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Design of Fixing Devices for Computer Cable Storage

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Abstract: To address problems such as current overload and abnormal heat dissipation caused by the bundling of cables for high-performance computer accessories, a fixing device incorporating a storage box and a cover plate was designed. The front side of the storage box features raceways at the top and card slots at the top and bottom respectively, while perforated boards are positioned at both ends. Mounting brackets are installed at the inner ends of the box, with cooling fans mounted externally on these brackets. The perforated partitions and bobbin posts are used to separate the cables. By adopting a winding storage method, gaps are maintained between the cables. In conjunction with the cooling fans, this design prevents heat accumulation and enhances heat dissipation efficiency.

Keywords: Computer cables; Cable storage and fixation; Device design; Storage box; Cover plate

Introduction

This design focuses on the technical field of computer accessory equipment. Computers, commonly refered to as “PCs”, are modern, intelligent electronic devices that play a crucial role in high-speed computing. They perform numerical and logical operations, as well as storage and memory functions, and can automatically process vast amounts of data at high speed according to programmed instructions. This capability has significantly advanced data and information management across various fields.The research, development, and widespread adoption of high-performance desktop computers have become a notable trend. Among household users, many individuals with computer knowledge are enthusiastic about assembling their computers to customize and enhance performance. However, when high-performance accessories operate under heavy loads, there is a conflict between the requirements for electrical performance and the design of cable layout. To ensure proper power supply and signal transmission, the cables must be long enough to accommodate to the space within the computer case. While users often bundle the cables for improved aesthetics and tidiness, this practice can lead to current overload and abnormal heat dissipation due to electromagnetic induction and the thermal effect of resistance. These issues can result in the aging of the cable insulation deterioration of cable performance, a shortened lifespan, and even safety hazards such as short circuits and fires. Such incidents can damage other hardware and jeopardize the safe and stable operation of the system.

1. Device Structure Design

1.1 Shell Design

The housing of the device is made from high-strength engineering plastics, offering advantages such as fire resistance, wear-resistance, and the ability to isolate electromagnetic interference[1]. The housing’s shape is shown in Figure 1, and its dimensions are designed to match the layout of common computer equipment and the quantity of cables, ensuring adequate cable accommodation. The device comprises a storage box and a cover plate. The front side of the storage box features multiple raceways and card slots located at both the top and bottom. Two indicator lights are securely installed at the top. The back side includefour screw holes, two adhesive backings that are movably attached, and a fixed rubber strip. Additionally, the back side of the cover plate has several catches positioned at both the top and bottom.

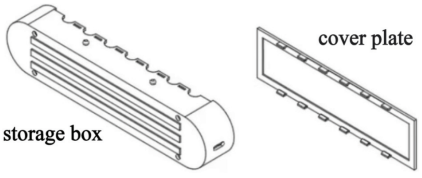

Figure 1. Overview Diagram of the Device

1.2 Internal Design

Perforated boards are securely installed at both ends of the front side e of the storage box, and mounting brackets are fixedly attached inside both ends of the box. Cooling fans are movably mounted on the outer side of the mounting brackets. Inside the storage box, several

perforated partitions are securely installed, with multiple bobbin posts fixedly positioned on the opposite side of these partitions. A USB Cable interface is installed on one end of the storage box. A circuit control board is movably mounted within one end of the storage box, while a buzzer is fixedly installed at the opposite end, away from the circuit control board. Temperature sensors are securely attached to the inner wall of the storage box[2]. Additionally, a glass panel is fixedly mounted inside the cover plate.

1.3 Detailed Design

The raceways and card slots are evenly and alternately distributed in a linear arrangement on the front of the storage box, with the raceways positioned opposite the perforated partitions. The perforated partitions are arranged linearly and evenly inside the storage box, and there are at least three bobbin posts. Four screw holes are evenly distributed in a rectangular pattern and penetrate the back of the storage box. The adhesive backing and rubber strip are positioned on the inner side of the screw holes. The screw holes are located at both ends of the storage box, with the rubber strip placed opposite the adhesive backing. The catches are arranged linearly and evenly on the back of the cover plate. The specifications and dimensions of the catches are matched to those of the card slots. The cover plate's specifications and dimensions are compatible with those of the storage box and the perforated board[3]. The input terminal of the circuit control board is electrically connected to the output terminal of the USB cable interface via wires.

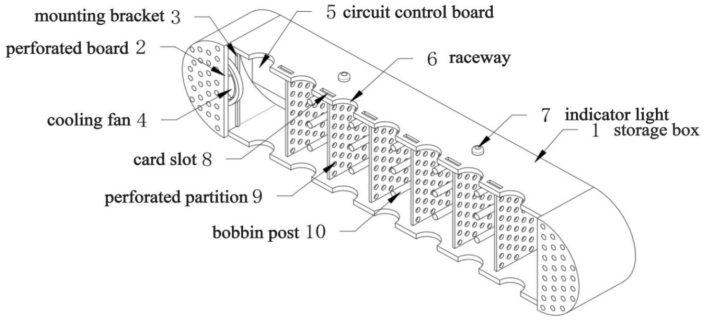

Figure 2. Three-dimensional Appearance Structure Diagram of the Storage Box in Front View

2. Specific Application and Implementation

2.1 Implementation Plan 1

To use the device, users should first install the storage box inside or around the computer case. Next, place the cables or wires to be stored on the inner side of the perforated partitions. Wind and stack different cables separately on the outer side of the bobbin posts and the opposite side of the perforated partitions. Ensure that the incoming and outgoing cables pass through the raceways. Connect the USB cable interface to the computer's USB power supply interface. Attach the cover plate to the front of the storage box and secure it by snapping the catches into the card slots.

2.2 Implementation Plan 2

The input terminal of the circuit control board is electrically connected to the output terminal of the USB cable interface through wires. Moreover, the input terminal of the circuit control board is electrically connected to the output terminals of both the USB cable interface and the temperature sensor through wires. Meanwhile, the output terminal of the circuit control board is electrically connected to the cooling fan, the indicator light, and the buzzer through wires. This configuration facilitates power supply and enables convenient control of the cooling fan, indicator light, and buzzer, ensuring stable and reliable operation.

2.3 Implementation Plan 3

The perforated partitions are arranged linearly and evenly inside the storage box, with at least three bobbin posts installed. These perforated partitions and bobbin posts effectively separate the stored cables, ensuring that different cables are kept apart. This design prevents the issue of one cable overheating due to overload and negatively impacting other cables.

Moreover, the winding and storage method differs from traditional bundled storage, creating gaps between the stored cables. Combined with the air extraction functionality of the cooling fans, this design prevents heat accumulation within the storage box, significantly enhancing heat dissipation efficiency. This device also boasts a simple structure, easy operation, and convenient maintenance. With a relatively large number of bobbin posts, it is particularly convenient for winding long cables in an S shape around the opposite side of the bobbin posts. This arrangement helps to separate the cables using the perforated partitions, increases the gaps between them, and minimizing cable folding.

2.4 Implementation Plan 4

The catches are linearly and evenly arranged and distributed on the back of the cover plate, with specifications and dimensions compat-

ible with those of the card slots. Similarly, the cover plate's specifications and dimensions align with those of the storage box and the perforated boards. When the catches are snapped into the card slots, the cover plate is securely fixed to the outside of the storage box. This design simplifies the installation process, allowing the cover plate to be easily positioned on the front of the storage box opposite the perforated borad. This strcture enhances usability, enabling stable installation, as well as easy disassembly and reassembly. Additionally, the glass panel allows for easy observation of the cables inside, further facilitating use by operators.

2.5 Implementation Plan 5

Four screw holes are evenly distributed in a rectangular pattern and extend through the back of the storage box. An adhesive backing and a rubber strip are positioned on the inner side of the screw holes, with the rubber strip located opposite the adhesive backing. The screw holes are placed at both ends of the storage box, allowing screws to be inserted to securely fix the storage box in place, such as on a computer case, ensuring convenient and stable installation. The flexible deformation of the rubber strip simplifies the installation and tightening of the screws.

2.6 Implementation Plan 6

The raceways and card slots are linearly and alternately distributed evenly on the front of the storage box, and the raceways are located on the opposite side of the perforated partitions. The raceways can facilitate the passing of cables, make it convenient to fix their positions, and provide positioning and fixation for the cables when they pass through the perforated partitions.

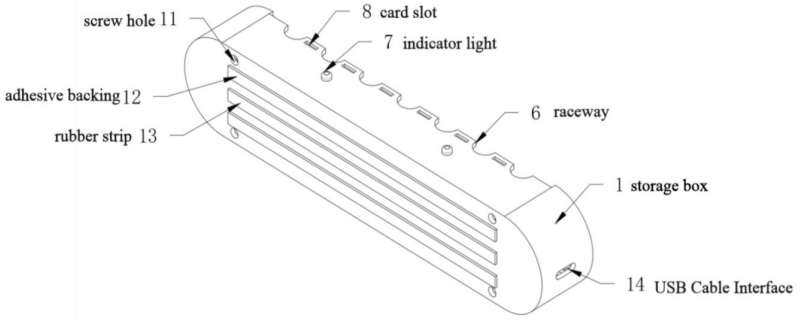

Figure 3. Schematic Diagram of the Rear Three-dimensional Appearance Structure of the Storage Box

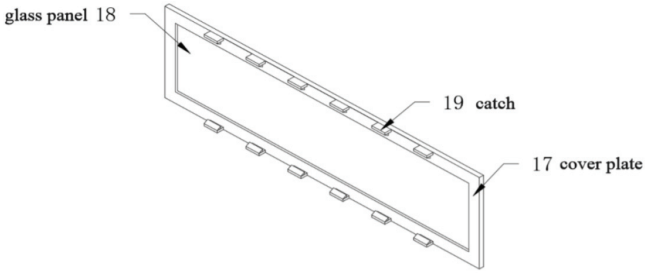

Figure 4. Schematic Diagram of the Three-dimensional Appearance of the Cover Plate

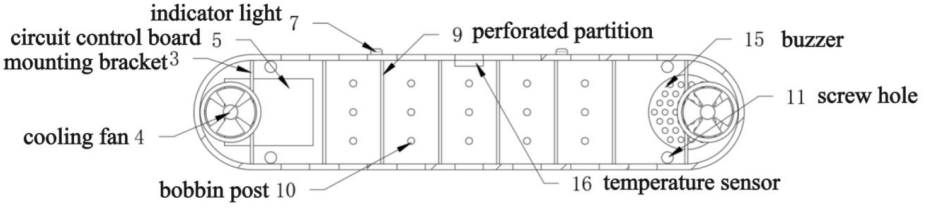

Figure 5. Schematic Diagram of the Internal Structure in Front Sectional View of the Storage Box

3. Conclusion

This article mainly conducts an in-depth exploration into the design of the fixing device for computer cable storage. Firstly, by analyzing a multitude of problems triggered by the chaos of computer cables, it has been found that situations like cables being intertwined with each other, being liable to damage and having poor heat dissipation exist. Next, the design objectives of the fixing device are expounded, specifically aiming at achieving the orderly arrangement of cables, enhancing space utilization as well as strengthening security and practicability. During the design process, full consideration has been given to the characteristics of computer cables and their application scenarios. Through the research and comparison of the device's structure and materials, this device has been designed. It exhibits a high degree of adaptability and

can meet the cable storage requirements of different kinds of computer equipment.

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