Control Panel Modeling Design of Household Electrical Appliances

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Abstract. According to the functional requirements, the control panel modeling of household electrical appliances is explored from the aspects of layout composition, color, characters, graphic symbols and signs, materials and coloring process.

Introduction

There are many kinds of modern household appliances and new styles, but almost every product is indispensable to the control panel. The control panel is used to install control and display functional components. It is a device which integrates button knob, indicator, display panel, jack, label, model and so on. The control panel of household electrical appliances is the bridge of man-machine information transmission and exchange, the window of man-machine dialogue, the most frequent component for people to observe and operate, the visual center of the whole machine, the core part of the appearance and decoration, which will leave an important and deep first impression on people. It can be seen that the modeling design of the control panel of household appliances has a great impact on the use effect, modeling and even sales of the entire product, and must be given high attention.

Modeling Requirements for Control Panel

Before starting the design of the control panel, we must analyze the requirements of the design panel.

1) Meeting functional requirements.
Function plays a dominant and decisive role in the structure and modeling of the control panel. The structure, shape and color design of the panel should meet the functional requirements.

2) Meeting the requirements of users.
The layout of functional components is reasonable and conforms to logical rules; the size, shape, position and color of functional components should conform to human physiology, psychology and habits, and be easy to observe and operate. It is not easy to weary, make no mistakes, and use safely and reliably.

3) Having fast identification.
The characters, symbols and display on the panel must be clear, concise and easy to understand, easy to recognize, fast to read, in order to improve the efficiency of use.

4) Having adaptability.
This refers to the adaptation to environmental conditions. It can adapt to mechanical environment (enough strength, stiffness, reliable connection, vibration resistance, etc.), climate and electromagnetic environment, can meet the requirements of corrosion protection, etc.

5) Having artistic.
The composition, color, texture of the panel should give people a strong artistic appeal, with a sense of the times, and should be in harmony with the whole machine molding style.

6) The structure has good manufacturability and high efficiency.

7) Easy to install, adjust and maintain.
Layout Composition of Control Panel

Layout composition should start from the operation of the product itself, using color, color blocks, lines and other ways to achieve clear, at a glance. The composition should be full of rhythm, guide the line of sight to flow according to the degree of operation, to maximize the satisfaction and convenience of users.

1) Layout of according to the component function

If there are more components on the control panel, they should be arranged according to the position of the application program, and applying formal aesthetic principles such as uniformity and balance, rhythm and rhyme, unity and change, to form functional needs in order and to be arranged in a rhythmic and rigorous layout visually (Figure 1).

2) Layout of using color block and ribbon

If the control panel needs some kind of color sentiment, it can adopt the uniform layout of the color block and ribbon. Axis line orientation is used on the control panel to break the balance of the color block and ribbon by the position of the components and make the whole panel active (Figure 2).

3) Layout of using separation line

Some control panels can be layout of using separation line if the hue is limited for the sake of the whole machine elegance and quietness. Using separation line may divide the operation parts into several areas. It can be a deep bottom with white line or a shallow bottom with deep line (Figure 3).

4) Layout using shading lines

The control panel of modern household appliances tends to low chroma, and shading lines is also a trend. Generally, we use longitudinal lines, tilting lines, dots, or points with a certain image (Figure 4).

![Figure 1. Layout of according to the component function.](image1)

![Figure 2. Layout of using color block and ribbon.](image2)

![Figure 3. Layout of using separation line.](image3)
When composing the control panel for a certain household appliance, we should make a reasonable layout according to the function of the product and the number of components. It can be a single method or a combination of various methods, but no matter what method is used for layout, the following issues should be noted:

1) The hierarchical relationship of the control panel

Highlighting the theme is the first problem to be solved in the design of the control panel. Subject plays a decisive role in the composition, and the object plays an important role. Subject refers to the main functional parts, is observation center. The proper treatment of the subject can form a visual or interest center. The key to highlight the subject is to deal with the hierarchical relationship of the control panel plane, so that the two-dimensional plane of the panel presents the effect of three-dimensional space. Generally, the strong contrast and the outstanding parts (such as buttons, knobs, names, models, scutcheon, etc.) should be regarded as the "foreground"; the moderate contrast, no stimulation or less stimulus parts (such as words, symbols, etc.) should be regarded as "middle scenery"; The soft and implicit parts (such as backplane, display screen, etc.) are used as "background", which can make the control panel level clear and improve the artistic effect of modeling.

2) The position relationship of the control panel plane

The different plane positions of the panel top and bottom, left and right give people different feeling effect. The upper part of the panel can cause people a relaxed, fluttering, free feeling, the more upward, the more strong this feeling; The lower part of the panel gives people a feeling of pressure, restraint, restriction, heavy. The reason is mainly due to the internal experience of the human eye being affected by gravity on the plane. The left half of the panel gives people a feeling of relaxation, flow and freedom; the right half of the panel gives people a feeling of tension, heavy and fixed.

3) Blank in control panel layout.

The layout of the components, characters and symbols on the panel should not overfull or even the whole panel, which makes people feel overcrowded and breathless. There should be appropriate blank space, gathering, scattered, sparse, close, real and virtual, which can eliminate the monotony of the panel, and leave room for the expansion of the function of the panel. The blank is equivalent to the background, which plays an important role in setting up and strengthening the theme.

The above composition layout methods are for reference only. The actual design should be based on the position, content and size of the control panel placement, and according to the overall art of household appliances modeling requirements to reasonable composition, in order to achieve better results.

**Color of Control Panel**

The control panel is the "face" of household appliances. How to handle the color is not only related to the function and use of the product, but also has a great impact on the modeling.

**Main Color of Control Panel**

Generally, a single color is used to give people a sense of simplicity, elegance and generosity. Monochromatic is not monotonous, because there are other colors on the control panel of household appliances, such as indicator light, buttons, scutcheon, they can make the overall color still very rich. Of course, when considering the main body color of the control panel, we should always pay attention to the coordination of the whole machine color.
Color Matching of Control Panel

The control panel of household appliances has many components and characters for users to observe and use, which requires that the color of the control panel is pleasant, lively and clear. In general, you can use a slightly higher value and moderate lightness.

Attention Points of Control Panel Color

1) Large harmony and small contrast.
   Overall color harmony should be adopted for larger household appliances, and small area contrast colors should be used on the control panel.
2) Seeking harmony in contrast.
   Large contrast can also be used to achieve harmonization for small household appliances.
3) The texture of the panel
   With fine, gentle, no light, muted colors is appropriate. On the panel and near the panel should avoid electroplating parts that produce glare in order to avoid strong visual stimulation.

Characters, Graphic Symbols and Scutcheons on the Control Panel

The control panel of household appliances is designed to communicate with people and convey information about the use of products. And this kind of communication is through the characters, graphic symbols and scutcheons as a medium, so their design is also very important.

1) Characters
   The characters on the control panel usually uses an equal line font or Fang song Ti(imitation song font). But the control panel of household appliances, because of its large size and few components, can also choose a slightly lively and varied font, giving people a sense of joy.
2) Graphic symbols
   Various types of graphic symbols are widely used in modern means of instruction. It replaces and supplements the transmission of character signals with a highly general, concise and vivid graphic language. Graphic symbols are intuitive, and you can know what the meaning is when you see them. They are universal, not limited by the country, region, language, cultural level. Many graphic symbols have become the user's universal common language.
   Most graphic symbols have national standards, so national standards should be used as far as possible. If there is no national standard, the relevant symbols of the control panel of other household appliances can be appropriately referred to.
3) Scutcheons
   Scutcheons refer to trademarks and nameplates of products. A trademark is a mark of a commodity, it may not be changed at will. A nameplate is the type and name of the product. They are well designed and play a good decorative role and a strong propaganda role, so we must also attach great importance to them.

Control Panel Material and Coloring Process

The main materials for making control panels are metal aluminum plate, engineering plastics and plastic aluminum sheets.

1) Metal aluminum plate
   Metal aluminum plate is the most widely used material in household appliances. Different texture panels can be obtained by electrochemical treatment, dyeing, sandblasting, wire drawing, polishing and painting. Aluminum plate has the advantages of light weight, long service life, simplicity and variety of treatment methods, suitable for single piece, small batch and large-scale production.
   Commonly used coloring processes are aluminum plate fine print and it offset printing.
2) Engineering plastics
   The injection molding engineering plastics can be made into a concave and convex, Stereoscopic control panel. This kind of panel has the characteristics of soft color, harmonious pattern and diversified color. It is also a widely used material in the control panel of household appliances. But
it is not easy to make single piece or small batch, because the cost of making a set of molds is very high.

Commonly used coloring processes are:
(1) PVC transparent plate screen printing. It is mainly used in household appliances such as fridge, color TV, electric fan, washing machine, robot sweeping machine, etc.
(2) Polycarbonate PC colorless transparent plate screen printing. Computers, laptops, washing machines etc. have been widely used.
(3) Direct screen printing of plastic parts. Modern household appliances pursue simple style without decoration. Direct screen printing is in line with this trend.
3) Plastic aluminum sheets
Plastic aluminum plate is formed by sticking the PVC laminating together with aluminum plate through a certain process. It has a variety of colors, soft color, fine texture, simple and generous, stable and elegant artistic effect. This material is also widely used in household appliances. The plastic paste coloring process is basically similar to that of engineering plastics.

Concluding Remarks
With the development of science and technology, more and more electrical appliances will enter the family, which puts forward new requirements for the function and modeling of the control panel. As long as designers make full use of modern science and technology and analyze the market demand, they can design a new type of household appliances control panel with complete functions and perfect shapes.

References