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THERMOFUSION KETTLE

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ABSTRACT

Introducing an innovative jug kettle redefining beverage preparation. This dual-functionality kettle seamlessly heats and cools liquids, providing users with unprecedented versatility. The heating element employs electrical resistance and conduction to elevate liquid temperatures efficiently, while the integrated Peltier cooling module ensures rapid and precise cooling by absorbing excess heat. A sophisticated thermostat maintains the desired temperature, offering a user-friendly experience. Enhancing convenience, the jug kettle features a small, intuitive screen displaying real-time temperature readings. This digital interface empowers users to monitor and adjust temperatures with ease, adding a new dimension to beverage customization. Crafted with thermal insulation for energy efficiency, the kettle embodies a harmonious blend of cutting-edge technology and practical design. This appliance not only elevates the traditional kettle's capabilities but also opens avenues for diverse culinary applications, making it a pioneering solution for those seeking a dynamic and efficient liquid temperature management system. And the integration of a thermostat allows set temperature to be achieved that turns the kettle off once it achieved desired temperature.

Keywords: thermostat; ThermoFusion kettle; dual-functionality; desired temperature.

1. INTRODUCTION

Drinking a favourite beverage is one of the best pleasures in life which is only improved by desired temperature and that is why it is with great pleasure and enthusiasm (iqsdirectory.com, n.d). We present the ThermoFusion Kettle, the most revolutionary invention that will change the world of brewing as we know it. Where the ordinary kettles have consistently disappointed beverage enthusiasts, our high-tech solution not only promises to meet all your needs but also to surpass all your expectation. Thus, the ThermoFusion Kettle comes with a very easy-to-set-up console that enables the user to set the rest of the temperature requirements effortlessly. With this kettle, you no longer have to struggle guessing the brews, considering that you are guaranteed a brew with precise desired temperature.

The life of a student makes them incapable to find cold beverages easily let alone keep them cold for a long period of time. The ThermoFusion Kettle presents a useful solution for students struggling to keep cold beverages due to a lack of refrigeration. Unable to bring and maintain a refrigerator in dormitories or study rooms, students are often unable to maintain cold beverages, which are particularly vital during lengthy studies hours or while sitting in overnight study groups. The unit's cooling capability, which is based on Peltier cooling technology [2], keeps

students supplied with chilled water that they can pour and enjoy cold drinks directly at the study desk.

In addition, a traditional kitchen often experiences the inconvenience of requiring separate appliances for heating and cooling water. Our kettle combines both functions, creating a sophisticated and stylish appliance. The ThermoFusion Kettle has a strong heating function; it quickly brings the water to the desired temperature for hot beverages. Moreover, thanks to the revolutionary Peltier cooling technology (Yan-Wei et al., 2017), the kettle has a cooling function that allows it to cool the water, providing cold drinks without the need for additional devices.

2. METHODOLOGY

2.1 Material

The following material are the chosen material to make this product, the stainless steel, plastic, silicone rubber, heating coil, peltier cooling module and temperature display.

2.2 Design

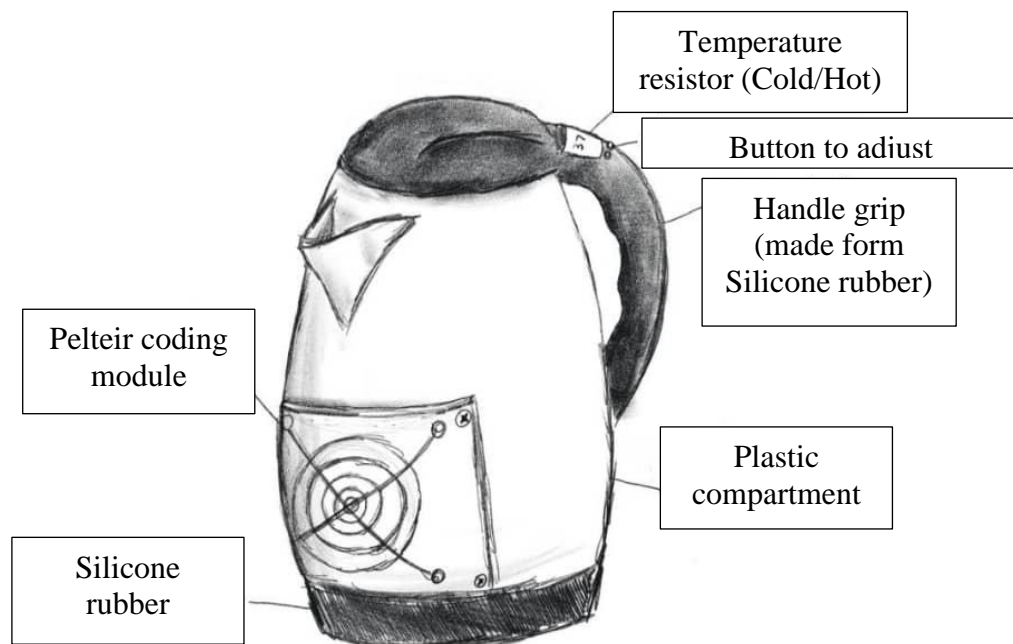


Figure 1. The prototype model of ThermoFusion Kettle.

3. DISCUSSION

3.1 Heating up

The heating coil within the Thermofusion Kettle facilitates the process of heating water through the Joule heating effect, which involves the conversion of electrical energy into heat energy (Jiawei Zhou et al., 2022).

3.2 Peltier Cooling Module

A Peltier cooling module, also known as a thermoelectric cooler or TEC, is a semiconductor device that utilizes the Peltier effect to transfer heat from one side to the other when an electric current is applied.

3.3 Thermostat Operation

Thermostat is crucial to be integrated into the product for its function to regulate temperature and detect temperature using sensors like thermistor to carry out certain orders such switching the kettle off (Jorge Tabanera et al., 2022).

3.4 Temperature Display

The temperature display allows the user to tell the temperature without touching the kettle encouraging safety (Cyril Hilsum, 2010).

3.5 Commercialization Potential

3.5.1 Relevance of Product

The Thermofusion Kettle possesses a high potential for commercialization due to its innovative characteristics and relevance to a modern lifestyle while combining consumer comfort and meeting societal needs. The kettle is multifunctional and combines heating and cooling functions in a single device. That is, when using this appliance, one does not have to boil water or cool it before being able to prepare a drink which significantly saves time and energy. This product is intended towards students that live in colleges or even campers.

3.5.2 Contribution to Society

Contribution to New Knowledge or Society The integration of new advanced technologies such as Joule heating for rapid water heating and Peltier cooling to offer efficient cooling is significant in the appliance design and thermodynamics field. This technology incorporation either improves the user experience or enables energy efficiency and sustainability. The screen display of the Thermofusion Kettle and the thermostat operation incorporating core temperature control mechanism created a new way of understanding by users which creates awareness and educate users on the thermodynamics in their daily living.

3.5.3 Marketability

The broad demographic of the ThermoFusion kettle, as well as its apparent ease of use, make the product a highly marketable item. It cools and heats, which makes it suitable for many tastes and needs, such as homes, offices, hotels, and outdoor settings. ThermoFusion kettle is a more convenient solution for consumers and businesses in the beverage preparation sector.

4. CONCLUSION

To sum up, the Thermofusion kettle is a novel product in beverage preparation offering distinct advantages in versatility, convenience, and energy savings. This already makes this product attractive for its commercial potential. Nevertheless, there are opportunities for enhancement that can increase its value for consumers. One of the main areas for improvement is increasing the cooling module's cooling rate, which is currently too slow to deliver a cold beverage experience upon request. The maximal approach would be developing advanced temperature regulation systems for precise regulation. These will improve the product quality and its appeals for consumers who will be offered a fully precision tool. Another room of improvement is the integration of smart home technology enabling features like remote control, schedule, and monitoring via mobile apps.

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