Experiments on a crane overspeed protection device

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Abstract. A crane overspeed protection device can quickly control the movement of the lifting rope and drum when the load of the crane overspeed, which can prevent the phenomenon that the lifting rope and drum are subjected to gravity and then continue to move under impulse, and effectively improve the braking efficiency of the lifting rope and drum.

1. Introduction
Crane is a multi-action lifting machine that lifts heavy objects vertically and horizontally in a certain range. Also known as crane, aerial crane, crane.

At present, most cranes are equipped with overspeed protection devices. In the process of crane use, when the load of the crane's lifting device is overspeed, the existing overspeed protection devices basically control the rotation of the drum by means of friction plate and decelerate the lifting device. However, in use, most of the overspeed protection devices speed the drum though [1, 2]. In degree control, the drum will still be decelerated and rolled by the impulse, and the lifting rope on the drum will still be sliding by the gravity of the heavy object, which leads to the failure of the protective device to stop the drum and lifting rope quickly and effectively, and the phenomenon of low braking efficiency exists [3,4]. Therefore, we design a kind of crane overspeed protection device to solve the above problems [5].

2. Contents of experimental methods
The purpose of the utility model is to solve the shortcomings existing in the prior art, and a crane overspeed protection device is proposed.

In order to achieve the above purpose, the utility model adopts the following technical scheme. A crane overspeed protection device includes a support frame, one side of the support frame is provided with a fixed plate at both ends, one side of the two fixed plates close to each other is provided with a rotating shaft, one side of the two rotating axes close to each other is rotated to connect a finite position plate, two limit plates are connected with a reel, and two fixed plates are separated from each other in the middle of one side. The top of the two connecting shafts is provided with a vertical upward supporting rod, the top of the two supporting rods extends to the top of the fixed plate and is connected with a horizontal supporting plate, the top center of the supporting plate is provided with a first push rod motor, the output end of the first push rod motor, the output end of the first push rod motor is provided with a vertical downward first push rod, and the bottom of the first push rod. The bottom part extends to the bottom of the supporting plate and...
is provided with a horizontal positioning plate. The bottom part of the positioning plate is provided with a fixed chuck. The sliding sleeve of the drum is connected with a lifting rope. The fixed chuck is matched with the lifting rope. A fixed frame is arranged above the side far from each other of the two supporting rods, and a second push rod motor is arranged below the side far from each other. The output end of the two second push rod motors is provided with a horizontal second push rod. The other side of the two push rods runs through the fixing frame and is provided with a connecting plate arranged in a mirror image. A positioning block is arranged on one side of the connecting plate far from the fixing frame in both groups, and slots are arranged on both sides of the two fixing plates adapted to the positioning block. A circular positioning ring is arranged on one side far from each other, and the positioning ring is matched with the positioning block.

Compared with the prior art, the beneficial effect of the utility model is as follows. The first one is both sides of the two fixing plates are equipped with slots matched with the locating blocks, and on the far side of the two locating plates are equipped with circular locating rings. The design of the locating rings matching the locating blocks is conducive to the timely and rapid control of the drum movement when the load of the crane's lifting device falls too fast. The second one is the bottom of the positioning plate is equipped with a fixed chuck, and the design of the fixed chuck adapted to the lifting rope can brake the drum and control the force movement of the lifting rope quickly through the fixed chuck.

3. Implementation methods
Referring to fig. 1, a crane overspeed protection device includes a support frame 1, one side of the support frame 1 is provided with a fixed plate 11 at both ends, one side of the two fixed plates 11 is close to each other is provided with a rotating shaft, one side of the two rotating axes is close to each other, and the limited plate 5 is connected with a reel between the two limit plates 5, and the middle part of the side of the two fixed plates 11 is located at a distance from each other. The top of the two connecting shafts 16 is provided with vertical upward supporting rods, the top of the two supporting rods extends to the top of the fixed plate 11 and connects with the horizontal supporting plate 3, the top center of the supporting plate 3 is provided with the first push rod motor 7, the output end of the first push rod motor 7 is provided with the first push rod 8 vertically downward, and the bottom of the first push rod 8 extends to the support plate 3. The bottom is provided with a horizontal positioning plate 9, the bottom of the positioning plate 9 is provided with a fixed chuck 10, the sliding sleeve of the drum is connected with a lifting rope 6, the fixed chuck 10 is matched with the lifting rope 6, the upper side of the two supporting rods far from each other is provided with a fixed frame 4, the lower side of the two fixed rods 4 far from each other is provided with a second push rod motor 12, and the output end of the second push rod motors 12. A horizontal second driving rod is arranged, and the other side of the two second driving rods runs through the fixture 4, and a connecting board 13 with mirror setting is arranged. A locating block 14 is arranged on one side of the connecting boards 13 far from the fixture 4, a slot 15 matching the locating block 14 is arranged on both sides of the two fixed boards 11, and a circular locating ring 2 is arranged on the side of the two locating boards 5 far from each other. The positioning ring 2 is matched with the positioning block 14. The vertical section of the fixing frame 4 is "L" structure. The positioning pins are arranged on one side of the two connecting plates 13 far from the second driving rod. The central part of the connecting shaft 16 is provided with a penetrating positioning slot. The positioning slot is matched with the positioning pin. The connecting plate 13 is a fan-shaped structure. The control device is arranged on one side of the support frame 1 far from the two fixing plates 11. The first pushing rod is electrically powered. The machine 7 and the second push rod motor 12 are electrically connected with the output end of the control device. The inner side of the fixed clamp 10 is provided with uniformly distributed first clamp teeth, and the side of the positioning block 14 far from the connecting board 13 is provided with the second clamp teeth matching the inner side of the positioning ring 2.

Working principle: In the course of using, when the load of crane's lifting device falls too fast, the first push rod motor 7 and the second push rod motor 12 are controlled by the control device to work. The first push rod motor 7 is used to control the first push rod 8 to push the positioning plate 9. The
positioning plate 9 is clamped on the lifting rope 6 through the fixed chuck 19 and braked through the first chuck. The lifting rope 6 moves, the second push rod motor 12 drives the connecting board 13 to move horizontally. The connecting board 13 drives the two locating blocks 14 through the slot 15 and extends to the inner part of the locating ring 2. The drum in the middle of the two locating plates 5 and the two locating plates 5 rotates rapidly through the second clamping teeth. The utility model occurs in the lifting device of the crane. When the load falls too fast, the lifting rope 6 and the drum can be controlled to move quickly to prevent the lifting rope 6 and the drum from being subjected to gravity and the impulse to continue to move, thus effectively improving the braking efficiency of the lifting rope 6 and the drum.

Figure 1. Example diagram

4. Conclusion
The utility model can quickly control the movement of lifting rope and drum when the load of the crane's lifting device falls over the speed, prevent the phenomenon that the lifting rope and drum are subjected
to gravity and then continue to move under impulse, and effectively improve the braking efficiency of the lifting rope and drum.

Acknowledgments
This work was financially supported by National Natural Science Foundation of China (51602087), Natural Science Foundation of Zhejiang province (LY19E020010), Visiting Scholar Fund of State Key Laboratory of Silicon Materials (Nos. SKL2018-10)

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