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Design and Application of a Novel Wire Stripper

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Abstract: With the rapid development of the power industry, the work of the power electrician is becoming increasingly heavy, and the demand for improving work efficiency and reducing work intensity is becoming increasingly prominent. As one of the common tools of electric power, the design and application of wire stripper has an important influence on the efficiency and safety of electric power. This paper briefly analyzes the design and application of ceramic wire for electric power and electricians to provide a reference for the development of related fields.

Keywords: Electric power and electrician; Wire stripper; Structure; Design

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1. Introduction

Electrical repair operations usually involve stripping the insulation layer of wires and cutting them off. Current electrician knives only have a single function, so electricians need two tools, one for stripping insulation skin and the other for cutting off the wire. Therefore, they need to switch back and forth, which is inconvenient. The traditional wire stripping methods for power electricians mainly include manual wire stripping and the use of simple wire stripping tools. Manual wire stripping is usually performed using wire cutters and pliers [1]. The simple wire stripping tool is a semi-automatic wire stripping equipment that allows easy wire stripping. In addition, electrical knives in existing technologies are insulated using a metal outer protective plastic skin, so if the plastic skin breaks, it is easy to cause an electric shock. Therefore, performance electrical knives with better electrical insulation are needed.

2. Disadvantages of traditional electric power electrician stripping mode

The traditional power electrician wire stripping method usually requires manual operation, and the wire stripping speed is slow, which cannot meet the needs of large-scale production. In addition, manual wire stripping is also easily affected by the skill level of workers, and the efficiency of wire stripping is unstable. The traditional wire stripping tools are shown in **Figures 1 & 2**, while the new wire stripping tool is shown in **Figures 3 & 4**. In recent years, technicians have also been continuously researching new wire-stripping tools to improve wire-stripping efficiency and quality [2-5]. For example, developing new semi-automatic and new wire

stripping tools that can automatically adapt to different specifications and types of wires, reducing the tedious operation of tool replacement and adjustment methods.

Figure 1. Multifunctional peeling pliers

Figure 2. Cable telephone network cable stripping pliers

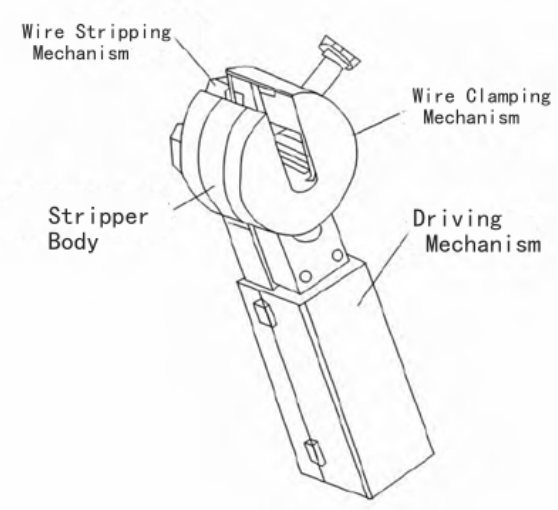

Figure 3. Schematic diagram of the overall structure of a portable semi-automatic wire stripper

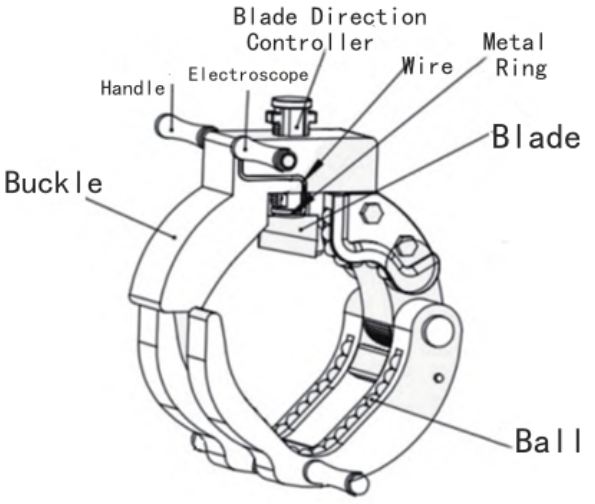

Figure 4. Main structure of the new wire stripper

2.1. Risk of electric shock

Traditional electric wire stripping poses a risk of electric shock during operation primarily due to the lack of effective insulation protection measures in the wire stripping tools. This exposes electricians to the possibility of coming into contact with live wire parts while stripping wires, increasing the likelihood of electric shock accidents and posing a serious threat to personal safety. Additionally, improper operation or tool damage during the wire stripping process with traditional methods can lead to wire breakage or wire popping, further heightening the risk of electric shock.

2.2. Time-consuming and laborious

Traditional electric wire stripping conducted by electricians typically involves manual operation, which is both cumbersome and inefficient to manually clamp, rotate, or pull wires in order to strip them. This manual process demands significant physical strength and time, and is prone to being influenced by human factors, resulting in inconsistent stripping quality [6]. Moreover, for tasks involving a large number of wires requiring stripping, the

efficiency of traditional wire stripping methods is further diminished, failing to meet the demands of modern electrical work in the power industry.

2.3. Not adaptable in terms of size

Traditional wire stripping tools often lack the adaptability to accommodate the diverse specifications and materials of wires. Consequently, power electricians frequently encounter the need to switch between different-sized wire stripping tools during the stripping process. This not only heightens the complexity and time investment of the task but also compromises the quality of wire stripping due to potential errors in tool selection. Moreover, certain specialized wire specifications may render traditional stripping tools inadequate, rendering the stripping task unachievable [7-10].

3. Design principle and significance of ceramic stripping

3.1. Design principles

To ensure the stability and durability of ceramic wire cutters, it is crucial to prioritize materials with high purity and exceptional physical properties [11]. These materials should offer resistance to wear and tear as well as high temperatures. Additionally, the structural design should adhere to standards of usability, stability, and safety. Firstly, the operation of the wire stripper should be straightforward and user-friendly, enabling power electricians to initiate operations swiftly. Secondly, the structure must demonstrate stability and reliability, capable of withstanding various mechanical stresses during operation. Lastly, safety considerations should be thoroughly incorporated to mitigate the risk of misuse or safety hazards during usage.

3.2. Significance

Utilizing ceramic wire strippers offers several benefits. Firstly, it significantly boosts work efficiency due to its unique design and material, enabling quicker wire stripping and reducing the time needed for power electricians to complete tasks. Additionally, these strippers are easy to operate, allowing electricians to quickly learn how to use them effectively, further improving efficiency. Secondly, ceramic wire strippers do not produce sparks during stripping, reducing safety risks such as fire and electric shock. Moreover, their high hardness ensures durability, reducing the likelihood of damage during use and enhancing safety. Lastly, the excellent wear and temperature resistance of ceramic material prolongs the lifespan of these strippers [12-13], reducing the need for replacements and lowering operating costs for businesses.

4. Basic principle and structure of the stripper

The basic principle of the wire stripper is to use the mechanical principle, through the insulation layer of the wire or cable, exposing the internal conductor, in order to facilitate connection or maintenance. A ceramic wire cutter, including a handle sleeve, a ceramic cutting knife, the handle housing, a fixed module set in the handle housing, a blade bin at the back end of the fixed module, a ceramic cutting knife is a single-sided curved ceramic blade, including a positioning rail fixed in the handle housing, and a positioning unit set on the positioning rail. The specific structure is shown in **Figure 5**.

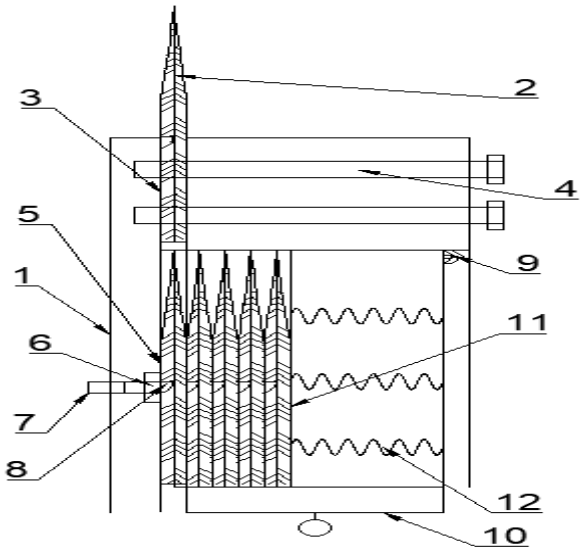

Figure 5. Structural structure of ceramic wire cutter. Description: 1-handle case, 2-ceramic blade, 3-positioning rail, 4-plastic screw, 5-slide, 6-pusher, 7-pusher, 8-lock tongue, 9-connection buckle, 10-housing, 11-baffle 1,12-spring

5. Application analysis of wire stripper for electric power and electrician

In the practical process of power stripping, various line specifications are encountered due to different power properties, electrical demands, and loads. The new ceramic wire stripper is designed to accommodate various sizes of lines. The specific operating procedure is described as follows:

(1) The plastic screw is released and the pusher is pushed to the middle of the slide rail, completing the necessary preparation before use.

(2) Usage is initiated by connecting the knife bin and handle sleeve via the connecting buckle. The handle sleeve is held, and the pusher is pushed to the end of the slide, causing the push plate and L-shaped baffle to fit together gradually. As the lock tongue tilts towards the back opening, it is retracted into the push plate until it locks into the groove on the side of the ceramic blade [14-15].

(3) The pusher is pushed forward along the rail, driving the push plate, lock tongue, and ceramic blade simultaneously. This action transfers the ceramic blade while ensuring it is properly positioned within the rail. Once the pusher reaches the front end of the slide rail, the ceramic blade is secured with fixed bolts.

(4) When the ceramic blade wears out significantly, the fixed bolts are loosened and the blade is removed using handheld pliers to prevent injury. Then, the ceramic blade is replaced by retrieving, transferring, and reinstalling it securely. Finally, the remaining ceramic blades in the chamber are monitored through the glass window [15-19]. When the number of ceramic blades in the chamber is lower than the preset parameters, the blade chamber is extracted and replaced using the ring.

6. Application scenarios of wire strippers

(1) Wire repair and replacement

Wire repair and replacement are common tasks in electrical works. The wire stripper enables rapid and precise removal of the insulation layer from the wire, facilitating subsequent maintenance and

replacement tasks while enhancing work efficiency.

(2) Cable installation and commissioning

Wire strippers also play an important role in cable installation and debugging. Through the removal of the cable insulation layer, facilitated by the stripper, the cable head can be easily connected, ensuring the normal operation of the cable.

(3) Other application scenarios

In addition to wire maintenance and replacement, cable installation, and debugging, wire strippers can also be used in electrical maintenance, automobile maintenance, and other fields. This provides efficient and safe wire stripping solutions for electricians.

(4) Development trend

With the continuous development of science and technology, the future of wire strippers will likely embrace new advancements. Introducing intelligent features like sensors and controllers can enable automation and intelligent operation, thereby enhancing the accuracy and efficiency of the stripping process. Moreover, to meet the diverse needs of power electricians, future strippers may move towards multifunctional integration. By integrating modules with various functions, such as stripping, cutting, and crimping, the working efficiency of electricians can be significantly improved.

7. Conclusion

This report analyzes the design and application of electric power strippers, summarizing their basic principles, structures, design considerations, application scenarios, and development trends. By optimizing the design of ceramic wire strippers and enhancing their performance and safety, significant support can be provided to the work of power electricians, thereby promoting the sustainable development of the electric power industry. In the future, as science and technology continue to advance and market demands evolve, further innovations and improvements in stripper design are expected.

Disclosure statement

The author declares no conflict of interest.

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