ;

Un composant de glissière situé à l'intérieur de la troisième rainure de coulissement, relié de manière coulissante à la troisième rainure de coulissement et relié à la troisième extrémité de connexion du composant en losange ;

Un second composant de commande situé au fond de la fente de montage, avec son extrémité télescopique reliée à la quatrième extrémité de connexion du composant en losange.

6. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 5, dans lequel le composant en losange est une structure combinée, comprenant :

Un premier composant de plaque mobile, avec plusieurs éléments en saillie sur ses deux côtés, et des trous de rotation sur les éléments en saillie ;

Un second composant de plaque mobile, avec plusieurs éléments en saillie sur

ses deux côtés, et des trous de rotation sur les éléments en saillie ;

Un troisième composant de plaque mobile, avec plusieurs éléments en saillie sur ses deux côtés, et des trous de rotation sur les éléments en saillie ;

Un quatrième composant de plaque mobile, avec plusieurs éléments en saillie sur ses deux côtés, et des trous de rotation sur les éléments en saillie ;

Les éléments en saillie d'un côté du premier composant de plaque mobile s'emboîtent avec les éléments en saillie d'un côté du second composant de plaque mobile, tandis que les éléments en saillie de l'autre côté s'emboîtent avec ceux d'un côté du troisième composant de plaque mobile ;

Les éléments en saillie d'un côté du quatrième composant de plaque mobile s'emboîtent avec les éléments en saillie de l'autre côté du troisième composant de plaque mobile, tandis que les éléments en saillie de son autre côté s'emboîtent avec ceux de l'autre côté du second composant de plaque mobile ;

Un premier composant d'arbre de rotation, passant à travers les trous de rotation sur les côtés reliés des premier et troisième composants de plaque mobile, ainsi que sur les côtés reliés des second et quatrième composants de plaque mobile, un composant de tige coulissante étant prévu sur celui-ci ;

Le composant de tige coulissante est articulé au premier composant d'arbre de rotation ;

Un second composant d'arbre de rotation, passant à travers les trous de rotation sur les côtés reliés des premier et second composants de plaque mobile ; les deux extrémités du second composant d'arbre de rotation sont reliées au composant

de glissière ;

Un troisième composant d'arbre de rotation, passant à travers les trous de rotation sur les côtés reliés des troisième et quatrième composants de plaque mobile, et relié à l'extrémité télescopique du second composant de commande.

7. Le dispositif auxiliaire de nettoyage automatique pour panneaux photovoltaïques selon la revendication 6, dans lequel le composant de glissière est une structure combinée, comprenant :

Un composant de bloc fixe, situé à l'intérieur de la troisième rainure de coulissement du composant de positionnement et relié de manière coulissante à la troisième rainure de coulissement ;

Un composant de colonne fixe, situé sur le composant de bloc fixe et relié de manière permanente à celui-ci, avec une connexion rotative au second composant d'arbre de rotation.

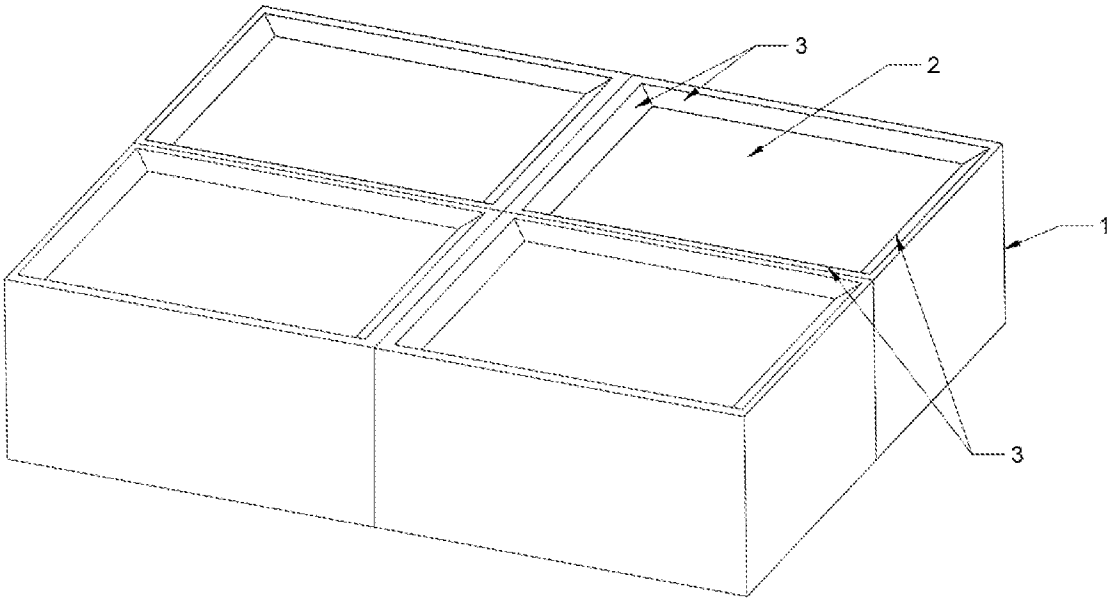

FIG.1

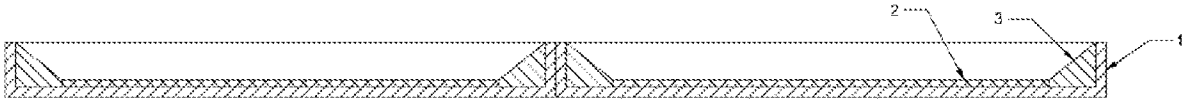

FIG.2

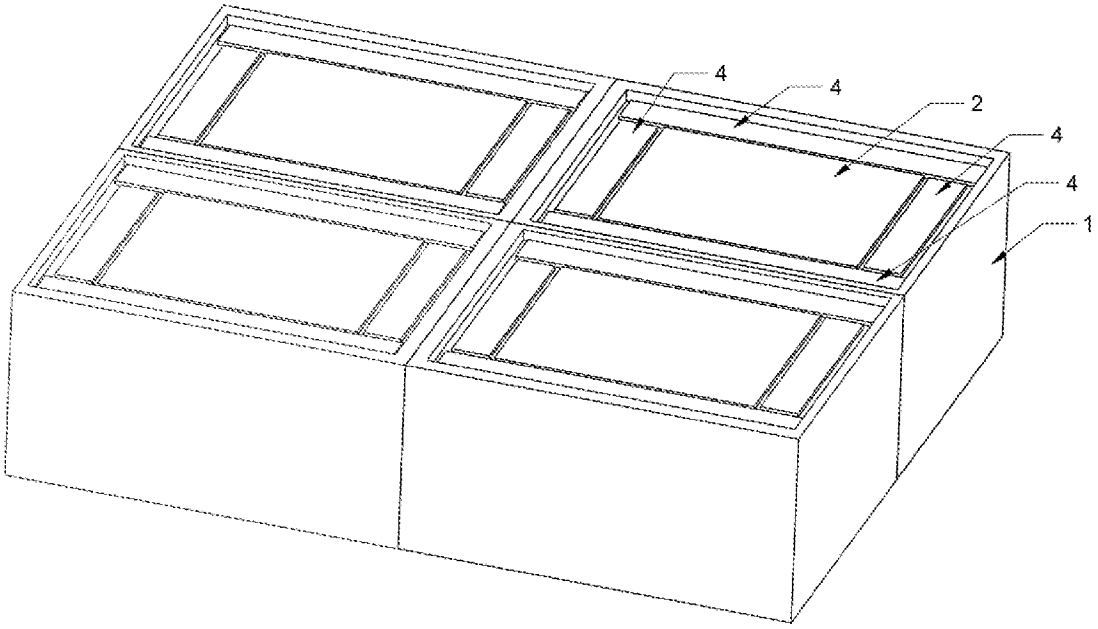

FIG.3

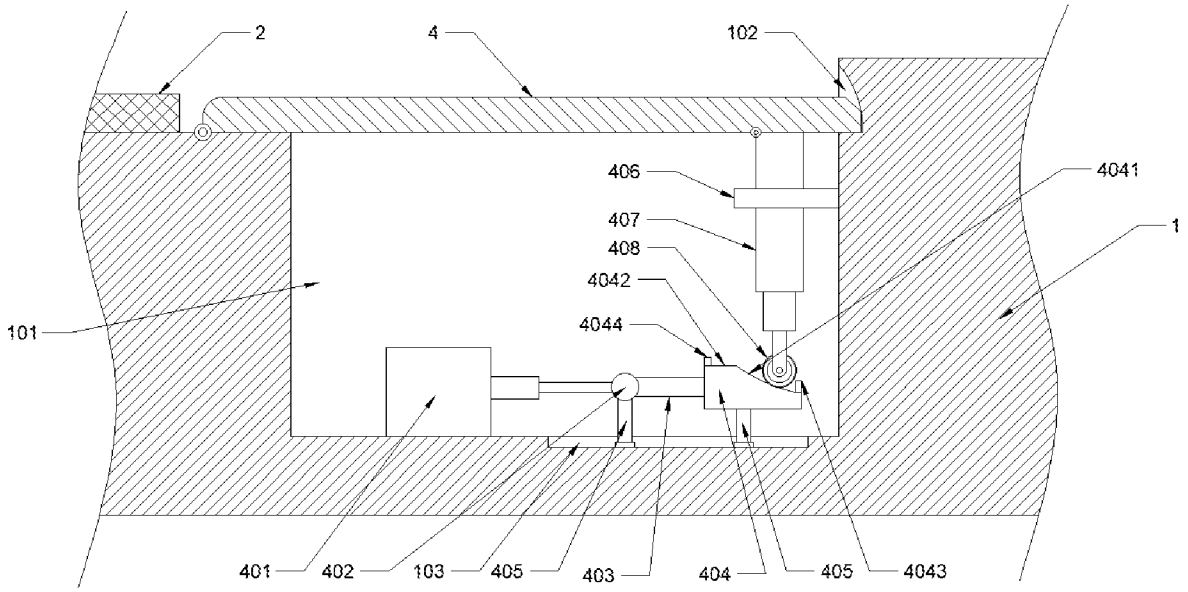

FIG.4

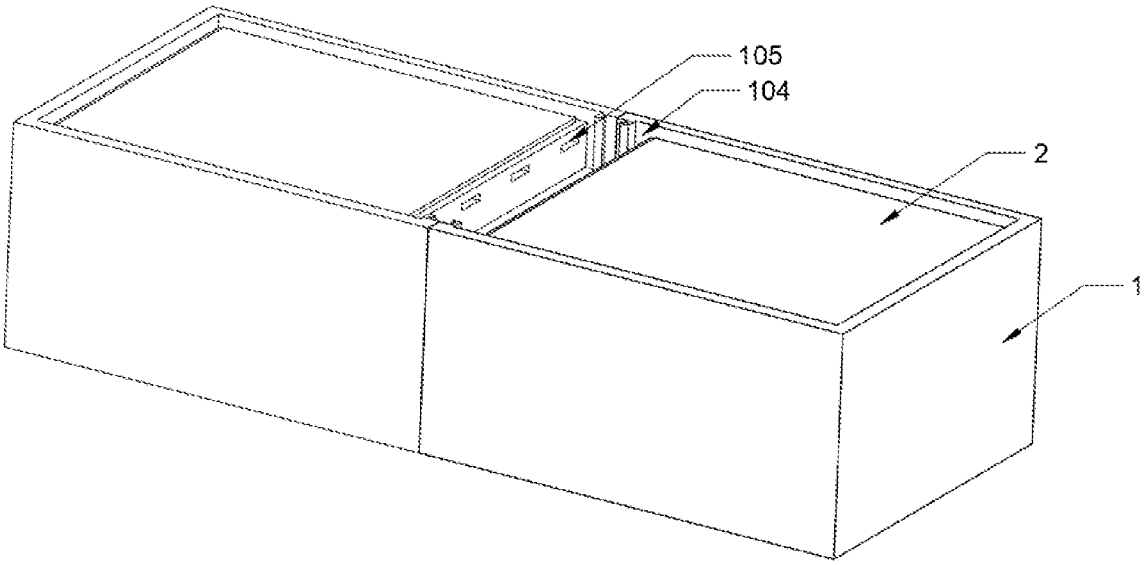

FIG.5

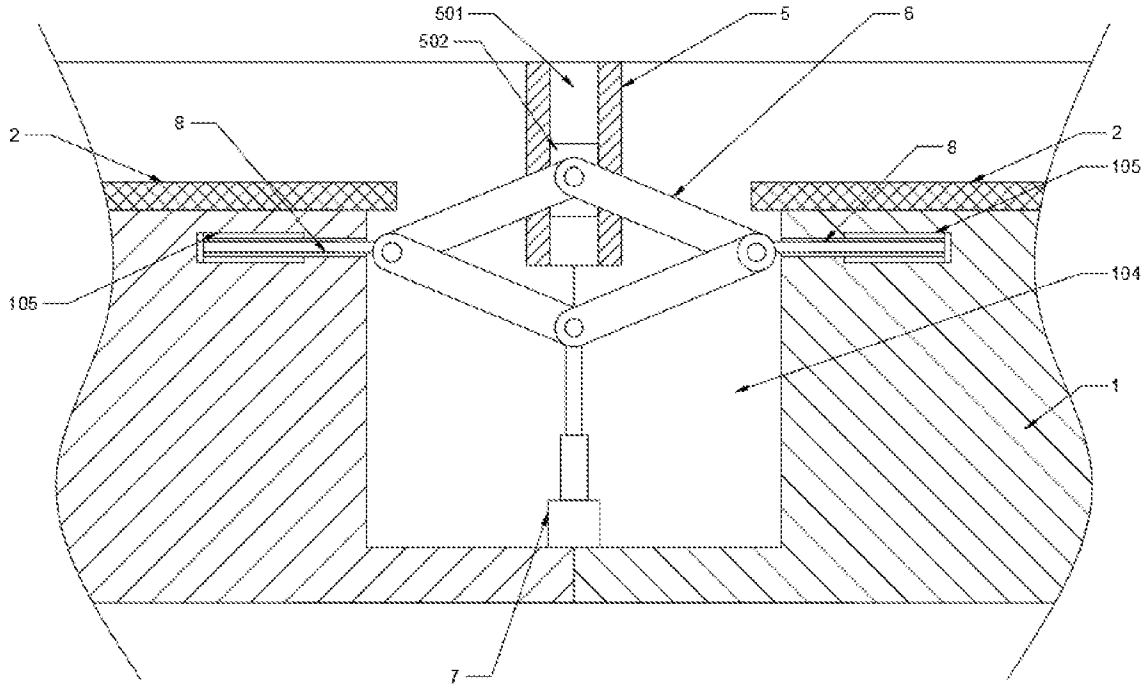

FIG.6

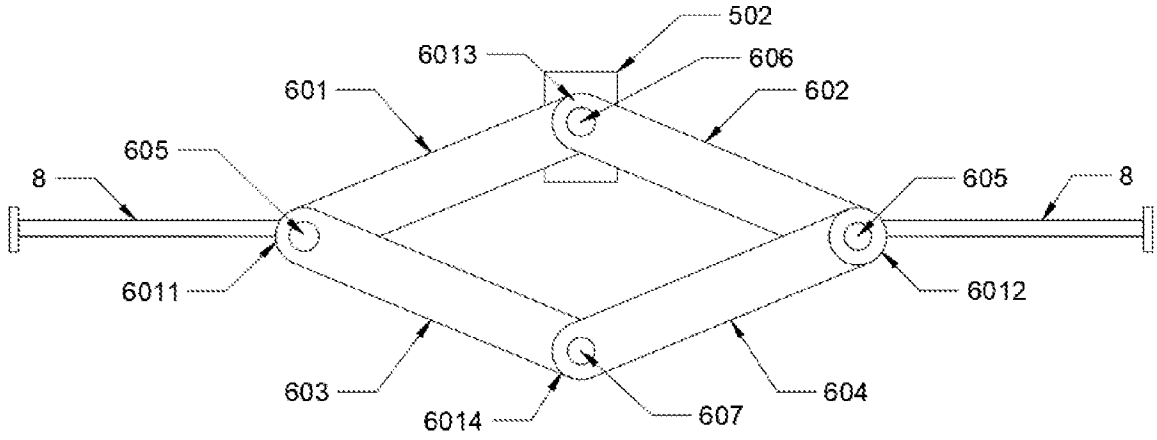

FIG.7

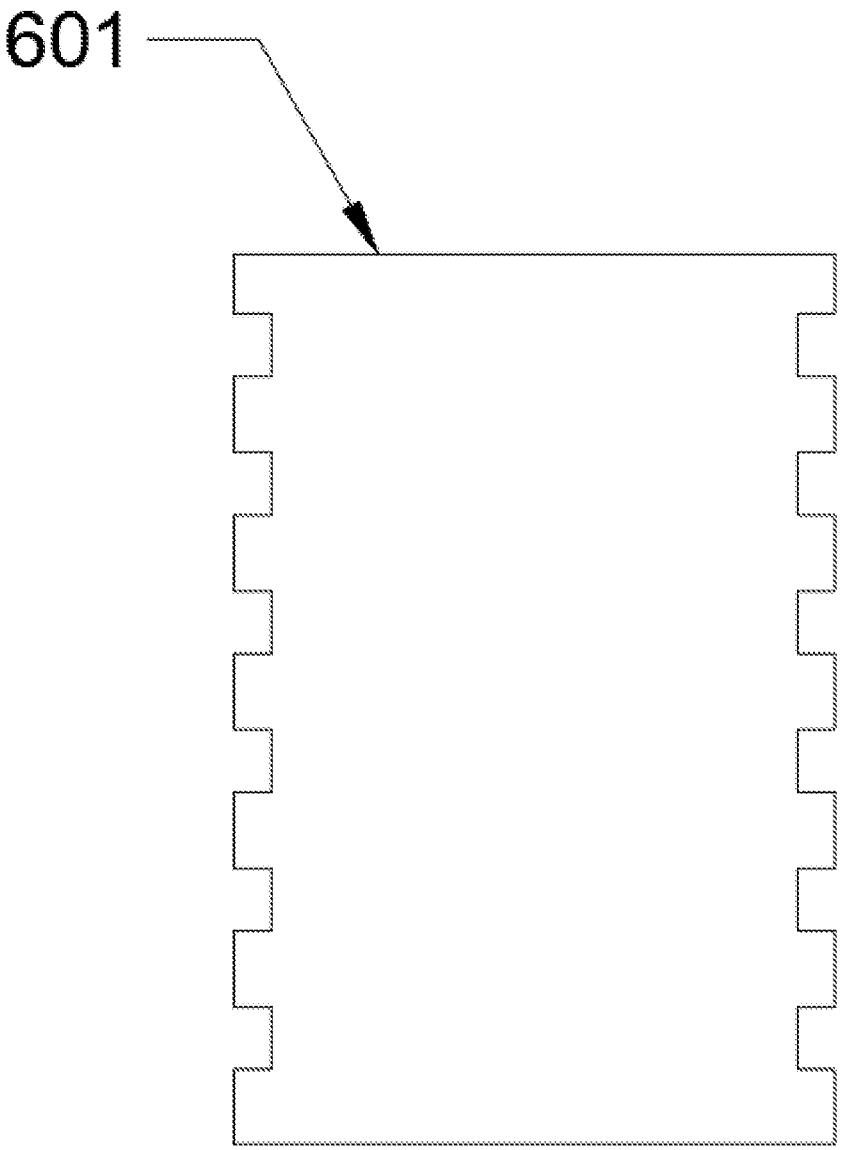

FIG.8

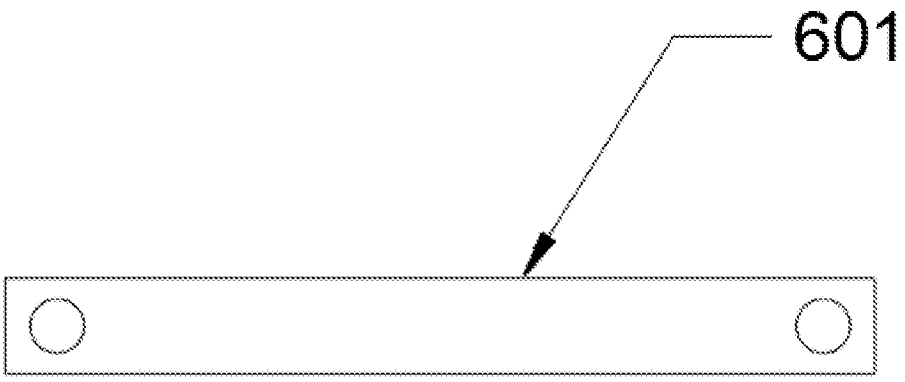

FIG.9

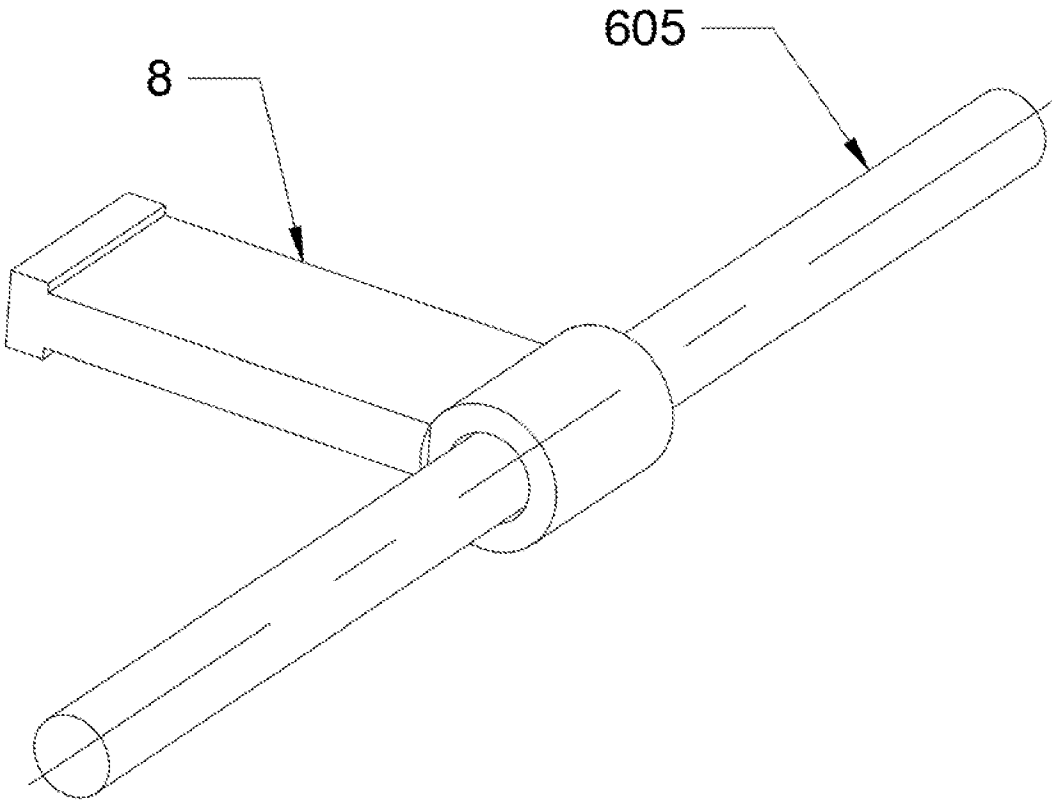

FIG.10

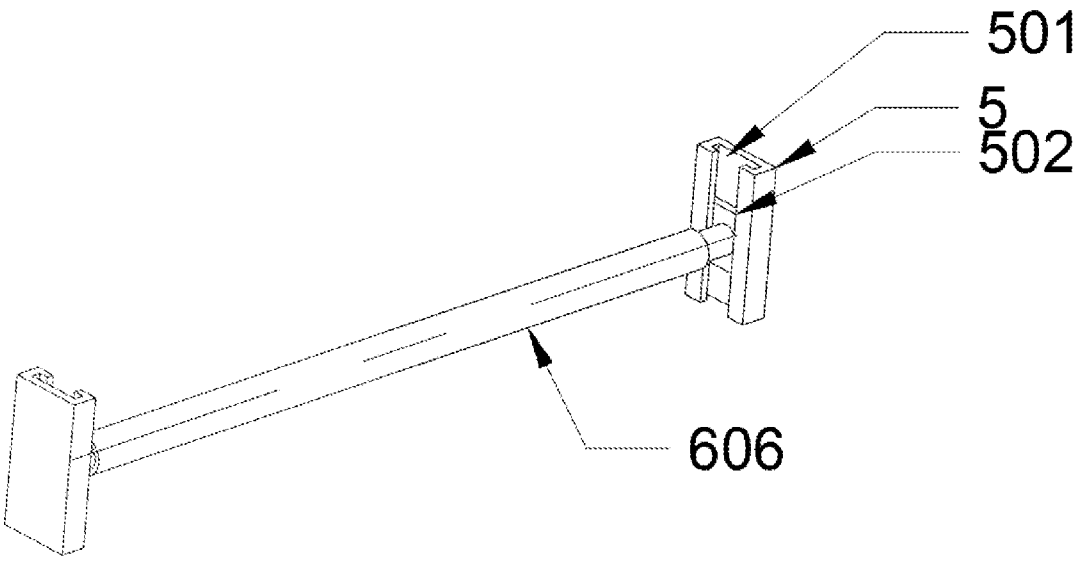

FIG.11

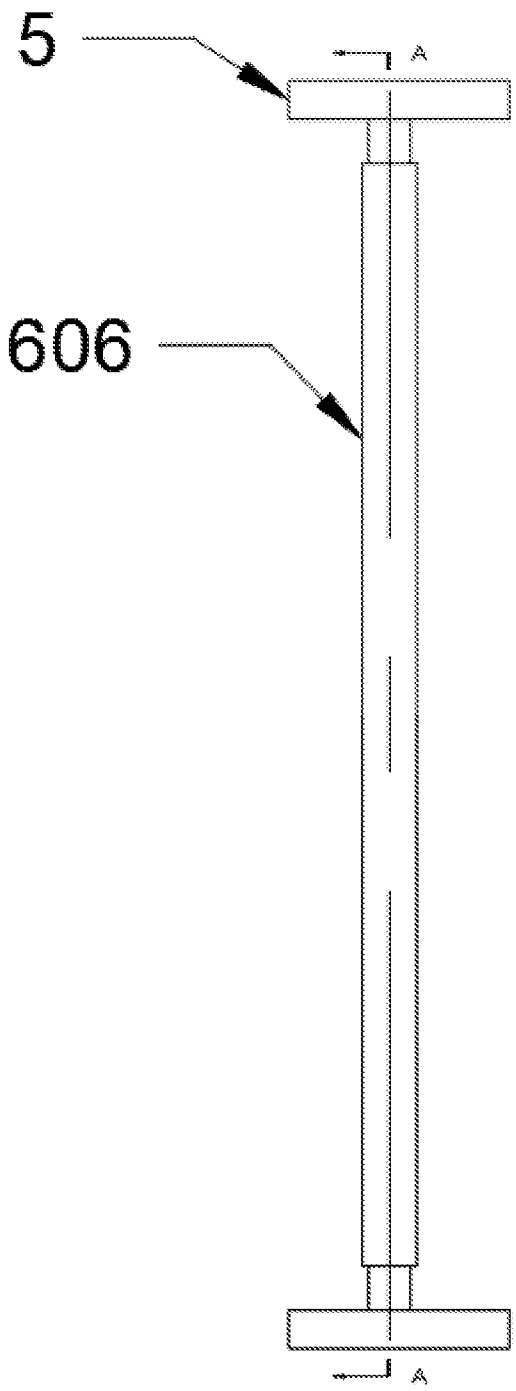

FIG.12

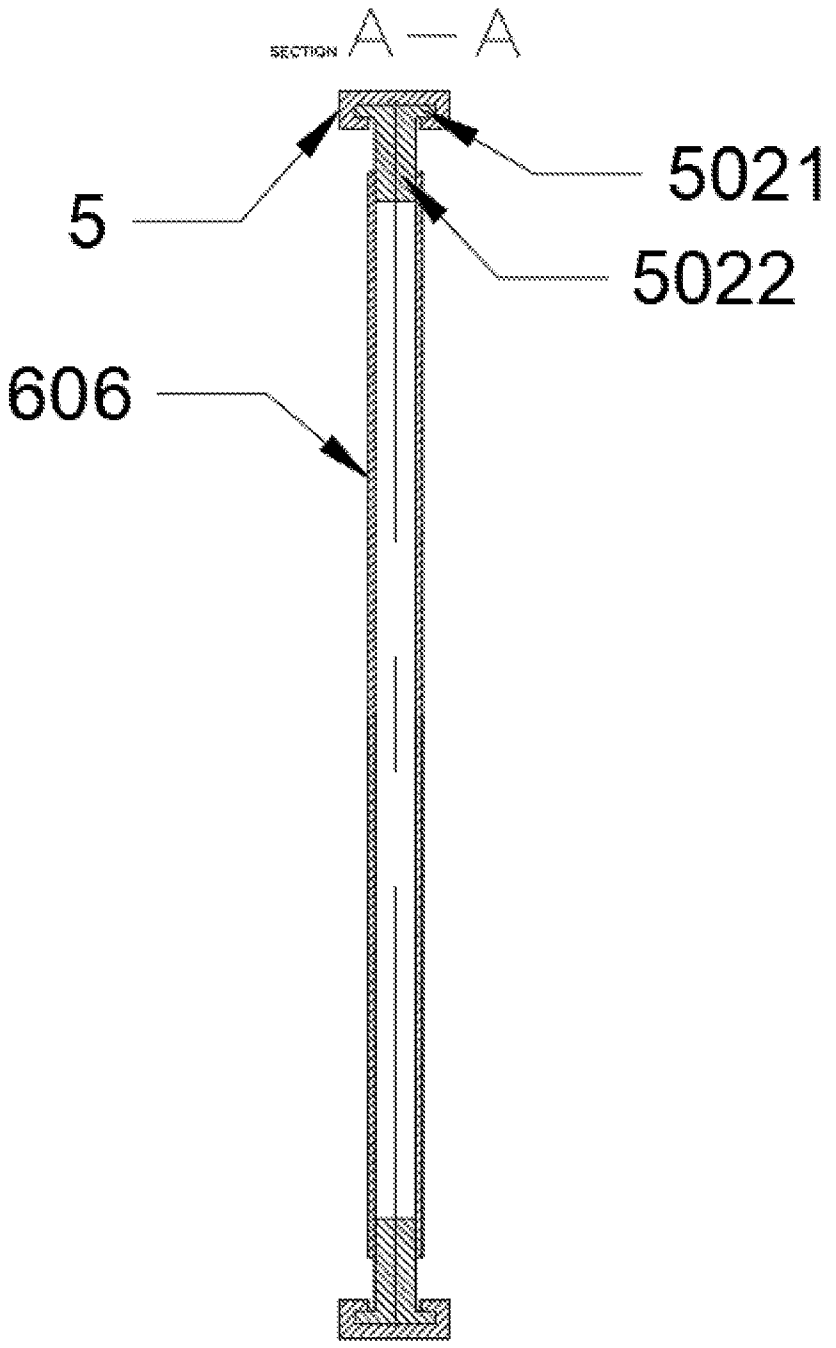

FIG.13