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Modeling Design on Horizontal Box

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Abstract. We discuss the method of modelling design on horizontal box from five aspects: function, modelling, material, process and color. It is pointed out that in order to adapt to the market, it is necessary to design new products with a sense of the times.

1. Introduction

In industrially developed countries attaches great importance to the modelling design of products. Product modeling is reflected through the appearance of the product, and its appearance is a specific image that can be remembered by people. Products of the simple and bright appearance give people a feeling of precision in structure and reliability in performance. Through the appearance of art modeling, it also gives people beauty and artistic enjoyment. This will play a crucial role in the promotion of the product.

The box is common component in industrial automation control equipment, instrumentation, household appliances, food machinery and agricultural and sideline processing machinery. The purpose of studying the box modelling is to explore the characteristics and treatment methods of the modern boxes, improve the appearance quality of the products, and continuously introduce new products with contemporary characteristics to meet the needs of the market.

There are many types of box modeling. This paper only analyzes and discusses the problems in the modeling design of horizontal box. Of course, these questions also have some reference for other types of box modeling design.

2. Function

Function refers to product-specific technical functions. It is the main purpose of product modeling, is the most important use requirement of product. For different functions, different products have different modeling.

The box function plays a leading and decisive role in its structure and modeling.

Looking at all box shapes, it is an important functional component of the product. It forms a unified body with the entire product. Its main functions are as follows:

- (1) To ensure the realization of the technical specifications of the product;
- (2) To have adequate reliability and effectiveness;
- (3) To have sufficient strength and stiffness to prevent deformation to affect function;
- (4) Can eliminate the influence of electromagnetic interference, vibration impact, chemical corrosion and heat, and ensure the stability of product performance;
- (5) To conforms to human physiological and psychological characteristics and habits, is convenient and efficient in operation, and ensures the safety of operators

Designers should fully grasp the function of the box when they designing its modeling. If they pursuit the novelty, the time sense of the product modeling, and ignore of their own functions, this product is not practical, but also no market.



3. Modeling

The horizontal box is mainly composed of three parts: the main structure(frame, skeleton), the shell structure(including the front and rear panels, the upper and lower cover panels, the left and right sides panels, etc.) and the accessories(including the handle, the bottom foot, the foot, etc.) This division is not absolute. Horizontal box is generally suitable for small and medium-sized box. The horizontal line is usually used as the modeling element, that is, the box shape, its decorative lines and its colors are all arranged as the "main tone" in parallel in the horizontal direction. This kind of horizontal line style gives people a sense of stability, calm, and quiet. It bring the human sight to the horizontal, produces a wide sense of visual effects, can relax people's work tension, and give people a feeling of rest.

Based on the linear style of horizontal lines, the box of small electronic instruments mostly forms a morphological feature with a flat rectangular hexagonal body as the "keynote", as shown in Figure 1.

The linear geometry has a solemn, uniform, calm, and serious feeling, and the processing process is relatively simple, but this modeling is rigid and monotonous. Therefore, in the linear treatment, the use of round corner transition, causing movement in the quiet, to the linear line appears lively and changeable; this has become the mainstream of the contemporary horizontal box modeling.



Figure 1. Small electronic instrument modeling



Figure 2. Current small instrument modeling

Figure 2 shows the current popular small instrument modeling. The modeling of the medium-sized horizontal box is also basically a rectangular body. It is also the most convenient means to obtain a concise modeling. Of course, this modeling is based on the function of the box itself.

Figure 3 is the freezer modeling. The interior structure of the freezer is relatively simple. In addition to the refrigeration system, the largest space is the refrigerator for food. In the modeling design, it is generally necessary to have the horizontal waist line, which can break the monotonous atmosphere of the rectangular plane and increase its stability, as shown in Figure 3(a). The some freezers shrink inward at the bottom to increase the three-dimensional space level, as shown in Figure 3(b). In the latest freezer, the linear line is flexible into the curve line, to make the body strong, generous, lively and friendly, as shown in Figure 3(c).

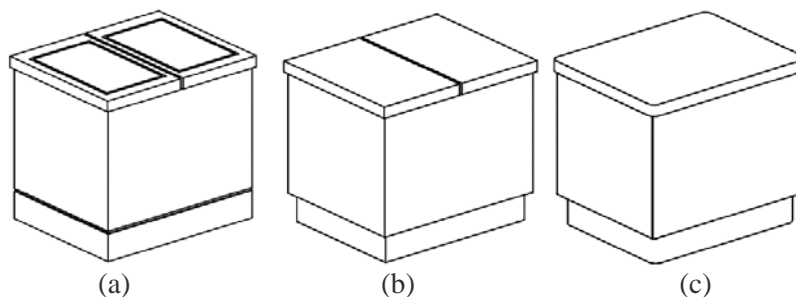


Figure 3. The freezer modeling

The previously analyzed horizontal box is generally made into a cuboid. The cuboid is stiff and monotonous, and it is not easy to obtain lasting beauty. Designers often use horizontal waist lines, facade segmentation, ventilation windows, trademarks, control panels, handles and other decorative components to beautify the box. To a certain extent, these techniques can make the box image more vivacious, as shown in Figure 3. However, due to the lack of changes in the main body, this technique has a certain degree of locality. Therefore, according to the characteristics of the functional components of the product, the designer always focuses on making changes in the cuboid, and can even be designed as a trapezoidal shape, to make people refreshing feeling, to achieve better visual results. Figure 4 shows the newly popular horizontal box. They give full play to the function of the product, using the method of box division or combination, to reflecting the characteristics of the times.

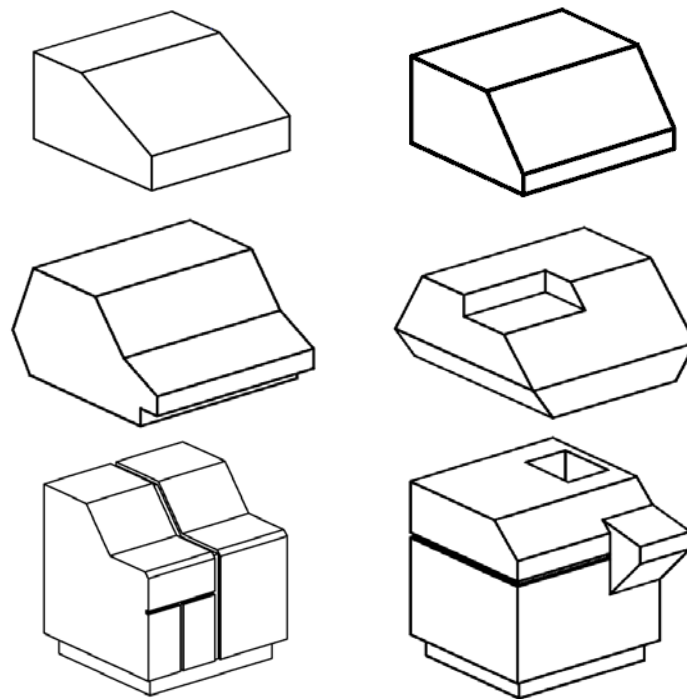


Figure 4. The modern modeling of various horizontal boxes

4. Material

The appearance of a product is a design of the exterior structure, which depends on the material. The material is the material foundation of the modeling. Reasonable selection of materials is an important part of modeling design. If the material selected is inappropriate, not only does it damage the beauty of the form, but it also loses its performance, which greatly reduces the use value of the material.

As the same kind of products have almost the same functions, the possibility that the products of each manufacturer are similar in modeling has greatly increased, and for the designers, they all want to maintain their own uniqueness in order to improve the reputation of their manufacturer and promote sales. Under the condition that the basic form is roughly the same, the reasonable selection of materials can improve the modeling image of the product.

The small horizontal box is mainly used to install various instruments, appearances and other electronic components, which requires that the box materials have the characteristics of light weight, good strength, simple processing, and convenient combination. Aluminum profiles have been widely used as raw materials for box because of their small specific gravity, high specific strength and excellent corrosion resistance. With the continuous development of new technologies and new materials, the box materials are gradually replaced by engineering plastics, because the quality of such engineering plastics is light, the strength is also higher than that of ordinary metals, and it also has an intrinsic beauty. Due to the fact that medium-sized box are mostly used for larger cabinets, food

processing machinery, agricultural and sideline products processing machinery, etc., the weight is too light to be conducive to the stability of its work. Therefore, metal materials are generally used, but engineering plastics are also used in some places that have decorative functions.

The temperature, humidity, acidity and alkalinity in the environment affect the mechanical properties, physical properties and chemical properties of the box materials. According to the working environment of the product, the material can be reasonably selected, which can enable the product to maintain its use performance and novel and beautiful appearance for a long period of time. The processing performance and standardization of materials are also factors that should be considered when selecting box materials.

5. Processing Process

The production process of any product includes two kinds of processing process and decoration process. The former is the means achieving modeling, and the latter is the condition of perfect modeling. In the entire manufacturing process, various processes do not appear alone; it is often mutual combination, mutual penetration, and mutual promotion. Process is a combination of art, technology, and craftsmanship. A certain process has a certain modeling, which means that there is a close connection between modeling and process. In modeling design, it is necessary to have a suitable process to meet the needs of modeling.

Panels of medium-sized horizontal box are generally formed with metal thin plates on the bending machine, and there are also profiles for stamping and welding. The box manufactured with this technology has a smooth and clean surface, straight lines, and clear corners. Surface decoration is used with paint or plastic coating;

For a small batch of products, in order to reduce their costs, the box is divided into some small shapes, so that the mold used and the corresponding equipment cost are much lower. In addition, due to the segmentation of the facade, it is also easy to rid the box out of the monotony of the plate, to make people feel three-dimensional and thickness. If the case is not manufactured in large quantities, this method can be used.

For the modeling of small-sized horizontal box, the applicable process methods are relatively wide, the technical requirements are high, and there are many types of work. Common: cutting processing, plastic injection, plastic spraying, electrostatic injection, chemical coating, refinement oxidation, vacuum coating, adhesive and so on. By this kind of process processing of the box, it has a noble, exquisite sense, to show the high technology level, to highlight the modern style of modern design features.

6. Color

In product modeling design, if the shape of the product is accepted through understanding and has a greater degree of rationality, the color of the product is almost completely sensitive. Color is a kind of color feeling produced by the light acting on the visual organs. It can produce important physiological and psychological effects on people, thus to give color spiritual function. In the process of product sales, to make the product attractive and stimulate consumers' desire to buy, color must play a stronger and more direct role than shape.

Product color design is not an easy task. Although the color scheme has greater diversity and flexibility, it does not mean that the color scheme can be put together arbitrarily. Any successful product color design must be carefully scrutinized and carefully practiced. In general, the product modeling design is the box layout first, and the color configuration is later. Therefore, color design must take into account the characteristics of the form, and can not only ask for the one-sided pursuit of color processing. Only by integrating the comprehensive aesthetic form of "shape, color, and quality" with the essential content of "people, product, and environment" can perfectly achieve the effect of product modeling design.

The horizontal box, especially the medium-sized box requires large areas of color. If the color is too bright and strong, it will make people disgusted. It is generally advisable to consider cold color with high brightness, low purity, small color difference, and weak contrast. The color difference should not exceed 60°. Only the color coordination can enable people to concentrate their thoughts in

the work environment, work safely, and create the highest work efficiency. Using color aesthetic association can induces people's desire to buy, to achieve the purpose of promotion.

When the surface of the metal is colored, attention should be paid to the coating process, otherwise the coated oil layer is easy to peel off. Engineering plastic itself can choose different colors, and can be arbitrarily colored. Using the characteristics of engineering plastic can rich box color, and will not fade.

7. Conclusion

The modeling design of the horizontal box is a comprehensive design. It is necessary to consider the function, structure, materials, and process of the box, as well as to consider its color and economy. Only in this way, can we design a new, beautiful, with distinctive characteristics of the times, to meet the market needs of fierce competition.

8. Reference

- [1] Gao Min. Product Modeling Design, Machinery Industry Press, 2012.
- [2] Shuchan-Cheng. Electronic products modeling and process manual. Jiangsu Science and Technology Press, 2008
- [3] Zhenbang-Chen, Wei Chen. Preliminary exploration of horizontal box modeling. Jiangsu Industrial Design Society, 2006
- [4] Anonymous. Picture. [EB/OL]. <https://image.so.com/i?q=%E5%8D%A7%E5%BC%8F%E6%9C%BA%E7%AE%B1%E9%80%A0%E5%9E%8B&listsrc=sobox>
- [5] &listsign=e54e1db629e5bf2a9663bf2c9ee6cb2d&src=360pic_strong[2018-12-28]
- [6] Anonymous. [EB/OL]. <https://baike.so.com/doc/6727287-6941556.html>[2018-12-28]