HOT AIR OVEN USING EMBEDDED SYSTEM

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ABSTRACT: It is an oven which uses dry heat air to circulate through out to maintain the temperature inside the chamber. A temperature sensor is used to sense the temperature. A fan is used to circulate the hot air throughout the chamber. A Display system displays the set temperature of the oven. Overall control of the oven is by embedded electronics. Present work is to produce economical dry heat oven. It is used in Pharmaceutical field for sterilisation of glass, syringes and softening thermoplastic mask. Dry Heat is absorbed by the outer surface of the item, then it passes through the centre of the item, layer by layer. From the outer surface it reaches the inner layer. **Challenges:** There are challenges in achieving the temperature and choosing the accurate temperature sensor.

Keywords: Temperature sensor, display system.

Introduction: Present work is to produce economical dry heat oven by using embedded electronics. It is used in Pharmaceutical field for sterilisation of glass, syringes and softening thermoplastic mask. In this work, the circuit is initially designed in electronics CAD and it is simulated. Results of simulating the circuit where successful. The same circuit is replicated in real-time had practical challenges. When the power is given, the system is turned on. Then user gives the input and the input signal is sent to the micro-controller and it displays it in the display system. According to the constraints, fan and heating element is turned on and off. The temperature sensor is involved sensing the temperature and it sends the information to the micro-controller. If necessary drivers could be used to boost up the voltage. There is challenges in maintaining the temperature level and circulating the dry air, and finding the precise sensing element.

Literature findings: In 1954, E. M. DARMADY AND R. BARRINGTON BROCK had experimented about the gas ovens and hot air ovens with fan. It had graphical and typographical results on choosing the right model for circulating the dry heat throughout the cabin. It gave finding in choosing the appropriate temperature sensor. It also gave numerical values to arrive at economical sensor from the deviations each model in their arrived experiments.

In 2016, INDRA KUMAR PUROHIT AND N. VISHAL GUPTA had a study to ensure the performance of hot air oven.

This work demonstrates the calibration needs in sensors and datalogger to get the accurate values. The study deals with load and without load characteristics. It shows the study with 6 Thermocouple sensors. They have used 6 different probes to detect the temperature at various points inside the oven.

This paper inferences that more accurate and calibrated sensors need to be used inside the oven to get more precise and accurate value of temperature measured.

Block Diagram:

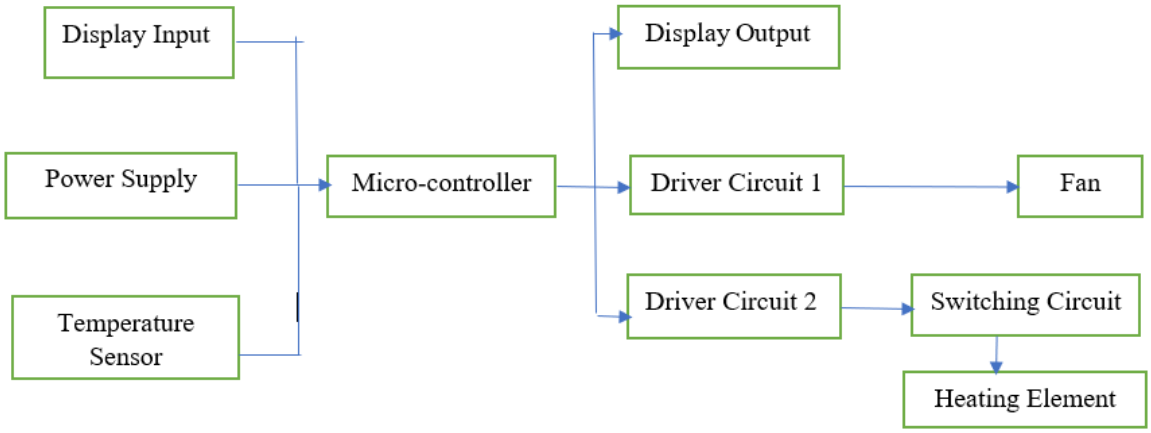

Fig: Block Diagram of the circuit

Component Description (in brief):

Display Input: It is 4x4 button inputs to the microcontroller.

Micro-controller: It is a 40 pin programmable IC which works on 5V input.

Display: It is 16 x 2 graphic display which works on 5V input and data input are from the micro controller's output.

Temperature Sensor: It is a 3 pin transistor which senses the temperature and gives the value to the display.

Driver Circuits: There are two different driver circuits used in this design. One driver is connected to fan and other one is connected to the switching element.

Switching Element: It is used to switch from NO to NC to give the power to the heating element.

Fan: It is used to circulate the hot air inside the oven.

Heating Element: High AC voltage is given in one terminal and other end is

connected to the relay.

Working Principle: Display Input is used to set the input temperature. It compares the temperature value with the set temperature and it performs the actions according to it. Temperature sensor reads the temperature and gives it to the micro-controller. It displays the temperature in the display. Basic process is heating element heats up the environments and fan blows the hot air to get circulated throughout the oven. These are performed as per the program and design of the circuit.

Mechanical Casing:

A wooden box is made on a rough scale to check the working of the electronics. As wood is bad conductor of heat, wood is used here. Hot air is made to circulate inside the wooden box. Fan and heating element was placed inside the wooden box.

Rest of the electronics is placed outside the wooden box.

Conclusion: The characteristics of hot air oven proved to be evident for making the oven. But the accuracy of the hot air oven seemed to be a considerable factor. As Economical model cannot be built with high accuracy. This model can fit into market with various levels of calibration and tuning with a better accuracy. Still, an economical product of hot air oven can be created with this prototype.

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