

An automatic orbital up-down scaffold

Field of the Invention

The present invention relates to a construction device, particularly to an automatic orbital up-down scaffold for construction that is moved up and down synchronously with an up-down type scaffold, which can make an up-down shelf or up-down platform easily move up and down, and support the system.

Background of the Invention

An up-down type scaffold is often used to construct a multi-story building at present. But such scaffold has many disadvantages. For example when the scaffold is moved up or down once, the take-up device and the point of hanging should be moved by person. Thus it is difficult to achieve automation control during up-down moving process because of high working intensity needed. Meanwhile, components of such scaffold are often carried and throwed off, resulting in easy damage. The support device of such scaffold performs the single function. So in order to meets with requirements for multifunctional support, the support device is often cooperated with several other means, such as an error adjusting means for a reserved hole, an anti-drop means, a guide means and a positioning means etc, which results in high possibility of occurring accidents because of difficulties in management and operation.

Summary of the Invention

The object of the present invention is to solve such technical problem by providing an automatic orbital up-down scaffold. The scaffold can ensure to achieve automation of up-down moving process. The multifunctional appendiculate support device has the functions of support, protection and adjusting error, etc, thus it can avoid accidents resulting from missing certain components. The error adjusting means can automatically eliminate secondary stress caused by big clearance between the guide rail and the guide means, and reduce possibility of being stuck in the process of up-down moving.

The present invention solves the technical problem by constructing an automatic orbital up-down scaffold. The scaffold includes a frame guide rail, a scaffold body connected to the frame guide rail, a take-up device fixed on the foot of the scaffold body, a pre-adjust tense device fixed on the top of the scaffold body, a guide-chain device connected to the impending end of the pre-adjust tense device and two free ends of the take-up device respectively and a multifunctional appendiculate support device fastening the frame guide rail to the building.

In another aspect of the present invention, the take-up device can be any one of single-chain, loop-chain or multi-chain electric hoists, or a low-speed lift.

In another aspect of the present invention, the guide-chain device comprises a fast pulley and a flexible guide-chain steel wire. The fast pulley is hitched to the pre-adjust tense device. One end of the flexible guide-chain steel wire threads through the fast pulley and is hitched to one free end of the take-up device. The

other end of the flexible guide-chain steel wire threads through the other free end of the take-up device and is hitched to the point of hanging.

In another aspect of the present invention, the pre-adjust tense device comprises an extension spring and an adjusting post connected in series to the extension spring.

In another aspect of the present invention, the multifunctional appendiculate support device comprises a support fixer fastened to the building, an anti-drop pendulum needle means fixed under the fixer, a guide means and a fine adjusting means. The fixer fastened to the building have two side plates with a straight groove on each. The guide means symmetrically locate at and can move long the inside of the both side plates of the fixer. And the fine adjusting means locates at the outside of the both side plates and is connected to the guide means through the straight grooves on the side plates.

In another aspect of the present invention, the guide means comprises an installing shelf with an opening and two shafts. The two shafts locate parallel to the both sides of the opening in the shelf and are provided with a roller outside of each.

In another aspect of the present invention, the fine adjusting means comprises a sleeve spindle, rack and nut. The sleeve spindle is attached to the guide means through the straight groove on the side plate. The rack is fixed at the outside of the side plates and locates parallel to the side of the straight groove. The rack-gearing gear is provided outside of the sleeve spindle. The nut fixing the

gear at the gearing point is located on the sleeve spindle.

In another aspect of the present invention, the fine adjusting means comprises a connecting post fixed to the guide means through the straight groove on the side plate, a nut connected to the end of the connecting post, and a screw that gears to the nut. The screw locates on the shelf fixed at the outside of the side plate. One end of the screw is fixed with an adjusting nut, and the other is provided with an elastic means outside. One side of the elastic means is placed against the side plate of the shelf, and the other side is provided with a fitting nut gearing to the screw and a retainer pin.

In another aspect of the present invention, the fine adjusting means comprises a screw fixed to the guide means through the straight groove on the side plate, and a nut fixed to the screw.

In another aspect of the present invention, the anti-drop pendulum needle means comprises an anti-drop block that is pivotally connected, and a reset spring that is connected to one end of the anti-drop block. The adjustable pendulum needle gears to the nut that is fixed in the middle of the anti-drop block.

In another aspect of the present invention, the elastic means is formed by several serried dish springs.

To carry out the guide-type automatic up-down scaffold in accordance with the present invention is through moving down the take-up device and fixing it on the scaffold body, and adding the guide-chain device and the pre-adjust tense device to the original structure of the device without moving the take-up device and the point

of hanging. Thus the scaffold makes an operator's work become easier with low cost and can be used for many different purposes. The pre-adjust tense device of the scaffold can automatically adjust the length between the take-up end and the out-chain end due to change in angle in the course of up-down moving, which can avoid getting stuck by virtue of sync of both ends. The pre-adjust tense device can secure to bear fair load. The multifunctional appendiculate support device comprises guide, supporting, loading, error adjusting, and anti-drop components. Thus the multifunctional appendiculate support device can supports the system, bears its load, prevents it from dropping, and adjusts the error of a reserved hole and partially eliminates secondary stress, which makes the scaffold safer in use.

Brief Description of the Drawings

Fig. 1 is a schematic diagram illustrating the structure of an automatic orbital up-down scaffold in accordance with a preferred embodiment of the present invention;

Fig. 2 is a schematic diagram illustrating the structure of the pre-adjust tense device of Fig. 1;

Fig. 3 is a schematic diagram illustrating the side connection structure of the multifunctional appendiculate support device and the frame guide of Fig. 1;

Fig. 4 is a planform illustrating the structure of the multifunctional appendiculate support device of Fig. 3;

Fig. 5 is a planform illustrating the structure of a preferred embodiment of the

fine adjusting means of Fig. 3;

Fig. 6 is a planform illustrating the structure of another embodiment of the fine adjusting means of Fig. 3;

Fig. 7 is a schematic diagram showing the moving process of the anti-drop means of Fig. 3 ;

Fig. 8 is a schematic diagram illustrating the side structure of the fine adjusting means of Fig. 5.

Detailed Description of the Preferred Embodiments

Fig. 1 illustrates the structure of an automatic orbital up-down scaffold in accordance with a preferred embodiment of the present invention. The scaffold comprises a take-up device 4 fixed on the foot of the scaffold body 3, a pre-adjust tense device 1 fixed on the top of the scaffold body 3, and a guide-chain device 2 which links the impending end of the pre-adjust tense device 1 and two free ends of the take-up device 4 respectively. The take-up device 4 can pull up and down the scaffold body 3 via the guide-chain device 2. The scaffold further comprises a multifunctional appendiculate support device 6 fastened to the buildings. The multifunctional appendiculate support device 6 is sliding connected to the frame guide rail of the scaffold and can vertically fix the scaffold body 3 on the buildings cooperated with the frame guide rail. The support device 6 has guiding, error adjusting and anti-drop functions.

The take-up device 4 of the scaffold can be any one of a single-chain, ring-chain or multi-chain electric hoist with two opposite free ends, or be a

low-speed lift.

The guide-chain means 2 can be of two structures. The first structure comprises a fast pulley 21 and a flexible guide-chain steel wire 22. The fast pulley 21 is hitched to the impending end of the pre-adjust tense device 1 (as shown in Fig. 2). One end of the flexible guide-chain steel wire 22 threads through the fast pulley 21 and then connects to a free end 41 of the take-up device 4, while the other end of the flexible guide-chain steel wire 22 threads through another free end 42 of the take-up device 4 and then connects to a point of hanging 5. (As shown in Fig. 1 and Fig. 2)

The second structure comprises a pulley block and a flexible chain. The fulcrum of the pulley block is connected to the pre-adjust tense device. One end of the flexible chain threads through the pulley block and then is connected to a free end of the take-up device, while the other end threads through the other free end of the take-up device and then is connected to a point of hanging. (Not shown in the Figs.)

The point of hanging can automatically move up and down through operating the take-up device without manual operation and is bolted to the building.

Fig. 2 illustrates the structure of the pre-adjust tense device 1. As shown in Fig. 2, the pre-adjust tense device 1 can automatically adjust according to the weight of the up-down device and the length change between the take-up end and the out-chain end due to change in angle in the process of moving up and down to ensure sync of up-down moving and guiding chain. The pre-adjust tense device 1

can be either of a spring structure (either open type or close type is ok) or a hydraulic-pressure means etc., and can also be formed by a spring 11 and a bolt-adjusting post 12 (as shown in Figs) or some other structures that can adjust length. The pre-adjust tense device can automatically adjust the length between the take-up end and the out-chain end due to change in angle in the process of up-down moving. It can avoid getting stuck by virtue of sync of both ends. At the top of the pre-adjust tense device, a length-adjusting device is additionally fixed as the presetting device of the up-down device before moving up and down to ensure several up-down devices bear average up/down load.

In the above-described structure, all the devices can compose an automatic, lifting guide-chain loop that can ensure sync of both ends and automatic movement of the point of hanging.

The basic component of the multifunctional appendiculate support device in accordance with a preferred embodiment of the present invention is a support fixer fastened to the building on which is equipped with a guide means 8, an anti-drop means 10 and the fine adjusting means 12. The support fixer fastened to the building comprises a fixing plate attached to the building 7 and two side plates 72, 73. Straight sliding grooves 71, 74, and 75 are located on the support fixer and two side plates 72, 73 (as shown in Fig. 3, 4, 5 and 6). The guide means 8 is fixed at the inside of both side plates 72 and 73 of the support fixer. The anti-drop means 10 is fixed under the guide means 8. The fine adjusting means 12 is fixed at the outside of the two side plates 72 and 73 of the support fixer 7 and

is connected to the guide means 8 through the straight grooves 74 and 75 on the side plates. The support component has supporting and loading functions. The straight groove 71 fixed on the fixing plate attached to the building 7 can adjust the error of a reserved hole. The guide means 8 has the function of guiding and also serves as the case of the anti-drop means 10. Meanwhile, together with the straight groove 71 and the fine adjusting means 12, the guide means 8 can adjust the horizontal distance and reduce the secondary stress caused by the extrusion between the frame guide rail 9 and the guide means 8.

The Fig. 5 shows the structure of the guide means 8. There is an installing shelf 81 with an opening is fixed on the guide means 8. And two shafts 83 are parallel located at the both sides of the opening of the shelf 81. Each shaft 83 is provided with a roller 82 outside. The roller 82 can fit the frame guide rail 9 in two modes. The first mode is that the roller 82 rolls outside of the guide rail 9. The outer surface of the roller 82 where one end of the side plate 72 is closer to is set as an arc structure which suits the outside of the guide rail 9. The guide means 8 can be of the sliding shaft cover structure vertically fixed on the shelf, cooperating with the frame guide rail 9 for guidance.

Three fine adjusting means structures are provided by the present invention to perform the fine adjusting function of the guide means 8. As shown in Fig. 5 and Fig. 8, in the first structure a sleeve spindle 122, rack 121 and nut 123 are mounted in the fine adjusting means. The sleeve spindle 122 is connected to the guide means 8 through the straight groove 74 on the side plate 72. The rack 121 is

fixed at the outside of the side plate 72 and locates parallel to the straight groove 74. The gear 124 that gears to the rack 121 is provided outside of the sleeve spindle 122. The nut 123 that fixes the gear on the gearing point locates on the sleeve spindle. When the frame guide rail 9 loads larger outside pull or inside pressure than the friction between the two surfaces of the gear 124 as the nut 123 is screwed down, the frame guide rail 9 can be adjusted inward or outward in the sliding groove 74 of the support device to eliminate the secondary stress which is caused by unbalanced force when the frame guide rail 9 moves up and down.

As shown in the Fig. 6, in the second structure a connecting post 131, nut 137 and screw 138 are mounted in the fine adjusting means. The connecting post is fixed to the guide means 8 through the straight groove 74 on the side plate 73. The nut 137 is connected to the end of the connecting post 131. The screw 138 that gears to the nut 137 is located on the shelf 132 fixed at the outside of the side plate 72. One end of the screw 138 is fixed with an adjusting nut, and the other is provided with an elastic means 135 outside. One side of the elastic means 135 is placed against the side plate of the shelf 132, and the other side has a fitting nut 134 gearing to the screw 138 and a retainer pin 133. This structure uses the elastic means to eliminate the secondary stress that is caused by unbalanced force when the frame guide rail 9 moves up and down.

As shown in Fig. 4, in the third structure of the fine adjusting means is fixed with a screw 76 fixed to the guide means 8 through the straight groove 74 on the side plate 72, and a nut 77 connected to said screw outside. This structure uses

the friction between the nut 77 and the side plate 72 to eliminate the secondary stress that is caused by unbalanced force when the frame guide rail 9 moves up and down.

As shown in Fig. 7, the anti-drop pendulum needle means 10 comprises an anti-drop block 101 that is pivotally connected, and a reset spring 104 that is connected to one end of the anti-drop block 101. An adjustable pendulum needle 102 gears to the nut 103 that is fixed in the middle of the anti-drop block 101. The anti-drop means 10 asway cooperates with the frame guide rail 9 and then together can prevent dropping. The pendulum needle 102 of the anti-drop means 10 together with the nut 103 that gears to the pendulum needle 102 can adjust the length. When the bore of the frame guide rail 9 occurs error, then it can be properly adjusted to ensure safe anti-drop. Also when the reset spring 104 is disabled, the anti-drop means 10 will fall down because of the weight of the anti-drop block 101 to prevent dropping.

Fig. 7 illustrates several working positions of the anti-drop means when the scaffold moves up and down. Position A is the normal position of the pendulum needle 102 of the anti-drop means 10. Position B shows the position when the anti-drop pendulum needle 102 moves up. Position C shows the position that the anti-drop pendulum needle performs its anti-drop function if the anti-drop means 10 drops too fast. The anti-drop means 10 can eliminate the error of a reserved hole caused by the frame guide rail 9's being fastened on the building via the fixing plate 7, which is stepless adjusted through the straight groove 71, to perform

reliably anti-drop in accordance with the change of speed at which the frame guide rail 9 drops. That is to say, the frame guide rail can pass if it drops slowly, but reliably anti-drops if it drops too faster. The scaffold body is fixed on the support device via the frame guide rail 9 and a hoop, and can adjust the vertical distance via moving up and down the frame guide rail 9 to meet with different height requirements of the multi-story buildings.

The support fixer fastened to the building 6 can be made by steel or cast steel. The support fixer and two side plates 72, 73 are fixed with straight grooves 71, 74, and 75, which can adjust the horizontal and vertical distance to adjust the error of a reserved hole and the distance between the frame guide rail 9 and the fastening point.

In the above-described structure, the anti-drop means 10 can adopt a pendulum needle type anti-drop means or other changeable mechanically and automatically anti-drop means. The lower pendulum of the pendulum needle can be adjusted. And the anti-drop means 10 will not lose the function of anti-drop when disabled.

The multifunctional appendiculate support device in accordance with a preferred embodiment of the present invention can be used together with the frame guide rail 9 on the scaffold to perform the functions of up-down moving of the scaffold and anti-drop. The frame guide rail 9 can be of iconic steel structure but also some other steel structures. But no matter what structure it is, it should be ensured that the combinative point to the anti-drop pendulum needle is of grid structure.

When using the present system, the pre-adjust tense device can automatically adjust the length between the take-up end and the out-chain end due to change in angle in the course of up-down moving without moving the take-up device and the point of hanging manually by presetting the guide-chain means and the pre-adjust tense device, after the take-up device is fixed on the body of the scaffold. It can avoid getting stuck by virtue of sync of both ends. The pre-adjust tense device can secure to bear fair load. When moving the scaffold, the multifunctional support device can supports the system, bears its load, prevents from dropping, and adjusts the error of a reserved hole and partially eliminates secondary stress, which makes the scaffold safer in use. The present invention has a simple structure, small volume and can be easily fixed, thus it has wide application fields.

The automatic guide-seat type up-down scaffold provided by the present invention can be safely used for many different purposes. The up-down moving distance of the system can meet with requirements for different heights of the multi-story building. The system can be easily operated and its manufacture method is simple with low cost. Also the system can achieve automation control of the up-down scaffold.

Claims

1. A automatic orbital up-down scaffold comprising a frame guide rail, a scaffold body connected to the frame guide rail, wherein further comprises a take-up device fixed on the foot of the scaffold's body, a pre-adjust tense device fixed on the top of the body, a guide-chain device connected to the impending end of the pre-adjust tense device and both free ends of the take-up device respectively, and a multifunctional appendiculate support device which attaches the frame guide rail to the building.

2. The scaffold as claimed in claim 1, wherein the take-up device can be any one of single-chain, ring-chain or multi-chain electric hoists, or a low-speed lift.

3. The scaffold as claimed in claim 1 or claim 2, wherein the guide-chain device comprises a fast pulley hitched to the pre-adjust tense device and a flexible guide-chain steel wire, one end of which threads through the fast pulley and is hitched to one free end of the take-up device, and the other end threads through the other free end of the take-up device and is hitched to the point of hanging.

4. The scaffold as claimed in claim 1, wherein the pre-adjust tense

device comprises an extension spring and an adjusting post connected in series to said extension spring.

5. The scaffold as claimed in claim 1, wherein said multifunctional appendiculate support device comprises a support fixer fastened to the building, an anti-drop pendulum needle means fixed under the fixer, a guide means and a fine adjusting means, the fixer fastened to the building have two side plates with a straight groove on each, the guide means symmetrically locate at and can move along the inside of both plates, and the fine adjusting means locates at the outside of both plates and is connected to the guide means through the straight grooves on the plates.

6. The scaffold as claimed in claim 5, wherein the guide means comprises an installing shelf with an opening and shafts, the shafts locate parallel to both sides of the opening in the shelf and are provided with a roller outside.

7. The scaffold as claimed in claim 5 or claim 6, wherein the fine adjusting means comprises a sleeve spindle, rack and nut, the sleeve spindle is fixed to the guide means through the straight groove on the side plate, the rack is fixed at the outside of the side plates and locates parallel to the side of the straight groove, the gear that gears to the rack is

provided outside of the sleeve spindle, the nut fixing the gear at the gearing point is located on the sleeve spindle.

8. The scaffold as claimed in claim 5, wherein the fine adjusting means comprises a connecting post fixed to the guide means through the straight groove on the side plate, a nut connected to the end of the connecting post, and a screw that gears to the nut, the screw locates on the shelf fixed at the outside of the side plate, one end of the screw is fixed with an adjusting nut, and the other is provided with an elastic means outside, one side of the elastic means leans against the side plate of the shelf, and the other side is provided with a fitting nut gearing to the screw and a retainer pin.

9. The scaffold as claimed in claim 5 or claim 6, wherein the fine adjusting means comprises a screw fixed to the guide means through the straight groove on the side plate, and a nut fixed to the screw.

10. The scaffold as claimed in claim 5, wherein the anti-drop pendulum needle means comprises an anti-drop block that is pivotally connected, and a reset spring that is connected to one end of the anti-drop block, the adjustable pendulum needle pitches to the nut that is fixed in the middle of the anti-drop block.

11. The scaffold as claimed in claim 8, wherein the elastic means is formed by several serried dish springs.