

## Design of New Thermal Lunchbox Based on Humanization Design

Lü Xinxin<sup>1, a</sup>, Luo Jia<sup>2, b</sup>

<sup>1</sup>School of Fine Arts, Guangdong Polytechnic Normal University, Guangzhou, China

<sup>2</sup>School of Fine Arts, South China Normal University, Guangzhou, China

<sup>a</sup>email: 183472955@qq.com, <sup>b</sup>email: 172968380@qq.com

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**Abstract.** Many office workers choose to bring their own handy for lunch, but the heat preservation of meal is constrained by the external location and the attributes of the lunchbox. This product is with humanized design as the breakthrough point, combined with the characteristics of the physiological, psychological and behavioral aspects of office worker, to the innovative design of thermal lunchbox, to adapt to the fast-paced life and better meet the demand of health.

### Introduction

The rapid development of science and technology bring much convenience to our life, but due to a lot of reality problems at the same time. The product design of modern life needs to reflect 'human-oriented', making the humanistic concept throughout the product design to make the product that the users really want and to reflect the designer's rational care. As prices rise, the cost of living in big cities increases obviously and fast food outside causes many health and safety problems, more and more office workers prefer to bring their own lunch box. In this paper to make the innovative design of the insulation lunch box to meet the psychological and physiological office worker needs with the humanization design.

### Humanized Design of Thermal Lunchbox

**Products of humanized design.** Humanized design is based on the rationalization and functionality of the product, which is the Unity of humanity and materialization.

Humanized design mainly reflects in the people's psychological and physiological needs. The product humanized design reflects 'people-oriented' by making the analysis of the user's psychological and physiological needs and using ergonomics to meet the multifaceted needs to make the design combined with people, which better meet the user's demand and improve the comfort and convenience of product.

**The using characteristic analysis of thermal lunchbox.** Many office workers who bring their own lunchbox use microwave lunch box, thermal lunchbox and electric heating container mostly. According to the survey, for most workers, health and safety, saving money, saving time and quality are the major considerations of they having meals. Enjoying healthy and delicious meals in a brief meal time makes them cheerful and improve their working efficiency. Lunch box portability, the food heat preservation effect and palate comfort become user's standard of choosing thermal lunchbox.

There are three kinds of common thermal lunchbox: 1) the common thermal lunchbox. Adding insulation shell outside ordinary lunch box, between inside and outside two layer filling plastic foam, then to metal plating layer membranes, the hot dish inside insulation effect, which is limited in holding time, if heating it needs to aid of other heating equipment. 2) Electric lunch box. Food inside the lunch box directly by heating the body heat, the temperature uncontrollable, it can only achieve heating and heat preservation. the continuous heating is easy to cause the food moisture loss,

even seriously making food burnt, heating food with the consumption of energy, which cannot meet the demand of the outdoor workers. 3) Cooking lunch box. By heating the body heat water for cooking food box base will produce large amounts of water vapor in the heating process, lunch box isn't convenient to carry out due to its larger volume, due to using with electricity, which isn't suitable for outdoor workers. For electric lunch box and cooking lunch box, If you cannot control heating time with a correct designated position, then there is a certain security hidden danger and the high heating preservation makes the people not to eat right away.

Aiming at the shortcomings of the existing technology to design a new type of water heater temperature control thermal lunchbox. Water heater heating mode of the structure of flexible, able to adapt to the use environment of indoor and outdoor, achieve accurate temperature control of heating, simple structure, convenient operation and strong practicability, which can satisfy the function of bringing their own lunch box and psychological physical need, embodies the humanization of product design requirements.

### A New Type of Thermal Lunchbox Design

This new type of thermal lunchbox has the characteristics of simple structure and the strong practicability. Simple operation by users can realize in two ways to heat the food and can control the temperature effectively. The whole appearance of the structure just as shown in Fig.1.



Fig.1 The whole appearance of the structure

**Heating function design of the lunchbox.** Water heater temperature control thermal lunchbox designed two kinds of heating mode, the first is that open the shell at the top of the rubber plug, by in and out of the gate pour hot water in the tank, to realize the tank on the heating of food. Otherwise, on the basis of the first way, Insert the power cord into the power interface and connect the power supply, integrated circuit to control the current of the opening and closing, water temperature sensor can detect temperature of the water in the tank, when the temperature is lower than a certain degree, the integrated circuit to control the electric heating wire, converts electrical energy into heat energy, water heating, when the water temperature sensor to the water in the tank when the temperature higher than 70°C, integrated circuit power automatically, open the power supply automatically when the water temperature is less than 50°C to continue heating, to ensure that products continue to intermittent heating food to preheat and heat preservation effect, easy to use.

Due to the heating temperature is not high, so will not produce a lot of water vapor during the work, to avoid the expansion of the gas inside the box. Moderate temperature can be set in the heating process in place to ensure that users can have a meal at any time. Joining in hot water can also be to simple heating food without plug into sinks, which meets the needs of outdoor workers to

heat the food. Integrated circuit and temperature sensor is small, the size of the carton size does not need to be restricted by the parts, so lunch box size conform to the requirements of the portable, comply with the requirements for an office worker's choice of thermal lunchbox.

**The structure design.** Based on the above function purpose, to make structural design for the inlet type heating temperature control lunchbox, the spatial structure and cutaway structure as shown in Fig.2 and Fig.3 :

1. Circuit. 2. Power interface. 3. Power cord, the active connection of power cord and power interface. 4. The depression trough, on the power line connector in order to being conducive to put the power cord from the power outlet. 5. Rubber plug, above the outlet water ,being conducive to water heating and easy to use. 7. Shell cover, the silica structure which clamps to other shell, being conducive to heat preservation and hermetic seal. The shell cover sets the tableware clamping equipment to fixed the tableware, which is convenient for the consume to use. 8. Outer shell. 9. Liner tank, the PP material, it can make the flexible adjustment according to user's needs, which is besieged to be two or four grip. 10. Spoon, a fork or spoon. 11. Tableware clamping device, for being fixed. 12. The water temperature sensing equipment. 13. Heating wire. 14. Mat, to make the function of buffer and protection, also being conducive to smooth placed boxes. 15. The water tank .

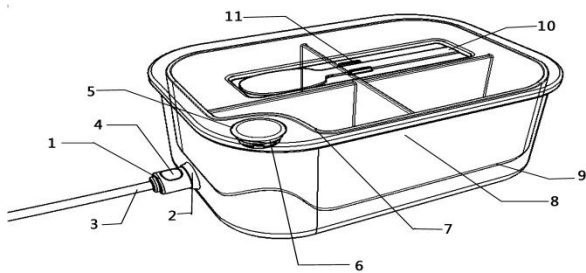


Fig.2 The three-dimensional structure diagram

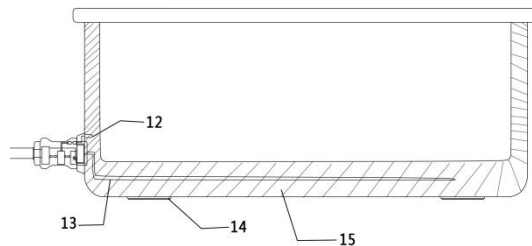


Fig.3 Section structure diagram

The shell box is consist of two shells, the water tank and equipment is connected with inlet and outlet of the shell. The shell is provided with a power interface, the interface is provided with heating wire and water temperature induction system which is used to induce to water temperature in the tank . The IC is connected with the water temperature induction systems to make the water temperature remain within the set temperature range, its schematic diagram of the control module is shown in Fig.4, the major components include integrated chip, input circuit, converting circuit, driven circuit, temperature sensor and memorizer and so on. The heating wire is placed in the water tank to heat the water in the sink .

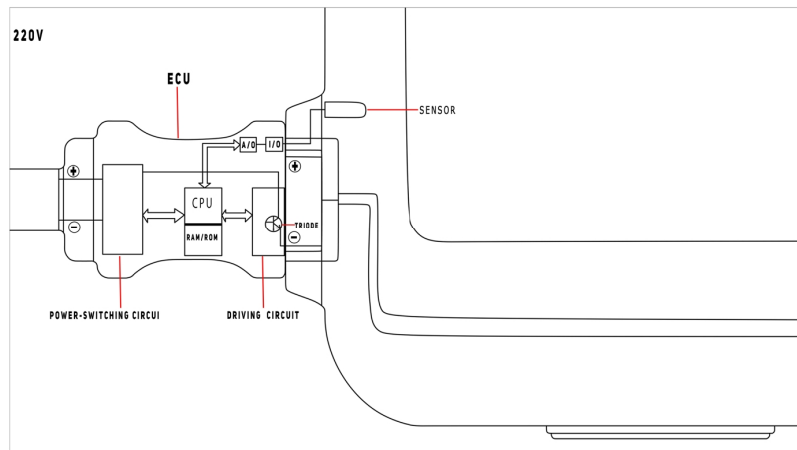


Fig.4 Structure of Control module

## Conclusions

The inlet type heating temperature control lunchbox adapt to the needs of different places office workers to bring lunchbox by heating in the flexible way, through the humanized heating temperature control, save time for operation and waiting for meals, to a certain extent, satisfy the user's psychological and physical requirements. Humanized design is the main idea of modern design, it must rely on user's experience and user's demand analysis, making the design of the product to meet the function needs and spiritual needs for of the user and leading an important roles to coordinate and balance the human spirit. The design of the product reflects the social development and technical progress by from the original simple practicality and the use of spiritual culture and how to the humanized design and user's experience requirements.

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