Study on Garden Machinery Color Design based on Color Psychology

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Keywords: Garden Machinery, Color Design, Color Psychology.

Abstract. The study analyzed the Chinese and foreign garden machinery color design. And it summed up color psychology principles including warm or cool, light or heavy, soft or hard and association of color, and studied their applications on garden machinery color design based on cases. Then the color application rules of garden machinery are summarized. On the basis of this, the author analyzed the color of the chain saw and designed the main color, warning color and detail color, so as to optimize the color design of garden machinery.

Introduction

With the development of urban construction and development, the urban greening and beautification has been paid more and more attention by people. However, many domestic garden machinery and equipment are agents of foreign brands. Independent brands are few in number, lack of characteristics and lack of quality. This makes the market share of the independent brands low. As the information a product first passes to a person is the shape and color, color optimization design has become an important means to improve the image of the product. When the product cost is certain, the rationality of product color setting is proportional to the product value [1]. Therefore, to discuss the color design of garden machinery from the perspective of color psychology, so as to improve the color design of garden machinery, is an effective way to refine the appearance of garden machinery products.

The Present Situation of Garden Machinery Color Design

At present, countries like the United States, Germany, Australia and Japan have a higher degree of garden mechanization. The garden machinery design in these countries pays great attention to the psychological effects of color, which enhances both the functionality of the color and the user experience of the product. For example, the German company Steele takes the orange and grey color as the special color collocation of their own company’s products. Although there are some independent brands such as “Luyou” brand and “Meishen” brand in Chinese garden machinery, most of which are more concerned about the quality and reliability of the product. When it comes to color design, the products of the Chinese independent brands usually cannot meet the psychological needs of the operators by the reasons of their single color matching, poor appearances and a bad integration of the color and the working environment. Some of the garden machinery products completely imitate foreign brand color designs, the others are designed by non professionals based on the GB2893-2001 "Safe Color" [2]. They have less innovation and breakthrough, but also do not combine the regional characteristics and cultural characteristics of our country. For example, some enterprises directly use the brand color of the foreign manufacturers on their products without their own brand characteristics, some manufacturers only focus on the performance of products, and the unscientific color matching results in the user’s visual discomfort and security risks.

Taking a panoramic view of the current situation of the Chinese and international garden machinery color design, we can find that most of the foreign garden machinery color design is based
on the consideration of function, environment and aesthetics. Chinese garden machinery color is still in its infancy, and most companies choose to follow the foreign color design. It is difficult for them to combine the characteristics of our population to meet the psychological needs of users. Therefore, Chinese garden machinery color design needs to combine with color psychology. When doing a design, Chinese companies should analysis the psychological status of the users, combine with the connotation of the product and highlight color difference as well as meet the psychological needs of the operators, so as to enhance the aesthetic value of garden machinery.

The Principle of Color Psychology and Its Application in Garden Machinery

The Warm-Cool Feeling of Color and the Application in the Garden Machinery

Warm and cool colors have a great influence on people's mood. Warm colors make people feel exciting while cool colors make people feel calm [3]. High lightness warm color let people have a sense of progress, and low lightness cool color let people have a sense of retreat. Therefore, in the design of garden machinery products, dangerous parts should be used warm color to enhance the vigilance of the operator. And for some minor parts, using cool color design can weaken these components visually and emphasize the integrity of the product. Fig. 1 is a Chinese grass cutter, the color of its throttle control handle is black. Since there is a certain risk of the operation of the grass cutter, the color of the handle is not suitable. For the important part like the throttle control handle, it is best to use light colors to increase their recognition and enhance security.

Figure 1. A Chinese Grass Cutter.
The Weight Feeling of Color and the Application in the Garden Machinery

Light colors make people feel light and dark colors make people feel heavy. The proper application of the light and dark colors in the garden machinery products can coordinate the balance and stability of the overall modeling. Fig. 2 is a Chinese wind fire extinguisher. Wind fire extinguishers are usually large in weight, and can easily cause fatigue in the process of long-term use. In this case, the product has a lot of dark blue color on the shell, which will increase the user's visual weight. It is a wrong use of color. To this kind of large hand-held garden machinery, the design of color needs to reduce its weight visually. So you can choose a bright color to reduce the visual weight, and make the product has bright and lively qualities, indicating the valued sense of the product [4].

The Soft Good Sense of Color and the Application in the Garden Machinery

Light medium-purity colors give people a sense of softness and comfort, and dark, high-purity or low-purity colors make people feel hard. The appropriate use of the soft and hard feelings of colors can improve the psychological comfort of products. In Fig. 3, the hand held part of the garden scissors is black. That's not right. While the hand holding part of the garden scissors is the direct contact part between the human and the machine, it should be used a more gentle neutral color to give a person a comfortable feeling.
The Association of Color and the Application in the Garden Machinery

When we see a color, we will search for visual experience in the subconscious to match it and then carry out a logical analysis of it [5]. In Fig. 4, this chainsaw’s main colors are black and white. However, for such kind of dangerous garden machine, black and white color collocation cannot well cause the operator’s vigilance. So it can’t play a protective role to the operator. Moreover, black and white collocation can’t associate with the environment a chain saw is used in, so it is not suitable for a chain saw. In the design of dangerous garden machinery products, a variety of factors should be taken into consideration, so that the color is able to cause the operator’s vigilance, while not causing visual fatigue, and in line with the use of the overall color of the environment.

Scheme and Analysis of Color Design for Garden Machinery

Through the analysis of the color psychology of garden machinery color and the investigation of the existing garden machinery products, the author tried to optimize the color design of a certain brand of chain saw.
The Determination of the Main Colors and the Analysis of Color Psychology

During the garden machinery color design, the appropriate use of the main colors of the operating environment can make the product and the operating environment more harmonious. When people see the color of the product, they will associate it with the place where it’s used. This can help people to understand the product better. Through the analysis of a chain saw’s operating environment, the author extracted the main colors. The specific steps are as follows: 1) collecting the pictures of chain saws’ operating environment. Chain saw is a gasoline powered hand tool, mainly used for cutting and bucking operations [6]. Fig. 5 shows the pictures of the chain saw’s operating environment. 2) According to the chain saw’s operating environment, use the professional software Lukar to analyze the colors and pick out the main colors. 3) Print the main colors and compare them with CMYK color reference. The color values are C45M4Y98K0, C80M41Y100K4, C74M68Y65K24 and C82M77Y75K56, as shown in Fig. 6(a).

Figure 5. The Main Working Environment of Chain Saws.

Figure 6(a). The Main Colors Extracted from the Main Working Environment of Chain Saws.

Figure 6(b). The Warning Colors Initially Selected.

The main colors extracted from the operating environment is easy to make people think of the use scenarios and the usage of chain saws. Green reminds people of trees, grey suggests adult trunks and soil. All of these can allow users to better understand how to use a chain saw. Studies also show that green and gray get higher flicker value in the critical flicker frequency (CFF) measurement, which suggests that these two colors are not easy to cause visual fatigue. Therefore, in the color design of the chain saw, the four kinds of color shown in Fig. 6(a) are able to be used in a large area.

The Selection of Warning Color and the Analysis of Color Psychology

When it comes to dangerous operations, safety risks should be fully taken into account, and relative warnings should be given. Emphasizing on product safety by reasonable use of color is also an important part of color design [7]. Warning colors should be high chroma and high lightness, so as to arouse people's attention. The study shows that the human eye is most sensitive to the light
with wavelength at about 550 nm, and the wavelengths of yellow light are at the optimum sensitivity. Although the red light beside has longer wavelengths, it has strong physiological and psychological effects. So, it can be replaced by the yellow orange in the 5Y-10R region of Munsell hue ring. Yellow orange is often used sparingly as a warning color in the design of mechanical products, in order to remind users to pay attention to the dangerous parts. Fig. 6(b) shows the initially selected warning colors, and their values are C0M73Y92K0, C0M52Y91K0 and C6M17Y88K0. In the chainsaw's color design, the warning color can be used on the starting handle, the safety brake and the throttle trigger.

**The Selection of the Details’ Color and the Analysis of Color Psychology**

1) The choke rod, the safety trigger, the fuel cap and the oil cap should use the dark grey color of which value is C82M77Y75K56. There are few risks with the operations of these parts. Therefore, choosing the color as same as the surrounding parts can avoid the color too messy and maintain integrity. 2) The front handle holding part should be soft light grey, suggesting that the material here be used for grasp. 3) The guide plate should use the color of stainless steel. In operation, the color of stainless steel can distinguish the guide plate from the operating environment in color. In addition, as the operation part, the guide plate wears out more serious because of constant usage. Revealing the color of the material itself without painted can avoid wearing out of paint.

**Determination of the Final Color Scheme**

In order to meet the color preferences of users in China, according to the above analysis, four preliminary color schemes were formulated. And after the satisfaction survey of the color schemes, the final color scheme is determined, as shown in Fig. 7.

![Figure 7. The Final Color Scheme.](image)

**Summary**

For garden machinery, a good color scheme can help reduce fatigue, improve work efficiency and ensure the safety of users. In addition, an accurate color scheme can also express the product characteristics, causing the user's resonance. The study first summed up the color psychology concepts including warm or cool, light or heavy, soft or hard and association of color. Then the garden machinery color design in our country was analyzed with specific cases. At last, the principles of color design suitable for Chinese garden machinery was summarized. And the theory was applied to practice, which had improved the color design of chain saws.
Acknowledgement
The current study was supported by the Fundamental Research Funds for the Central Universities (YX2013-25).

References