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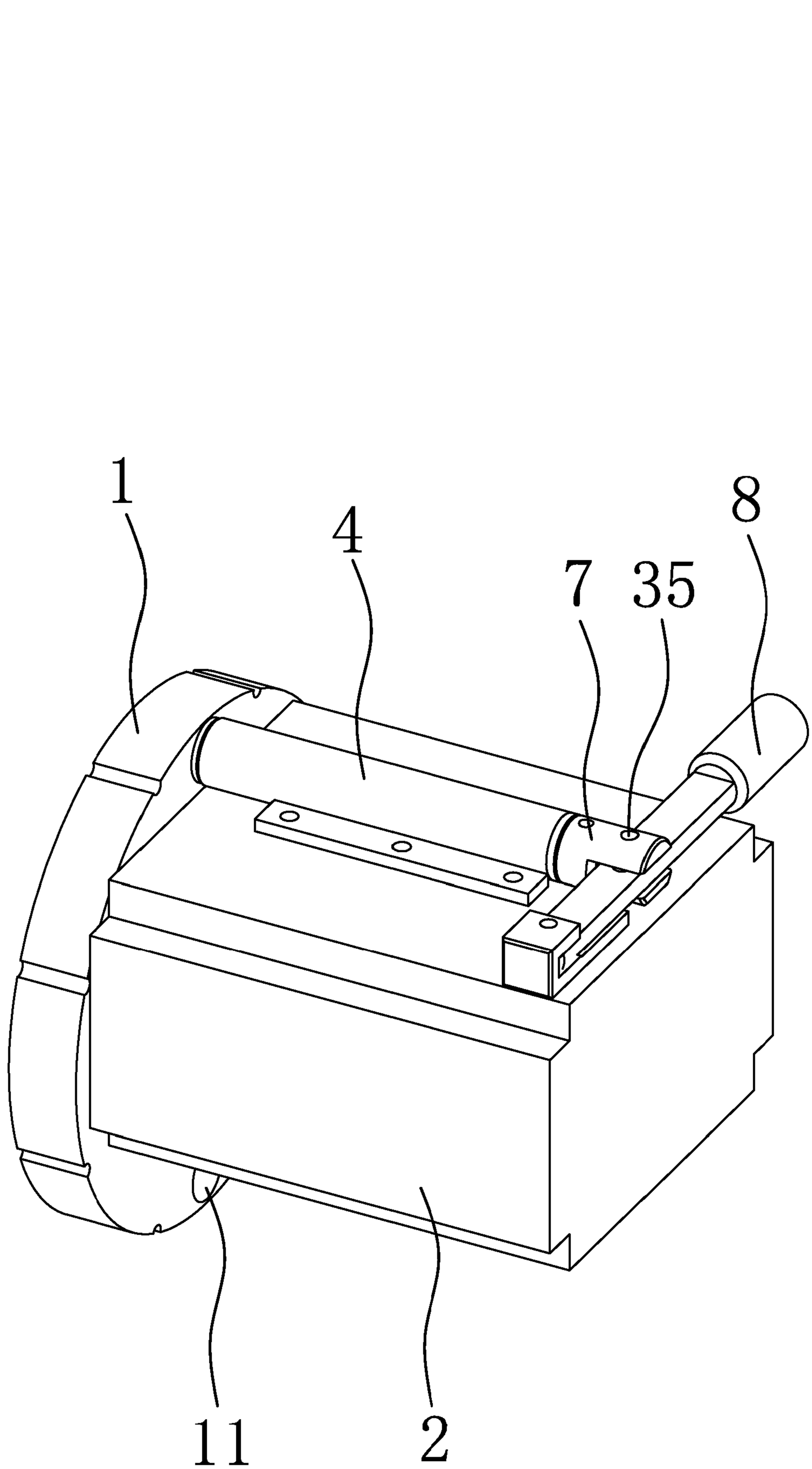

FIG. 1

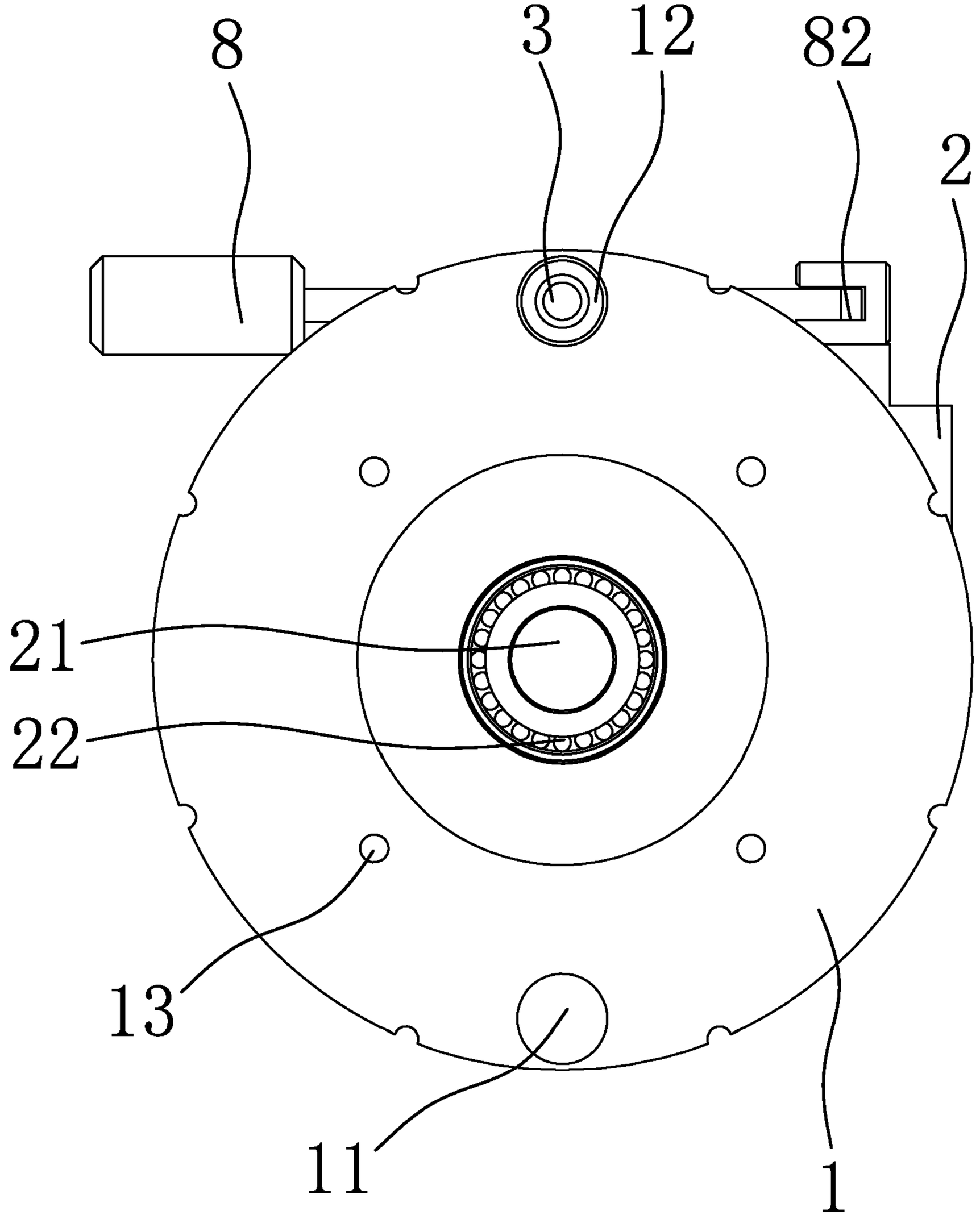

FIG. 2

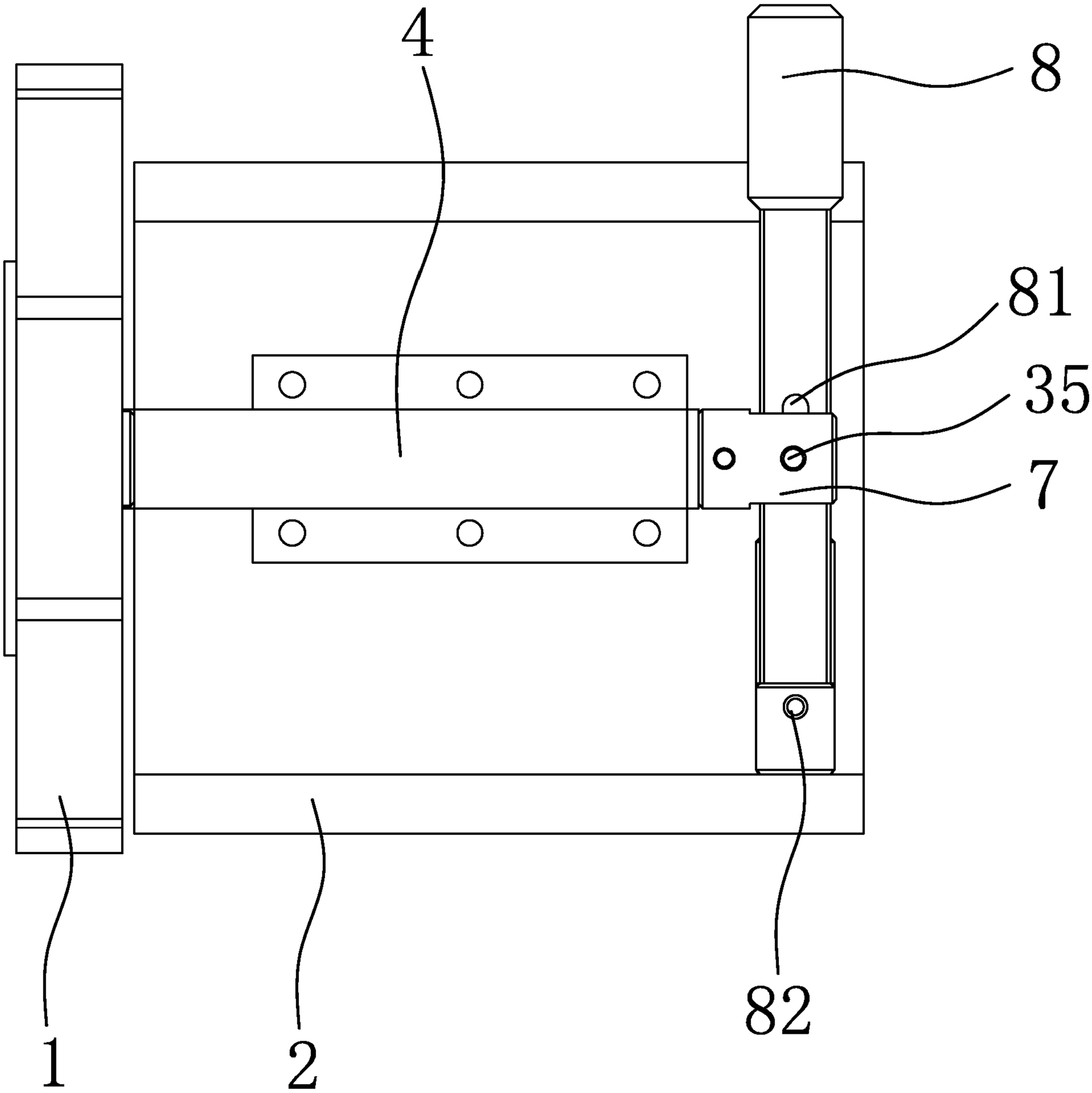

FIG. 3

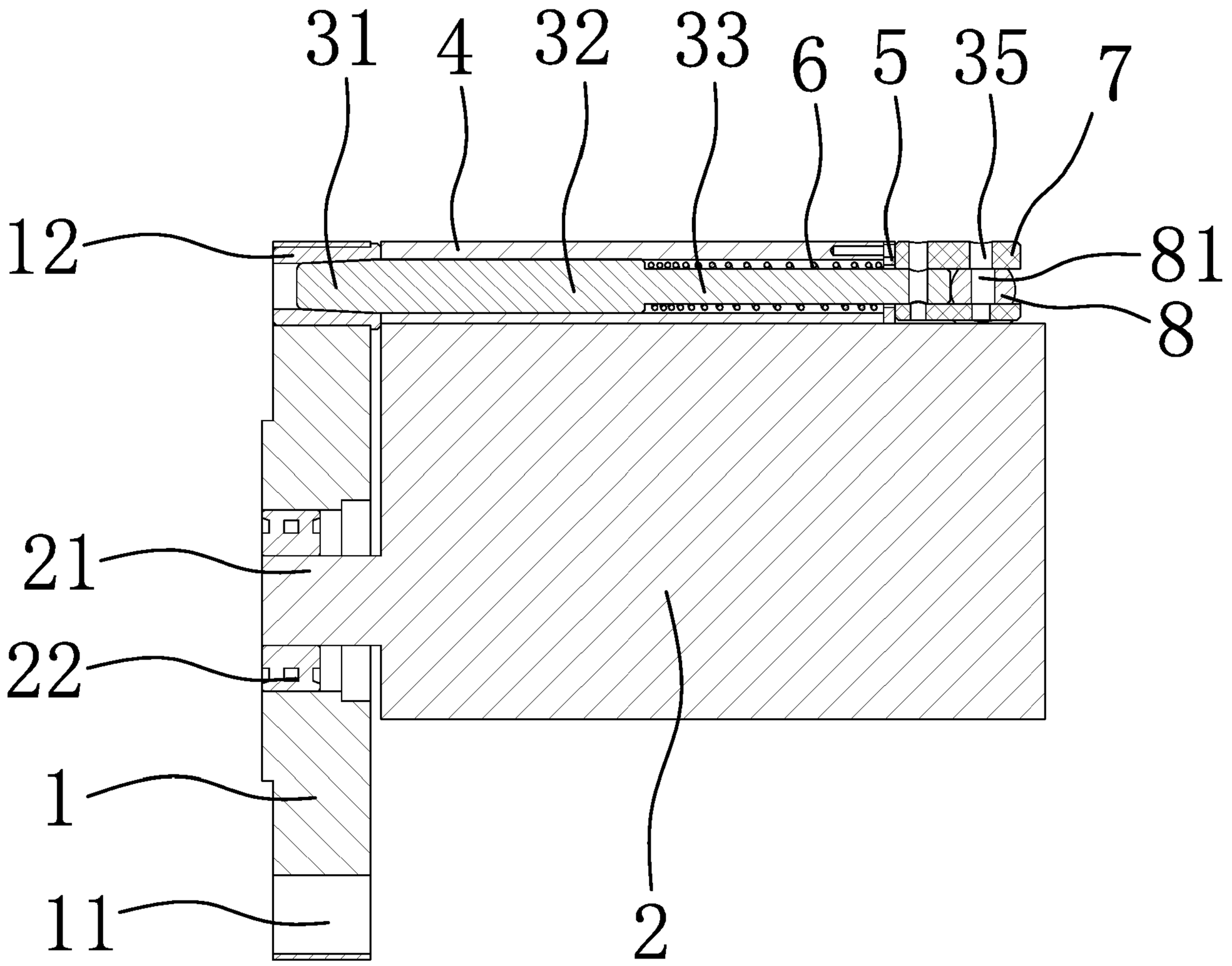

FIG. 4

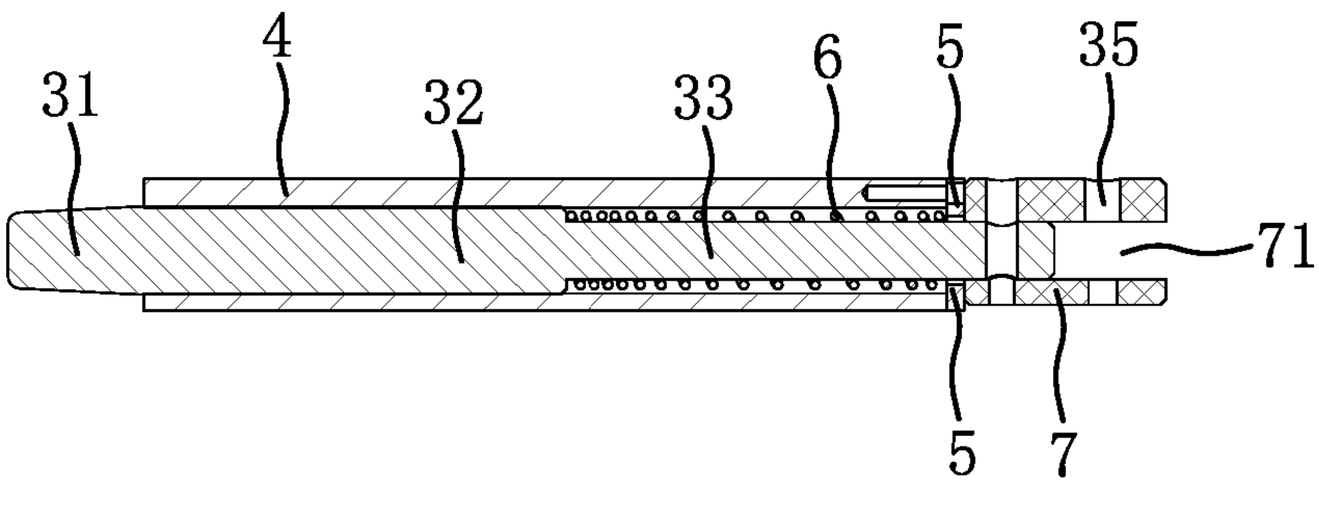

FIG. 5

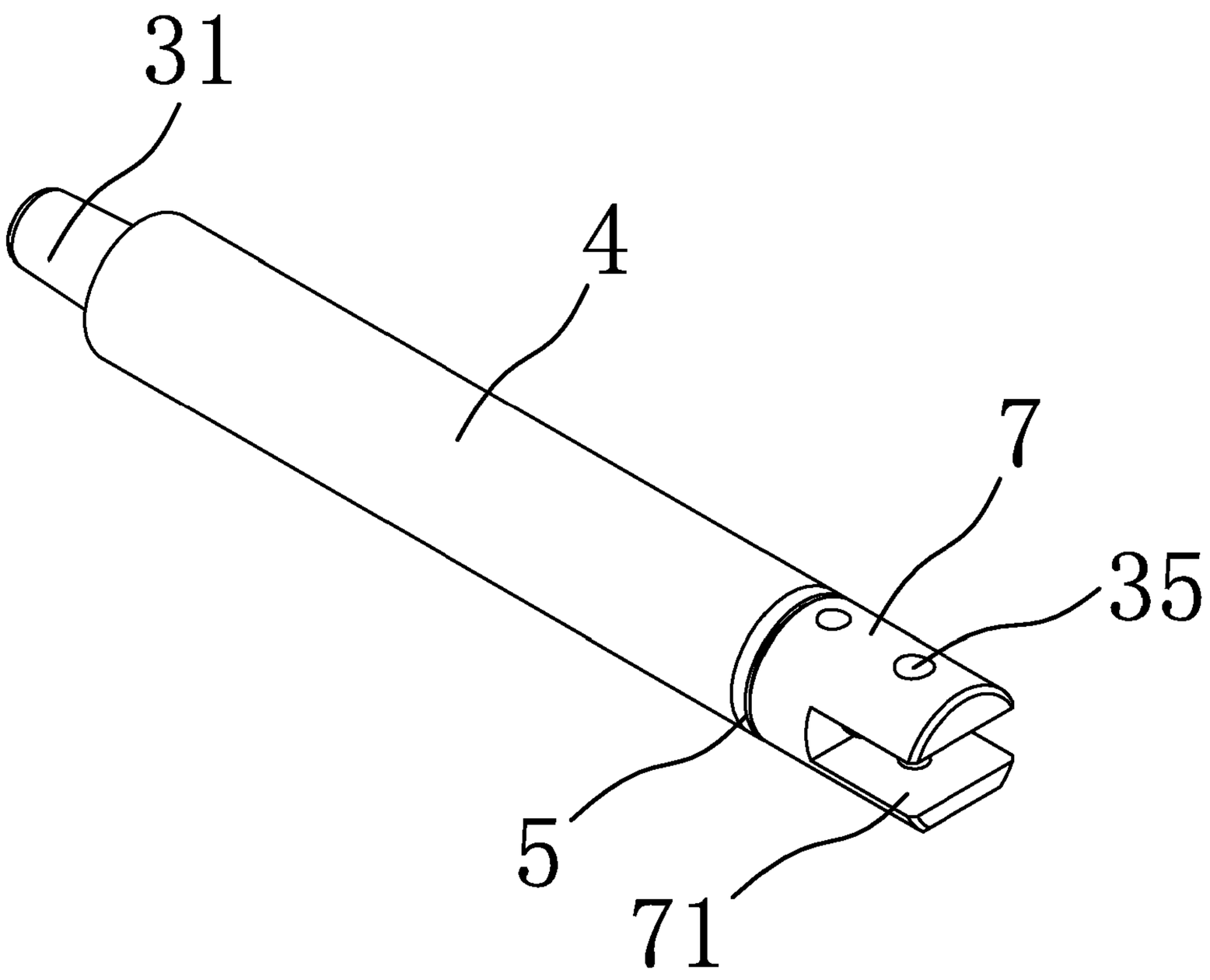

FIG. 6

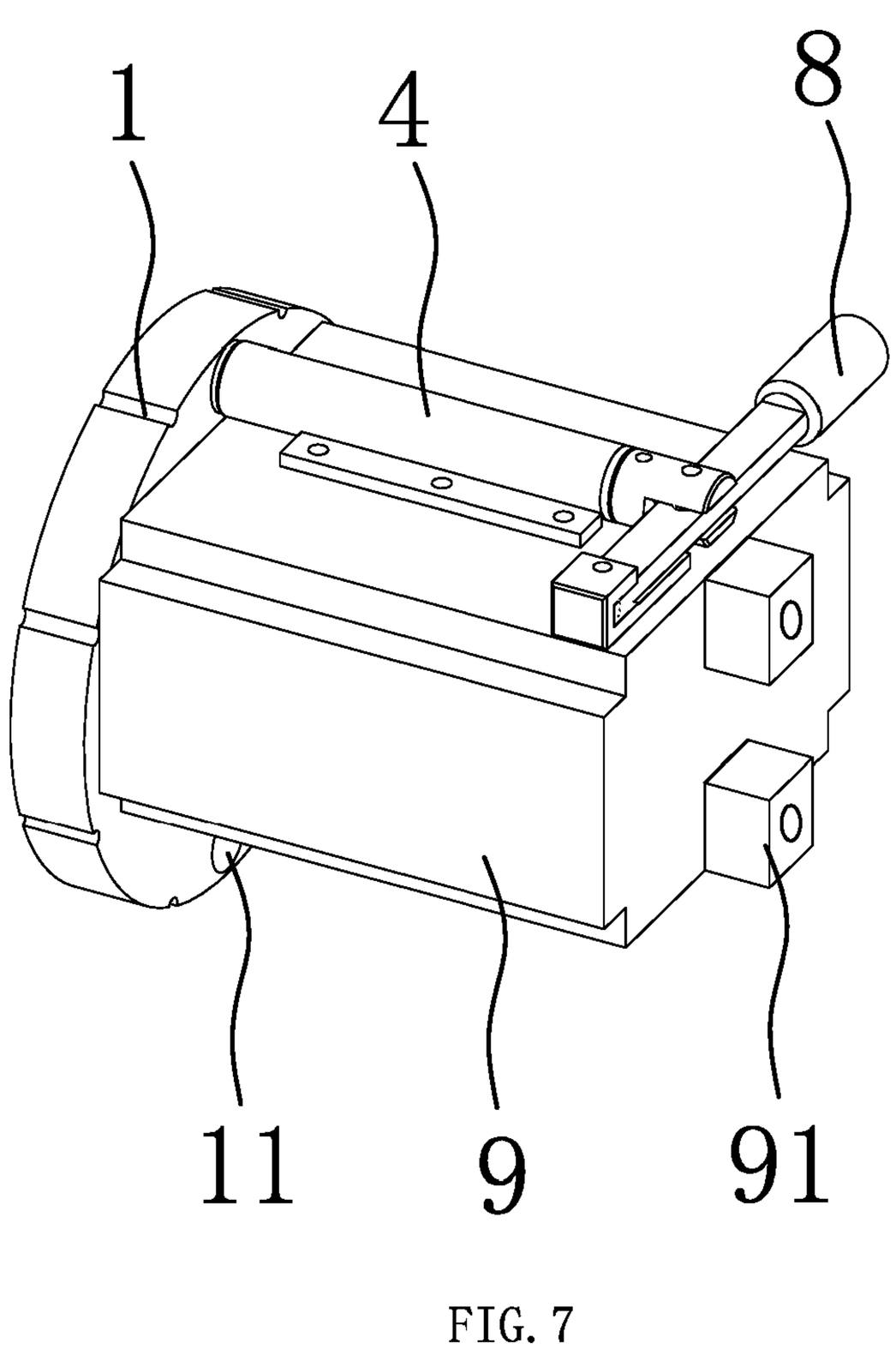

FIG. 7

POSITIONING DEVICE FOR WELDING BY ROBOT

Technical Field of the Invention

The present invention relates to the field of auxiliary welding devices, and in particular to a positioning device for welding by a robot.

Background of the Invention

To improve the welding efficiency and quality, welding robots are used to perform welding. However, a welding robot can perform welding on only one side of a component to be welded. If it is required to realize welding in multiple orientations of the component to be welded, more welding robots need to be used. As a result, the cost is increased greatly. Moreover, the welding robots will occupy a large space, and consequently, it makes the space very cramped.

Summary of the Invention

An objective of the present invention is to provide a positioning device for welding by a robot, which can improve the welding efficiency and quality.

The present invention discloses a positioning device for welding by a robot, including a fixture assembly used for fixing a component to be welded, a turntable fixed to the fixture assembly, and a rotary positioning device which is used for rotating and fixing the turntable, wherein the rotary positioning device includes a fixed shaft and a positioning member; the fixed shaft is fixed to the turntable, and the turntable can rotate about an axis of the fixed shaft; several positioning holes are formed on the turntable, and the several positioning holes are annularly arranged at intervals around the axis of the fixed shaft; the positioning member includes a positioning pin shaft; and, the positioning pin shaft is moved axially when stressed so that one end of the positioning pin shaft is moved into the positioning hole.

In the present invention, the rotation of the component to be welded is controlled by a rotatable turntable, so that it is convenient for a welding robot to perform welding in multiple orientations of the component to be welded. Moreover, it is

unnecessary to provide more welding robots to improve the welding efficiency and quality, and the cost can be thus reduced greatly. The number and position of fixture assemblies may be selected according to the shape and structure of the component to be welded, and the fixture assemblies may be combined and fixed on the turntable. The fixture assemblies may be fixed to the turntable via fasteners such as bolts and nuts. The coordination of the positioning pin shaft with the positioning holes ensures fixation of the turntable. This avoids deviation of the position of welding by the welding robot caused by rotation of the turntable due to an external force. The present invention has high stability and can ensure the welding quality.

The rotary positioning device includes a fixed seat; and, one end of the fixed shaft is fixed to the fixed seat while the other end thereof is fixed to the turntable via a bearing. An operator can apply a force to the turntable to manually rotate the turntable, without needing any motor having a high rotation precision. Accordingly, the cost is reduced. Moreover, the present invention is suitable for manual welding, and a welder can realize welding in multiple orientations of the component to be welded without walking around or crouching down.

The rotary positioning device includes a driving motor; the fixed shaft is linked with an output shaft of the driving motor; the driving motor is accompanied with several control boxes, each of which is provided with several control switches; the control switches are electrically connected to the driving motor, and each of the control switches correspond to one rotation position of the turntable and one positioning hole; and, when a control switch is triggered, the output shaft of the driving motor is rotated to drive the turntable to rotate, and the positioning hole corresponding to the triggered control switch is caused to be coaxial to the positioning pin shaft. By setting a control system, an operator can trigger a corresponding control switch according to the position of the turntable after its rotation. A servo motor may be used as a driving motor. After the turntable is rotated to allow one positioning hole to be coaxial to the positioning pin shaft, the positioning pin shaft is operated to move to the positioning hole, and an end of the positioning pin shaft close to the turntable is extended into the positioning hole. In this way, the turntable is positioned and fixed.

Subsequently, the welding operation can be performed.

Preferably, the positioning pin shaft at least consists of a first section and a second section; the diameter of the first section is greater than that of the second section, and the first section is close to the turntable; a guide cylinder is sheathed outside the positioning pin shaft; the guide cylinder is fixed to a fixed part, and a compression spring is provided within the guide cylinder; the compression spring is sheathed on the second section, and one end of the compression spring is resisted against an end of the guide cylinder away from the turntable while the other end thereof is resisted against the first section; a front through hole for allowing one end of the positioning pin shaft to pass therethrough is formed at an end of the guide cylinder close to the turntable; and, under a biasing force of the compression spring, the positioning pin shaft is moved to the turntable along the guide cylinder and then passes through the front through hole. This arrangement is used for fitting the positioning pin shaft with the positioning hole, and the position of the positioning pin shaft is maintained by the compression spring so as to realize the fixation of the turntable. The shape of the end of the positioning pin shaft close to the turntable is selected as required, so that the disengagement of the positioning pin shaft is avoided when the compression spring pushes the positioning pin shaft to the turntable. The fixed part is a shell of the driving motor, a fixed seat, a working platform or the like.

Preferably, a rear through hole for allowing the second section of the positioning pin shaft to pass therethrough is formed at an end of the guide cylinder away from the turntable; the second section of the positioning pin shat passes through the rear through hole and is then fixed to a rotary handle; one end of the rotary handle is hinged and fixed to a fixed part and forms a hinge point with the fixed part; a first fitting hole is formed at a part of the rotary handle deviated from the hinge point; the first fitting hole is an elongated hole and arranged along an axis of the rotary handle; and, a pin is fixed at a part of the second section outside the guide cylinder, and the pin is fitted within the first fitting hole. This arrangement is used for retreating the positioning pin shaft from the positioning hole and releasing the positioning and fixation of the turntable, so that it is convenient for welding in other orientations of

the component to be welded. In the present invention, the movement of the positioning pin shaft is realized by the linkage of the rotary hand with the positioning pin shaft. If it is required to release the fixation of the turntable, the operator pulls the rotary handle. In this case, the pin is moved within the first fitting hole and drives the positioning pin shaft to move so as to retreat the positioning pin shaft from the positioning hole.

Preferably, the positioning pin shaft includes a first section, a second section and a third section, with the first section being located between the second section and the third section, the diameter of the first section being greater than that of the third section, and the inner diameter of the front through hole being less than the diameter of the second section; and, the third section is of a frustum structure having an increasing diameter, positioning sleeves are fitted within the positioning holes, and tapered holes used for matching with the third section of the positioning pin shaft are formed on the positioning sleeves. This arrangement is used for limiting the positioning pin shaft to avoid the disengagement of the positioning pin shaft from the guide cylinder due to the compression spring. Since the third section looks like a frustum and tapered holes are formed on positioning sleeves within the positioning holes, it is convenient for allowing the positioning pin shaft to enter the positing hole, and it is also convenient for positioning and fixing the turntable.

Preferably, a connector located on an outer side of the guide cylinder is fixed at an end of the positioning pin shaft away from the turntable; a notch running through a radial outer wall of the connector is formed on the connector, and a second fitting hole used for fitting the pin is formed on the connector; the notch is communicated with the second fitting hole; and, the rotary handle is fitted within the notch via the pin so as to be fixed to the connector. The arrangement of the connector is convenient for the linkage of the rotary handle with the positioning pin shaft. The pin may be arranged vertically and the head of the pin may be located on an upper side of the connector, so that the separation of the rotary handle from the positioning pin shaft resulted from the disengagement of the pin is avoided.

Preferably, the second fitting hole runs through the connector; one end of the

connector is divided into two portions by the notch; and, the pin is fitted within the second fitting hole, and a middle portion of the pin is located within the first fitting hole. With such an arrangement, the structure of the present invention becomes more stable.

Preferably, the turntable is arranged at one end of the driving motor, while the control boxes are arranged at the other end of the driving motor; the fixed shaft and the output shaft are arranged coaxially; and, the several control switches are annularly arranged at intervals around the axis of the fixed shaft. The control switches of the control boxes and the positioning holes are both annularly arranged at intervals, and one control switch corresponds to one positioning hole. This arrangement is convenient for an operator to rotate the turntable as required so as to select a control switch.

Preferably, a fixed plate is fixed at an end of the guide cylinder away from the turntable via a fastener; the rear through hole is formed on the fixed plate; and, one end of the compression spring is resisted against an inner side of the fixed plate while the other end thereof is resisted against the first section. This arrangement is convenient for machining the guide cylinder and assembling the device of the present invention.

In the present invention, the welding quality and efficiency are improved without increasing the number of welding robots. Moreover, the present invention is easy to operate and high in stability.

Brief Description of the Drawings

Fig. 1 is a structural diagram of Embodiment 1 of the present invention;

Fig. 2 is a structural diagram of a turntable of the present invention;

Fig. 3 is a structural diagram of a rotary positioning device of the present invention;

Fig. 4 is another structural diagram of the rotary positioning device of the present invention;

Fig. 5 is a structural diagram of a positioning member of the present invention;

Fig. 6 is another structural diagram of the positioning member of the present invention; and

Fig. 7 is a structural diagram of Embodiment 2 of the present invention.

Detailed Description of the Invention

The present invention will be further described below by specific embodiments with reference to the accompanying drawings.

Embodiment 1

As shown in Figs. 1, 2, 4 and 5, the present invention provides a positioning device for welding by a robot, including a fixture assembly used for fixing a component to be welded, a turntable 1 fixed to the fixture assembly, and a rotary positioning device used for rotating and fixing the turntable 1. Fixture fitting holes 13 used for fixing the fixture assembly are formed on the turntable 1. The rotary positioning device includes a fixed shaft 21 arranged horizontally and a positioning member. One end of the fixed shaft 21 is fixed to a fixed seat 2, while the other end thereof is fixed to the turntable 1 via a bearing 22. The turntable 1 can rotate about an axis of the fixed shaft 21. Two positioning holes 11 are formed on the turntable 1. The positioning holes 11 are annularly arranged at uniform intervals around the axis of the fixed shaft. The positioning member includes a positioning pin shaft 3 parallel to the fixed shaft 21. The positioning pin shaft 3 is fixed within a guide cylinder 4. The guide cylinder 4 is fixed on an upper side of the fixed seat 2 via a fastener. The positioning pin shaft 3 is used for fitting in the positioning hole 11 to realize the positioning and fixation of the turntable 1, so as to prevent the rotation of the turntable 1.

As shown in Figs. 4 and 5, the positioning pin shaft 3 consists of a first section 32, a second section 33 and a third section 31. The first section 32 is located between the third section 31 and the second section 33, and the third section 31 is closest to the turntable 1. The diameter of the first section 32 is greater than the diameter of the second section 33 and the diameter of the third section 31. A front through hole for allowing one end of the positioning pin shaft 3 to pass therethrough is formed at an

end of the guide cylinder 4 close to the turntable 1, and a fixed plate 5 is fixed at an end of the guide cylinder 4 away from the turntable 1 via a screw. A rear through hole for allowing the second section 33 to pass therethrough is formed on the fixed plate 5. The inner diameter of the front through hole is less than the diameter of the second section 33.

A compression spring 6 is provided within the guide cylinder 4. The compression spring 6 is sheathed on the second section 33. One end of the compression spring 6 is resisted against an inner side of the fixed plate 5, while the other end thereof is resisted against the first section 32. Due to the compression spring, the positioning pin shaft 3 is moved to the turntable 1 along the guide cylinder 4 and then passes through the front through hole.

As shown in Figs. 1 to 6, the third section 31 is of a frustum structure having an increasing diameter. Positioning sleeves 12 are fitted within the positioning holes 11, and tapered holes used for matching with the third section 31 of the positioning pin shaft 3 are formed on the positioning sleeves 12. The second section 33 of the positioning pin shaft 3 passes through the rear through hole and is then linked with a rotary handle 8 via a pin. One end of the rotary handle 8 is hinged and fixed to the fixed seat 2 and forms a hinge point 82 with the fixed seat 21. A first fitting hole 81 is formed at a part of the rotary handle 8 deviated from the hinge point 82. The first fitting hole 81 is an elongated hole and arranged along an axis of the rotary handle 8. A pin is fixed to the second section 33 of the positioning pin shaft 3, and the pin is fitted within the first fitting hole 81.

A part of the second section 33 of the positioning pin shaft 3 passing through the rear through hole to extend to the outside of the guide cylinder 4 is connected to a connector 7 via a fastener. A notch 71 running through a radial outer wall of the connector 7 in a left-right direction is formed on the connector 7. One end of the connector 7 is divided into two portions by the notch 71, i.e., an upper portion and a lower portion. A second fitting hole 36 which is used for fitting the pin and runs through the connector 7 in an up-down direction is formed on the connector 7. The notch 71 is communicated with the second fitting hole 35. The rotary handle 8 is fitted

within the notch 71, and a middle portion of the pin is fitted within the first fitting hole 81.

Before use of the present invention, the fixture assembly is arranged according to the shape and structure of the component to be welded. Then, the fixture assembly is fixed on the turntable via a fastener to perform a welding operation. Subsequently, the rotary handle is pulled to retreat the positioning pin shaft from one positioning hole. An operator turns the turntable by one hand to rotate the turntable while maintaining the position of the rotary handle by the other hand. After the positioning hole is aligned with the positioning pin shaft, the rotary handle is released, and the positioning pin shaft then enters the positioning hole. Subsequently, a welding robot is operated to perform welding in the next stage.

Embodiment 2

As shown in Fig. 7, the rotary positioning device of the present invention includes a driving motor 9. The fixed shaft 21 is linked with an output shaft of the driving motor 9. The driving motor 9 is accompanied with two control boxes 91, each of which is provided with a control switch. The control switches are electrically connected to the driving motor 9, and each of the control switches corresponds to one rotation position of the turntable 1 and one positioning hole 11. When a control switch is triggered, the output shaft of the driving motor is rotated to drive the turntable 1 to rotate, and the positioning hole 11 corresponding to the triggered control switch is caused to be coaxial to the positioning pin shaft 3. The turntable 1 is arranged at one end of the driving motor 9, while the control boxes 91 are arranged at the other end of the driving motor 9. The fixed shaft and the output shaft are arranged coaxially. The two control switches are annularly arranged at uniform intervals around the axis of the fixed shaft. Other structures of this embodiment are similar to those in Embodiment 1.

In the present invention, by setting a control system for the control boxes, an operator can trigger a corresponding control switch according to the position of the turntable after rotation. As the driving motor, a servo motor may be used. After the turntable is rotated to allow one positioning hole to be coaxial to the positioning pin

shaft, the rotary handle is pulled to allow the positioning pin shaft to move to the positioning hole along the guide cylinder, and an end of the positioning pin shaft close to the turntable is extended into the positioning hole, so that the turntable is positioned and fixed. Subsequently, the welding operation will be performed.

Claims

1. A positioning device for welding by a robot, comprising a fixture assembly used for fixing a component to be welded, a turntable fixed to the fixture assembly, and a rotary positioning device which is used for rotating and fixing the turntable, wherein:

the rotary positioning device comprises a fixed shaft and a positioning member;

the fixed shaft is fixed to the turntable, and the turntable is configured to rotate about an axis of the fixed shaft;

a plurality of positioning holes are formed on the turntable and annularly arranged at intervals around the axis of the fixed shaft;

the positioning member comprises a positioning pin shaft which is configured to be moved axially when stressed so that one end of the positioning pin shaft is moved into the positioning hole;

the rotary positioning device further comprises a fixed seat and a driving motor;

one end of the fixed shaft is fixed to the fixed seat while the other end thereof is fixed to the turntable via a bearing;

the fixed shaft is linked with an output shaft of the driving motor;

the driving motor is accompanied with a plurality of control boxes, each of which is provided with a plurality of control switches electrically connected to the driving motor, each of the control switches corresponding to one rotation position of the turntable and one positioning hole; and

when a control switch is triggered, the output shaft of the driving motor is rotated to drive the turntable to rotate, and the positioning hole corresponding to the triggered control switch is caused to be coaxial to the positioning pin shaft.

2. The positioning device for welding by a robot according to claim 1, wherein:

the positioning pin shaft at least consists of a first section and a second section the diameter of the first section being greater than that of the second section, and the first section being close to the turntable;

a guide cylinder is sheathed outside the positioning pin shaft and fixed to a fixed

part, and a compression spring is provided within the guide cylinder;

the compression spring is sheathed on the second section, and one end of the compression spring is resisted against an end of the guide cylinder away from the turntable while the other end thereof is resisted against the first section;

a front through hole for allowing one end of the positioning pin shaft to pass therethrough is formed at an end of the guide cylinder close to the turntable; and

the positioning pin shaft is configured to move to the turntable along the guide cylinder and then pass through the front through hole under a biasing force of the compressing spring.

3. The positioning device for welding by a robot according to claim 2, wherein:

a rear through hole for allowing the second section of the positioning pin shaft to pass therethrough is formed at an end of the guide cylinder away from the turntable;

the second section of the positioning pin shaft passes through the rear through hole and is then fixed to a rotary handle;

one end of the rotary handle is hinged and fixed to a fixed part and forms a hinge point with the fixed part;

a first fitting hole is formed at a part of the rotary handle deviated from the hinge point, the first fitting hole being an elongated hole and arranged along an axis of the rotary handle; and

a pin is fixed at a part of the second section outside the guide cylinder and fitted within the first fitting hole.

4. The positioning device for welding by a robot according to claim 2, wherein:

the positioning pin shaft comprises a first section, a second section and a third section, the first section being located between the second section and the third section, the diameter of the first section being greater than that of the third section, and the inner diameter of the front through hole being less than the diameter of the second section; and

the third section is of a frustum structure having an increasing diameter,

positioning sleeves are fitted within the positioning holes, and tapered holes used for matching with the third section of the positioning pin shaft are formed on the positioning sleeves.

5. The positioning device for welding by a robot according to claim 3, wherein:

a connector located on an outer side of the guide cylinder is fixed at an end of the positioning pin shaft away from the turntable;

a notch running through a radial outer wall of the connector is formed on the connector, and a second fitting hole used for fitting the pin is formed on the connector;

the notch is communicated with the second fitting hole; and

the rotary handle is fitted within the notch via the pin so as to be fixed to the connector.

6. The positioning device for welding by a robot according to claim 5, wherein:

the second fitting hole runs through the connector;

one end of the connector is divided into two portions by the notch; and

the pin is fitted within the second fitting hole, and a middle portion of the pin is located within the first fitting hole.

7. The positioning device for welding by a robot according to claim 1, wherein:

the turntable is arranged at one end of the driving motor, while the control boxes are arranged at the other end of the driving motor;

the fixed shaft and the output shaft are arranged coaxially; and

the plurality of control switches are annularly arranged at intervals around the axis of the fixed shaft.

8. The positioning device for welding by a robot according to claim 3 or 5, wherein:

a fixed plate is fixed at an end of the guide cylinder away from the turntable via a

fastener;

the rear through hole is formed on the fixed plate; and

one end of the compression spring is resisted against an inner side of the fixed plate while the other end thereof is resisted against the first section.