

DC IronBox

Agy Fastian¹, Athul Prem², Neethu Merin R³, Nithya Nepolean⁴, Asst Prof Bino Nelson⁵

^{1,2,3,4}Agy Fastian, Athul Prem, Neethu Merin R, Nithya Nepolean, ECE, BJI, Kollam, Kerala, India

⁵Asst Prof Bino Nelson, Dept. of Electronics and Communication Engineering, BJI, Kollam, Kerala, India

Abstract - Conventional ironing technique has been the same for the past few years and these techniques consumes high power. In order to overcome this problem, a new technique is used with the help of glow plug and arduino. The heating element nichrome was replaced by glow plug, thus power consumed was reduced. The controlling of the glow plug is made with the help of arduino and relay. With the help of glow plug the heating time is reduced and makes it power efficient and hence the iron box can be used with the supply from inverter. A temperature sensor has been used to measure the temperature of the soleplate and the arduino maintains the temperature using the relay. Conventional analog temperature controlling has been digitalized using the push buttons for selecting the required material for ironing thus making the iron box user friendly.

Keywords: Arduino UNO, glowplug, max6675, relay.

1. INTRODUCTION

Ironing or smoothing is the work of using a heated tool to remove wrinkles from fabric. The most popular way of ironing is by using an electric iron. There are some features in a modern electrical irons such as thermostat, electrical cord, cord control and energy saving control, but sometimes, these features are not necessarily needed because it will contain more parts, thus increasing, the cost and production time. The working of an electric iron is very simple, it takes current from the mains and heats up the coil inside it. This heat is then transferred to the base plate. Which is pressed against the clothes to remove wrinkles.

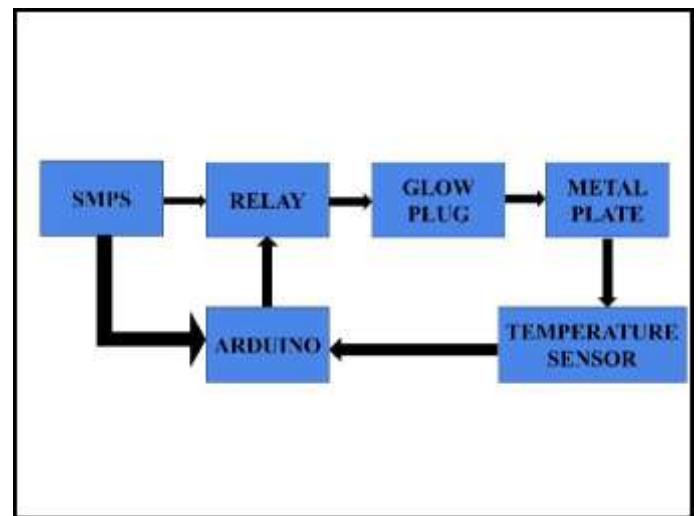
The most important component that helps to regulate temperature in an electric iron is the thermostat. The basic function of the thermostat is to keep the heat constant in a given setting.

When the fabric is heated, the molecules are more easily reoriented. In the case of cotton fibres, which are derivatives of cellulose, the hydroxyl groups that crosslink the cellulose polymer chains are reformed at high temperatures, and become somewhat "locked in place" upon cooling the item.

In permanent press pressed clothes, chemical agents such as dimethylol ethylene urea are added as crosslinking agents. The purpose of this project is to implement an electric iron with low power consumption.

2. BLOCK DIAGRAM

When the device is turned on, the arduino acts the brain which will initiate the required temperature to the glow plug. By convection process the heat transfer takes place from the glow plug to the sole plate. Digital control has been enabled through the arduino. Buttons has been assigned so that when it is pressed the desired heat will be produced for the corresponding cloth. The temperature will be maintained for the required cloth. A temperature sensor has been attached to the sole plate so that it can calibrate the temperature. The arduino uses the information provided by the temperature sensor and controls the relay. The temperature to be maintained is initiated by a push button which has been placed at the top of the iron box.



When the push button is pressed the relay is turned on, the temperature to be maintained is controlled by the arduino. The glow plug is heated by a DC voltage supply. The sole plate gets heated up by the glow plug. The K type thermocouple temperature sensor analyse the temperature and this value is given as the input to the arduino. The arduino always compare the temperature sensor output and the required value. If the required temperature exceeds the relay will be turned off. Thereby interrupting the power supply to the glow plug and the heating is controlled.

3. COMPONENT DESCRIPTION

The designed product consist of arduino UNO, glowplug, temperature sensor, relay, SMPS.

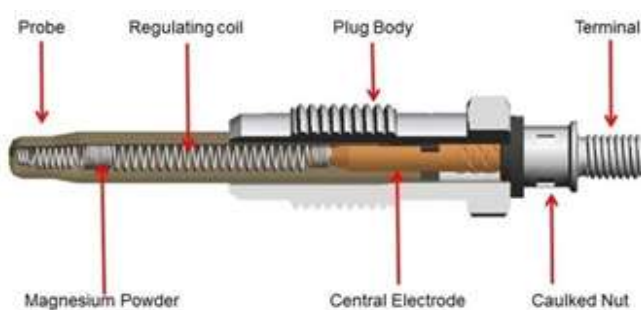
3.1 ARDUINO UNO

The Arduino UNO is an open-source microcontroller board. It is based on the microchip ATmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE)

1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.

3.2 GLOWPLUG

A glow plug is a heating device used to aid starting diesel engines. In cold weather, high speed diesel engines can be difficult to start because the mass of the cylinder block and cylinder head absorb the heat of compression, preventing ignition (which relies on that heat). Pre-chambered engines use small electric heaters (glow plugs) inside the pre-chambers. Direct-injected engines have these glow plugs in the combustion chamber. The glow plug is a pencil-shaped piece of metal with a heating element at the tip. This heating element, when electrified, heats due to its electrical resistance and begins to emit light in the visible spectrum, hence the term glowplug. The visual effect is similar to the heating element in a toaster. Operating temperature is 12V, 3A,150W. Preheating time is 1.2s. Fig 1: Glow plug



3.3. K-TYPE THERMO COUPLED TEMPERATURE SENSOR

A thermocouple is an electrical device consisting of two dissimilar electrical conductors forming electrical junctions at different temperatures. A thermocouple produces a temperature dependent voltage as a result of the thermoelectric effect and this voltage can be interpreted to measure temperature. Type K is the most common general purpose with a sensitivity of approximately $41\mu\text{V}/^\circ\text{C}$. It is inexpensive and a wide

variety of probes are available in its -200°C to 1350°C range.

3.4. TEMPERATURE CONNECTOR MAX6675

The MAX6675 performs cold-junction compensation and digitizes the signal from a type K thermocouple. The data is output in a 12 bit resolution. This converter resolves temperature to 0.25°C , allows readings as high as 1024°C , and exhibits thermocouple accuracy of 8LSB. It is a 8 PIN SO package.

3.5. RELAY

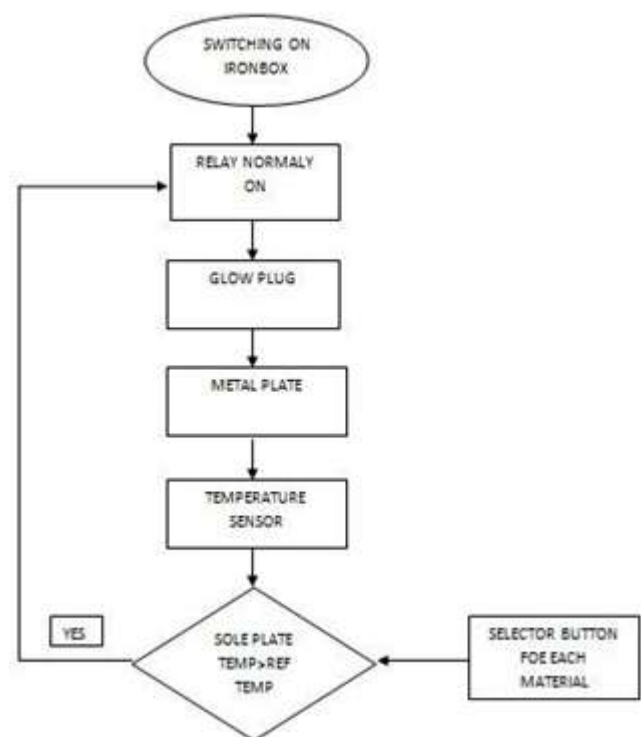
A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. Operating voltage is 5V.

3.6. SMPS

A Switching mode power supply is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Higher power conversion efficiency is an important advantage of a switched mode power supply. 12V,10A SMPS is used since glowplug uses 10A.

4. ARDUINO PROGRAMMING

The working of the system is shown as a flow chart below:



5. CONCLUSION

In our project, an alternate solution to high power ironbox is proposed. The new DC ironbox can iron clothes even under low power supply. Under emergency conditions, it can be powered from home inverters or batteries. It is also very user-friendly since it is digitized.

REFERENCES

- [1] Aghanwa Sunny,Ezeonu Stella,2014,'Design and Fabrication of a Gas Pressing Iron'.Journal of Multidisciplinary Engineering Science and Technology,vol1.
- [2] Aman Kaushik; Aakash Mishra; Harsh Singh; Asst. Prof. B.Hemalatha, 2014, 'Automatic Ironing Machine'.
- [3].Mohd Hazuan Bin Mohd Zawawi, 2010, 'Design and analysis of electrical iron using boothroyd dewhurst dfma methodology'.