COMPUTER-AIDED DESIGN AND CONSTRUCTION OF AN ELECTRIC IRON 1000WATTS 230VOLTS

BY

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DEDICATION

This project is dedicated to GOD almighty the author and finisher of our faith. To him be all the glory, honour, power, praise and majesty forever, Amen.

DECLARATION

I Yisa Jemimah Nnaadi, declare that this project was done by me and has never been presented elsewhere for the award of a degree. I also hereby relinquish the copyright to the Federal University of Technology, Minna

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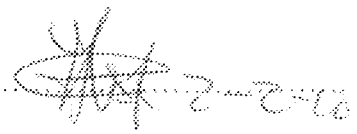

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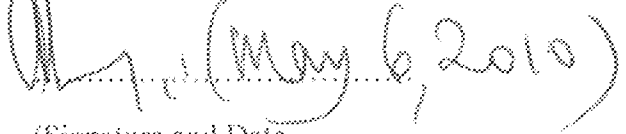

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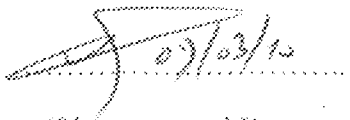

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Thanks to almighty GOD for his grace, mercies and endless support, without whom it couldn't have been possible.

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ABSTRACT

The project deal with the design and construction of an electric iron, 1000W, 230V. The core of this is heating element which is made of MICA ICA popularly know as paper element of 1000W. The control is made of a thermistor and relay in other to adjust the temperature of the pressing Iron.The iron was consinucted, tested and found working

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CHAPTER ONE

INTRODUCTION

1.1 GENERAL INTRODUCTION

Computer Aided design and construction of an electric iron 1000 watts 230 volts is a project embarked upon in order to ensure a modern way of pressing clothes with low power consumption and at an affordable price. It is designed in such a way that only a single user can employ its use at a time. It also converts electrical energy for both domestic and commercial usage. The discovery of heating effect of current in 1841 by joule [1] has found a very wide range of application both domestically and commercially. The hot element of these devices radiates heat energy as a form of energy which is converted from electricity. Heat flows from a higher temperature gradient to a lower temperature gradient. Temperature is a measure of the intensity of heat and it is recorded in lower ranges by a thermometer and in higher ranges by a pyrometer. Heat is usually caused by difference in temperature between the body and its surroundings. When we say computer Aided Design (CAD):- we simply mean the use of computer to design and determine the components to be used in the production of items in their appropriate specifications. It is software used creating précised engineering drawings. Engineers use the computer- the Computer-Aided Manufacture.

1.2 HISTORY OF COMPUTER AIDED DESIGN

It was invented by an American Ivan Sutherland in 1961 when he described a computerized sketched pad in a doctoral thesis while attending the Massachusetts. He designed CAD to replace the traditional drafting bond and other tool drafters such as ink pen, plastic stencil and elastic eraser. Early CAD software ran on large, expensive

computers. Today engineers can run CAD software on personal computers or UNIX stations.

1.3 AIMS AND OBJECTIVES

The aim of this project is to design and construct an electronic iron of 1000 watts, 230v for domestic uses. The electric iron is to use commercially available 1000watts MICA ICA element as its heating element under the operation of a voltage of 230V.

1.4 METHODOLOGY

In the design method, the circuit was divided into sub-system. The mode of operation of each sub-system was explained for the readers understanding. These sub-systems, when joined together will give the whole circuit layout in a simple manner. The process followed will help in achieving the objective of this project.

1.5 LIMITATION

Some imperfectives may arise during the useful life of the device because of the temperature effects on some of the components used in the design. Another limitation on this design is that the thermostat icon was not provided or present on the simulation except the device is switched on and off. The device is power dependent that is it is not useful when there is no power supply.

1.6 PROJECT LAYOUT

This report consists of five chapters, each of which consists of sections and sub-sections as outlined on the table of contents for easy referring. The write up is well structured to meet up the technical report standard figures table and symbols are numbered.

Chapter one talks about the introductory aspect of the project.

Chapter two reviews the literature and existing type of project and also describe in detail the history and evolution of electric iron.

Chapters three is based on the hardware designs, analysis, and simulation details of the general circuit mode of operation and also describe in details the major components of the project.

Chapter four is based on the construction, testing, results and project casing.

Chapter five gives the conclusion of the whole project and it also gives possible future recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 ELECTRIC IRON AS AN ELECTRONIC

What is an electronic? Electronics are the tools or devices which with the help of electrical conduction can make the manual system automatic.[2] There are a number of electronics available in the market and taking into consideration our own houses we will find out that there are a number of electronic devices used at various places in our homes. The most of the electronics are used in the kitchens, sitting rooms, bedrooms and other places within house.

2.2 INFORMATION ON ELECTRONICS

Electronics basically operates on the fundamentals of physics. The electrical charges are passed through the electrical system installed in the electronics and these charges make the electronics to operate. Some electronics uses batteries which need to be charged for future use. More over other types of electronics get the direct energy supply. The requirement of energy supply varies like in some countries it can be X volts and in other countries it can be Y volts. The values of X and Y are arbitrary values.

2.3 ELECTRONICS DEVELOPED AS CONSUMER ELECTRONICS

Basically there are various products using the electronic components. An electronic component is the system of circuits used for the movement of the electrons and finally results in the production of energy. This energy can be consumed for the operation of the electronic devices. In all of the electronics the system can be hidden and embedded in the machine and as such the consumer cannot touch it unless he opens the machine .This done in other to keep the machine safe for residential use. There are a number of

consumer electronics available around the world but in this project i will be talking about electric iron because it is used in our every day business.

2.4 HISTORY OF PRESSING IRON

Before we can talk about electric iron we must talk about the pre-existing irons although no one can say exactly when people started trying to press cloth smooth, but it was known that the Chinese were using hot metal for ironing before anyone else.[3] Pan filled with hot coals was pressed over stretched cloth. A thousand years ago this method was already established.

Meanwhile people in northern Europe were using stones, glass and wood for smoothing. This continued in use for "ironing" in some places into the mid-19th century, long after western blacksmiths started to forge smoothing irons in the late middle ages.

Flattish hand-size stones could be rubbed over woven cloth to smooth it, polish it, or to press in pleated folds. Simple round linen smoothers made of dark glass have been found in many Viking women's graves, and are believed to have been used with smoothing boards. Archeologists know there were plenty of these across medieval Europe, but they aren't completely sure how they were used. Water may have been used to dampen the linen, but it's unlikely the smoothers were heated.

Slick stones were standard pieces of laundering equipment in the late middle ages in England and else where and went on being used up to the 19th century, long after the introduction of metal irons. Presumably they were convenient for small jobs when you don't want to heat up irons, lay out ironing blankets on boards, and so on.

Even in modest homes with no presses, large items needed to be tackled with something bigger than a slick stone. They could be smoothed with mangle board and

rolling pin combination. In England boards, paddles or bats like these were called battledores, battels, beatels, beetles or other beating names. In Yorkshire a bittle and pin was used in the same way as the Scandinavian mangle board and roller. Flat irons were also called sad irons or smoothing irons. Metal handles had to grip in a pad or thick rag. Some irons had cool wooden handles and in 1870 a detachable handle was patented in US. This stayed cool while the metal bases were heated and the idea was widely imitated. The sad in sad iron (sadiron) is an old world for solid, and in some contexts this name suggests something bigger and heavier than flat iron. Goose or tailors was another iron name, and this came from the goose-neck curve in some handles and this is used by people in Scotland.

If you make the base of your iron into a container you can put a glowing coal inside it and keep it hot a bit longer. This is a charcoal iron and it has a hinged lid and the air holes to allow the charcoal to keep smoldering. These are sometimes called ironing boxes, or charcoal box irons, and may come with their own stand. Some irons were shallower boxes and had fitted slugs or heaters i.e. slabs of metals which were heated in the fire and inserted into the base instead of charcoal. It was easier to keep the ironing surface spotlessly clean, away from the fuel, than with flatirations or charcoal irons.

Late 19th century iron designs experimented with heat – retaining fillings. Designs of this period became more indigenous and this led to the invention of electric iron.

2.5 HISTORY OF ELECTRIC IRON

Hand irons are devices used for garment pressing. Irons have being heated directly by gas flame, stove plate or in the case of modern iron by electricity.

On June 6, 1882 Henry W Seely of NYC patented the electric iron and at that time it was called the electric flatiration. Early electric iron used carbon arc to create heat, however this was not a safe method.

In 1892, hand irons using electrical resistance were introduced by Crompton & co and the general electrical company. During the 1950s electric steam irons were introduced. [4]

Smoothing stones have been in existence since the 8th and 9th century and are known as the earliest western ironing devices, looking some what like mushroom. Electric iron contains a resistance wire, so when a current of I ampere is passed through the wire, electrical energy produced is equal to I^2Rt (joules) which is entirely converted to heat. This is a unique characteristic of resistance element as compared to capacitors or inductors where there is no power dissipation. Here R=resistance of the wire in Ohms and t=the amount of time that the current passes through the resistance wire. The metal base at the bottom of the electric iron is thus heated up.

2.6 ADVANTAGES OF ELECTRIC IRON

Electric irons are very advantageous in our modern world today because:

- They are clean.
- They have temperature control with time to turn-off for an unattended iron in other to prevent burning of clothes.
- They don't need to be heated externally by something like a stove top

2.7 DISADVANTAGES OF ELECTRIC IRON

The only disadvantage noted for now is that it can not be used without electricity and the electric cord can also get in the way. [5]

2.8 HEATING EFFECT OF ELECTRIC CURRENT ON ELECTRIC IRON.

Energy exists in various forms such as mechanical energy, heat energy, chemical energy, electrical energy, light energy and nuclear energy. Energy can be transformed from one form to another according to the law of conservation of energy.

In our daily lives we use many devices where electrical energy is converted into heat energy, light energy, chemical energy or mechanical energy. When an electric current is passed through a metallic wire like the filament of an electric iron, heater, oven or geyser, the filament gets heated up and here the electrical energy is converted into heat energy. This is known as the heating effect of current. Why is heat produced when current is passed through a wire? A metallic conductor has a large number of free electrons in it and when a potential difference is applied across the ends of a metallic wire, the free electrons begin to drift from a region of low potential to a region of high potential. These electrons collide with the positive ions (i.e atoms which have lost their electrons). In these collisions, the energy of the electron is transferred to the positive ions and they begin to vibrate more violently and as a result of this heat is produce. The greater the number of electrons flowing per seconds, the greater will be the rate of collisions and so greater is the heat produced.

2.9 MATHEMATICAL EXPRESSION FOR HEAT PRODUCED.

Potential difference is a measure of work done in moving a unit of charge across a circuit. Current in a circuit is equal to the amount of charge flowing in one second. Therefore the work done in moving "Q" charges through a potential difference "V" in a time "T" is given by: Work done =Potential difference × Current × time

$W = VIT$

It can also be expressed using Ohms law therefore according to Ohms law

V=IR

So Work can be expressed as

W = VIT

or

W = (IR) × It = I^2Rt

The work done gets dissipated in the resistors as heat energy "H"

Therefore H = I^2Rt

Thus, heat produced is directly proportional to the resistance, to the time and to the square of the current. It can also be expressed as shown; H = V(V/R)t = (V^2/R)t.

2.10 APPLICATION OF HEATING EFFECT OF CURRENT

The heating effect of current is utilized in the electrical heating appliances such as electric iron, room heaters, water heaters e.t.c. All these heating appliances contain coils of high resistance wire made of nichrome alloy. When these appliances are connected to power supply by insulated copper wires then a large amount of heat is produced in the heating coils because they have high resistance but a negligible heat is produced in the connecting wires because the wires have low resistance.

2.11 GENERAL OVERVIEW OF COMPUTER-AIDED DESIGN PACKAGES USED FOR THE PROJECT.

Computer-aided design (CAD) is the use of computer technology for the design of objects, real or virtual. The design of geometric models for object shapes, in particular, is often called computer-aided geometric design (CAGD). [6] However CAD (computer aided design) often involves more than just shapes. As in the manual drafting of technical and, engineering drawings the output of CAD often must convey also symbolic

information such as materials, processes, dimensions, and tolerances, according to application-specific conventions.CAD((computer aided design) may be used to design curves and figures in two dimensional ("2D") space; or curves, surfaces, or solids in three-dimensional ("3D") objects. CAD is an important industrial art extensively used in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. CAD is also widely used to produce computer animation for special effects in movies, advertising, technical manuals. The modern ubiquity and power of computers means that even perfume bottles and shampoo dispensers are designed using techniques unheard of by shipbuilders of 1960s. Because of its enormous economic importance, CAD has been a major driving force for research in computational geometry, computer graphics (both hardware and software), and discrete differential geometry. Current Computer-Aided Design software packages range from 2D vector-based drafting systems to 3D solid and surface modelers. Modern CAD packages can also frequently allow rotations in three dimensions, allowing viewing of a designed object from any desired angle, even from the inside looking out. Some CAD software is capable of dynamic mathematic modeling, in which case it may be marketed CADD — computer-aided design and drafting

CAD is used in the design of tools and machinery and in the drafting and design of all types of buildings, from small residential types (houses) to the largest commercial and industrial structures (hospitals and factories).

CAD is mainly used for detailed engineering of 3D models and/or 2D drawings of physical components, but it is also used throughout the engineering process from conceptual design and layout of products, through strength and dynamic analysis of assemblies to definition of manufacturing methods of components.

CAD has become an especially important technology within the scope of computer-aided technologies, with benefits such as lower product development costs and a greatly shortened design cycle. CAD enables designers to layout and develop work on screen, print it out and save it for future editing, saving time on their drawings. The people that work in this field are called: Designers, Cad Monkeys, Automotive design.

2.12 SOFTWARE

Originally software for Computer-Aided Design systems was developed with computer languages such as Fortran, but with the advancement of object-oriented programming methods this has radically changed. Typical modern parametric feature based modeler and freeform surface systems are built around a number of key C (programming language) modules with their own APIs. A CAD system can be seen as built up from the interaction of a graphical user interface (GUI) with NURBS geometry and/or boundary representation (B-rep) data via a geometric modeling kernel. A geometry constraint engine may also be employed to manage the associative relationships between geometry, such as wireframe geometry in a sketch or components in an assembly.

Unexpected capabilities of these associative relationships have led to a new form of prototyping called digital prototyping. In contrast to physical prototypes, which entail manufacturing time and material costs, digital prototypes allow for design verification and testing on screen, speeding time-to-market and decreasing costs. As technology evolves in this way, CAD has moved beyond a documentation tool (representing designs in graphical format) into a more robust designing tool that assists in the design process.

2.13 HARDWARE AND OS TECHNOLOGIES

Today most Computer-Aided Design computers are Windows based PCs. Some CAD systems also run on one of the Unix operating systems and with Linux. Some CAD systems such as QCad, NX or CATIA V5 provide multiplatform support including Windows, Linux, UNIX and Mac OS X.

Generally no special hardware is required with the possible exception of a good graphics card, depending on the CAD software used. However for complex product design, machines with high speed (and possibly multiple) CPUs and large amounts of RAM are recommended. CAD was an application that benefited from the installation of a numeric coprocessor especially in early personal computers. The human-machine interface is generally via a computer mouse but can also be via a pen and digitizing graphics tablet. Manipulation of the view of the model on the screen is also sometimes done with the use of a space mouse/Space Ball. Some systems also support stereoscopic glasses for 3D model.

2.14 THE EFFECTS OF CAD

Starting in the late 1980s, the development of readily affordable Computer-Aided Design programs that could be run on personal computers began a trend of massive downsizing in drafting departments in many small to mid-size companies. As a general rule, one CAD operator could readily replace at least three to five drafters using traditional method. Additionaly, many engineers began to do their own drafting work, further eliminating the need for traditional drafting departments. This trend mirrored that of the elimination of many office jobs traditionally performed by a secretary as word processors, spreadsheets, databases, etc. became standard software packages that "everyone" was expected to learn. Another consequence had been that since the latest advances were often quite expensive, small and even mid-size firms often could not

compete against large firms who could use their compatational edge for competitive purpose .Today, however, hardware and software costs have come down. Even high-end packages work on less expensive platforms and some even support multiple platforms. The costs associated with CAD implementation now are more heavily weighted to the costs of training in the use of these

high level tools, the cost of integrating a CAD/CAM/CAE PLM using enterprise across multi-CAD and multi-platform environments and the costs of modifying design work flows to exploit the full advantage of CAD tools.

CHAPTER THREE

DESIGN AND CONSTRUCTION

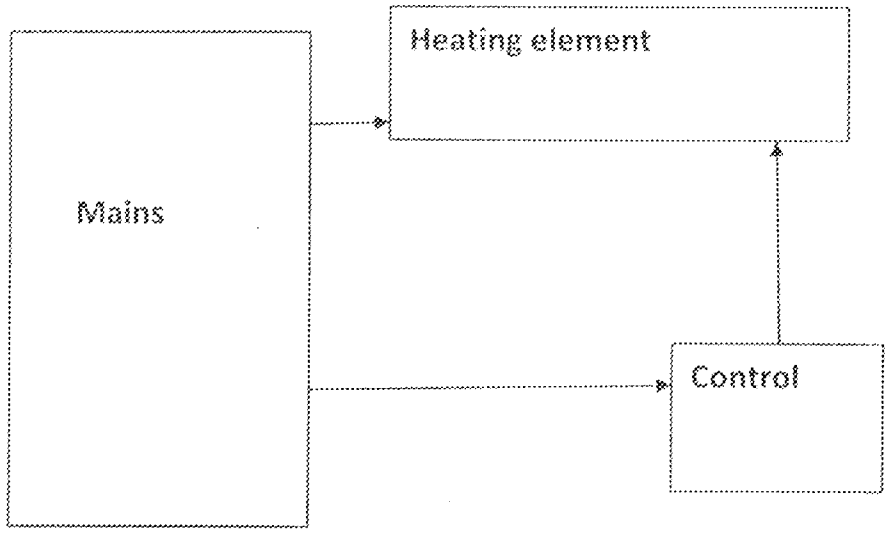

Fig3. The system block diagram

This section will give a thorough description of the system that was designed and constructed. The system consists of 6 basic units which are listed:

1. Power supply unit

2. Heating element

3. Control

4. Rectifier

5. LED indicators

3.1 POWER SUPPLY UNIT

The power supply was derived from an A.C source through a full wave bridge rectifier a 7805 regulator as configured below:

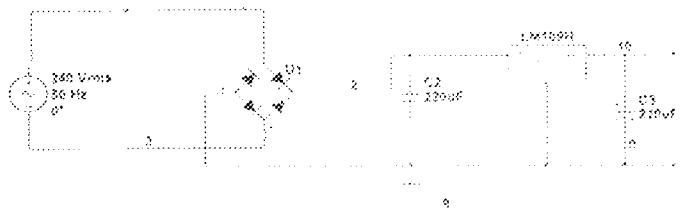

Figure 3.3

The 230 AC voltage was converted into DC voltage of amplitude:

Vdc = (Vrms X √2) – 1.4 = 230 × √2 – 1.4 = 323.87v .

The d.c voltage was smoothened by a capacitor which was derived from the relation :

C = It/Δv

Where I = Load current ;

t=1/2F and ΔV = Peak to Peak Voltage.

Load current was computed using the formula : P = I/V ;

So I = P/V = 1000/323.87 = 3.088A = 3088mA

Smoothening Capacitor "C" = It / ΔV = (3.088 X 1/100)/323.87 = (0.03088)/(323.87) = 9.53 X 10^-5 = 0.9μf

Resistance = V/I

3.2 HEATINGELEMENT

An electric iron includes a soleplate and an heating element. The heating element includes multi-layer conductive coating of nano-thickness disposed on the sole plate. The Heating element further includes electrodes disposed on the multi-layer conductive coating. The multi-layer conductive coating has a structure and composition which

stabilizes performance of the heating element at high temperature. The electronic iron can perform both heating and ironing functions using alternating current electrical power converted to direct current electrical power.

The material responds to electrical current by resisting its flow and heating up. It converts electricity into heat and its rating is determined by length and diameter of the wire as well as the electrical current it can carry and voltage it needs to push the current. If an heating element is faulty, it is replaced with the exact size, shape, power rating and resistance.

There are different types of heating element but in this project I will use the MICA ICA element which is popularly known as PAPER ELEMENT due to the following:

1.It is replaceable.

2. It can be easily maintained.

3. It has less energy consumption.

4. It is light weighted and less base material.

5. Low cost.

It also has disadvantages: since it has light base and weight it will have low power retention when there is power outage.[7]

3.3 CONTROL:

This unit is responsible for controlling the system through the use of a thermistor in collaboration with a relay. A thermistor is a temperature sensing element composed of sintered semiconductor material which exhibits a large change in the resistance

proportional to a small change in temperature. It usually have negative temperature coefficient which means the resistance of the thermistor decreases as temperature increases. It has several advantages such as accuracy and stability.

A relay is an electrically operated switch in which when current passes through the coil of the relay it creates a magnetic field which attracts a lever and changes the switch contacts. So the main function of the relay is to switch on and off when the iron is either hot or cold.

3.4 RECTIFIER:

A rectifier is a circuit that changes ac voltage to dc voltage using switching element or diode. The process is called RECTIFICATION and could be half wave or full wave. The full wave is more efficient because it converts both polarities of the input to DC. The bridge rectifier is a full wave containing either four elements or six elements connected as the arm of bridge circuit.

The 230V Rms AC was rectified to a DC voltage value of Vrms$\sqrt{2}$−1.4 nfactor1.4=2XVf Where $\sqrt{2}$= rms to peak connection factor Vf = forward voltage drop of the two adjacent diode pair

Vdc = 230$\sqrt{2}$ – 1.4 = 323.87v. This is a general purpose operational amplifier featuring

offset voltage null capability. The conunon mode input voltage range and the absence of latch – up makes the amplifier ideal for voltage follower applications. The device is short circuited protected and the internal frequency compensation ensures stability without external components.

This amplifier is used to control the LEDs depending on the level of voltage in other to ensure its display.

3.1.5 DISPLAY UNIT:

This unit comprises of LED indicators. These indicators are used to indicate the power supplied to the circuit and to detect the voltage level of the circuit. Example when the green light switches on, it means there is power supply but low, yellow light indicates average voltage, orange light indicates full and normal voltage while red light signifies too high voltage. This unit consists of a NPN transistor connected to the operational amplifier in other to control the display
positions. [8]

Other components used include the following:

1. Temperature level indicator.

2. Circuit power indicator i.e when the circuit is powered it switches on.

3. Environmental illumination light

4. Upper base copper/brass thin plate

5. Cast iron or steel pressure plate.

6. Stainless upper base cover or white polish iron.

7. Power pack between the base cover and the handle.

8. Wooden handle

9. 3-4yardsofpowercable.

10. Plug H cube with neon bulb.

3.2. BASIC OPERATION OF CIRCUIT DESIGN:

When current flows through any resistive load, heat is dissipated which heat up the heating element of the electric iron domestically used for pressing cloth. A relay was incorporate into the device to control the heating of the pressing iron. The thermistor senses the heat and de-energized the relay which in turn cut the flow of the current.

3.3 CONSTRUCTION OF AN ELECTRIC IRON

The construction of the iron started by first carving the sole plate and dressing it by covering it with aluminum because of its high thermal conductivity. After this is done the heating element which is made of copper of 1000 watts is fixed on it and after that a shiny stainless steel is attached to it in other to reduce the quantity of heat that will be lost since heat lose is in three forms which are conduction, radiation and convection.

In other to prevent heat lose due to radiation these stainless steels are used as laminations and when heat wants to escape it will be reflected back as such reducing heat lose by radiation.

As in the case of convectional heat lose an iron clamp is made and it is used to clamp everything together very tightly so that air dose not enter it and this also helps to reduce eddy current lose. A pressure plate is also part of the construction for proper heat reservation and after all these accessories the first cover is used to cover it. This cover carries all the circuit connections and the final cover bearing the handle is used to cover it.

3.4 MAINTAINANCE OF AN ELECTRIC IRON

Electric irons are simple appliances that require only routine maintenance to keep them ironing for years and if they need fixing, they are relatively easy to trouble shoot and repair.

What can go wrong? Fortunately, there are very little inside a well made iron that can go wrong. Most repairs are for faulty cords, damaged handles, and mineral deposits that hamper steam iron. Problems with an irons electronic part should be dealt with by an authorized service centers. It typically is more cost effective to replace rather than repair an iron with internal problems.

How can I identify the problem? As with many small appliances, regular maintenance makes a dramatic difference in how trouble free the electric iron will be. Even so things can happen such as:

1. If the iron dose not heat make sure that:

- ❖ Power is on to the outlet.
- ❖ Check the electrical cord and the control system that is the thermostat but in this project a thermistor was used because of its sensitivity to temperature and replace if necessary.

2. If the iron heats but steams improperly, inspect the sole plate and clean the vents, flush sediments out of the steam chamber.

3. If the iron produces too much or too little heat, test the electrical cord. Also test and if need be check or adjust the calibration of the control system.

4. If it's a spray iron and it dose not spray properly inspect and clean the nozzle. If the iron leaks or spits, clean the steam vents, nozzle and tank.

5. If the iron sticks and stain to fabric, clean or repair the sole plate, clean the tank with a commercial cleaner and use distilled or filtered water.

3.5 CAUTION

Iron carefully around buttons, zippers and other attachments and decorations that can scratch the sole plate.

3.6 MATERIALS USED IN CLEANING AN ELECTRIC IRON

Some important tools are required in other to ensure maximum maintenance of the electric iron. Some of these tools are highligited below:

1. Screw drivers.
2. Toothpicks or pipe cleaners.
3. Sewing needles.
4. Commercial electric iron cleaning solution or vinegar.
5. Soleplate cleaner.
6. Emery cloth.
7. Steel wool.
8. Metal cooking pot.

3.7b STEPS IN CLEANING AN ELECTRIC IRON

1. Unplug the iron and make sure it is cool before cleaning.
2. Use the toothpick or pipe cleaner to remove buildup in the steam vents making sure the debris dose not falls in to the vents.

3. Use a fine sewing needle to carefully clean the spray nozzle of mineral deposits.

3.3 GENERAL WORKING PRINCIPLE OF ELECTRIC IRONS

Basically, an electric iron is a small home appliance amidst other appliances such as heaters, fans, portable electric brushes and other devices.

In short of how current is supplied to the components included in an electric iron, the electric iron contains a resistance wire. When a current of I ampere is passed through the wire, electrical energy equal to I^2Rt (joules) is produced which is entirely converted to heat. This is a unique characteristic of resistance element as compared to capacitors or inductors where there is no power dissipation.[16,4,3] Hence R = resistance of wire in ohms, t = amount of time the current passes through the resistance wire. The metal base at the bottom of the electric iron is thus heated up.

The element of an iron has resistance, the voltage across the resistance causes current to flow through it. Current flowing through an element develops heat in the element.

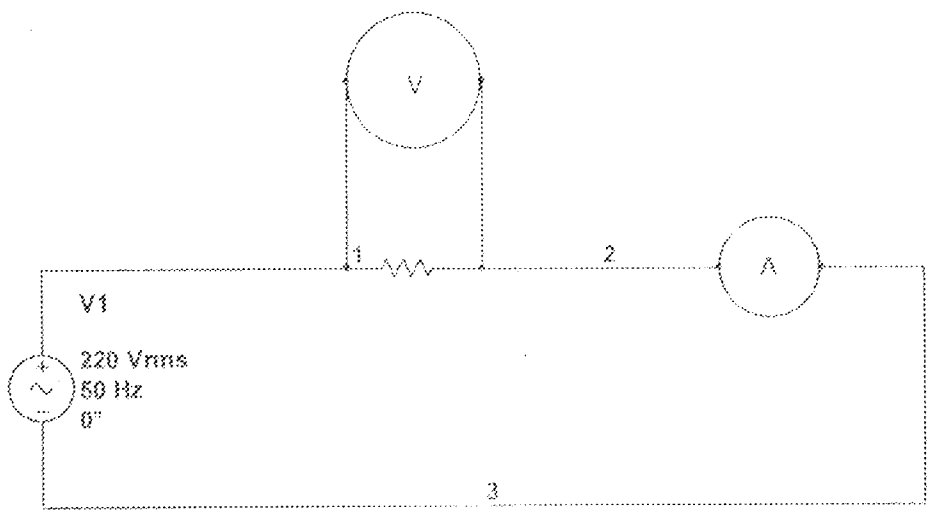

Fig 3.2 Circuit diagram

CHAPTER FOUR

CONSTRUCTION, TESTING AND RESULT

4.1 CONSTRUCTION

The circuit construction of an electric iron 1000watts 230v was carried out in sections.

All the components purchased for this project were technically tested to determine their operation ability, stated values, continuity and durable functionalities. Testing was carried out using the digital multimeter. Most of the components had actual values less than their stated values though falling between their manufacturers operating range.

This project involves practical exercise in making the circuit diagram on paper into a real working hardware. The specified components were connected together under the guide of the circuit diagram carefully. The entire circuit was divided into several units and each unit was tested one after the other, after which they were joined together as a single working construction. The construction was quite delicate involving care and reasoning. The software and hardware implementation were also handled with care. After troubleshooting and modification of the device, the final circuit was tested several times and the same type of result was obtained repeatedly.

4.2 TESTING

Tests were performed on the completed construction so as to check its response and performance. The testing basically depends on the temperature regularities of the system to the systems on test.

Firstly, it involves the plugging in of the device to the AC mains power supply and powering it ON by the use of set push button. This operation initiates the active/working mode of the device by switching on the power indicator and the heating element starts getting hot. The thermistor provides an accurate control of the heat and the LED indicators are used to know the level of voltage supplied to the iron.

4.3 DISCUSSION OF RESULT

The results obtained at the end of repeated tests were found to be consistent and matched up to expected results. The aim of this project was met.

From the test result, it was observed that the operation of the device centers on switching ON and OFF.

4.4 PROJECT LIMITATIONS

1. The project can only be powered by electricity.
2. The designed functionality is programmed for voltages of 230v and power of 1000watts.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The computer aided design and construction of an electric iron 1000 watts 230 volts has been successfully designed and constructed. The heating effect of the element is determined by the level of the voltage supplied to the circuit. Also the temperature of the iron is controlled by thermistor in collaboration with a relay. The various result obtained were close to theoretical results.

The project provided a practical knowledge to electronics components, design and construction.

5.2 RECOMMENDATIONS

Having completed this project, the following are hereby recommended for future improvement

1 A provision for wider temperature control was incorporated using both a thermistor as a sensor with a relay to de-energize it when the voltage supply is high.

2 A modification in the user design to control various devices could be modified on.

3 An alarm unit for audible alert can be introduced into the system to indicate either high temperature or voltage.

4 For reduction in the circuit space, a specific microcontroller that can incorporate the circuitry can be used to realize the same result.

5 An iron using a remote control can be developed

6 An iron which can determine the heat required for a particular material can also be developed.

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