

Manipulator Type Electric Ground Clip for Maintenance of High Voltage Transmission Lines

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Abstract

With the development of The Times, electric power transportation spans more and more distances, and the use of high-voltage transmission lines also increases. In the maintenance of high voltage transmission lines, the ground clip is often used as a temporary grounding protection device. Most of the existing ground clips in the market are manually operated, with low degree of automation, complicated operation steps, long time consumption and high working intensity. Therefore, we propose a kind of ground clips similar to manipulator, which is driven by a motor to reduce the working intensity of the staff.

Keywords

Ground Clip; Manipulator; Motor.

1. Introduction

As a basic resource related to national economy and people's livelihood, electric power is of great significance to the normal production of society and People's daily life. At the same time, the high-voltage transmission line plays a role in the power industry, so it is of great significance to ensure that the high-voltage transmission line can be repaired in time when the fault occurs [3].

Ground clip is a protection device for temporary grounding during maintenance and construction of high-voltage transmission lines, but the existing ground clips have such following shortcomings:

- 1) The existing ground clips require a lot of manual operation by maintenance personnel, which is not only inefficient, but also delays the time to restore power supply [4].
- 2) Under the influence of external factors such as strong wind, it is easy to pose a threat to the safety of maintenance personnel [5].
- 3) Ground clip Uses spring elasticity to clamp the wire. In the process of dismantling, once workers exert too much force, it is easy to cause safety accidents, friction between the ground clip and the wire is also easy to cause damage to the wire.

Therefore, we propose a new type of ground clip similar to manipulator and powered by a motor to solve the problems of existing products.

2. Structure and Function of Manipulator Type Electric Ground Clip

2.1. Structure of Manipulator Type Electric Ground Clip:

As shown in the figure: 100- manipulator type electric ground clip, 1- first clamping arm, 11- first clamping part, 2- second clamping arm, 21- second clamping part, 3- retaining piece, 31-

protective shell, 32- support piece, 4- drive device, 41- drive motor, 42- screw, 5- sliding piece, 6- first link, 7- second link.

Special note:

- 1) The first link and the second link have the same shape and size.
- 2) The first clamping arm has the same shape and size as the second clamping arm.
- 3) The first clamping arm is provided with a first clamping part, and the second clamping arm is provided with a second clamping part. The first clamping part and the second clamping part have arc-shaped clamping surface, which can better fit with the high voltage transmission line. The dimensions of the arc-shaped clamping surface of the first clamping part and the second clamping part need to be selected according to the specific use requirements.

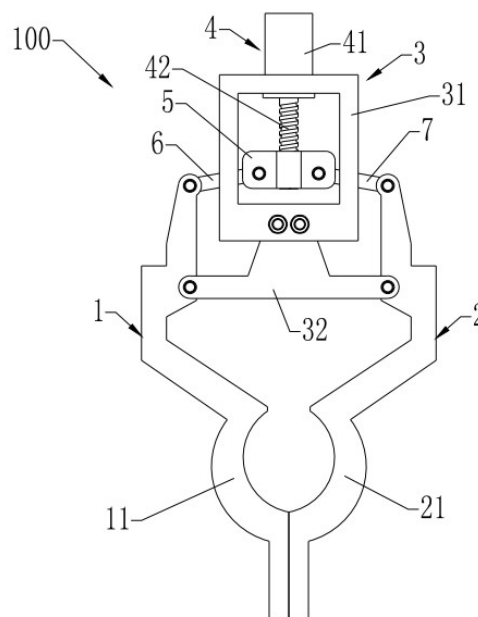


Figure 1. The concrete structure of manipulator type electric ground clip

2.2. The Function of Manipulator Type Electric Ground Clip:

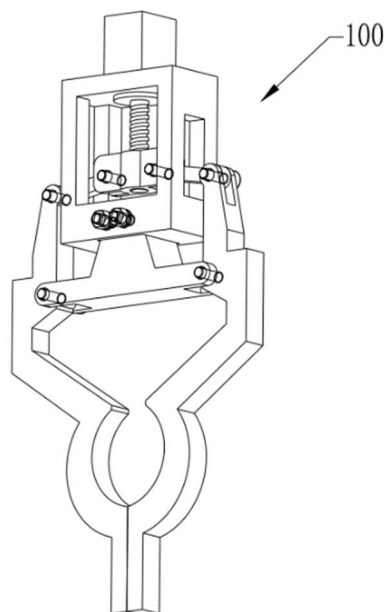


Figure 2. Schematic diagram of manipulator type electric ground clip

The ground clip proposed in this paper can clamp the high voltage transmission line between the first clamping arm and the second clamping arm by driving one end of the first clamping arm and one end of the second clamping arm close to each other. In addition, the ground clip can also drive one end of the first clamping arm and one end of the second clamping arm away from each other through the drive device, that is, the first clamping arm and the second clamping arm loosen the high voltage transmission line.

Through these designs, the following objectives can be achieved:

- 1) In this way, maintenance personnel can reduce the manual operation of the ground clip in the process of clamping the high-voltage transmission line or loosening the high-voltage transmission line, thus reducing the technical proficiency requirements of maintenance personnel, saving time and effort, reducing the maintenance personnel's work intensity, and ensuring the personal safety of maintenance personnel.
- 2) Since the first clamping arm and the second clamping arm open a certain angle to relax the wire, there will be no excessive friction with the wire in the process of loosening the wire, thus reducing the damage to the wire.

3. The Specific Realization of Manipulator Type Electric Ground Clip:

- 1) We assume a positive direction, the motor drives the screw to rotate in the positive direction specified by us, the sliding part moves away from the drive motor, and the sliding part moves away from the drive motor to drive the first clamping part and the second clamping part close to each other, so as to clamp the high-voltage transmission line; when the motor drive screw rotates in the opposite direction, the sliding part moves close to the drive motor, and the sliding part moves close to the drive motor, so that the first clamping part and the second clamping part are far away from each other, thus loosening the high-voltage transmission line.

This design has simple structure, clear force transmission path and good self-locking performance. It is not easy to relax the clamping of the high voltage transmission line because of the weather and other external factors, thus greatly improving the reliability of the grounding clip, and the overall structure is compact, small space, so that it is more convenient to carry.

- 2) Through remote control to control the drive motor open and close, to further ensure the personal safety of maintenance personnel, and the drive motor uses ordinary DC micro motor, with small volume, light weight, high efficiency, strong stability, simple structure and other advantages.

In order to prevent the first clamping arm and the second clamping arm from clamping the high-voltage transmission line after the drive motor continues to rotate, resulting in the drive motor heating damage and other consequences, the method of measuring the current value can be used to control the start and stop of the drive motor. For example, when the drive motor is working properly, the current is 1 ampere, When the first clamping arm and the second clamping arm clamp the high voltage transmission line, the driving motor is blocked (stuck), at this time the blocking current is 2.8 ampere, so once the measurement current value is 2.8 ampere, the driving motor can be shut down.

4. Conclusion

In this paper, the transmission lines of new type ground clip has the following advantages: use a simple quick, accidental rate is low, small volume, light quality, using the new apparatus can greatly improve the work efficiency, ensure reliable grounding line outage repair work, eliminate the hidden trouble in security existing ground clip, has good application value and popularization significance.

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