

Lunch Box Using Induction Heating

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ABSTRACT

In this paper, a lunchbox is prepared using the induction heating. The effect of the installation of induction coil, MOSFET, transformers and temperature controller in the normal lunchbox were investigated. The results showed that adding of induction heating technology improve quality and efficiency of the reheating method of food. 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 “Induction Lunch Box”, to adapt to the fast-paced life and better meet the demand of health.

Keywords —Induction coil, Transformer, MOSFET

1. INTRODUCTION

In this paper, we have designed a lunch box by using induction heating technology, because these are fast, not bulky and also easily transferable. It requires less power. So the induction lunch box becomes cheap. It requires less space, easy to install, so can fitted easily in the corner of any room or kitchen.

Induction heating is widely used in today's industry, such as melting, hardening and brazing etc. It is also getting popularity in cooking ranges due to good heating efficiency, clean working environment and low cost advanced power semiconductor devices. When an AC current flows in a coil in close proximity to a conducting surface

the magnetic field of the coil will induce circulating currents (eddy) in that surface.

By this we reduce wastage of time. This will take the overall experience to a different level. With the use of these lunch box customers can enjoy their food. In this way they can save time and in few minutes they can enjoy hotfood.

2. INDUCTION HEATING TECHNOLOGY

Electromagnetic induction is the creation of an electromotive force in a conductor as the result of a changing electromagnetic field around the conductor. This involves raising the temperature of an electrically conductive material by subjecting it

to an alternating electromagnetic field. The conductor and the electromagnetic field generator do not need to be in contact for induction to occur – the electric currents induced in the conductor bring about dissipation of power in the form of heat. This allows a conductive material to be heated without removing it from its insulator container.

3. GOAL AND OBJECTIVES

The main purpose of our project is to provide time saving technology for reheating food, especially for the office workers. In this project, we have designed a lunch box by using induction heating technology, because these are fast, not bulky and also easily transferable. It requires less power. So the price of induction lunch box is less. It requires less space, easy to install, so can be fitted easily in the corner of any room or kitchen. Therefore it is affordable to everyone.

4. METHODOLOGY

Induction Lunch Box is used for reheating food by using principle of induction heating powered by electricity. Induction heating is the process of heating an electrically conducting object (usually a metal) by electromagnetic induction, through heat generated in the object by eddy currents. The rapidly alternating magnetic field penetrates the object, generating electric currents inside the conductor called eddy currents. The eddy currents flowing through the resistance of the material heat it by Joule heating principle.

Design Overview

The Induction Lunch Box consists of following component:

1. Induction Coil
2. Current Amplifying Circuit
3. Temperature Controller
4. MOSFET
5. High Frequency Transformer

The Block diagram of our proposed induction lunch box is as shown in fig-1:

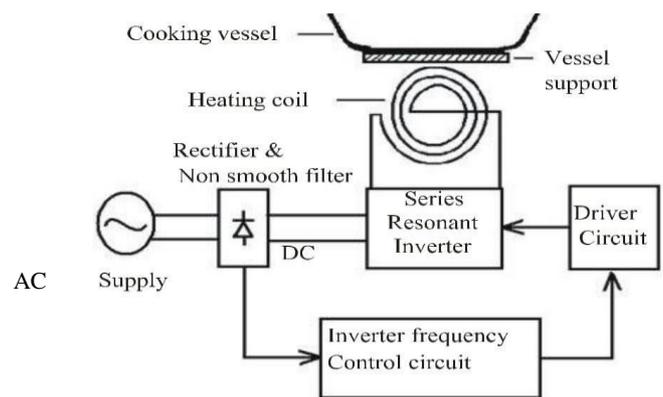


Fig-1 Block diagram of induction heating circuitry

4.1 Induction Coil

An induction coil is a type of electrical transformer used to produce high-voltage pulses from a low-voltage direct current (DC) supply. To create the flux changes it is necessary to induce voltage in the secondary coil, the direct current in the primary coil is repeatedly interrupted by a vibrating mechanical contact called an interrupter. This causes a high voltage pulse to be developed across the secondary terminals through electromagnetic induction. Because of the large number of turns in the secondary coil, the secondary voltage pulse is typically many thousands of volts. Due to which it heated up and that heat is used in the lunchbox for reheating purposes.

4.2 Current Amplifying Circuit

As induction coil requires the high frequency current, so that the coil get heated and the heat produced by the coil can be used. The normal supply does not carry that much enough frequency, so to provide that we have used a Current Amplifying Circuit.

It includes:

- High Frequency Transformer
- MOSFET
- Capacitor
- Inductor
- Resistors

MOSFET

The metal-oxide-semiconductor field effect transistor (MOSFET) is most commonly fabricates by the controlled oxidation of silicon. It has an insulated gate, whose voltage determines the conductivity of the device. This ability to change conductivity with the amount of applied voltage can be used for amplifying or switching electronic signals. Another reason for using the MOSFET is, to cool down the induction lunch box when it stops working.

High Frequency Transformer

Disclosed is a switching power supply transformer used for a high-power induction heating. The switching power supply transformer is characterized in that a high-strength enamelled wire. The high frequency transformer has fewer turns on primary and secondary. It has a ferrite core rather than laminated iron. High current windings on the high frequency transformer are likely to be “multifilar” i.e. a quantity

of smaller wires rather than one large wire. So, High Frequency Transformer is used for amplifying the current for the input of the induction coil.

4.3 Temperature Controller

Temperature controlling is necessary for the lunch box, otherwise there could be the wastage of power and also it may not be feasible or reliable on some conditions. So, we are using a temperature controller. A Digital temperature controller circuit is a precise temperature controller in medical, industrial and home applications. This system is better than analogue or thermostat system, which has poor accuracy. It can use for temperature control of an incubator where maintaining a precise temperature is very important. This proposed Digital temperature controller system provides the temperature information on a display screen and, when the temperature exceeds the set point, then the load (i.e. Heater) switches OFF.

5. RESULT

Hence, we have designed an Induction Lunchbox. It is designed to reheat the food with controlled temperature. It has been developed by using induction heating principle.



6. FUTURE SCOPE

In future we can work on the size of induction coil(used in lunch box) and compact according to our needs and uses or spacelimitations.

Research can be done on the power consumption and efficiency of lunchbox.

Induction lunchbox also has good future scope for market also. Like:

- Can be used for preserve foodreheating.
- Can be used inoffice.
- Can be used during traveling.
- Applicable in commercial (fooddeliver).

7. CONCLUSION

This paper presents the Induction Lunch Box model. By this we reduce human labor which is required to take care of situation of food to heat. This will take the overall experience to a different level. Thus, after concluding we can say that microwave lunch box

technique will be more feasible option in the future. The system based on microwave technology well planned and reduces human efforts. For smart human point of view we are working on that project and we want to give a smart project like this to ourcountry.

8. REFERENCE

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