Research on the Application of Internet of Things Technology in Packaging Intelligent Design

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Abstract

The Internet of Things technology has highly informationalized and intelligent characteristics, and its application range is wide, which is reflected in all aspects of people's production and life. There are still many practical problems in packaging design at this stage, which affect the development of packaging intelligent design. This paper started from the basic concepts and contents of the Internet of Things technology, analyzed the current situation of the packaging intelligent development, deeply studied the application of Internet of Things technology in packaging intelligent design, and discussed the development trend of packaging design under the background of the Internet of Things era.

Keywords

Internet of Things; Packaging design; Intelligent design.

1. Introduction

Since entering into the 21st century, new technologies represented by biotechnology and information technology have brought historical changes to social development. As an important part of information technology, Internet of Things technology is the backbone of information science research and industrial development. The concept of the Internet of Things was first proposed in the 1990s and has been widely used in various fields during more than ten years of development. In recent years, with the continuous development of the Internet of Things technology, the field of packaging intelligent design has also been affected by the Internet of Things technology, intelligent hardware equipment such as radio frequency identification, GPS, various sensors and information technology are used in packaging design.

2. Concept of Internet of Things

The essence of the Internet of Things is a network technology where all kinds of objects are connected through the intelligent sensors and Internet, and conduct information transmission and exchange based on the specific communication protocol, so as to realize intelligent identification, monitoring and management. Commonly used intelligent sensing devices include GPS positioning, infrared receptor, radio frequency identification, laser scanners and so on. As far as technical methods and specific goals, the ultimate goal of the Internet of Things is to realize the information automation and intelligent interaction and processing among different terminal equipment.

The technologies related to the Internet of Things are very extensive, including wired and wireless communication technologies, hardware embedding and integration technologies, radio frequency intelligent identification technologies, cloud data integration processing technologies, and cloud computing technologies, etc. In the constructing process of Internet of Things devices and systems, engineers need to integrate, develop and apply various information technologies, connect each device terminal intelligently, and then realize the purpose of intelligent observation, dynamic data collection, information processing and management control of the whole network equipment.

3. Development Status and Shortcomings of Packaging Intelligence

3.1 Outdated packaging technology and low economic benefits

At this stage, the packaging technology of products does not match the modern market demand, the mainly manifestation is high packaging production costs and low economic benefits. With the continuous development of social economy, major changes occur in consumers' aesthetics and shopping needs in the market, and the market has put forward higher requirements for product packaging. However, the backward product packaging design and manufacturing process will directly hinder the pace of intelligent development of product packaging design. n particular, contemporary packaging design and manufacturing have deficiencies in innovative products and technologies, which do not match actual needs. In addition, some enterprises do not consider their own development status and actual market conditions; blindly follow overly unique packaging design techniques, increase production and operation costs, but fail to achieve good actual results.

3.2 Packaging manufacturing and recycling

Modern society is increasingly advocating the construction of the ecological environment; enterprises in many industries have conducted transformation and upgrading, abandon the traditional high-pollution and energy-intensive production methods, turn to clean energy, greatly improve product utilization and reduce waste of resources. There are problems in the process of product packaging design and production. At present, some packaging design works do not fully consider the issues of energy conservation and waste reduction, which do not conform to the current development concept of protecting the ecological environment.

Traditional product packaging types include bags, boxes and sacks, etc., the materials are cardboard, wood board, polymer plastic, glass, and various common metals. Traditional packaging materials come from natural resources, in order to save manufacturing and transportation costs, most enterprises will replace all-timber boxes with boxes made of mixed materials or plastics, this method will cause the product to appear unfixed and damaged during transportation. In addition, owing to the slow progress of municipal waste classification, the recycling of product packaging is also difficult to proceed smoothly.

4. Application of Internet of Things Technology in Packaging Intelligent Design

4.1 Application of RFID technology in packaging design

RFID is the radio frequency identification technology, as a common automatic identification technology, it can conduct related work of equipment identification in a non-contact manner, and it is widely used in the Internet of Things technology. Specifically, when the product with the RFID tag passes through the relevant identification device, the RFID tag can be read by the radio frequency signal of identification device, and the whole process does not require manual operation. This intelligent identification method is highly applicable to the application environment and has extremely high application value in the field of packaging intelligent design.

With the rapid development of Internet technology, the emergence of artificial intelligence technology, big data technology, AR technology and other new information technologies influence all aspects of production and life. The extensive application of RFID technology in the intelligent packaging design has extremely important significance for product transportation management, warehouse management, and commodity sales. For example, the offline logistics systems of many e-commerce sales platforms have strengthened the application research of RFID technology in product packaging and transportation, in order to improve the quality of product packaging and the efficiency of logistics and transportation.

4.2 Application of intelligent hardware in packaging design

The foundation of the Internet of Things technology is various intelligent hardware devices, such as GPS positioning, infrared receptor, radio frequency identification, and laser scanners. With the

application of various intelligent hardware devices and new information technology in the product packaging field, product packaging design is on the threshold of more diversified development, and high-end product packaging design is gradually emerging, packaging has changed from focusing on brand culture and highlighting product creativity to paying more attention to the application of intelligent packaging, thus forming the intelligent trend of packaging design.

On the global scale, the application of intelligent hardware in packaging design has also brought unique effects, packaging design can not only highlight product design concepts, but also become an important way to convey enterprise philosophy and brand culture. For example, the coffee packaging design of the alarm clock bottle cap designed by Nescafe. The timing alarm is embedded in the caps of bottled and canned Nescafe coffee through 3D printing technology and new polymer materials, and the alarm will stop when the coffee cap is opened. This design method prompts coffee consumers to turn on the coffee when they wake up in the morning, open the coffee naturally to brew and enjoy it. This kind of design method that combines intelligent hardware with product packaging and conforms to human life habits, and it also reflects a new idea of intelligent packaging design.

5. Development Trend of Packaging Intelligent Design under the Background of Internet of Things

5.1 Wide application of intelligent recognition

In the construction process of the intelligent development of product packaging, the Internet of Things technology provides the positive solutions. The Internet of Things technology represented by RFID has shown good use results in product anti-counterfeiting query, production and transport quality control, and product traceability, etc. By conducting the intelligent label management of each product, products can be accurately monitored, traced and controlled throughout the whole process from production to consumer use, and it is of positive significance to realize the information, automation and intelligent management of commodities.

On the one hand, adding intelligent labels to product packaging can improve management efficiency during product transportation and storage, which adapt to the rapid development status of e-commerce sales and offline logistics transportation at present. On the other hand, radio frequency identification technology is also widely used in the new retail industry. For example, Wal-Mart supermarket in the United States and Marks in the United Kingdom have adopted a large number of RFID devices on their product packaging, they has basically realized the automation and intelligent management of the whole product process, which not only reduces labor costs, but also ensures the trace and control of product quality.

5.2 All-round interactive experience

The promotion and application of Internet of Things technology makes it possible to experience brand products anytime and anywhere. While optimizing the product packaging design, the Internet of Things technology has also greatly enhanced consumers' experience in product use, and made brand experience and human-computer interaction more diverse. In addition to the organic integration of intelligent hardware devices and physical products, the Internet of Things technology also promotes the full integration of online product information and offline products; provide consumers with diversified brand experience, and this has gradually become the new direction of product packaging design in recent years.

5.3 Brand innovation and value highlight

Online e-commerce sales and offline new retail industries continue to develop and grow, various traditional brands continue to strengthen brand innovation, seek the cohering point of times needs and their own brands, and continue to highlight their own brand value. The widespread application of the Internet of Things technology provides new development opportunities for the brand building and product promotion of enterprises. By providing consumers with the emotional and authentic experience, enterprises can package and promote hot-selling products, and can also define their own

brands in the new era. For example, traditional food production and sales enterprises can actively introduce the Internet of Things technology, not only use innovative design methods on product packaging, but also enhance interaction with consumers through augmented reality interactive games, cloud shelves and other means. These ways can not only grasp the actual consumption needs of consumers at all times, but also increase the added value of products and economic benefits.

6. Conclusion

To sum up, in order to realize the automated and intelligent interaction and processing of information among different terminal equipment, the Internet of Things integrates products with intelligent hardware equipment, and connects them through the Internet and various information technologies. At this stage, there are mainly practical problems in product packaging design work, for example, backward packaging technology, low packaging economic benefits, low packaging production and manufacturing efficiency, and difficult recycling. However, as RFID technology is widely used in the intelligent identification management of packaging, the combined application of intelligent hardware has promoted the development progress of packaging design intelligence. Under the background of the era when the application range of Internet of things technology is constantly expanding, the development of packaging design intelligence will be increasingly broad.

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