

Study on the Innovative Design of Luminaires from the Perspective of Ergonomics

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Abstract: With the progress of society. Human-machine factors .such us safety, high-efficiency, friendly, convenience, receive more respect .Lamp form is the communication medium of product and users. Application of ergonomics characterizes lamp design with humanity and connotation. This article briefly studies the relationship between ergonomics and lamp form design, and researches the methods of lamp form design based on ergonomics.

1. The Necessity of Ergonomics Research in the form of Lamps and Lanterns

Lamps and lanterns is widely used in household, office, leisure and other places, which is closely related to our life, and easy to affect us, The study of ergonomics factor in the form of lamps and lanterns is not only a conceptual research, more in-depth discussion of the practical application of lamps and lanterns.

On the one hand, From the point of view of the user, due to the lamps and lanterns is cheap and easy to get and easy to update, people at the time of lamps and lanterns of choose and buy, less aware of man-machine efficacy problem in the form of lamps and lanterns, and attention is often the most basic function of product attributes, namely lighting efficiency and stability. on the other hand, under the drive of market factors, Lamps and lanterns product design for cost, tide factor is more, for less ergonomic factors considered, produce some pretension and the lack of practical or rough, direct no aesthetic value of form design of lamps and lanterns, this violated the product design for one of the basic principles of "suitability"[7].Therefore, in the tide of modern product development, along with man-machine factors of mechanical products, electronic products, such as deepening research at the same time, it is particularly important to the discovery and application of lamps and lanterns of man-machine .

2. The Connotation of Product of Human-Computer Ergonomics

Human-computer ergonomics is also known as the man-machine engineering, The purpose of which is in the man-machine-environment system to establish harmonious relations between people and products, and to excavate the potential of people and the using of the comprehensive balanced muscle can, protect human health, so as to improve productivity. Human-computer ergonomics is the result of human-machine-environment system engineering,[15] has a wealth of background, psychological physiology and anatomy of engineering, is a comprehensive fringe technology discipline, early human ancestors in the Stone Age when it is in use tools to hunt for food with the concept of bud and ergonomic until modern times, people begin to pay close attention to the huge role in production and living, ergonomic gradually began to carry on the systematic study, and is widely used in military and civil field.

Man-machine efficacy emphasizing "human factor" is taken into account in the design process, any design concept to people demand as a starting point, through to the human factors, the increase in use process of physical and mental comfort and improve work efficiency and reduce mistakes and fatigue.

Man-machine efficacy is of great significance in promoting the value of products, optimize the

product design,. Under the background of market economy, to consider in the design of human-computer ergonomics factors, make the design of the "pleasant", is the expression of the designers professional quality and social responsibility. Product every detail will be reflected stylist humanities concern to the users.

3. The Connotation of the Form Design of Lamps and Lanterns

Product form expresses the product quality of a material, organization, structure, the connotation of the extension products such as essential factors, which is the medium of communication products and people. The tools of lamps and lanterns is lighting, it consists of light emitting parts and accessories. Main light parts of lamps and lanterns of improvement and change, prompted the continuous improvement of the form. In ancient times, using the candles or wick burning glow for the effect of lighting, and so on the form design of lamps and lanterns, often consider the luminous body heat content of the ventilation and smoke control, such as modern lamps and lanterns is to use metal or gas under certain conditions the glowing characteristics for light. The form as well as a function of lamps and lanterns of lamps and lanterns of the external performance, but also contains more deep meaning, such as economy, people, environment, material and so on various factors. Lamps and lanterns are discussed in this paper is mainly on the vision is given priority to with form of embedded type lamps and lanterns, type, including table lamp, pendant lamp and floor lamp.

4. Relationship and Function between Ergonomics and Form of Modern Lamps

The life cycle of lamps and lanterns forms lamps and lanterns of micro- environment system, including the lamps and lanterns-people, lamps and lanterns-environment, three subsystems of people and environment, and lamps and lanterns-people-a big system of the environment. The shape, color, state of lamps and lanterns is sensation, to implement control behavior of lamps and lanterns, lamps and lanterns to produce the corresponding feedback, this is the lamps and lanterns - system. The shape and color of lamps and lanterns, state and environment interact with each other and function, form the lamps and lanterns - environment system. Light irradiation in color on the walls, for example, reflection form new light color; After the lamps and lanterns is abandoned, material degradation, into the environmental system. Lamps and lanterns of lamps and lanterns, the environment and human interact each other, and forms the lamps and lanterns-man-environment system. Environment-people system more involves the environmental information, because the category, project's mad again and again will not enter the discussion. The relationship of the whole system is shown in (figure 1), the arrows in figure by the actor to the actor.

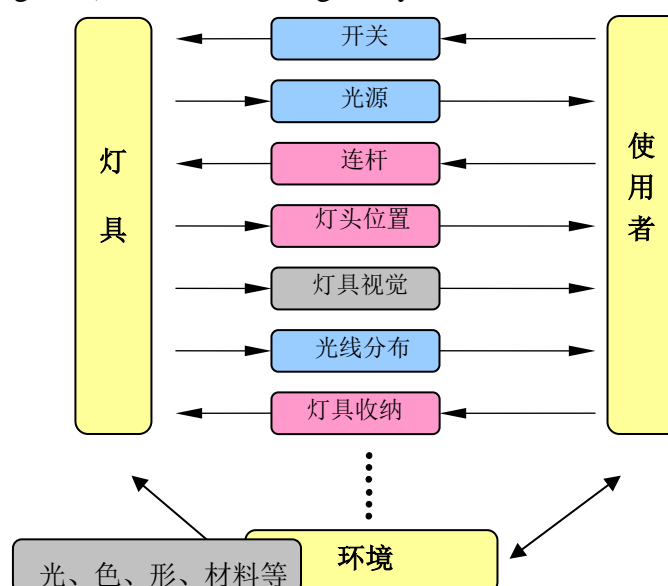


Fig 1. Lamp-People-Environmental system

Man-machine Efficacy and Lamps and Lanterns Appeal to Each Other.

Man-machine efficacy to appeal in the form of lamps and lanterns, which for the form design of lamps and lanterns to attach importance to human factors. Lamps and lanterns as everyday items related to human life, directly affect the human production and living activities, and the value of human-computer ergonomics as a design science more highlighted in this, therefore, in order to make the lamps and lanterns of agreeableness, in the form design of lamps and lanterns, should fully consider the use of lamps and lanterns of each link, the relationship between human and lamps and lanterns and the environment.

Human-computer ergonomics form design of lamps and lanterns, is not only to a greater degree of play to the practical value of lamps and lanterns, and for some special cases, and special group has more prominent significance. Such as: lamps and lanterns of children, elderly, emergency lamps and lanterns of lamps and lanterns[9], etc.

Children form design of lamps and lanterns, for example, because users are children, children is a kind of dreamy, strong curiosity, like the hands-on, the characteristics of the special groups, vulnerable children so the form design of lamps and lanterns with the ordinary difference of lamps and lanterns



Fig 2. Child chandelier



Fig 3. Children's table lamp

Considering the safety factor, lamps and lanterns is mostly chandeliers, wall lamp, children or small lights using battery power. Modeling of lamps and lanterns, the position of the switch components such as flexible, puts forward new requirements to man-machine for effect. Children can form design of lamps and lanterns to ensure children touch the part of the insulation and low temperature. Such as using insulation wire, use full sealed chimney, as shown in (figure 2). Desk lamp of small size, easy to grasp. As shown in (figure 3).

5. From the Perspective of Human-Computer Ergonomics Design Thinking and Method of Modern Forms of Lamps and Lanterns

5.1. Morphology of Lamps and Lanterns Should Comply with the Scale of the People.

The scale of the lamps and lanterns shape and the size of the people are Consistency, such as the diameter of the knob corresponds to the user's finger is most suited to push distance; The size of the lamps and lanterns is easy to move and carry, desk lamp is generally not more than 250 * 250 * 500 mm. Parts - switch is operated in the form of lamps and lanterns of moderate height, Angle, appropriate to hold user in the operation of the switch of lamps and lanterns, wrist corner within the scope of the right Angle; Power in the hands of muscular body parts, including the fingertips, tucks, big thenar and hypothenar, finger root joints and the palm of your hand should not force. As shown in (figure 4), green said is suitable for the area, red is not suitable for the area.

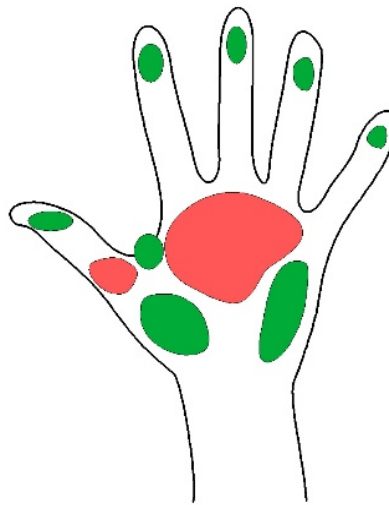


Fig 4. Hand Force Division

Brightness, color, shape, etc, in the person's visual and psychological acceptance within the scope of the visual form mild stimulus, such as using only 1 to 3 kinds of color, modeling of lamps and lanterns of harmony. Based on the design of the chimney, the light reflected by appropriate shade, weakened or, thus forming the reasonable light distribution, positive influence on the consumer and the environment[10].






5.2. Lamps and Lanterns form Embodies Easy to Accept the Cognitive Function of the Elements.

In the modeling of lamps and lanterns are a recognizable tool and because of its shape semantics by users understand easily, rather than crude of arbitrary shape. For example, cylindrical shape with a circle of grain is considered a knob, the above lines suggest operation method is rotating. Raised on both sides of the button, reminiscent of the "seesaw", said one end of the press, the other end of the cock, at both ends for the use of two different states. On the other hand, cognitive functions include role cognition. Colourful cartoon form, for example, are generally children product of lamps and lanterns, the model of gray or black is suitable for business people or stable character, use with warning signs like red color, is often used in emergency lighting and other special environment.

5.3. Lamps and Lanterns has Convenient Function Form.

Form of lamps and lanterns is not only the appearance of lamps and lanterns, but also functional components. The functionality of lamps and lanterns is embodied in use, maintenance, cleaning, handling. Table 1 from the perspective of functional illustrates the application of ergonomic in the form of lamps and lanterns .(Table 1.)

Table 1 form of lamps and lanterns is convenient to use a function

Form of lamps and lanterns	Function	Introductions	case
variability	Various convenience for the different occasions, the use of methods, namely "one lamp is multi-purpose"	The innovative book LED lights, for example, open the "book", the light is on, by changing the Angle of the opening and closing, adjust radial light and shade. Users can put it on a desk, bookcase and other places, and the center of gravity of lamps and lanterns is smooth, put in many ways.	
There is no "blind Angle" (that is, can't touch the part of the)	Easy cleaning and maintenance	If there is a concave shape, groove Angle should not be less than 90 ° or design for the groove fillet.	
Humanized interface parts	Convenient disassembly, repair and receive	Modelling concise, parts connection relationship and clear	
Anxiliary function	Provide convenient usage	The lamps and lanterns can, for example ,clip on the edge of the desk or book form.	
Sealing, isolation, to a certain extent sunlight	There is good safety performance to avoid contact of electric shock, burns, and so on	Fully sealed design, for example, USES the heat insulation material, etc	

5.4. Lamps and Lanterns Shape Aesthetic Value.

Aesthetic value in the form of lamps and lanterns is refers to the cultural connotation in the form of lamps and lanterns, individuality, diversity and other characteristics and trends, meet the aesthetic needs of people in spirit, it embodied on the style of lamps and lanterns shape design, which is also the mainstream direction of the current design of lamps and lanterns. Through various forms of lamps and lanterns design semantics, give people a positive message, make use of the process of lamps and lanterns is full of enjoyable experience. Classic beauty after one thousand years, gradually abstraction into a particular element symbols, symbols of lamps and lanterns is a blend of these elements form, make people pleasing, infinite daydream. The Chinese style droplight, as shown in (figure 5) USES Chinese traditional square element, into the ancient lattice pattern characteristic, give a person with aesthetic experience; In (figure 6) European classical droplight,

thick with European classical style, draw lessons from ancient people's candle lighting style design, the original candle to change into a form similar to modern bulbs, wrought iron candlestick, use the adornment of the rococo style, just like a classical and modern science and technology perfect coordination of symphony. Modern society, the form design of lamps and lanterns of personalized and interesting often get the favor of people. As shown in (figure 7) floor lamp, it is a color paper lamps and lanterns. Its appropriate use of the transmission characteristics of paper, build sweet atmosphere, the paper forms the shape of the lamps and lanterns, quite interesting[14].



Fig 5. Classical chandelier



Fig 6. European chandelier



Fig 7. Fun Luminaire

6. Summary and Outlook

Human-computer ergonomics optimization form design of lamps and lanterns, form design of lamps and lanterns is a new point of view of the system. Use the product process is the process of the user and the product communication, users create subtle relationship with the product. For people with subjective initiative of the people, for the lamps and lanterns of the progressive relationship includes: would like to know - form conforms to the scale of the people, can get to know - the symbol contains regular form, you can use - form has the function of externalization, ready to use form - create use of pleasure. For each process of qualitative and quantitative analysis and application of man-machine relationship, to develop the value of the product of lamps and lanterns, is beneficial to businesses and consumers. Therefore, the research and application of human-computer ergonomics for product design of lamps and lanterns has far-reaching

significance.

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