DESIGN AND CONSTRUCTION OF AN AUTOMATIC EMERGENCY LIGHTING SYSTEM

BY

RABI'U BILYAMINU

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DEDICATION

This project is dedicated to Allah the Almighty, for his mercy over me since inception of my life to date. Also I will like to dedicate the project to my father Alh. Rabe Dansakai and my lovely mother Hajiya Balkisu Rabe Dansakai.

DECLARATION

I RABI'U BILYAMINU declare that this work was done by me and has never been presented elsewhere for the award of a degree. I also here by relinquish the copyright to the federal university of technology, minna.

RABI'U BILYAMINU

.....

Student

30/11/2010

Signature and Date

MR. NATHANIEL SALAWU

.....

Supervisor

30/11/10

Signature and Date

Engr. A. G. Raji

.....

H.O.D

Jan. 11, 2011

Signature and Date

Engr Dr. G. I. Igbuku

.....

External Examiner

1/12/10

Signature and Date

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ABSTRACT

This project is titled design and construction of an automatic emergency lighting system. It lights ON only when there is darkness in the area to be illuminated by the system and turns OFF if there is light in the area automatically, regardless of the supply. The use of a switch to manually switch ON/OFF the system and interruption due to power failure are eliminated. The system is designed to use LEDs as the lighting source instead of incandescent lamp, fluorescent, or mercury vapour. This makes the system not to produce heat and to have advantages of long lifespan, minimum running cost, start at low voltage among others. This project was well researched, analyzed, designed and constructed to give the specified output.

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CHAPTER ONE

1.0 INTRODUCTION

Man for years has been intrigued by the nature of the universe, and more particularly the world around him. He has modified his environment in various ways to beautify and make it more comfortable for him to live. One of the ways in which man modified his environment is the illumination such as lighting system. "Automatic Emergency lighting system" as the name implies can be applied in various ways in our everyday life. Example of such is the light in our homes, industries, factories, theater rooms, occasion halls, highly secured areas and so on, where the illumination is necessary for our everyday activities. Automatic Emergency lighting system is use to provide necessary source of light in our homes, industries, theater rooms, secured areas, halls, football fields e.t.c. during power outages, either during the day or at night which has gone a long way to beautify and our environment.

In early times lighting systems were controlled manually by switches. But presently modern electronics has made it possible to design emergency lighting systems using semi-conductor devices such as light dependant resistors (LDR) which enables the light to be controlled automatically. Considering the present situation of continuous power failure in our homes, industries, offices, halls, theater rooms, football fields, libraries, along the streets and even every where in the Nigeria today, an automatic emergency lighting system is the solution to this problem since it supplies power automatically without experiencing any black out whenever there is power failure. The problem of power failure is a serious one and needs to be avoided. For example in a theater room, any power failure may lead to loss of

life, power failure in libraries affect reading and research activities, power failure in our homes, offices, occasion halls, industries and streets deny use security and beauty to our environment and much more negative influences, all as a result of power failure.

This project is designed to illuminate an area either at night or during the day time and turn OFF whenever there is brightness in the area automatically, regardless of the supply, that is to say the system is not interrupted as a result of power failure.

1.1 AIMS AND OBJECTIVES

To design and construct a system that lights ON only if there is darkness in the area to be illuminated and turns OFF if there is light automatically without the use of switch.

1.2 METHODOLOGY

The project came into existence after analyzing the circuit, studying each of the components, that is, the operation and behavior of components in the circuit, getting the components from market, test of each component to ensure its reliability, fixing the components on the bread board (bread boarding) and testing to obtain required result and finally soldered on a Vero board and cased.

1.3 SCOPE

The scope of this project is to design and construct an automatic emergency lighting system using white light emitting diode (WHITE LED), which enables the light to turn ON /OFF automatically during power outages depending on the nature of the area to be illuminated without making use of switch to control the light manually.

1.4 SIGNIFICANCE OF THE STUDY

The project is of great importance in many areas such as the theater rooms where light failure is highly avoided. Other places where this system could be used are: occasion halls, highly secured areas, homes, industries, various buildings, football fields e.t.c

1.5 PROJECT OUTLINE

The project comprises of five chapters. The first chapter consists of the general introduction, aims and objectives of the project, methodology, scope of the project, significance and project outline. The second chapter covers the literature review, theoretical back ground of the project, block diagram of the project, operation and explanation of each component's function in the circuit. The third chapter consists of steps used in designing the project, modular design and calculations of individual module, circuit diagram of each module and explanation, determination of appropriate component and assembly sections (general circuit diagram). The fourth chapter is testing and the used method for testing the work, results obtained, and discussion of the result. The fifth chapter is conclusion, problems encountered, and recommendations.

CHAPTER TWO

2.0 HISTORICAL BACKGROUND/LITERETURE REVIEW

2.1 HISTORICAL BACKGROUND

The earliest experiments in electric lighting were conducted by British chemist Sir Humphry Davy, who produced electric arcs and also made a fine platinum wire incandescent in air by passing a current through it. Beginning about 1840 a number of incandescent lamps were patented. None were commercially successful however, both because the vacuum pumps at that time could not create a vacuum strong enough to protect the wire filaments and because electricity was expensive to obtain. In 1878 and 1879, British inventor Joseph Swan and American inventor Thomas Edison simultaneously developed the carbon-filament lamp. Improved vacuum pumps and the increased availability of electricity made these lamps a success. During the same period various arc lamps were introduced. The first practical arc lamp was installed in a lighthouse at Dungeness, England, in 1862. The American pioneer in electrical engineering Charles Francis Brush produced the first commercially successful arc lamp in 1878. Tungsten filaments were substituted for carbon filaments in incandescent lamps in 1907, and gas-filled incandescent lamps were developed in 1913. The fluorescent lamp was introduced in 1938 [5].

For most of the 20th century, the incandescent light bulb was widely used for lighting in homes. More energy-efficient and longer-lasting fluorescent lamps were later adopted for industrial and office use. In 1979 a compact fluorescent bulb that screwed into ordinary light fixtures was introduced. The compact bulbs used 75 percent less electricity and lasted 10

times longer than regular incandescent light bulbs. However, the compact fluorescent bulbs were also much more expensive and had only modest success with consumers [4].

2.2 LITERATURE REVIEW

Before now, the lighting sources used for emergency lighting were incandescent lamps, lamps from arc between two carbon electrodes (cleared filled lamps inside prostrated gas filled lamps), discharge lamps (sodium vapour lamps, high pressure mercury vapour lamps, fluorescent mercury vapour lamps), etc. But presently, light emitting diodes (LED) are used.

INCANDECENT LAMPS: An incandescent lamp essentially consists of a fine wire of high resistance metal placed in an evacuated glass bulb and heated to luminosity by passage of current through it. "Tungsten filament lamp" as it also called is the common bulb still used in our homes today. It consists of a thin filament of tungsten inside a glass bulb. When current is passed through the filament, heat is produced and the temperature of the filament rises. The filament is designed such that it reaches a temperature at which light energy as well as heat energy are produced which makes the filament to glow [3].

The higher the temperature of the wire the more efficient is the conversion of electrical energy to light energy, but if the temperature is too high the wire melts and break. Tungsten has a melting point of 3383°C. Fig. 2.1 shows the incandescent lamp [4].

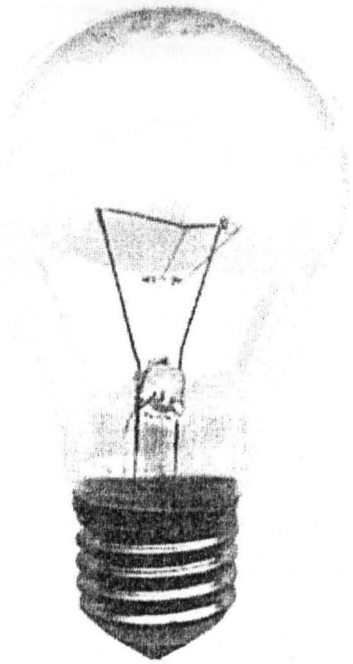

Fig. 2.1: Incandescent Lamp.

CLEAR FILLED LAMP: The clear filled lamp has the advantage of facilitating, controlling and necessing use in the lighting unit where accurate distribution is required such as in flood light for building, projectors and motor-vehicle head lamps. However the clear gas filled lamp produces hard shadow glares from its filament.

INSIDE FROSTED GAS FILLED LAMP: These have luminous output of about two percent (2%) greater than the clear glass lamp of the same rating but they produce sofer shadow and practically eliminate glare from filament. Such lamps are ideal for use in industries' open fitting located in the line of sight at a mounting height and in diffuse of opal glass type in order to avoid the presence of filament striation on the surface of the glass ware [3].

DISCHARGE LAMP: In a discharge lamp current is passed through a gas vapour which renders it luminous. The elements used commonly in this process of producing light by gaseous conduction are neon, mercury and sodium vapour. Example, neon discharge yields orange red light of nearly 6,500 Au. It is very popular in advertising, sign and other spectacular effects. The pressured use in neon tubes is usually from 3 to 20 mmHg. Mercury-vapour light is bluesh green and deficient in red rays whereas, sodium vapour light is orange yellow.

Discharge lamps are of two type, the first type consist of those lamps which the color of light is the same as produce by the discharge through gas or vapour. This group consists of neon gas lamps, mercury vapour (MV) and sodium vapour lamps. The second discharge through the vapour produces ultraviolet wave which causes fluorescence in certain materials such as phosphorus. This type consists of vapour lamp which use phenomenon of fluorescence. Example of light sources based on discharge lamps are: sodium vapour lamps, mercury vapour lamps, neon gas lamps, and fluorescent mercury vapour lamps [4].

SODIUM VAPOUR LAMP: This consists of two electrodes and certain sodium together with the small amount of neon gas at a pressure of 10mmHg and 1% of argon whose main function is to reduce the initial ionization potential. The discharge is first started in the neon gas which gases out radish colors. After few minutes, the heat of discharge through the neon gas becomes sufficient to vapourise sodium and then the discharge passes through the sodium vapour. In this way the lamp starts ist normal operation, emitting its characteristic yellow light.

HIGH PRESURE MERCURY VAPOUR LAMP: Like sodium vapour lamp this lamp is also classified as electric discharge lamp in which light is produced by gaseous conduction. Such a lamp usually consists of two bulbs, an arc tube containing the electric discharge and an outer bulb which protects the arc tube from charging in temperature. The arc tube contains a small amount of mercury and argon gas [3].

FLUORECENT MERCURY VAPOUR LAMP: A fluorescent lamp consists of a glass tube internally coated with suitable fluorescent powder. This contains a small amount of mercury along with argon whose function is to facilitate the starting of the arc. There are two sealed electrodes at each end of the tube. The two basic types of electrodes used in fluorescent lamps are:

1. the coated coil tungsten wire type. It is used in standard pre-heat, rapid restart, instant start lamps e.t.c.
2. the inside coated metal cylinder type which operates at a lower and more even temperature than the tungsten type and it is called cold cathode. Fig. 2.2 shows the fluorescent lamp [4].

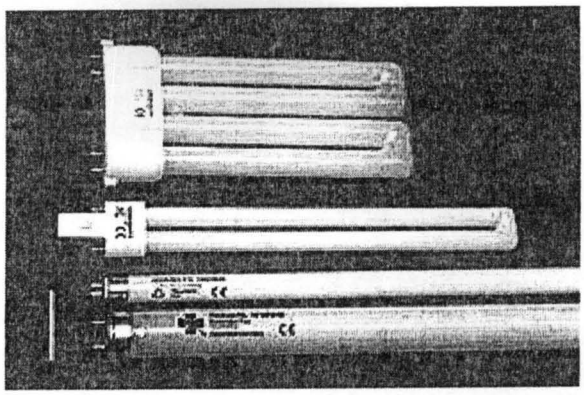

Fig. 2.2: Fluorescent Lamp.

LIGHT EMITTING DIODE (LED): This is a semi conductor light source. LEDs are used as indicator or lamp in many devices and are increasingly used for lighting. The LED was introduced as a practical electronic component in 1962. Early LEDs emitted lights of low intensity but modern versions are available across the visible ultraviolet and infrared wavelengths, with very high light intensity. An LED is often small in area, less than $1mm^2$ and integrated optical components may be used to shape its radiation pattern. Fig. 2.3 shows the light emitting diode [6].

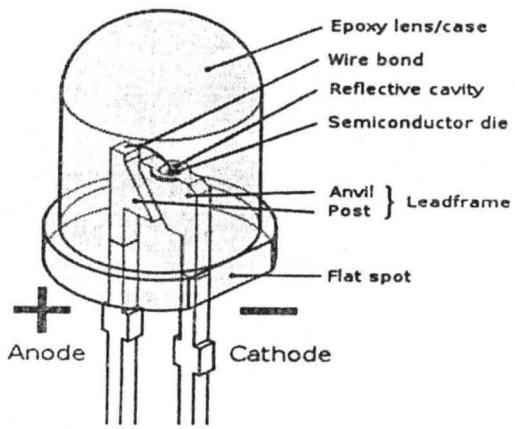

Fig.2.3: Light Emitting Diode

Tables 2.1, 2.2and 2.3 shows the advantages of using Light Emitting Diodes over Incandescent, fluorescent, and mercury vapour lamps respectively.

Table 2.1: Advantages of using Light Emitting Diode over Incandescent lamps.

LED	INCANDECENT
Lights ON automatically	Becomes momentarily off when the supply goes off.
Low running cost	Running cost is high.
Change of supply voltage does not affect their output or lifespan in any way.	Change of supply voltage affects their output and lifespan in much ways.
Does not produce heat	Produces heat

Table 2.2: Advantages of using Light Emitting Diode over Fluorescent lamps

LED	FLUORESCENT LAMP
Cost of installation is minimum	Maximum cost of installation
Change of voltage does not affect their starting.	Change of voltage affects their starting.
Frequent switching does not affect their life span.	Frequent switching affects their life period.
Works even at low voltages	Requires high voltages.

Table 2.3: Advantages of using Light Emitting Diode over Mercury vapour lamps

LED	MERCURY VAPOUR LAMP
Starts instantly	Takes 5 – 6 minutes for starting
Starts automatically when there is power failure.	When it goes off, it cannot be restarted after the voltage recovery, until the pressure falls to normal.
Change of voltage does not affect their starting time.	Change of voltage affects their starting time.
Cost of installation is minimum	Cost of installation is high.

CHAPTER THREE

3.0 DESIGN AND INPLEMENTATION

3.1 PRINCIPAL OF OPERATON

As the name implies, an Automatic emergency lighting system is a system designed to operate automatically independent of power supply because of the 9v rechargeable battery that was build in which power the system when ever there is power supply failure. Also this system was design and operate in such a way that it can sense the area to be illuminated and make decision either to light ON or turn OFF automatically, that is when ever the system sense darkness in the area in which to be illuminated the system will turn ON automatically and if the area to be illuminated by the system has light the system turn OFF. This feature helps to preserved energy and reduces waste. Fig. 3.1 shows the block diagram of the system.

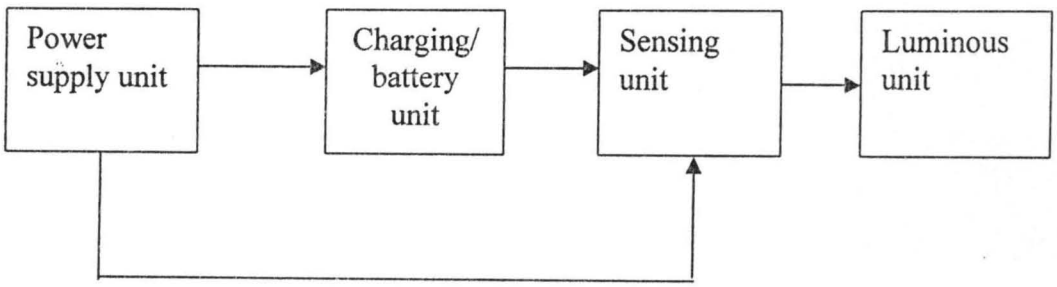

Fig. 3.1 System Block Diagram

3.2 POWER SUPPLY

The power supply unit is one of the significant sections of the circuit in which the transformer takes in voltage from the source and sends out the voltage either by stepping it up or stepping down.

The power supply is the input of the circuit which comprises of transformer, rectifier, and filter capacitor. The power supply circuit is in electronic equipments. And the function is to give appropriate amount or value of voltage or current to the part of the circuit. The power supply unit converts alternating current energy in to direct current energy, which is taking to the circuit and to the rest of the equipment (component). The transformer use in this project is step down transformer (primary voltage is greater than secondary voltage) of 230v -12v, 500mA.

3.2.1 TRANSFORMER

A transformer is a static or stationary piece of apparatus by means of which electric power in one circuit is transformed into electric power of the same frequency in another circuit. It can raise or lower the voltage in a circuit but with corresponding decrease or increase in the current. It consists of two coil winding primary and secondary. The first coil in which the electric energy is fed from the ac supply mains is called primary winding and the other from which the energy is drawn out is called secondary winding.

In this design a 230V a.c is supplied through the input of the transformer that is primary side and is step down to 12v at the secondary side of the transformer which is connected to the rectifying and smoothing unit.

3.2.2 RECTIFIERS

The process of converting alternating current A.C voltage into direct current D.C voltage is called Rectification. The rectification takes place through the bridge rectifier by converting the 12v ac to the 12v dc with help of electrolytic capacitor which filter the ripple voltage and then send it to the remaining circuit.

The diodes which are use as rectifier, convert energy from AC source to DC energy which needed for normal operation of the circuit. There are different rectification circuits commonly used:

1. Half wave (one diode) rectifiers
2. Full wave (two diode) rectifiers
3. Full wave bridge rectifiers

FULL WAVE BRIDGE RECTIFIERS: A full wave rectifiers is used in this project which is needed when there is need for high power output from a rectifier. In this type of rectifier, four (4) diode are used and are connected head to head, thus does not require center tap transformer.

ADVANTAGES

1. The bridge circuit uses only half the number of secondary turns for a given mean load voltage.
2. For a given diode peak inverse voltage rating, twice the mean output voltage can be obtained from it since, the peak inverse voltage encountered is Vm compares to 2Vm for full wave rectifier. Fig. 3.2 shows the Full Bridge Rectifier

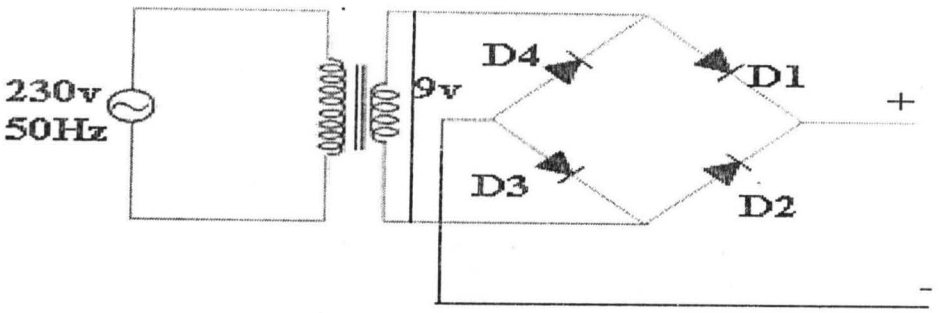

Fig. 3.2 Full Bridge Rectifier

3.2.3 FILTER CAPACITOR

A filter is a network use to shave a frequency spectrum of electrical signal. In this project a filter capacitor is used since the resulting output of either half wave or full wave rectifier is pulsating voltage. Before it can be applied to other circuit in a radio or television receiver the pulsation must be renowned to a negligible amount. Hence, pure direct current is desirable. A capacitor connected across the output of the rectifier provides some filtering action.

Electrolytic capacitor is used for this purpose because large capacitance is needed in a limited space. Hence a pure D.C is obtained at the output to supply the electronic circuit. Fig. 3.3 shows the Filtered DC signal.

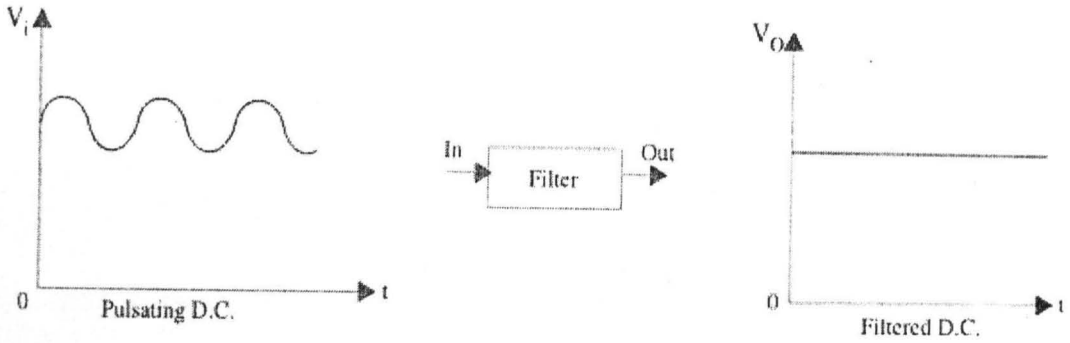

Fig. 3.3 Filtered DC Signal

A capacitor is use as a filter and has basic property of opposing charges in voltage and hence the high the capacitor the smaller the ripple factor. It is found that an increase in size of capacitor will;

1. Increase the DC voltage toward the limiting value of peak rectifier output.
2. Increase the peak current of the diode.
3. Reduce the magnitude of ripple voltage
4. Reduce the time of flow of current pulse through the diode.

CALCULATIONS:

Vp-p = primary peak voltage

Vip = peak rectifier output

Vdc = DC value of load voltage

Idc = DC volue of load current

Vdiode = Diode voltage

F= frequency

C = Capacitor

γ = Ripple factor

Therefore

$$Vdc = 2Vp\text{-}p/\pi \quad (1)$$

$$= 2 \times \frac{24}{3.142}$$

$$= 15.27v$$

$$I_{dc} = \frac{2I_{p-p}}{\pi} \quad (2)$$

$$= 2 \times \frac{0.5}{\pi} = 0.318A$$

$$= 318mA$$

$$V_{ip} = V_{dc} - 2V_{diode} \quad (3)$$

$$= 15.27 - 2 \times 0.7$$

$$= 13.8v$$

$$Ripplefactor = \gamma = \frac{1}{4\sqrt{3fCR_L}} = \frac{1}{4\sqrt{3fCV_{ip}}} \quad (4)$$

$$= \frac{318 \times 10^{-3}}{4\sqrt{3} \times 50 \times 1000 \times 10^{-6} \times 13.9}$$

$= 0.066$

$= 6\%$

3.3 CHARGING UNIT

Charging section is a section which charges the 9V battery used in the circuit which power ON the system during power failure from the source. This is archive with the help of regulator and zener diode which regulate the voltage and prevent the battery from over charging.

3.3.1 REGULATOR

A regulator is an electronic control circuit which is capable of providing a early constant D.C output voltage even when there are variation in load or input voltage. Regulated power supply can be obtained by using voltage regulator circuit. A fixed positive linear voltage regulator IC 7812 is used in this project for the regulation purpose and 12V regulated voltage was obtained.

The DC Power Supply circuit is based around the 7812 voltage regulator. It has only 3 connections (input, output and ground) and it provides a fixed output. The last two digits of the part number specify the output voltage, eg. 05, 06, 08, 10, 12, 15, 18, or 24. The 7800 series provides up to 1 amp load current and has on-chip circuitry to shut down the regulator if any attempt is made to operate it outside its safe operating area. If this happens, the chip cool down and attach the heat sink. Fig. 3.4 shows LM7812 Configuration.

To calculate the output of the regulator;

$$V_{out} = V_{f\,ixed} + [\frac{V_{fixed}}{R_1} + I_q]R_2 \quad (5)$$

Where;

Vout = output voltage of regulator

V_{fixed} = fixed voltage of regulator =12v

R_1 = 1.2k ohm

R_2 = 16 ohm

$$V_{out} = 12[\frac{12}{1.2k} + 1]16$$

$$= 28.16v$$

3.3.2 ZENER DIODE

Zener diode is similar to, but also different from other silicon PN junction diodes. Zener diode is similar because both these type of diode are made from P and N material. However, they differ because in zener diode the P and N material is doped so that it can be use in reverse direction. A typical PN junction allow current to flow in forward direction when about 0.7V is across it, causing forward bias.

Generally, a PN junction diode is found in a rectifier circuit where it passes only one direction of current flow from an AC signal. Current s blocked when a junction PN is reverse biased, unless the reverse voltage reaches the breakdown level, which is usually around 5V. However the zener diode is designed to perform a different task. It is use in it reverse direction so that current will flow through it when a particular voltage reverse biases the zener diode. Like PN junction diode, the zener diode allow current flow when about 0.7Vis cross it in the forward direction.

Zener diode usually put in parallel with other component requiring voltage regulation or protection. In this project the zener diode was selected to protect the battery and load from too much current since the load circuit will be destroyed if voltage across it is greater than 9V. While the voltage applied is less than 9V the zener is like an open switch and all the current will flow trough the load. However when voltage applied reaches 9V the zener act as a closed circuit so that little current can flow through the load. This is how zener protect the the load circuit. Fig. 3.5 shows the Charging Circuit with LED Indicator.

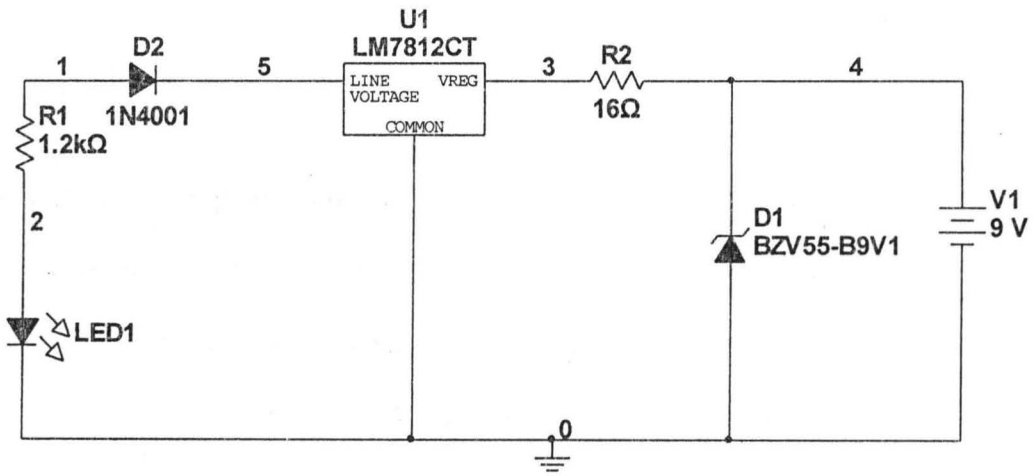

Fig. 3.5 Charging Circuit with LED Indicator

3.4 SENSING UNIT

This is a unit that controls the lighting condition of the system, that is either the system to turn ON or OFF as the case may be depending on the nature of the area to be illuminated by the system. This light control is enabling by the help of a semi conductor device called light dependant resistor (LDR) in a monostable mode of 555 timers IC.

3.4.1 LIGHT DEPENDANT RESISTOR:

This is a semi conductor device whose resistance varies inversely with the intensity of light that falls upon it, which is also known as photo resistive cell because it operates on the principal of photo resistivity.

The resistivity of a semiconductor depends on the number of free charge carrier available in it. When the semi conductor is not illuminated, the number of charge carrier is small and sensitivity is high, but when light strikes the semiconductor, each photon deliver energy to it. If the photon energy is greater than the energy band gap of the semi conductor, free mobile charge carriers are librated and as a result, resistivity semiconductor decreased. Many semi conductor devices such as photo resistor make use of light sensitivity and are designed to be use as light detecting device. When light falls on a semiconductor material some of it is absorbed. The energy that is impacted produce an electron hole pair, and free electron and hole are available for carrying current through a semi conductor reducing the electrical resistance and hole usually formed in value band which is current flows. The amount of energy delivered by the light falling at the semi conductor is important, and since light of different wavelength provide different amount of energy, the semi conductor are selected based on the frequency of light they respond to. Photo conductive cell are generally

made of calcium compound such as cadminium sulphide (CDS) and cadminium selenide(SDS). Fig. 3.6 shows Light Dependant Resistor.

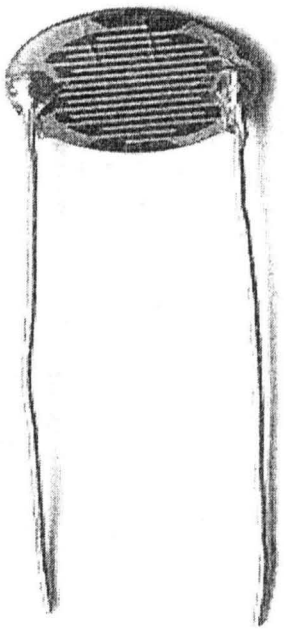

Fig. 3.6 Light Dependant Resistor (LDR)

3.4.2 555TIMER IC

The 555 Integrated Circuit (IC) is an easy to use timer that has many applications. It is widely used in electronic circuits and this popularity means it is also very cheap to purchase, typically costing around N 50. For the 555 timer to function it relies on both analogue and digital electronic techniques, but if we consider its output only, it can be thought of as a digital device. The output can be in one of two states at any time, the first state is the 'low' state, which is 0v. The second state is the 'high' state, which is the voltage Vs

(The voltage of your power supply which can be anything from 4.5 to 15v. 18v absolute maximum). The 9v supply is use in this project.

The most common types of outputs can be categorized by the following (their names give you a clue as to their functions):

- Monostable mode: in this mode, the 555 functions as a "one-shot". Applications include timers, missing pulse detection, bounce free switches, touch switches, frequency divider, capacitance measurement, pulse-width modulation (PWM) etc
- Astable - free running mode: the 555 can operate as an oscillator. Uses include LED and lamp flashers, pulse generation, logic clocks, tone generation, security alarms, pulse position modulation, etc.
- Bistable mode or Schmitt trigger: the 555 can operate as a flip-flop, if the DIS pin is not connected and no capacitor is used. Uses include bouncefree latched switches, etc.

In this project the monostable mode were used. A monostable circuit produces one pulse of a set length in response to a trigger input such as a push button. The output of the circuit stays in the low state until there is a trigger input, hence the name "monostable" meaning "one stable state". his type of circuit is ideal for use in a "push to operate" system for a model displayed at exhibitions. A visitor can push a button to start a model's mechanism moving, and the mechanism will automatically switch off after a set time. Fig. 3.7, 3.8 and 3.9 shows 555 timer output waveform in monostable mode, 555 timer, and 555 timer configuration respectively.

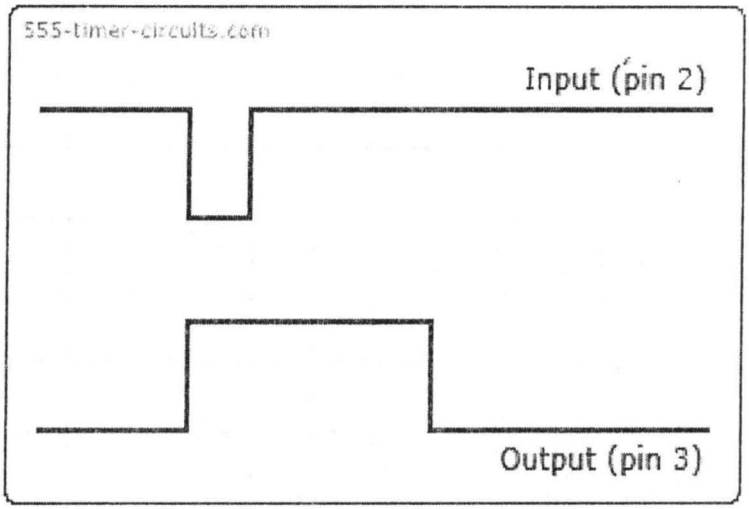

Fig. 3.7: 555 Output Waveform In Monostable Mode

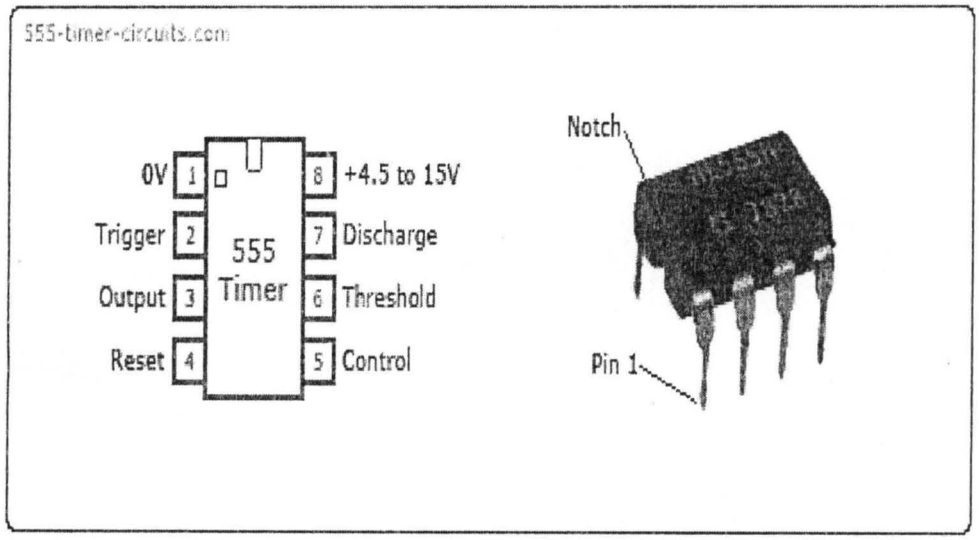

Fig. 3.8: 555 Timer

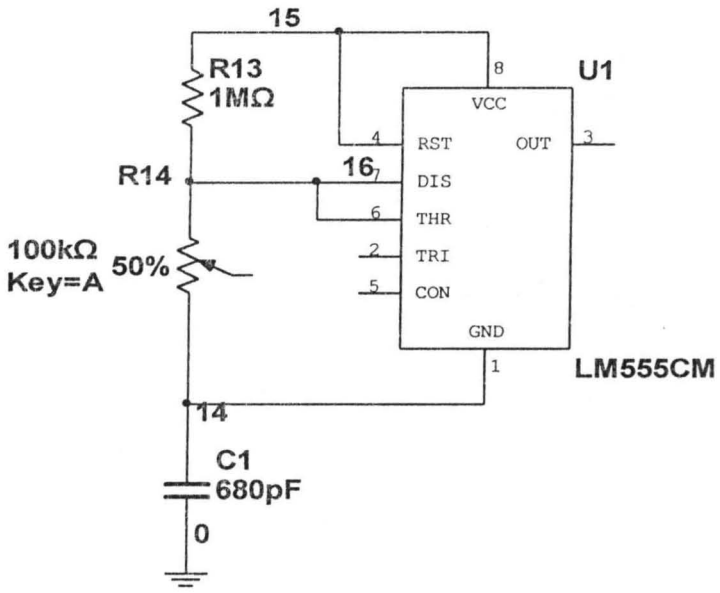

Fig. 3.9: 555 Timer Configuration

Calculations:

t_1 = time interval 1

t_2 = time interval 2

F = Frequency wave output

$T = t_1 + t_2$

R_a and R_b are resistors

C = capacitor

$t_1 = 0.7RbC$ (6)

$t_2 = 0.7(Ra + Rb)$ (7)

take Ra to be infinity, R_b = 100k and Capacitor = 680pf

$t_1 = 0.7(100\ 000) \times 680 \times 10^{-12}$

= 476mS

$t_2 = 0.7(100000 + \infty)\ 680 \times 10^{-12}$

$= 476mS$

$t_1 = t_2 = T$

Therefore time interval remain the same and hance no trigering from the timer and ther

be no light at the luminous position.

When $R_a = 1000k$ and R_b is varied to 47k

$t_2 = 0.7(1000 \times 10^3 + 47 \times 10^3) \times 680 \times 10^{-12}$

$= 49.8mS$

$T = 49.8 + 476 = 525.8mS$

$$F = \frac{1}{T} = \frac{1}{525.8} = 1.9Hz$$

Hence every output of a wave form takes 525mS and 1.9HZ to triggered and the LED

ON.

When LDR senses light its resistivity will increase to the resistance greater than resistance value of the variable resistor, therefore the timer will not triggered and LEDs will not light ON. But when the LDR does not sense any light the variable resistance value is greater than that of LDR therefore the timer triggered and the LEDs light ON automatically. Fig. 3.9.1 shows the LEDs connection.

Calculation; Vs= 9V, R = 1KΩ, V_d = diode voltage = 0.7

$$I = V_S - \frac{V_D}{R}$$

$$= 9 - \frac{0.7}{1000} = 8.3mA$$

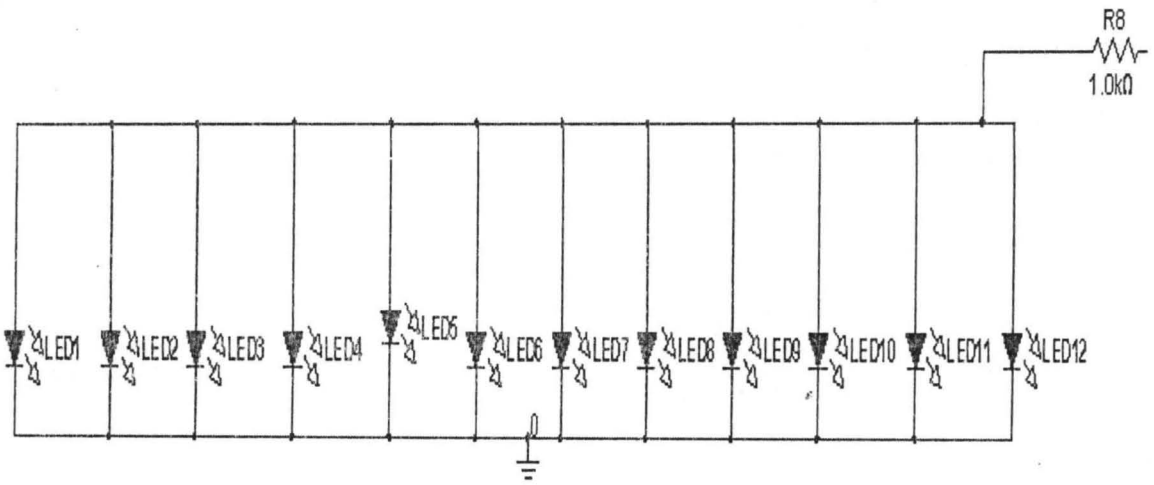

Fig. 3.9: LEDs Connections

3.6 GENERAL CIRCUIT DIAGRAM

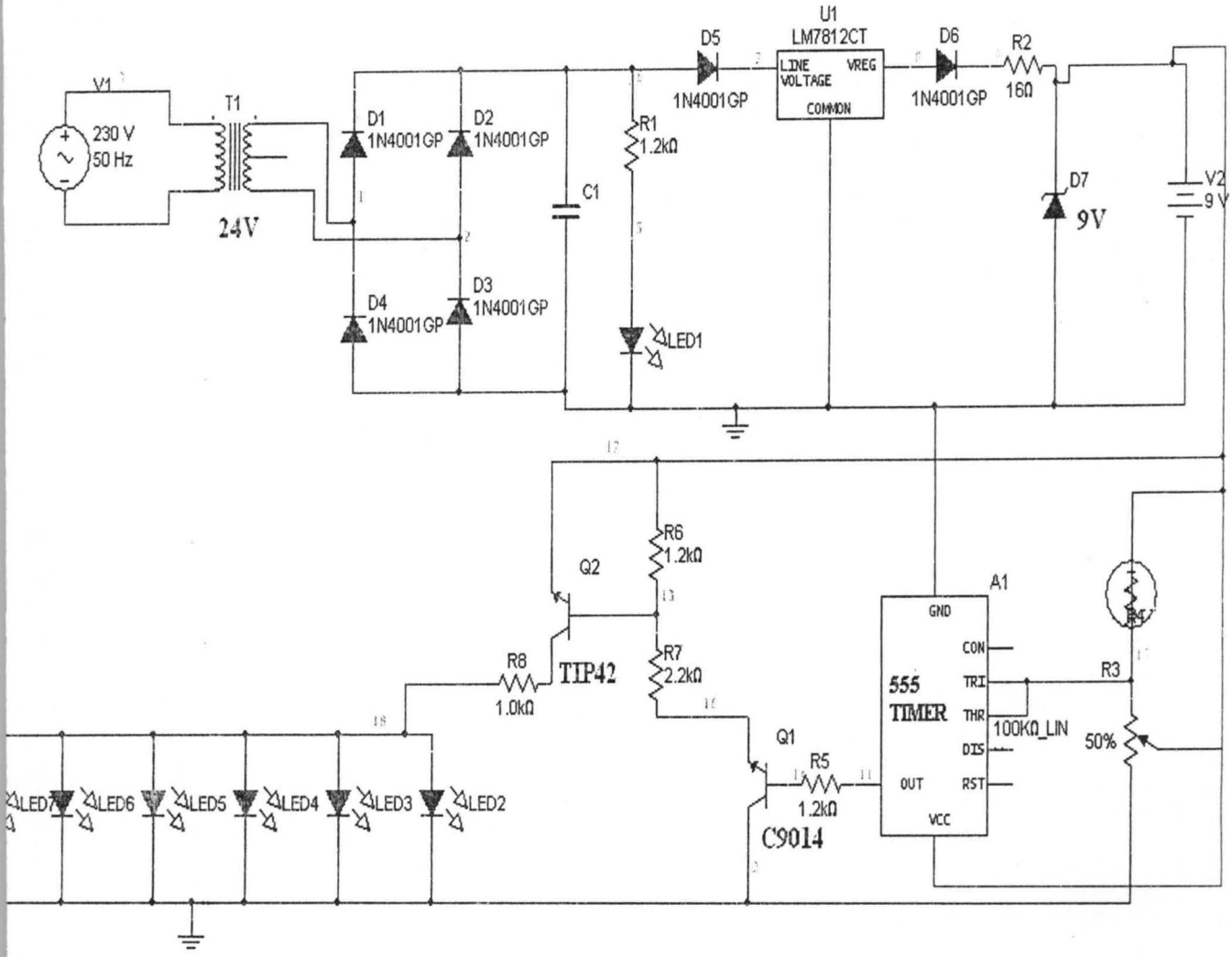

Fig. 3.10: General Circuit Diagram

CHAPTER FOUR

4.0 TEST, RESULT AND DISCUSSION OF RESULT

This chapter contain the steps taken to test the work, result obtain after various steps and final result which was combine together to makes up complete work, photograph of various section of the work and discussion of result are also in this chapter.

4.1 TESTING OF COMPONENT AND SECTIONS OF THE PROJECT

During the construction of this project the voltage rectifier was first constructed and tested to determine the voltage value with the use of digital millimeter. Also voltage regulation unit, voltage that charge the battery, supply current, LDR if there is shadow (no light), LDR if there is no shadow (light) were also tested.

The entire test was made with open circuit and short circuit. Testing of various components was consistent before and after coupling both on the breadboard and Vero board that is after soldering. Also different sections that were couple together to make of the project were tested and recorded. The table 4.1 shows the sections tested and the result obtained

In the case of light dependant resistor (LDR) the 555 timer was confirm operating in monostable mode and the variable resistor (potentiometer) was adjusted till the aim were achieved (required result) that is the sensor (LDR) can sense light and respond base on the nature of the area to be illuminated, as shown on the table 4.1 of the result.

4.2 RESULT

After all the test were conducted the result obtain were noted and recorded, that is each section of the project was carefully measured and corresponding result is displayed on the table 4.0.

Table 4.1: Results obtained at various sections tested

SECTION TESTED	RESULT OBTAINED
Power supply unit	15.23V
Voltage regulation unit	10.2V
Voltage charging the battery	10.2V
Supply current	318mA
LDR if there is no light (shadow)	Light turns ON
LDR if there is light (no shadow)	Light turns OFF

4.3 DISCUSSION OF RESULT

As seen in the table 4.0 above that record all the result obtain from various sections that are coupled together to make up the project. All results were satisfied and confirmed the design values. Also coupling the whole sections together makes the system to work as design that is formed the automated lighting system that comes ON when ever it sense darkness to the area to be illuminated by the system, and the system automatically turn OFF when it sense light in the area to be illuminated.

The proper working of the system was archived due to the fact that the tested result confirms the design result.

CHAPTER FIVE

5.0 CONCLUSION, PROBLEMS COUNTERED AND RECOMMENDATION

This consist of conclusion of the project, problems encounter from the conceptualization stage the final stage of the project, and recommendation

5.1 CONCLUSION

Having carried out all design and construction analysis and test, the result obtain from testing of individual sections confirmed with the result in the design value. A conclusion of the existence of an automated system with following features were made;

1. Automatically turn ON or OFF regardless of the supply.
2. Conserved energy since the system do not supply light where there is light.
3. Uninterrupted supply since users do not notice the power failure.
4. The system use LEDs as alighting source instead of incandescent lamp or other lighting source therefore do not produce heat.
5. Eliminate manual use of switch to ON/OFF

5.2 PROBLEMS ENCOUNTER

From the conceptualization stage to the final stage of this project I encountered a series of problems which was later solve as a result of thorough research, testing and studying. Some of the problems encounters are;

1. During the construction some of the component gets burst when the circuit was powered for testing due to high current or voltage which the component can not withstand.

2. Difficulty of charging the battery which was later found that supply voltage that is needed to charge the battery is less than battery rating.

3. I also encountered problem of installing light dependant resistor (LDR)

4. Almost half of the components were burnt because of the heat during soldering process.

5.3 RECOMMENDATION

Considering the present situation of continuous power failure in Nigeria I recommend that this system should be improved and be install in areas where light failure cause an interruption or even an embracement such as theater room, football field, occasion halls, library e.t.c.

Also the system should be improved by using a solar system to charge the battery instead of electric supply, so that even people in the rural areas where there is no power supply can make use of it.

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