DESIGN AND CONSTRUCTION OF AN AUTOMATIC NIGHT LIGHT

BY

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2003/15477EE

SUBMITTED TO

THE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF A BACHELOR OF ENGINEERING (B.ENG.) DEGREE IN ELECTRICAL AND COMPUTER ENGINEERING.

NOVEMBER 2008

Dedication

I dedicate this work to GOD ALMIGHTY for bringing me to the end of my degree programme. I also dedicate this work to all my family members for their encouragement and love.

DECLARATION

I, OTENE OJOCHOGWU SAMSON, deçlare that this work was done by me and has never been presented elsewhere for the award of a degree. I also hereby relinquish the copy write to the Federal University of Technology, Minna.

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Acknowledgement

My sincere acknowledgment goes to God for His mercy and grace upon me throughout my stay in school. To my parents, Elder Joseph Otene and Mrs. Rachael Otene for their prayers, financial and moral support from start to completion of my studies. To my Elder brothers; John Otene, Friday Otene, Pastor & Mrs. Ezekiel Otene, Solomon Otene. To my sisters; Ruth Otene and Ojoma and my younger brother Abraham.

To my supervisor, Engr Galadima for his good initiative and commitment in my project work; I say thank you. In addition, I appreciate all the staff of Electrical/Computer Engineering Department as well as students for being such a wonderful part of my career development.

Abstract

The basis of the design is the concept of the Light Dependant Resistor (LDR) being the most active component connected to a fixed resistor (Sensor). Light intensity generally falls on the LDR more in day time and less at night. The sensor senses the occurrence and then the effect is received at the LM 741 comparator. LM 741 comparator being a voltage comparator is meant to compare the voltage level between the negative and positive inputs. At night, the LDR value is enough to trigger the switching transistor with the help of the 100k biasing resistor hence causes the 12v electromagnetic relay to be activated.

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CHAPTER ONE

Introduction

Introduction

Engineering is about making life easier through the application of sciences for the design and building of machine and structures. In a bid to do this, various researches were carried out and are still being carried out to understand phenomenon around us and through the application of these understanding, complex methods can be carried out through easier means.

There are many things we benefit from nature and an example of these is natural light. At night, we still need light not only at home but also on the streets for security. Take Street lighting for example, street light should be on at night and at any time in a day when there is heavy cloud cover creating darkness. Human operation is thus very inconvenient in this situation. The best is to have a circuit whose self regulation depends on the intensity of natural light once the intensity of light rises to a certain value; the circuit is turned OFF and vice versa.

This project is a light dependant regulation switch with an LDR as the sensory element. Hence, it is an LDR based circuit with the importance of turning on security light at night in residential or non-residential building and used in street light to make traffic and obstruction on road clearly visible in order to promote safety and convenience and also to make the street more attractive. [1]

1.1 Objective of the Project

1. To provide a simpler, cost effective device aimed at preventing darkness at anytime within the environment when needed

2. To demonstrate effectively how important constant research for improvement can help to save time and energy

1.2 Methodology

The designed circuit operates in such a way that the LDR is responsible for the ON and OFF state, sensed by the variable resistor which compares voltages inputs (+ve and –ve) with the help of the LM741 comparator; the switching transistor is then triggered thereby causing the relay to be activated.

This project is designed specifically to put on security lamps when darkness is casted ON the sensor and also to turn OFF the lamps when there is light. The light to be used is the normal day light and the darkness which is available at night.The sensor brings about variation in voltages due to variation of light intensity across the resistor R_1. This varied voltage is then compared with the other voltage, by the use of the variable resistor (this voltage is called the reference voltage).

Whenever light intensity decreases, the resistance of the sensor (LDR) is increased; this decreases the voltage across the inverting input of the comparator. As a result of this and the proper setting of variable resistor, the comparator will switch from low to high.

1.3 Project Outline

This project work was carried out in various part as stated below;

Chapter one, gives the general introduction about the objective, methodology and scope of the project.

Chapter two carries the literature review

Chapter three gives the design and construction.

Chapter four gives the testing, result.

Chapter five is the conclusion

CHAPTER TWO

Literature review

Theoretical background

Illumination which is the provision of light to make something visible or bright is an important aspect of this project and can be controlled in many ways as well. This project is on a basis of an automatic night light whose control unit automatically operates the light for a pre–determined period of time. It is also automatic in the sense that, it will only switch on the electric light during night time hours once the ambient light level have fallen below a pre determined level. This project is designed to assist mankind in the area control, which is an absolute essential part of operation of any reliable system. One already made project in this area the insteon switch linc Relay countdown timer. Its aim is to control the use of light in the home by preventing the wastages of current from a light bulb been left on. It replaces the usual wall switch and acts as a standalone wall switch timer. Once you press the paddle top to turn ON the switch, it activates the built in timer as well and will automatically turn the light OFF in 15 minutes.

Tapping the paddle again will keep the light on for an hour and each additional tap will add another hour to the timer; the highest you can go is up to 24 hours maximum, the device all has timer setting stored in a non-volatile memory and are not lost during power failures. If such power outage occurs, the timer will return to its last ON/OFF state when power is restored.

Even though products like the INSTEON switch Relat switch linc countdown timer is a simple project for comfort, constructing the project had created some difficulties. The use of incandescent light bulb could be change to fluorescent bulbs since it consumes much more power, generate a great deal of heat and relies on a filament that deteriorates with use.

2.2 Brief History 0f Lights And Lights lamps [2]

2.2.1 Pre-Electrical Lamps

The first lamp was invented around 70,000BC. A hollow rock, shell, or other natural found object was filled with moss or similar material that was soaked with animal fat and ignited. Humans began imitating the natural shapes with manmade pottery, alabaster and mental lamps. Wicks were later added to control the rate of burning. Around the 7^{th} century BC, the Greeks began making terra cotta lamps to replace handheld torches. The word lamp is derived from the Greek word lampas, meaning torch.

2.2.2 Oil Lamps

In the 18th century, the central burner was invented, a major improvement in design of lamp. The fuel source was now tightly enclosed in metal and an adjustable metal tube was used to control the intensity of the fuel burning and intensity of the light. Around the same time, small glass chimneys were added to lamps to both protect the flame and control the flow of air to the flame. Ami Argand, a Swiss chemist is credited with first developing the principle of using an oil lamp with a hollow circular wick surrounded by a glass chimney in 1783.

2.2.3 Gas Light

In 1792, the first commercial use of gas lighting began when William Murdoch used Coal gas for lighting his house in Red Ruth, Cornwall. German inventor Frederic Winze (Windsor) was the first person to patent coal gas lighting in 1804 and a "thermo Lampe" using gas distilled from wood was patented in 1799. David Melville received the first U.S. gas light patent in 1810.

Early in the 19th century, most cities in the U.S and Europe had streets that were gas light. Gas lighting for streets gave way to low pressure sodium and high pressure mercury lighting in the 1930s and the development of the electric lighting at the turn of the 19th century replaced gas lighting in homes.

2.2.4 Electrical Lighting

Sir Joseph Swann of England and Thomas Edison both invented the first electric incandescent lamps around the 1870s. Incandescent light bulbs work in this way: electricity flows via the filament that is inside the bulb, the filament has resistance to the electricity, the resistance makes the filament heat to a high temperature, the heated filament then radiates light. All incandescent lamps work by using a physical filament.

Thomas A. Edison of the US invented the first commercially successful incandescent lamp around 1879. Since then, incandescent lamps are what are regularly used in our homes.

Types Of Lights

1 The Incandescent Light Bulb

The incandescent light or lamp is a source of artificial light that works by incandescence. Incandescent bulbs are called electric lamps a term originally applied to the original arc lamps. A term originally applied to the originally applied to original arc lamps. Incandescent bulbs are made in a wide range of sizes and voltages, from 1.5 volts to about 300volts. They require no external regulating equipment and have low manufacturing cost and work well on either alternating current or direct current. As a result the incandescent lamp is widely used in household and commercial lighting, for portable lighting such as table lamps, some car headlamps and electric flash lights and for decorative and advertising lighting.

.2 Light Emitting Diodes

Light Emitting Diode (LED) are PN junction devices that give off light radiation when biased in the forward direction.

Most LEDS function in the near infrared and visible ranges though there are now Ultra-Violet LEDS. LEDS are a reliable means of indicator compared to light sources such as incandescent and neon lamps.

LEDS are solid-state devices requiring little power and generating little heat. Because their heat generation is low and do not rely on a deteriorating material to generate light, LED have long operating lifetimes. One of the alternatives is incandescent bulbs, consumes much more power/generate a great deal of heat, and rely on a filament that deteriorates with use. Neon bulbs on the other hand, rely on excited plasma, which along with its electrode can deteriorate over time.

Common features of LEDS include lens type choices, bipolar, construction, dual LEDS, and arrays. Lens type choices include flat lences and doomed lenses. Bipolar LEDS work even if voltage is reversed. Dual LEDS are two LEDS lamps in the same housing. In an LED array the LEDS are packaged as multiply.

2.3.3. Fluorescent lights

Another type of electric lamp containing a low pressure vapour, usually mercury in a glass tube, passing an electric circuit via it produces ultraviolet radiation that is converted into visible light by a coating inside the tube.

Fluorescent lamps are cooler and more efficient than incandescent lamp, which produce light by heating a filament to high temperatures.

A fluorescent lamp consists of a glass tube filled with a mixture of argon and mercury vapour and coated with phosphorus on the inside surface. Each end of the tube is fitted with metal electrodes coated with a compound of an alkaline earth metal and oxygen, called an alkaline earth oxide that produces element when connected to a power source. a device called a starter sends extra voltage to ionize or give a net electronic charge to the gas in the tube. When current flows via the ionized gas between the electrodes it emits ultraviolet radiation. The phosphor coating inside the tube absorbs this ultraviolet radiation and re-emits the energy as visible lights.

Since the discovery of fluorescence in the 1600s, scientists have synthesized hundreds of thousands of phosphors. Each phosphor has a characteristic color of emission and duration of luminescence. Some phosphors such as Zinc sulfide and cadmium sulfide are excited by a beam of electrons. As a result, these phosphors are used in the production of radar and television screens.

Engineers at the General Electric Company were the first to combine phosphors with mercury vapour lamps to produce the first practical florescent lamp in 1934.

Fluorescent lamps rapidly replaced incandescent lamps in industrial use and have also grown in popularity for home lighting.

CHAPTER THREE

3.1 Design And Implementation

The design and implementation of this project was done by the breaking down of systems into segment/units.

Steps taken for this design involved the schematic block layout, the circuit design, circuit analysis, breadboard design, test and records of the results, the fixing of components on the vero board and finally, the entire constructed, housed in a pack or case (Wood in this case).

Below is a schematic block diagram of the process.

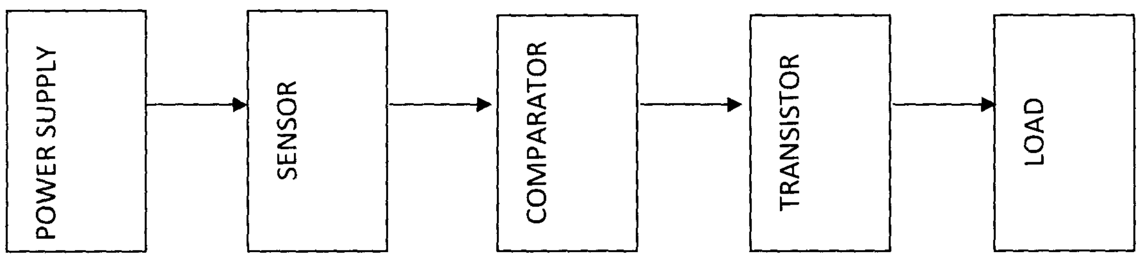


Fig 3.1 : Schematic Block Diagram

3.2 Power Supply Unit

The most important aspect of any electronic equipment is the power supply unit and for correct operation of such electronic equipment, suitable power supply must be available. The block diagram is as shown in fig 3.2.

The power supply unit is designed to convert A.C to D.C voltage of desired value. Its purpose is to supply the required D.C. Voltage and current with low level of A.C. ripple, good stability and correct regulation irrespective of the changes in the main input voltage.

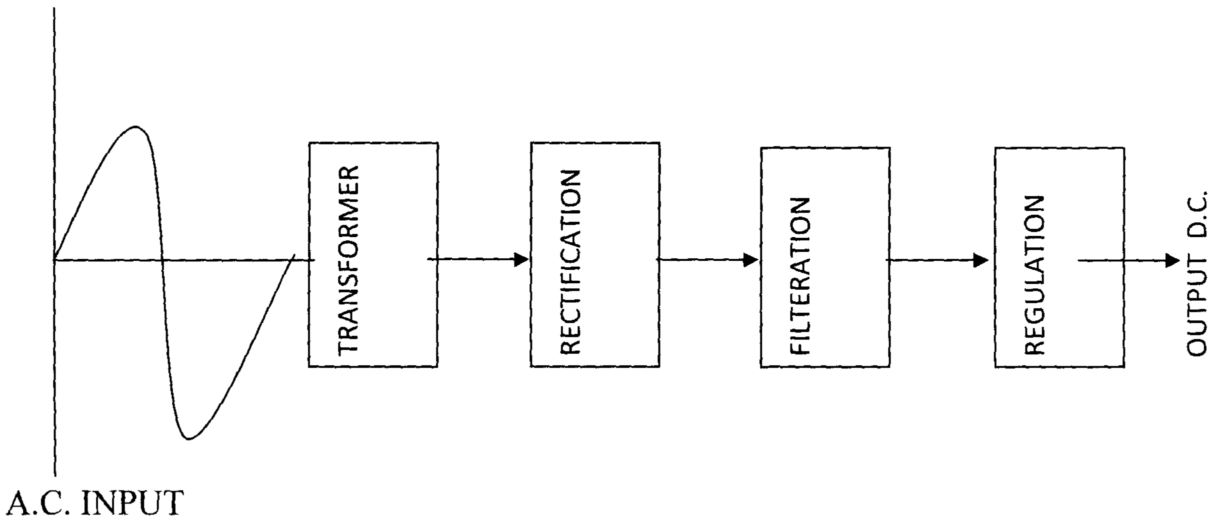


FIG 3.2 Block Diagram of Power source

3.1.1 TRANSFORMER CIRCUIT

The transformer basically is to step-down the voltage from the source (240V) to the desired voltage of 24v, suitable for use in the circuit design under consideration.

In this case, the 240/24v centre tap was used because the available or specified components to be used for the design have ability of handling only voltage values from from 0 to 24v as prescribed by the manufacturers.

A transformer consists of two windings isolated from each other and wound on the same iron core. The primary coil receives the input voltage from the A.C supply mains while the secondary coil provides the output voltages. The diagram below shows the schematic of a transformer.

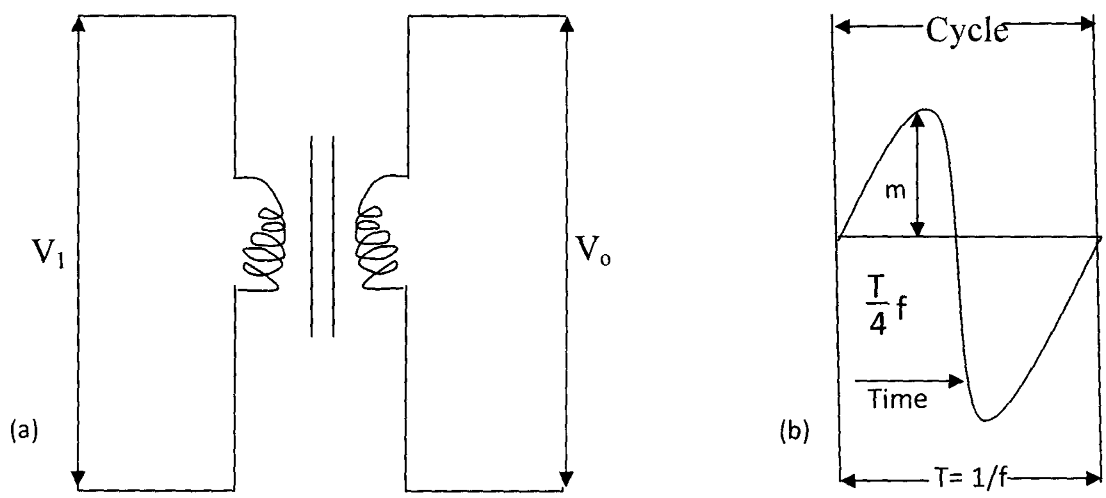


Fig 3.3 SCHEMATIC DIAGRAM OF A TRANSFORMER

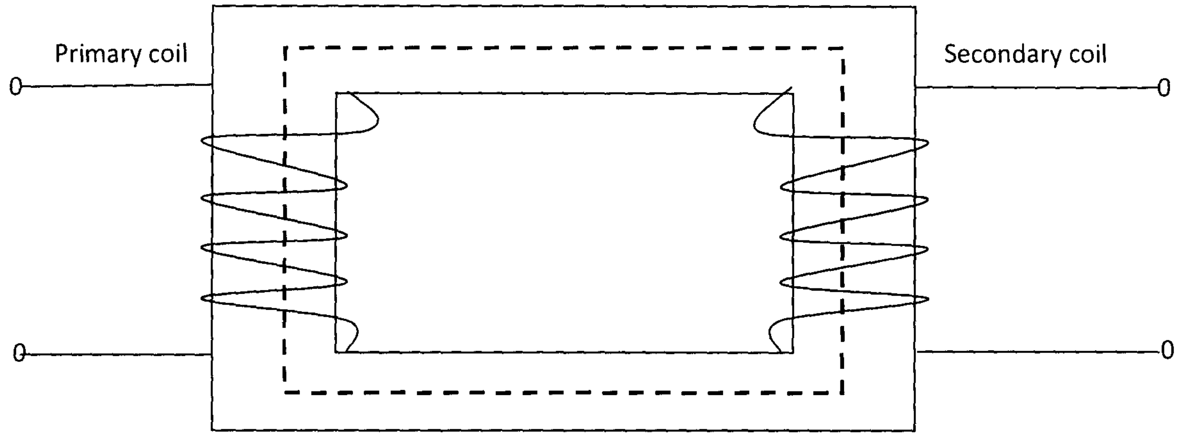


Fig 3.4 structure of a step down Transformer

Let N_1 =Number of turns in primary

N_2= Number of turns in secondary

0

Φ_m = Maximum flux in

= B_m X A

F = Frequency of A.C input in Hz.

As shown in fig 3.3b, flux increases from its zero value to maximum value Φ_m in one quarter of the cycle i.e in 1/4f seconds.

Thus, Average rate of change of flux

$$= \frac{\Phi_m}{1/4f} \quad \text{.......} (1.0)$$

$= 4f\,\Phi_m$ Wb/s or volts

Now, rate of change of flux per turn means induced e.m.f in volts.

Therefore, Average e.m.f. per turn = $4f\,\Phi_m$ Wb/s or volts .... (1.1)

If flux Φ_m varies sinusoidally, then the r.m.s value of induced e.m.f. is obtained by multiplying the average value with form factor

$$\text{Form Factor} = \frac{\text{r.ms. value}}{\text{Average value}} = 1.11$$

Therefore, r.m.s. value of e.m.f./turn = $1.11 \times 4f\,\Phi_m = 4.44f\,\Phi_m$ volt.

Now, r.m.s. value of the induced e.m.f in the whole of primary winding

= induced e.m.f./turn x No of primary turns

$E_1 = 4.44fN_1\,\Phi_m = 4.4fN_1B_mA$ ....(1.2)

Similarly, r.m.s. value of the e.m.f induced in the secondary is

$E_2 = 4.44fN_2\Phi_m = 4.44fN_2BmA$ .... (1.3)

Dividing (1.2) by (1.3)

$$\frac{E_1}{E_2} = \frac{N_1}{N_2}$$

OR

$$\frac{E_1}{N_1} = \frac{E_2}{N_2} = K$$

K = Constant known as voltage transformation ratio.

It means that e.m.f./turn is the same in both the primary and secondary winding.

In an ideal transformer on no load,

$V_1 = E_1$ and $E_2 = V_2$ .... (1.5)

Also

Input power (VA) = Output power(VA)

$$V_1I_1=V_2I_2 \quad \text{OR} \quad \frac{I_2}{I_1} = \frac{V_1}{V_2} = \frac{1}{K} \qquad \text{.............................. (1.6)}$$

For a step down transformer, If $N_2 < N_1$, i.e. $K<1$ [4]

3.2 Selection of 12v Center Tap Transformer

For this design, 12v centre tap transformer was chosen based on the following reasons;

i. Since $V_1 = 220V$, $V_2 = 24V$

$$K = V_1/V_2 = 220/24$$

$$= 9.17 \approx 10 > 1 \qquad \text{...................................... (1.7)}$$

ii. The Centre tap transformer offers the advantage of delivering twice than the single phase voltage transformer does.

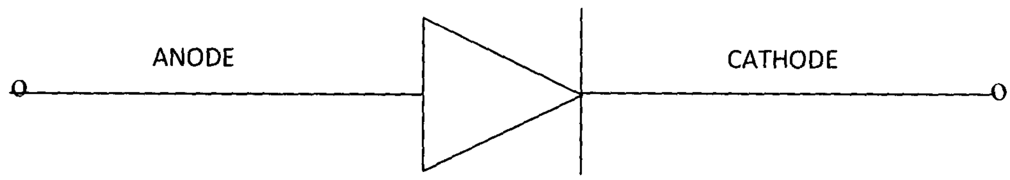
In this case, for single phase output = 12.

For centre tap end to end supply output, 2 x 12 = 24V.

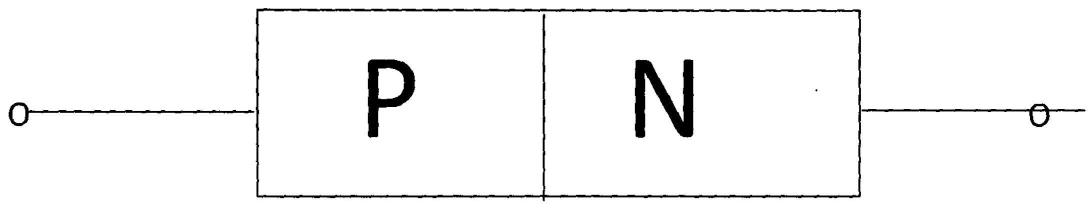
We conclude that the cost of buying a single 24V type is reduced.

3.2.3 **Diode**

A diode is an electrical device allowing current to pass through it in one direction far greater than in the other. It is a two terminal device consisting of a P-N junction. The P and N type regions are referred to as anode and cathode respectively as shown



SCHEMATIC SYMBOL



P-and-N type region

Fig. 3.5 : Schematic symbol and the P-and-N type region

3.2.1 BIASING NATURE OF A DIODE

Biasing simply means, preparing it for use. It is basically of two types; forward biasing and reverse biasing.

3.2.2 Diode Applications to the Design

1. Rectification

Rectification is the process of converting an alternating signal to a direct signal mostly voltage or current signals.

In this design, the incoming source is an A.C. but because the circuit compartment that makes up the design circuit are such that they accommodate direct current (D.C.) of lower voltages values, rectification therefore becomes necessary in the power supply unit. For this design, a bridge rectification circuit was used as shown in fig 3.6.

It offers the following advantages,

i. Low cost

ii. High reliability to small valued transformer

iii. Converts A.C. to D.C. pulsating on both inputs' positive and negative half cycles.

2. **Free Wheeling Effect**

The diode performs the following functions;

i. Prevent the high reserved load from appearing across the switching device.

ii. Keeps the load current away from the switching device.

3.2.3 Selection of Diode

The following ratings were considered for the choice of the four diode used as rectifiers.

1. Maximum voltage = 24V

2. Maximum forward current = 1.5A

The peak value of the full wave signal is V_p

From the expression

$V_p = \sqrt{2} \times Vr.m.s$ .... (1.8)

But Vr.m.s = 12V

$V_p = \sqrt{2} \times 12$

$= 16.97V$

Hence, diode N4001 was chosen with a peak inverse voltage of 24V.

3.3 Bridge Rectifier Circuit

During the positive input half-cycle, terminal M of the secondary is positive and N is negative as shown separately in fig 3.6 (a) and (b) respectively.

In (a) diodes D_1 and D_3 become forward-biased (ON) whereas D_2 and D_4 are reverse-biased (OFF). Hence, current flows along MEABCFN producing a drop across R_L.

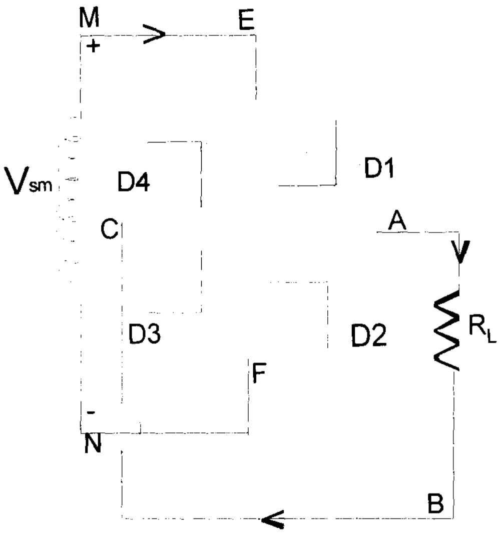


Fig 3.6 (a)

During the negative input half-cycle, secondary terminal N becomes positive and M becomes negative. Now, D_2 and D_4 are forward biased. Circuit current flows along NFABCEM as shown in Fig 3.6(b).

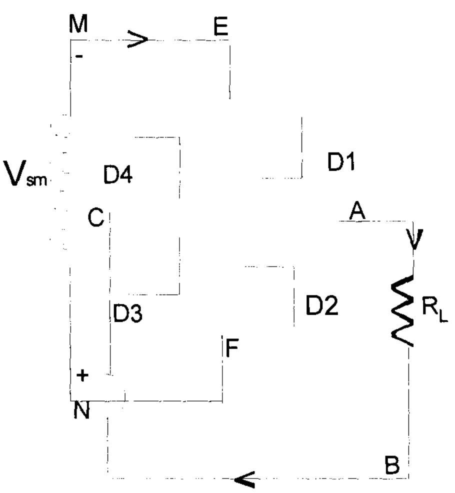


Fig 3.6(b)

Hence, current keeps flowing through load resistance R_L in the same direction AB during both half – cycles of the a.c. input supply. The output wave form is as shown below in fig. 3.7

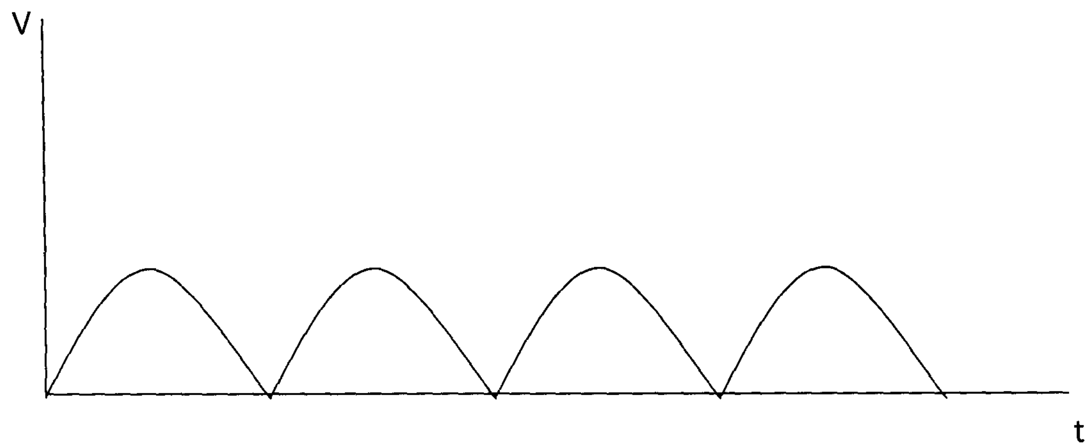


fig. 3.7

3.4 Capacitor

A capacitor generally is a device which stores electrical charges. But for the purpose of this design, we make use of its extended application which is its ability to filter undesirable a.c ripples from a particular d.c signal. This is achieved through the charging and discharging process of a capacitor. Fig 3.8 is a schematic diagram of a capacitor

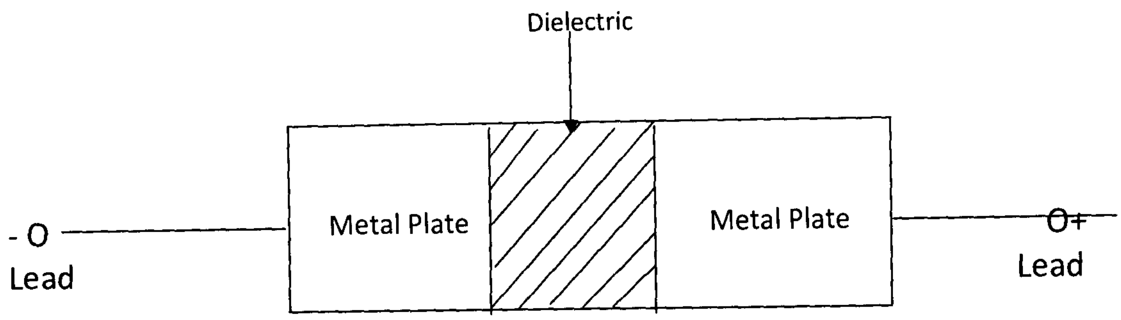
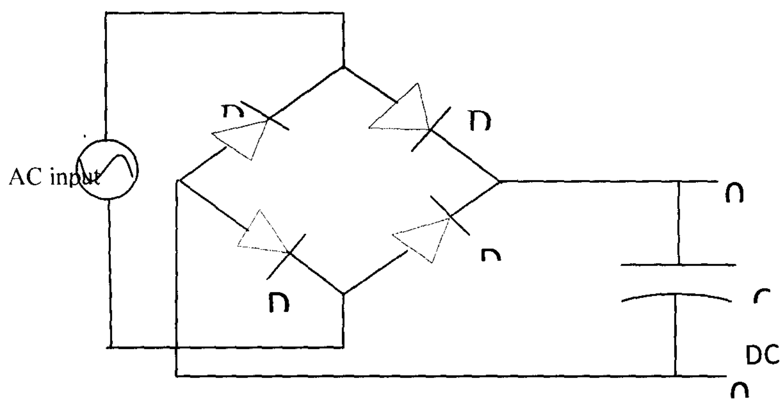
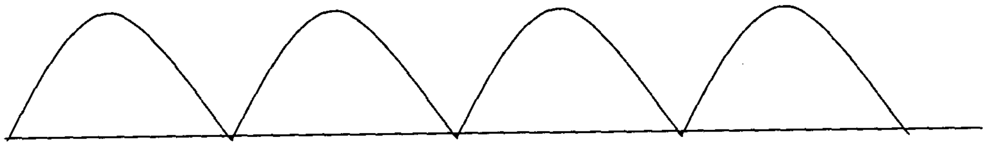


Fig. 3.8 : Schematic Diagram of a capacitor

3.4.1 Filtering Effect of A Capacitor

The d.c. components output realized from the rectified circuit earlier, yet has some a.c ripples (though small compared to d.c).The 24/1000μf. Capacitor used in the design circuit further filters or reduces the ripple contents as much as possible thereby making the d.c waves form as shown in Fig below





Full-wave rectified DC Voltage

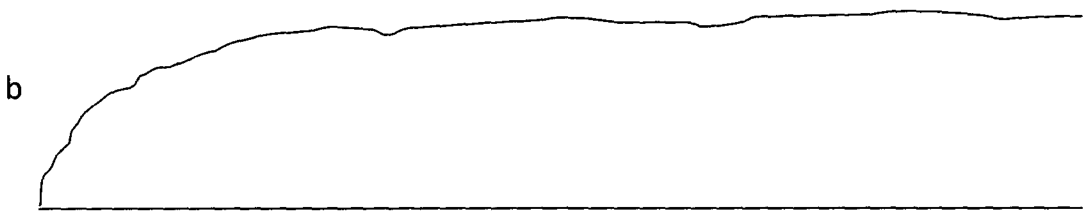


Fig 3.9 Full-wave rectified DC Voltage with filtering

The charging and discharging circuit shown in fig below

Fig 3.4.1

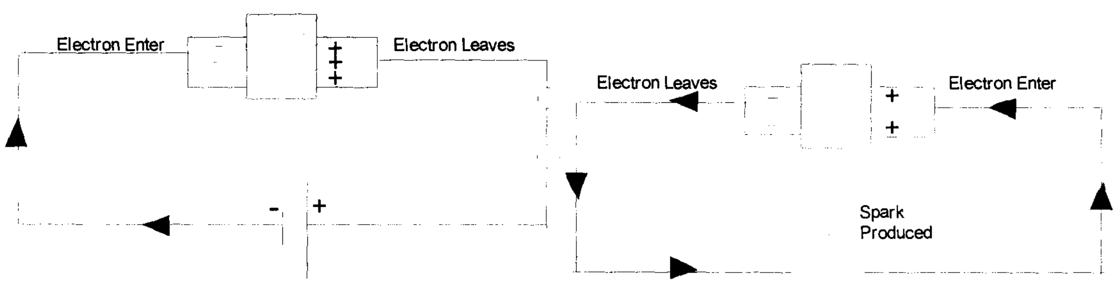


Fig 3.4.1 The charging and discharging circuit

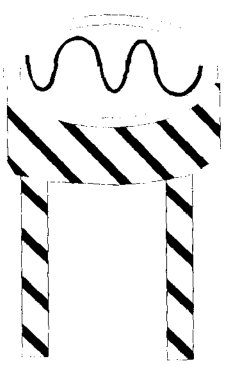
3.5 Voltage Regulator

Its main function is to keep the terminal voltage of the d.c supply constant even when the a.c input voltage to the transformer varies (deviation from 240V are common) and when the load varies.

LM7812, 12V regulator was chosen to handle the circuit for the design.

3.6 Sensor Stage

The sensor stage consists of a light dependant resistor (LDR) connected in series with a fixed resistor R_1 as shown in fig 3.6(a) schematic diagram, and (b) circuit diagram



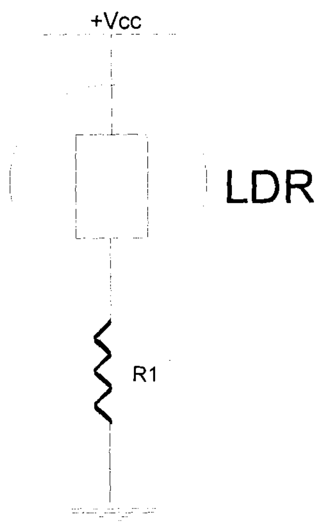
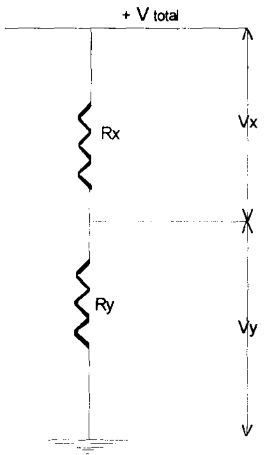


Fig 3.1.2 Schematic and circuit diagram of sensor stage

There is always a variation of voltage across R_l since there is variation across the LDR. This is proven if one compares the system with that used in the voltage dividers network indicated below.



This network thus gives

$$V_X=(R_X/R_X+R_Y) \times V_{Total} \qquad (1.9)$$

Or $$V_Y = \left(\frac{R_Y}{(R_Y+R_X)}\right) \times V_{Total} \qquad (2.0)$$

As R_X increases, V_X increases too in (1.9). The same applies to equation (2.0)

Also from ohm's law;

$$V = IR \qquad (2.1)$$

$$I = V/R \qquad (2.2)$$

For low current values, it implies a high resistance and vice versa. The design circuit components are such that they accommodate current of very small Amperes (mostly in mill amperes) therefore; selection of resistors with high resistance about kilo Ohms is justifiable.

3.70 Operational Amplifier (Op-Amp)

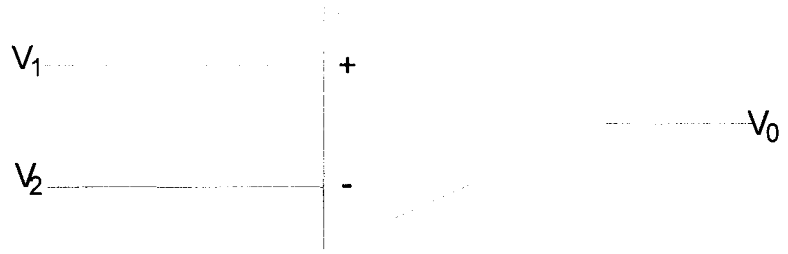


Fig. 3.1.3 Circuit symbol of Op-amp

Basically there are different types of op-amp circuits. The common ones are inverting amplifier, non inverting amplifier, summers intergrator and differentiator and comparator circuit in this design is made to op-amp as a comparator.

3.7.1 Properties of An Ideal Op-Amp

(1) The input impedance is infinite

(2) The output impedance is zero

(3) The open loopgain approaches infinity

(4) Band with is infinity

3-7.2 Comparator Circuit

This has two input: inverting and non inverting input.

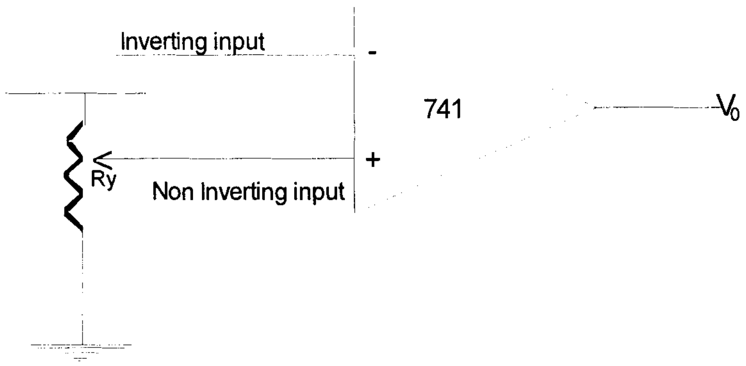


Fig. 3.1.4

This stage compares voltage at the inverting input with that at the non-inverting input which is the reference voltage. With this there are three (3) possible situation, with three (3) [possible results respectively:

(1) When the input is equal to the reference voltage

Result: the output voltage is zero

(2) When the input voltage is less than the reference voltage

Result: the output voltage is more positive (i.e high)

(3) When the input voltage is more than the reference voltage

Result:- the output is low

This can further be illustrated with the following formular

Vout = Ao Vin..................................(2.3)

When Ao= open 1oop voltage gain = 20,000 or more.

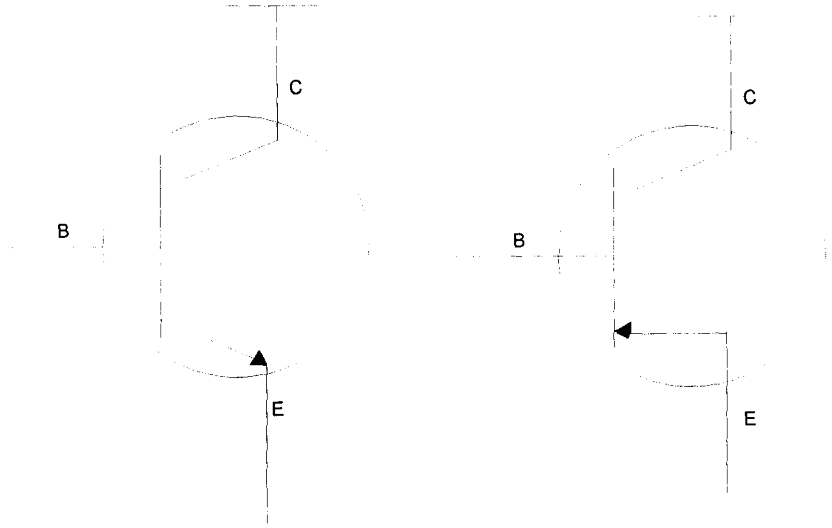
:. Vin = V+ -V- ....(2.4)

When V+ is the voltage at non inverting ouput and V- is the voltage at the inverting input.

3-8 Transistor Switching Circuit

The switching transistor switches on the relay whenever it is biased and vice versa.

This is effected by the output of the comparator. When this is high it allows certain transistor through Rb. As a result, there is an amplification of current since transistors are current amplifiers. Thus amplified current are driven by certain voltage which is applied at the coil the relay causing it to energize and then pulling the contacts together.



(I)NPN (II) PNP

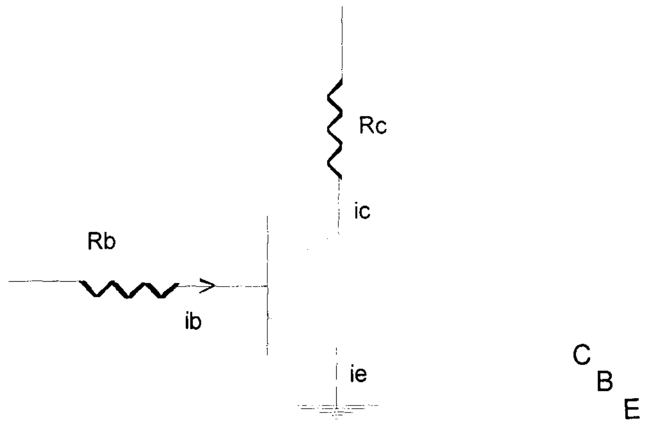


Fig 3.1.5

In this case Rc = resistance of relay coil which is 400- (coil resistance)

Vcc = 12

For Silicon transistor is switched)

Vout- from comparator = 12 V

$Hf_c = 300$ (from data sheet for Bc 337)

Since

$Vcc = Ic\, Rc + Vce$...(2-5)

$Vin = I_B\, R_B + V_{BE}$ ....(2.6)

$\frac{Ic}{I_b} = hf_e$...(2.7)

From equation (2.6)

$R_b = (Vin - V_{BE})/I_B$..(2.8)

Where

Ic = Collector current

I_B =base current

Vin = input voltage

Vcc = power Supply

Vce = collector – emitter voltage

hf_e = current gain

from equation (2.5)

$12 = Ic\, R_c + Vce$

$12 = Ic\ (400) + 0$

$400\, Ic = 12$

$Ic = 12/400$

$= 0.03A \approx 30mA$

From equation (2.7)

$I_B = Ic/ hf_e$

$= 30 mA/300$

$= 0.1 \approx 100uA$

From equation (2.6)

$12v = 100 R_b + 0.6$

$100 R_b = 12V - 0\text{-}6$

$100 R_b = 11.4$

$R_b = 11.4/100$

$R_b = 0.114 K\text{~}$

$\approx 114 K\text{~} \quad = 100 K\text{~}$

3.9 ELECTROMECHANICAL RELAYS

Electromechanical relays consists of devices which have sets of contacts closed by some type of magnetic effect. Regardless of its many design, the general purpose relay is basically a mechanical switch operated and available with magnetic coils that can open or close contacts, making them IC compatible to TTL and CMOS gate. The 12V relay selected from the manufacturer's data sheet specification considered the following features.

V = 12V dc, I = 5A and R =40Ω

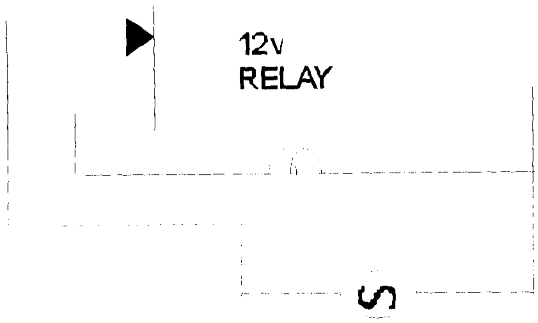
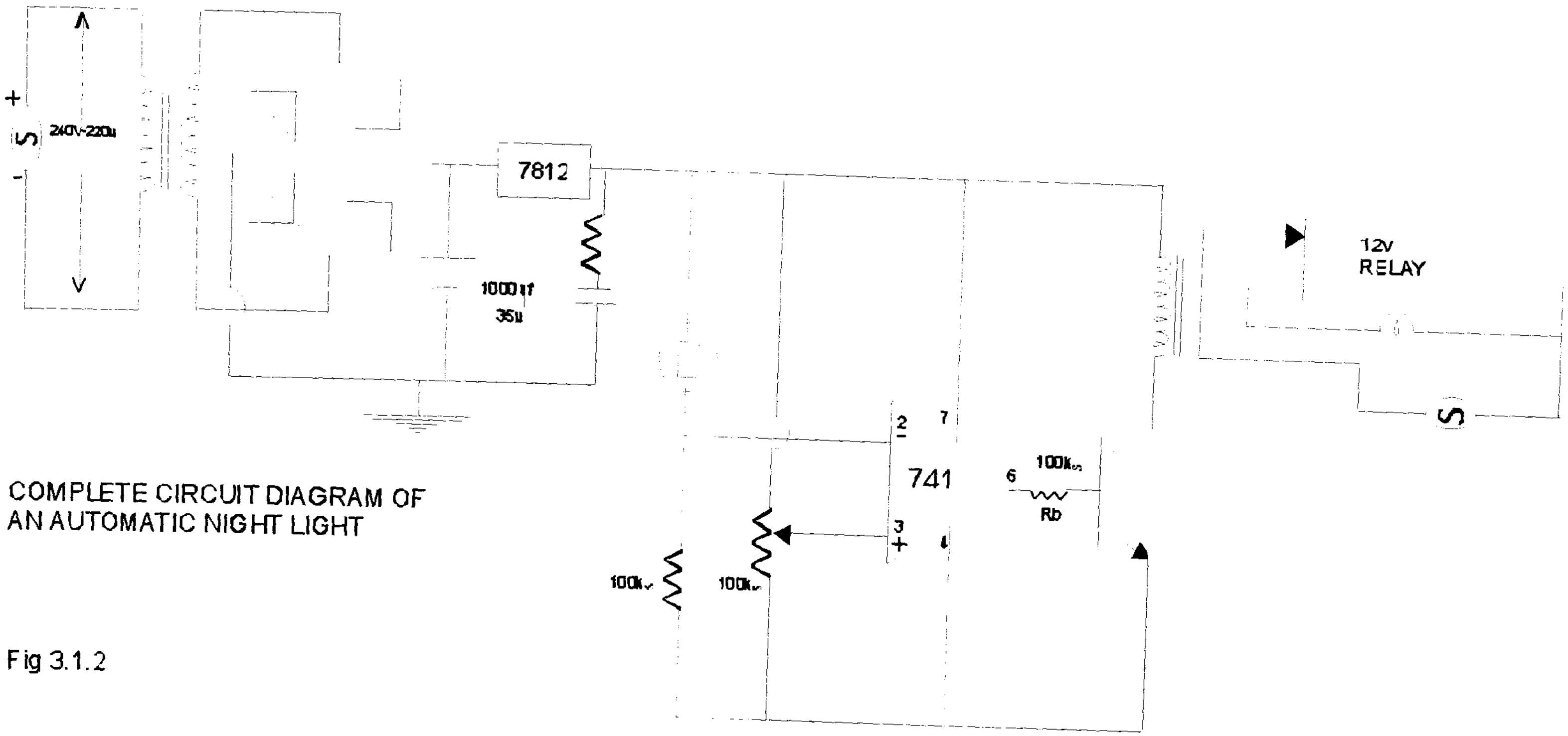


Fig 3.1.6

3.1.1 Construction

This is simply the process of putting together all components of the sub-systems discussed earlier on the breadboard and tested. After which they are being transferred to the veroboard for final construction with soldering where necessary.

Finally, the metal casing containing the complete construction of the circuit under construction is however made exposed through provisional holes or air spaces in it to give proper ventilation which takes care of the heat energy generated by components devices as current flow through them giving a conducive temperature environment to the design circuit.



COMPLETE CIRCUIT DIAGRAM OF
AN AUTOMATIC NIGHT LIGHT

Fig 3.1.2

CHAPTER FOUR

4.1 Testing

After the design and construction has been completed and with a clear understanding of the automatic night light, the project was then tested.

The light intensity was then reduced while the light dependant resistor (LDR) was shaded with a dark material or using the hand.

The relay coil then gets energized and makes a close contact thereby switching on the bulb connected.

Immediately, the dark shadow or material was removed, light ray falls on the LDR, de-energising the relay and the bulb turns off. The process of switching ON and OFF was repeated for several times to ensure the reliability of the design and construction of the circuit. It was confirmed very active and reliable.

4.2 Discussion of Result

When the power pack is powered from a 240V, there is a light up (ON) which indicates the right magnitude of voltage of 24V is being supplied to the circuit.

When darkness is casted on the sensor (LDR), the relay in the circuit makes contact (closed) and the light comes up. This is therefore a positive result. When the LDR is exposed to light or bright environment which naturally will come up in the early hours of the following day, the relay losses contact which is the expected result; thus the aim of this project is achieved.

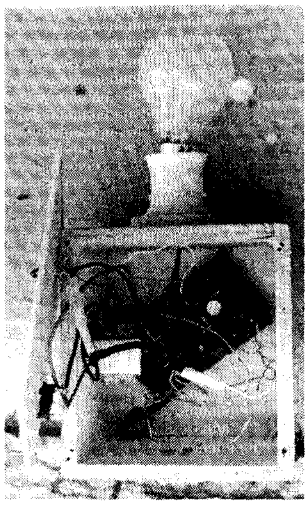


Fig 4.1 Top Vew of Project work (Photographed)

4.3 Limitation

The major limitation to this project is the unnecessary feedback (i.e. light being around the sensor) that causes the oscillation of the sensor.

This can be handled by directing or wiring the light away from the sensor.

CHAPTER FIVE

5.1 Conclusion

The project report has given the detail of the design and implementation of an automatic night light; description of materials as well as components used in the project.

The designed outlook was simple because of right selection of compatible materials and components used thus making the design portable. This project greatly reduces or even eliminates human or manual interference in power switching control and also difficulties encountered due to error in manual operation of circuit thereby saving time and energy. Most of all, the aim of the project was realized.

5.2 Problem Encountered

In the course of this project, the following setbacks were encountered:

1. Unavailability of components at close proximity
2. Constant power failure which slowed down the pace at which the work was carried out.

5.3. Recommendation

This project has improved the theoretical and practical knowledge I have acquired in school and during the industrial training (IT) programme. Thus, this project should be regarded as a prototype which can be modified and improved upon to construct a real life automatic night light system applicable to street light, railroad system, security lights, photography, error detector, door entrance, etc. it could also be used in street lighting system in campuses and its environs.

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