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APPARATUS FOR AUTOMATICALLY MOUNTING H-SHAPED STEEL COLUMN.

(57)

Disclosed is an apparatus for automatically mounting an H-shaped steel column, the apparatus comprising a grabbing device for fixing an object to be mounted, wherein the grabbing device is fixedly provided with a moving device that moves the grabbing device along the x-axis, y-axis and z-axis, and the grabbing device is further fixedly provided with a turning device; and the turning device comprises a beam turning mechanism used for rotating the object to be mounted, which is in a horizontal state, to a position above a mounting position, and further comprises a cantilever turning mechanism used for rotating the object to be mounted, which is in a horizontal state, to a vertical state.

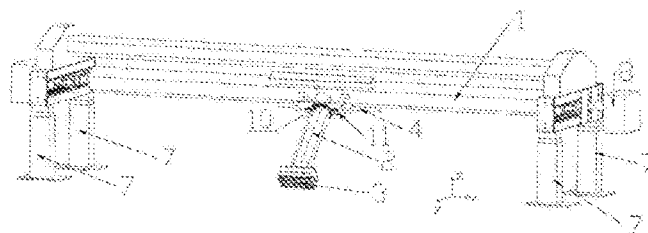


Fig. 1

Technical Field

The present utility model belongs to the technical field of engineering machinery, and relates to the installation of H-shaped steel columns of overhead lines of the electrified railway, in particular to an apparatus for automatically installing H-shaped steel columns.

Background Art

Overhead lines are high-voltage transmission lines erected in a zigzag shape overhead the rails of an electrified railway for the pantograph to draw current. The overhead line is a main frame of a railway electrification project, and is an electric power transmission line in a special form erected overhead the railway line to supply electric power to the electric locomotives. The overhead lines consist of contact suspension, supporting means, positioning means, columns and foundation, wherein the columns and the foundation are used to bear all the loads of the contact suspension, supporting means and positioning means, and fix the contact suspension at specified position and elevation. The overhead lines in China employ pre-stressed reinforced concrete columns and steel columns. The foundation is for the steel columns, i.e., the steel columns are fixed on the underlying foundation made of reinforced concrete, and the foundation bear all loads transferred by the columns and ensures the stability of the columns. The pre-stressed reinforced concrete columns and the foundation are made into one piece, with the bottom end directly buried in the ground. The steel columns are often installed by means of mechanical equipment owing to the great dimensions and heavy weight of the steel columns.

Early in 2005, improved caterpillar excavators were employed in Germany to accomplish electrified steel column installation and construction. The bucket device in the conventional caterpillar excavator was modified to a grabbing bucket device that was enclosed and applied force in opposite directions; the improved caterpillar excavator grabbed the reinforced concrete poles or steel columns laid along the foundation pit in advance and accomplished steel column construction accurately and quickly by virtue of the flexible advantage of the caterpillar tracks when the equipment was transported to the foundation pit before the railroad tracks were laid. After the tracks were laid, post-erecting cars for the overhead lines were utilized to finish the remaining pole erection work. In that way, in the installation work of reinforced concrete poles or steel columns, railroad tracks have to be laid on the ground so that the apparatus can move with the caterpillar tracks. Thus, the operation is inconvenient and has low efficiency.

A semi-mechanized mode is employed in electrified railway construction in China. In the steel column installation process, the steel columns are lifted by a truck crane or lorry-mounted crane before the tracks are laid; then the steel columns are positioned in place with manual assistance; after the tracks are laid, post-erecting cars for the overhead lines are employed to lift the steel columns for installation with manual assistance. Such an approach has the following defects: firstly, the degree of mechanization is low, manpower assistance is required strongly, and the working efficiency is seriously limited by the proficiency of the construction personnel, the working efficiency is low and the construction cost is high; secondly, since the steel columns are usually

lifted on the truck or crane with ropes, the steel columns may sway in the movement process, and certain safety distance between the workers and the steel columns must be kept in the working process; thirdly, there are some hazards in the working process, for example, the poles have to be supported and positioned manually, and the workers have to climb up the poles and pick off the harness, etc.

Contents of the Utility Model

To overcome the drawbacks in the prior art, the object of the present utility model is to provide an apparatus for automatically installing H-shaped steel columns, so as to achieve the purposes of improving the level of mechanization, reducing the labor intensity of the workers, and improving the working efficiency.

To attain the object described above, the present utility model employs the following technical solution: an apparatus for automatically installing H-shaped steel columns comprises a gripping device for fixing the object to be installed, wherein a moving device is fixed on the gripping device to move the gripping device along x-axis, y-axis, and z-axis, and a revolving device is also fixed on the gripping device;

the revolving device comprises a beam revolving mechanism for revolving the object to be installed in a horizontal state to a position above the installation position, and a cantilever revolving mechanism for revolving the object to be installed in the horizontal state to a vertical state.

As a definition of the present utility model, the gripping device fixes the object to be installed by magnetic attraction.

As another definition of the present utility model, the gripping device comprises a cantilever and a beam, wherein the cantilever is vertically and fixedly connected to the beam, and the bottom end of the cantilever is used to fixedly connect with the object to be installed.

As a further definition of the present utility model, the moving device comprises an x-direction moving mechanism arranged at the top end of the cantilever to move the cantilever along the x-axis, a y-direction moving mechanism arranged at the left end and the right end of the beam to move the beam along the y-axis, and a z-direction moving mechanism arranged at the bottom end of the y-direction moving mechanism to move the beam along the z-axis.

As a further definition of the present utility model, the two ends of the beam are provided with a beam revolving mechanism, which comprises a beam revolving motor for driving the beam to rotate and a coupling for connecting the beam revolving motor with the beam.

As a further definition of the present utility model, the cantilever revolving mechanism comprises a driven gear ring fixed on the cantilever and a driving gear engaged with the driven gear ring so that the driven gear ring drives the cantilever to rotate around the axis of the cantilever.

As another definition of the present utility model, the x-direction moving mechanism is a lead screw, the y-direction moving mechanism is a rack and pinion mechanism, and the z-direction moving mechanism is a hydraulic cylinder.

As a further definition of the present utility model, both the cantilever and the beam are columns

with an octagonal cross section.

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As a further definition of the present utility model, an electromagnet is fixedly connected to the bottom end of the cantilever, the lead screw is driven by an x-direction motor to rotate, and the rack and pinion are driven by a y-direction motor to drive the gear to rotate.

As a further definition of the present utility model, the hydraulic cylinder is connected with an electro-hydraulic proportional valve, and the driving gear is driven by a cantilever revolving motor to rotate;

a control signal input terminal of the electro-hydraulic proportional valve, a control signal input terminal of the electromagnet, a control signal input terminal of the x-direction motor, a control signal input terminal of the y-direction motor, a control signal input terminal of the beam revolving motor and a control signal input terminal of the cantilever revolving motor are respectively connected with a control signal output terminal of a control device.

With the technical solution described above, the present utility model achieves the following beneficial effects when compared with the prior art:

- (1) In the present utility model, the object to be installed is rotated from a horizontal state to a vertical state before the installation by means of adjusting the distance of the object to be installed relative to the installation position along the x-axis, y-axis and z-axis, in combination with the use of a revolving device; thus, the movement is flexible, the degree of mechanization is high, the object can be installed accurately, quickly and conveniently, the working efficiency is greatly improved, and the labor intensity is greatly reduced.
- (2) In the present utility model, the object to be installed is fixed by means of magnetic attraction; thus, compared with the prior art in which the object to be installed is lifted and fixed by means of steel wire ropes, the object can be stably kept in the gripping device without sway in the movement process, and the safety risk in the installation process is reduced; in addition, by means of magnetic attraction, the object to be installed can be fixed on the gripping device easily, and can be detached from the gripping device easily as well.
- (3) In the present utility model, by utilizing the x-direction moving mechanism, y-direction moving mechanism and z-direction moving mechanism, the object to be installed can be moved in the x-direction, y-direction and z-direction at the same time, thereby the time required for adjusting the position of the object to be installed can be reduced.
- (4) In the present utility model, both the cantilever and the beam have an octagonal cross section, and has higher strength and longer service life compared with the quadrangular cantilevers and beams in the prior art.
- (5) In the present utility model, remote control can be realized to facilitate the operation by means of the control device.

In summary, the apparatus provided by the present utility model has a high mechanization level, can accomplish installation conveniently, quickly and accurately, reduces manpower input, ensures the safety of the workers, and has high practicability.

The apparatus provided by the present utility model is applicable to the installation process of objects to be installed, especially objects with height greater than the sectional dimensions, particularly objects that can be attracted by magnetic force, such as H-shaped steel columns for the overhead lines of electric railways.

Description of Drawings

Hereunder the present utility model will be further detailed in specific embodiments, with reference to the accompanying drawings.

Fig. 1 is a schematic structural view of the apparatus in an embodiment of the present utility model;

Fig. 2 is a schematic structural view of the y-direction moving mechanism and the beam revolving mechanism in an embodiment of the present utility model;

Fig. 3 is a schematic structural view of the cantilever revolving mechanism and the gripping mechanism in an embodiment of the present utility model;

Fig. 4 is a schematic view of the connection relationship with the control device in an embodiment of the present utility model.

In the figures: 1 - beam; 2 - cantilever; 3 - electromagnet; 4 - x-direction moving mechanism; 5 - gear; 6 - toothed rack; 7 - hydraulic cylinder; 8 - beam revolving motor; 9 - coupling; 10 - driven gear ring; 11 - driving gear; 12 - cantilever revolving motor; 13 - y-direction motor; 14 - moving carriage; 15 - sliding track.

Embodiments

Hereunder some preferred embodiments of the present utility model will be detailed with reference to the drawings. It should be understood that the preferred embodiments described here are only provided to explain the present utility model, and shall not be deemed as constituting any limitation to the present utility model.

Example: An apparatus for automatically installing H-shaped steel columns

As shown in Figs. 1-3, in this example, the object to be installed is fixed by means of a gripping device, the movement of the object to be installed in the x-direction, y-direction and z-direction in relation to the installation position is adjusted by means of a moving device, and the object to be installed is rotated by means of a revolving device from a horizontal state to a vertical state at the installation position. The apparatus in this example comprises a gripping device, a moving device, a revolving device, and a control device.

I. Gripping device

The gripping device comprises an electromagnet 3, a beam 1 and a cantilever 2. Both the cantilever 2 and the beam 1 are columns with an octagonal cross section.

The beam 1 extends in the x-direction, while the cantilever 2 extends in the y-direction, and is vertically fixed to the center of the beam 1 to form a "T" shape. The object to be installed is fixedly connected to the bottom end of the cantilever 2. The object to be installed may be detachably connected to the bottom end of the cantilever 2 by means of threads; in this example, the object to

be installed is fixed by means of magnetic attraction to facilitate the installation without damaging the surfaces of the object to be installed. An electromagnet 3 for attracting a flat surface of the object to be installed is fixed to the bottom end of the cantilever 2. Thus, the objects to be installed must have a flat surface for magnetic attraction; in this example, the objects to be installed are H-shaped steel columns for the overhead lines of electrified railway.

II. Moving device

A moving device for moving the gripping device along the x-axis, y-axis and z-axis is fixed on the gripping device, and the moving device comprises an x-direction moving mechanism, a y-direction moving mechanism, and a z-direction moving mechanism.

(1) x-direction moving mechanism 4

The x-direction moving mechanism 4 is placed at the top end of the cantilever 2 for moving the cantilever 2 in the x-direction; the x-direction moving mechanism 4 employs a lead screw, the main body of the lead screw is fixed to the cantilever 2, and the lead screw on the main body of the lead screw is fixed to the top end of the cantilever 2 by bolts, so that the cantilever 2 can move in the x-direction along the threads of the main body of the lead screw. The lead screw model is SFU5005-4. In order to improve the degree of mechanization, the lead screw is driven by an x-direction motor to rotate.

(2) Y-direction moving mechanism

The left end and the right end of the beam 1 are respectively provided with a y-direction moving mechanism to move the beam 1 along the y-axis. The y-direction moving mechanism is in the form of a gear 5 and a rack 6. The beam 1 is fixedly connected with at least one gear 5, all gears 5 are engaged with the rack 6 extending in the y-direction, and the beam 1 is driven by the movement of the gears 5 on the rack 6 to move in the y-axis. In order to improve the degree of mechanization, a y-direction motor 13 is fixed on the gears 5, and is connected with the beam 1 via a y-direction reducer with model as WPDx-80-10-1.5. In order to facilitate the installation and improve the stability of movement, all of the gears 5, the y-direction motor 13 and the y-direction reducer are fixed on a moving carriage 14, and a sliding track 15 that is slidably connected is arranged below the moving carriage 14; thus, as the gears 5 move along the rack 6, the moving carriage 14 moves along the slide track 15 in the y-direction, so as to ensure the stability of the movement of the beam 1 in the y-axis direction.

(3) z-direction moving mechanism

The z-direction moving mechanism is disposed below the y-direction moving mechanism to drive the beam 1 to move along the z-axis. The z-direction moving mechanism is in the form of a hydraulic cylinder 7, which is fixedly connected below the sliding track 15 and the rack 6 in the y-direction moving mechanism; at least one set of z-direction moving mechanism may be provided; in this example, the two ends of each set of y-direction moving mechanism are provided with a hydraulic cylinder 7 respectively, and altogether four hydraulic cylinders 7 are provided. The hydraulic cylinder 7 is connected with the electro-hydraulic proportional valve, and is controlled by the electro-hydraulic proportional valve to rise and lower. The four hydraulic cylinders 7 rise or lower at the same time; they are at 1,700mm elevation before they rise, and the extreme elevation is

3,300 mm. The power for the hydraulic cylinders 7 is supplied by a hydraulic pump station, which employs gear oil pump with a rated pressure of 20Mpa, a maximum pressure of 25Mpa and a flow rate of 35L/min. The gear oil pump are driven by four 7.5kW motors.

III. Revolving device

The revolving device comprises a beam revolving mechanism for revolving the object to be installed in a horizontal state to a position above the installation position, and a cantilever revolving mechanism for revolving the object to be installed in the horizontal state to a vertical state.

(1) Beam revolving mechanism

The left end and the right end of the beam 1 are respectively provided with a set of beam revolving mechanism, the beam revolving mechanism comprises a beam revolving motor 8 and a coupling 9. The coupling 9 is fixedly connected to the moving carriage 14 of the y-direction moving mechanism, so that the coupling 9 moves with the moving carriage 14 in the y-direction. The coupling 9 connects the beam 1 and the beam revolving motor 8; the beam revolving motor 8 employs a servo motor, the rotation speed of the beam 1 is controlled by controlling the rotation speed of the servo motor, and the object to be installed is rotated to a position above the installation position by means of the rotation of the beam 1 around the axis of the beam 1. The beam revolving motor 8 and the coupling 9 are connected via a double-stage reducer: a motor cycloid reducer XWVCD-3-4-71 and a worm and gear reducer WHX2880-1-30.

(2) Cantilever revolving mechanism

The cantilever revolving mechanism is arranged on the cantilever 2 and the cantilever revolving mechanism comprises a driven gear ring 10 and a driving gear 11.

The bottom surface of the driven gear ring 10 is fixedly connected to the lower part of the cantilever 2, and the center of the top surface of the driven gear ring 10 is hinged to the upper part of the cantilever 2 through a hinge shaft; the driven gear ring 10 is engaged with at least one driving gear 11, and the driven gear ring 10 is driven to rotate by means of the rotation of the driving gear 11, so that the lower part of the cantilever 2 rotates around its axis. The driving gear 11 is driven to rotate by a cantilever revolving motor 12, and the cantilever revolving motor 12 and the driving gear 11 are connected via a reducer. The revolving process of the cantilever 2 is controlled by controlling the rotation speed of the cantilever revolving motor 12.

IV. Control device

The control device can realize intelligent control. As shown in Fig. 4, a control signal input terminal of the electro-hydraulic proportional valve is connected with a control signal output terminal of a control circuit for the electro-hydraulic proportional valve, and a control signal input terminal of the control circuit for the electro-hydraulic proportional valve is connected with a control signal output terminal of the control device for the electro-hydraulic proportional valve; a control signal input terminal of the electromagnet 3 is connected with a control signal output terminal of a control circuit for the electromagnet 3, and a control signal input terminal of the control circuit for the electromagnet 3 is connected with a control signal output terminal of the control device for the electromagnet 3; a control signal input terminal of the x-direction motor is connected with a control

signal output terminal of the control device for the x-direction motor, a control signal input terminal of the y-direction motor 13 is connected with a control signal output terminal of the control device for the y-direction motor 13, a control signal input terminal of the beam revolving motor 8 is connected with a control signal output terminal of the control device for the beam revolving motor 8, and a control signal input terminal of the cantilever revolving motor 12 is connected with a control signal output terminal of the control device for the cantilever revolving motor 12; wherein both the control circuits for the electro-hydraulic proportional valve and for the electromagnet 3 employ conventional circuits in the prior art. The connection relations between the control device and the electromagnet 3, between the control device and the electro-hydraulic proportional valve, between the control device and the x-direction motor, between the control device and the y-direction motor 13, between the control device and the beam revolving motor 8 and between the control device and the cantilever revolving motor 12, and the models of these devices are well-known in the art.

V. Installation method

The method for automatically installing H-shaped steel columns comprises the following steps:

S1. The electromagnet 3 is energized under the control of the control device, and the middle part of the object to be installed in a horizontal state is fixed to the bottom end of the cantilever 2 of the gripping device by the magnetic attraction force generated by the electromagnet 3.

S2. The object to be installed in the horizontal state is moved and rotated to a position above the installation position by using the moving device and the beam revolving mechanism in combination:

the position of the object to be installed in the x-axis, y-axis and z-axis is adjusted by using the moving device: the control device controls the rotation of the lead screw by means of the x-direction motor, the position of the object to be installed in the x-axis direction is adjusted by means of the lead screw, preferably a line connecting the center of the cantilever 2 and the center of the installation position is parallel to the plane defined by the y-axis and the z-axis; the control device controls the movement of the gears 5 along the rack 6 by means of the y-direction motor 13, thereby the position of the object to be installed in the y-direction is adjusted, preferably a line connecting the center of the object to be installed and the center of the installation position is parallel to the z-axis; the control device controls the rising and lowering of the hydraulic cylinders 7 by means of the electro-hydraulic proportional valve, thereby the position of the object to be installed in the z-axis direction is adjusted, so that there is enough space for rotation when the object to be installed is rotated from the horizontal state to the vertical state;

The position of rotation of the object to be installed in the plane defined by the y-axis and the z-axis is adjusted by means of the beam revolving mechanism 8 while the position of the object to be installed is adjusted by means of the moving device. The control device controls the rotation of the beam revolving motor 8, so as to control the rotation of the beam 1 around the axis of the beam 1, thereby the object to be installed is rotated to a position above the installation position;

After the adjustment with the moving device and the beam revolving mechanism, finally the object to be installed is placed at or near a position right above the installation position. Here, the position

right above the installation position is a position where the object to be installed can be aligned to the installation position after the object to be installed is rotated from the horizontal state to the vertical state.

S3. The object to be installed is rotated by 90° by means of the cantilever revolving mechanism from a horizontal state to a vertical state;

The control device controls the rotation of the cantilever revolving motor 12, thereby driving gear 11 rotates to drive the driven gear ring 10 to rotate, and the cantilever 2 rotates around the axis of the cantilever 2, finally the object to be installed is rotated from a horizontal state to a vertical state, i.e., the state in which the object is installed at the installation position.

S4. The moving device moves the object to be installed in the vertical state to the installation position, i.e., the object to be installed may be in either of the following two conditions:

S41. The object to be installed is placed above the installation position and has been aligned to the installation position, i.e., the object to be installed is right above the installation position:

the control device controls the hydraulic cylinders to lower by means of the electro-hydraulic proportional valve, so that the object to be installed is lowered vertically in the z-direction to the installation position, and then is fixed in the installation position by bolts;

S42. The object to be installed is placed above the installation position but is not aligned to the installation position, i.e., the object to be installed is offset from the position right above the installation position:

first, the position of the object to be installed is tuned by means of the x-direction moving mechanism 4 and the y-direction moving mechanism so that the object to be installed is aligned to the installation position; then the object to be installed is lowered to the installation position by means of the z-direction moving mechanism, i.e.:

First, the control device controls the lead screw to rotate by means of the x-direction motor, so that the position of the object to be installed in the x-direction is adjusted by means of the lead screw; the control device controls the gears 5 to move along the rack 6 by means of the y-direction motor 13, thereby the position of the object to be installed in the y-direction is adjusted, so that the object to be installed is aligned to the installation position. Then, the control device controls the hydraulic cylinders 7 to lower by means of the electro-hydraulic proportional valve, so that the object to be installed is lowered vertically in the z-direction to the installation position, and then is fixed in the installation position by bolts.

Thus, the installation process of the object to be installed is finished.

It should be noted that the embodiments described above are only some preferred embodiments of the present utility model, and should not be deemed as constituting any limitation to the present utility model. Although the present utility model is described and illustrated in detail with reference to the embodiments, the person skilled in the art can still easily make modifications to the technical solution described above in the embodiments or make equivalent replacement of some technical features therein. However, any modification, equivalent replacement or improvement made to the embodiments within the spirit and principle of the present utility model shall be deemed as falling

in the protection scope of the present utility model.

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Claims

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1. An apparatus for automatically installing H-shaped steel columns, comprising a gripping device for fixing the object to be installed, wherein a moving device for moving the gripping device along the x-axis, the y-axis and the z-axis is fixed on the gripping device, and a revolving device is also fixed on the gripping device;

the revolving device comprises a beam revolving mechanism for revolving the object to be installed in a horizontal state to a position above the installation position, and a cantilever revolving mechanism for revolving the object to be installed in the horizontal state to a vertical state.

2. The apparatus for automatically installing H-shaped steel columns according to claim 1, wherein the gripping device fixes the object to be installed by magnetic attraction.
3. The apparatus for automatically installing H-shaped steel columns according to claim 1, wherein the gripping device comprises a cantilever and a beam, wherein the cantilever is vertically and fixedly connected to the beam, and the bottom end of the cantilever is used to fixedly connect with the object to be installed.
4. The apparatus for automatically installing H-shaped steel columns according to claim 3, wherein the moving device comprises an x-direction moving mechanism arranged at the top end of the cantilever to move the cantilever along the x-axis, a y-direction moving mechanism arranged at the left end and the right end of the beam to move the beam along the y-axis, and a z-direction moving mechanism arranged at the bottom end of the y-direction moving mechanism to move the beam along the z-axis.
5. The apparatus for automatically installing H-shaped steel columns according to claim 4, wherein the two ends of the beam are provided with a beam revolving mechanism, the beam revolving mechanism comprises a beam revolving motor for driving the beam to rotate and a coupling for connecting the beam revolving motor with the beam.
6. The apparatus for automatically installing H-shaped steel columns according to claim 5, wherein the cantilever revolving mechanism comprises a driven gear ring fixed on the cantilever and a driving gear engaged with the driven gear ring so that the driven gear ring drives the cantilever to rotate around the axis of the cantilever.
7. The apparatus for automatically installing H-shaped steel columns according to claim 6, wherein the x-direction moving mechanism is a lead screw, the y-direction moving mechanism is a gear and rack, and the z-direction moving mechanism is a hydraulic cylinder.
8. The apparatus for automatically installing H-shaped steel columns according to any of claims 3-7, wherein both the cantilever and the beam are columns with an octagonal cross section.
9. The apparatus for automatically installing H-shaped steel columns according to claim 6, wherein an electromagnet is fixedly connected to the bottom end of the cantilever, the lead

screw is driven by an x-direction motor to rotate, and the gear and rack are driven by a y-direction motor to drive the gear to rotate.

10. The apparatus for automatically installing H-shaped steel columns according to claim 9, wherein the hydraulic cylinder is connected with an electro-hydraulic proportional valve, and the driving gear is driven by a cantilever revolving motor to rotate;

a control signal input terminal of the electro-hydraulic proportional valve, a control signal input terminal of the electromagnet, a control signal input terminal of the x-direction motor, a control signal input terminal of the y-direction motor, a control signal input terminal of the beam revolving motor, and a control signal input terminal of the cantilever revolving motor are respectively connected with a control signal output terminal of a control device.

1. Vorrichtung zum automatischen Montieren von H-förmigen Stahlsäulen, umfassend eine Greifeinrichtung zum Fixieren des zu montierenden Objekts, wobei an der Greifeinrichtung eine Bewegungseinrichtung zum Bewegen der Greifeinrichtung entlang der x-Achse, der y-Achse und der z-Achse befestigt ist, und an der Greifeinrichtung auch eine Dreheinrichtung befestigt ist;

die Dreheinrichtung einen Balken-Drehmechanismus zum Drehen des zu installierenden Objekts in einem horizontalen Zustand in eine Position oberhalb der Installationsposition und einen Ausleger-Drehmechanismus zum Drehen des zu installierenden Objekts in dem horizontalen Zustand in einen vertikalen Zustand umfasst.

2. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 1, wobei die Greifeinrichtung das zu installierende Objekt durch magnetische Anziehung fixiert.

3. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 1, wobei die Greifeinrichtung einen Ausleger und einen Träger umfasst, wobei der Ausleger vertikal und fest mit dem Träger verbunden ist, und das untere Ende des Auslegers verwendet wird, um eine feste Verbindung mit dem zu installierenden Objekt herzustellen.

4. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 3, wobei die Bewegungseinrichtung einen Bewegungsmechanismus in x-Richtung, der am oberen Ende des Auslegers angeordnet ist, um den Ausleger entlang der x-Achse zu bewegen, einen Bewegungsmechanismus in y-Richtung, der am linken Ende und am rechten Ende des Trägers angeordnet ist, um den Träger entlang der y-Achse zu bewegen, und einen Bewegungsmechanismus in z-Richtung, der am unteren Ende des Bewegungsmechanismus in y-Richtung angeordnet ist, um den Träger entlang der z-Achse zu bewegen, umfasst.

5. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 4, wobei die beiden Enden des Trägers mit einem Trägerdrehmechanismus versehen sind, wobei der Trägerdrehmechanismus einen Trägerdrehmotor zum Antreiben des Trägers zum Drehen und eine Kupplung zum Verbinden des Trägerdrehmotors mit dem Träger umfasst.

6. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 5, wobei der Auslegerdrehmechanismus einen angetriebenen Zahnkranz, der an dem Ausleger befestigt ist, und ein Antriebszahnrad, das mit dem angetriebenen Zahnkranz in Eingriff steht, umfasst, so dass der angetriebene Zahnkranz den Kragarm antreibt, um sich um die Achse des Auslegers zu drehen.

7. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 6, wobei der Bewegungsmechanismus in x-Richtung eine Leitspindel ist, der Bewegungsmechanismus in y-Richtung ein Zahnrad und eine Zahnstange ist und der Bewegungsmechanismus in z-Richtung ein Hydraulikzylinder ist. LU102796
8. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach einem der Ansprüche 3 bis 7, wobei sowohl der Ausleger als auch der Träger Säulen mit einem achteckigen Querschnitt sind.
9. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 6, wobei ein Elektromagnet fest mit dem unteren Ende des Auslegers verbunden ist, die Leitspindel von einem Motor in x-Richtung angetrieben wird, um sich zu drehen, und das Getriebe und die Zahnstange von einem Motor in y-Richtung angetrieben werden, um das Getriebe zu drehen.
10. Vorrichtung zum automatischen Installieren von H-förmigen Stahlsäulen nach Anspruch 9, wobei der Hydraulikzylinder mit einem elektrohydraulischen Proportionalventil verbunden ist und das Antriebszahnrad von einem Ausleger-Drehmotor angetrieben wird, um sich zu drehen;

eine Steuersignal-Eingangsklemme des elektrohydraulischen Proportionalventils, eine Steuersignal-Eingangsklemme des Elektromagneten, eine Steuersignal-Eingangsklemme des x-Richtungsmotors, eine Steuersignal-Eingangsklemme des y-Richtungsmotors, eine Steuersignal-Eingangsklemme des Balken-Drehmotors und eine Steuersignal-Eingangsklemme des Ausleger-Drehmotors jeweils mit einer Steuersignal-Ausgangsklemme einer Steuervorrichtung verbunden sind.

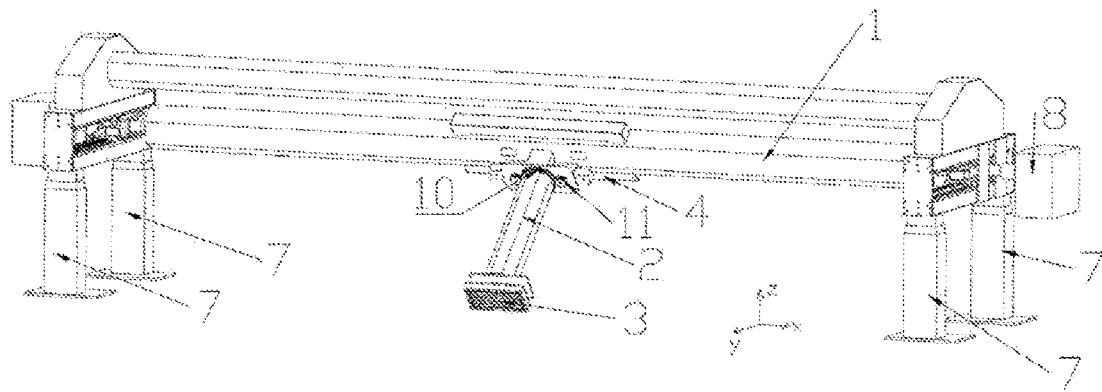


Fig. 1

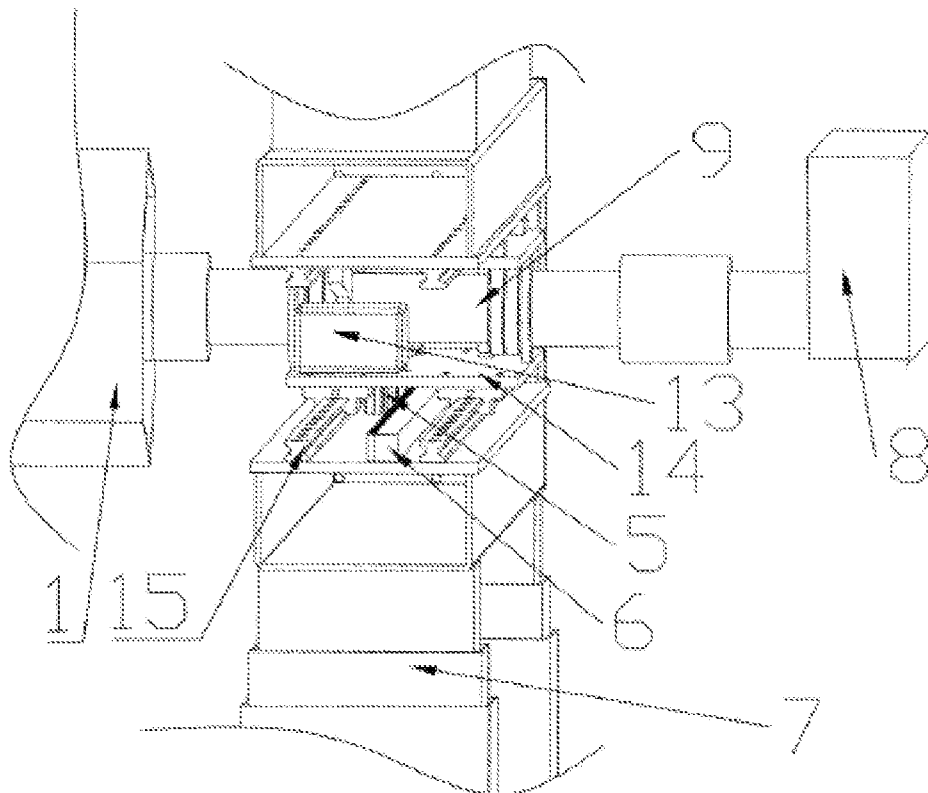


Fig. 2

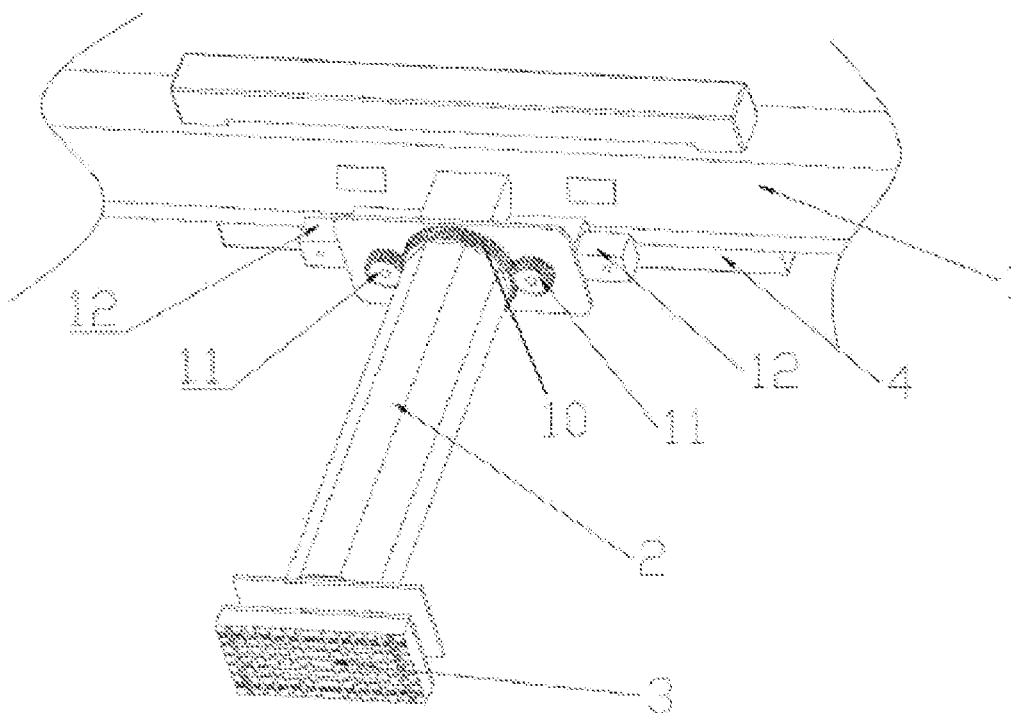


Fig. 3

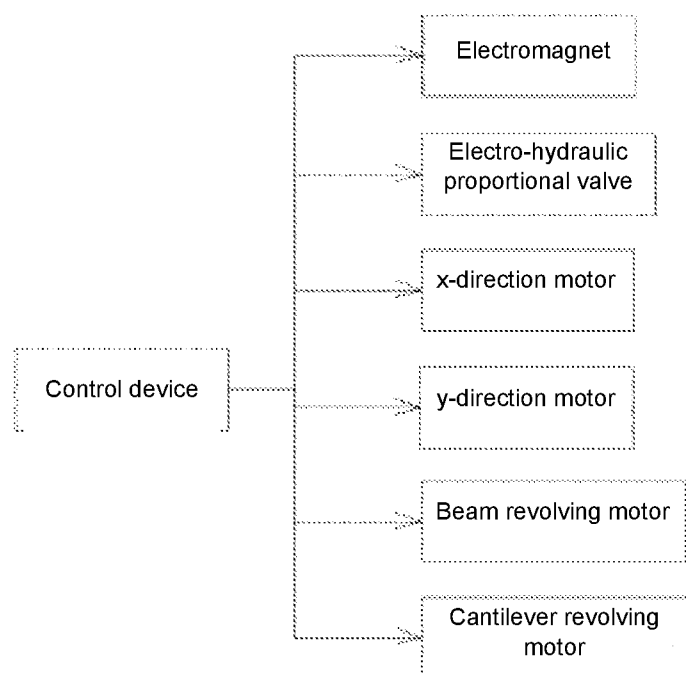


Fig. 4